

HEALTH SERVICE EXECUTIVE SOUTH EASTERN AREA



Feidhmeannas Seirbhíse Sláinte
Health Service Executive

Wound Management Guidelines

Nursing and Midwifery Planning and Development Unit

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Disclaimer:

Each situation must be judged on its own merits and it is unreasonable for readers to follow instructions in the guideline without proper assessment of individual circumstances. The information contained within this guideline is the most accurate and up to date, at the date of approval.

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1.0 Purpose

- 1.1 To set out guidelines which safeguard the patient and guides staff in caring for patients who present with a wound.
- 1.2 These guidelines have been developed in response to the need to standardise the wide variety of treatments used in the management of wounds and the urgency of ensuring that practice is based on the best evidence available.

2.0 Policy

- 2.1 The Health Service Executive South Eastern Area is committed to ensuring that patients with a wound receive optimal and expert care.

3.0 Applies to

- 3.1 All registered nurses/midwives with An Bord Altranais who are employed in Health Service Executive South Eastern Area.

4.0 Definitions

Leg Ulcer:	A leg ulcer is defined as a loss of skin below the knee on the leg or foot, which takes more than 6 weeks to heal” (Dale 1983).
Pressure Ulcer:	The terms pressure sore/ulcer or “decubitus ulcer” are used to describe any localised area of damage to the skin and underlying tissue, caused by direct unrelieved pressure, shearing forces or friction occurring most commonly over a bony prominence.(Barton 1981)
Wound:	A wound is defined as a disruption of tissue integrity that is typically associated with a loss of substance. (Sedlarik 2003)

5.0 Responsibilities

- 5.1 It is the responsibility of all registered nurses/midwives employed in the Health Service Executive South Eastern Area to read and comply with these guidelines.

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Introduction

Wound Management can be described as the pursuit of the permanent, functional and aesthetic healing in the patient's wound through the promotion of physiological healing and the prevention or elimination of factors – whether local, systemic or external - that disturb healing.

Good wound management focuses not only on the closing of the wound by procedures and dressings but also upon the mental and physical comfort of the patient throughout the process of healing.

This guideline is divided into the following sections:

- Documentation of Wound Management
- General Wound Management - Quick Reference Guide
- Wound Care
- Leg ulcer management
- Pressure ulcer Management.

This document builds on the extensive work previously undertaken in the region, which provided the foundation for these guidelines.

7.0 Dissemination and Implementation Plan

7.1 These guidelines will be disseminated locally through the development committee and the relevant nursing personnel.

7.2 It is the responsibility of all ward / line managers to bring these guidelines to the attention of nursing and midwifery staff.

7.3 Ultimately, it is the responsibility of each individual practitioner to ensure they are familiar with current best practice guidelines (An Bord Altranais 2000).

8.0 Resource Implications

8.1 In-service training will be provided in each local service.

9.0 Revision History

Date	Review No.	Change/s	Ref. Section

Replaces:

South Eastern Health Board (2000) Guidelines for the management of patients with leg ulcers.

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10.0 Evaluation / Audit

The content and structure of the guideline will be evaluated and audited in 2 years from the date of approval.

An audit tool is being developed which will assist with the auditing of the guidelines that are due for revision in two years.

11.0 Documentation of Wound Management

Accurate, detailed, concise and factual information regarding the treatment of wounds/pressure ulcers is an essential part of wound management.

11.1.1 Why is documentation necessary?

- To provide accurate and concise information regarding the patients wounds/pressure ulcers
- To judge improvement or deterioration in the patients wound/pressure ulcer
- To provide evidence that care has been planned and administered to the patient
- To communicate important information about the patient to our colleagues

11.1.2 General principles of documentation apply when documenting wound management

- All entries must be legible, dated, timed and signed
- All records including wound assessment charts (Appendix 1) must contain the patients name and chart number/identifier number
- Mistaken entries are corrected with a line drawn through them – mistaken entry is written and entry is signed
- The twenty four hour clock must be used
- Symbol's such as +++ to described exudate from wounds should not be used, instead use measurement terms – soak 2 swabs (size) in \pm hours
- Abbreviations must be documented according to the Regional Guidelines on Record Keeping (South Eastern Health Board 2001).
- Vague terms like 'healing well' should be avoided – describe the improvement, for example 'raw' – describes how the wound and surrounding area look. 'Appears to be' is a subjective term – be objective *it is* or *it isn't*
- Change of treatment and reason for this must always be documented

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- Advice given to the patient regarding their wounds/pressure ulcer must always be documented

On discharge, document:

- The advice given to patient and/or next of kin
- If a patient is transferred to another hospital or institution the transfer form must include details of wound management – include photocopy of wound assessment chart if applicable
- The information given to the General Practitioner/Public Health Nurse

Specific documentation relating to wound management

- Wound assessment tool's where appropriate should be used
- Tracings/photographs taken of wounds should always have the patient's name and identifier number, date & time taken, recorded on them. (Patient's consent should be obtained and recorded prior to photographs being taken). Tracings/photographs should always be taken prior to discharge and placed in the patient's chart.

11.1.3 Documentation in Wound Assessment

Wound assessment is an important part of wound management as 'without a thorough assessment individualized nursing care cannot exist, as there is no knowledge base about the patient from which to identify problems and plan care (Walsh 1989).

Plan of care should be documented and include:

- Any pain the patient experiences and interventions taken to relieve pain
- Interventions carried out to manage the wound/pressure ulcer such as dressings/pressure relieving devices etc.
- Frequency of intervention – do not write twice weekly – specify the days
- Factors that may delay healing such as the patients physical illness, past medical history, psychological illness, nutritional status should always be documented
- Document patients response to intervention and preferences they have regarding wound management

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The care plan must be relevant, solutions identified must alleviate or control the problem, and the solutions identified must be realistic. The care plan must be reviewed at each wound dressing or when there is a change in wound / pressure ulcer.

11.1.4 Progress notes

The progress notes should be based on the care plan. Documentation in the progress notes should include:

- If there was any deviation from the care plan and why
- New treatment orders
- Change in the patient 's condition
- Any tests or procedures relating to wound management, which were carried out.

It is important that all health care professionals practice good documentation of wound management in order to ensure that care and treatment can be communicated to everyone involved, especially the patient.

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12.0 General Wound Management - Quick Reference Guide

Recommendations

General infection control measures should be instigated during wound care procedures such as hand washing, wearing gloves and aprons.

Assessment

Assessment in wound care provides us with a baseline, which then becomes the basis for care and treatment. It should include:

- An overall assessment of the patient as a whole- as wound healing is affected by a number of physical, psychological and social factors.
- Identifying the aetiology of the wound- as underlying pathology will guide treatment.
- Tissue type in the wound bed-as this will indicate the stage of healing and will guide treatment objectives and dressing selection. Can be described in terms of colour:
 - PINK -EPITHELIAL
 - RED -GRANULATION
 - GREEN -INFECTED
 - YELLOW -SLOUGH
 - BLACK –NECROTIC
- Exudate levels-will guide dressing selection. Colour, odour and level of exudate will give indications to how the wound is progressing.
- Size and dimensions-measurement of the wound allows monitoring and evaluation of the healing progress. In clinical practice the easiest way to do this is by measuring the surface area of the wound, by calculating the maximum length and breadth of the wound or by tracing the surface of the wound. Photography can provide us with a baseline or template to compare or observe changes in the wounds status.
- Signs of infection -be alert to the clinical signs of infection. Wound swabs should not be routinely performed and should only be saved as a result of assessment and the suspicion that the wound is infected. Asepsis should be maintained during collection of swabs. All relevant information should be recorded on laboratory forms and specimen sent to laboratory as soon as possible.

Guidelines for specimen collection

- Collect the specimen using a sterile technique.
- The wound should be cleaned with a sterile non-antiseptic solution.
- Moisten the swab applicator with normal saline prior to swabbing the wound.
- Rotate the sterile swab applicator in 1 cm² of clean tissue in the open wound, applying pressure to elicit tissue fluid.

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- Insert the swab tip into the sterile container taking care not to contaminate the specimen.
- Complete the laboratory slip giving all the relevant data i.e. wound site, pyrexia, antibiotic therapy etc as well as the date and patient details.
- Ensure the specimen container is also clearly labelled.
- Send the specimen to the laboratory as soon as possible. If unable to send to the laboratory within a short space of time, store in a specimen refrigerator at 4°C.
- Document in nursing notes that a specimen has been sent.
- Best practice regarding transporting specimens from outlining hospitals or community areas should be adhered to as per local policy.

Wound Cleansing

The purpose of cleansing is to remove debris, excess exudate, necrotic tissue, slough or foreign bodies from the wound.

- Wounds should not be routinely cleansed at each dressing change.
- Do not dry the wound bed after cleaning as this contradicts the principle of moist wound healing.
- Normal saline 0.9% at room temperature is the cleanser of choice.
- If another cleanser is used, document reason for this.
- Wounds should be irrigated rather than swabbed, using a 20 ml syringe and green needle.
- If bathing or showering is indicated for cleansing, the potential for cross infection should be addressed. The appropriate disinfectant should be used.

Nutrition

The nutritional corner stone to wound prevention and treatment is a well balanced diet. Malnutrition and specific nutrient deficiencies can delay wound healing and increase susceptibility to wound or systemic infection.

- A comprehensive patient assessment should include a nutritional component to assure the patients diet can adequately support wound healing.
- Factors such as age, weight, underlying clinical conditions, wound exudate, pyrexia, mobility should all be taken into consideration when assessing dietary needs.
- Steps should be taken to correct any malnutrition, and daily nutritional needs met. This should be done in conjunction with the dietetic services where possible.

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13.0 Wound Care

13.1 Definition

A wound is defined as a disruption of tissue integrity that is typically associated with a loss of substance. Deeper injuries to the muscle tissue, the skeletal system or the inner organs are defined as complicated wounds (Sedlarik 2003). Whatever the cause, size or shape of the wound, the physiological response of the body is to initiate a wound healing process (Scotter 2002).

13.2 Wound Healing

The body's normal response to injury follows a well-defined pattern that under normal circumstances leads to wound healing. It is characterised by a sequential change in the types of cells infiltrating the wound (Torrance 1983). All wounds no matter how they are caused, have to pass through the same process to achieve healing (Young 2001). Wound healing is usually divided into distinct phases which can overlap in time and cannot be separated from each other (Lippert 1999) and it is important that health care professionals are aware that many wounds might show evidence of more than one wound-healing phase concurrently (Small 2000).

The process of wound healing occurs through two mechanisms:

1. **Regeneration** – Damaged tissue is replaced by identical replication of cells. In humans complete regeneration is only possible in a limited number of cell types e.g. Epithelia and liver cells.
2. **Repair** – Damage tissue is replaced by connective tissue, which then forms a scar. In humans this is the main mechanism by which healing occurs.

The Repair process can be divided into 4 phases:

1. **Haemostasis:** (vascular response). This phase protects the body from excessive blood loss by platelet constriction, platelet activation and fibrin clot formation. This fibrin clot seals the injured blood vessels and initially fills the wound space. In addition a release of several growth factors necessary for wound repair occurs.
2. **Inflammatory phase:** Inflammation is part of the normal protective response to injury. It can be observed clinically by local signs of
 - erythema
 - heat
 - oedema
 - discomfort
 - functional disturbance

This is due to vasodilatation and accumulation of fluid in the soft tissues. White blood cells migrate to the wound and essentially prepare the wound bed for healing by removing debris and necrotic materials. In addition they stimulate a variety of substances including growth factors, which are necessary for wound healing.

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3. **Proliferative phase:** During this phase the wound is filled with new connective tissue. The processes involved are:
- Granulation
 - Contraction
 - Epithelisation

Granulation: the term granulation is used to describe the formation of new capillary growth which in turn supports the development of new connective tissue. Healthy granulation tissue is granular in appearance, is pink - bright red in appearance, moist shiny and does not bleed easily. Collagen is produced at this stage.

Contraction: the amount of contraction in a wound is dependent on its anatomical location and the degree of mobility of the surrounding tissue. It does not occur in sutured wounds where there is minimal tissue loss but plays a vital part in large wounds healing by secondary intention.

Epithelisation: only occurs when the surface of the wound bed is filled with healthy granulating tissue and is approximately level with surrounding skin. New cells originate from either the wound margin or from remnants of hair follicles and sebaceous or sweat glands. Newly formed epithelial cells are translucent in appearance and have a whitish pink colour.

4. **Maturation phase:** This is the final phase of wound healing, starting when the wound is fully resurfaced and lasting for up to one year or longer. The tensile strength of scar tissue is never more than 80% of that of non-wounded skin. Mature scar tissue is avascular and contains no hairs, or sebaceous or sweat glands.

(Morison et al 1997, Torrance 1983)

Wounds that progress through these processes in a timely and orderly fashion are referred to as acute wounds. Chronic wounds on the other hand do not progress in such a manner and may be stuck in a particular phase of wound healing.

Types of Healing

Wounds heal by one of the following mechanisms:

1. **Primary intention:** Wound edges are pulled together and secured by a variety of methods including sutures, skin tapes, glue, clips and staples. Primary closure requires minimal deposition of connective tissue for wound repair. Wounds usually heal quickly with minimal scar formation as long as complications such as infection are prevented (Waldrop and Doughty 2000, Collier 1996).
2. **Secondary intention:** this applies to wounds in which it would be difficult to bring the skin edges together successfully such as pressure ulcers and leg ulcers. These wounds are left open, with a suitable dressing applied, and heal more slowly through the combined processes of granulation, contraction and re-epitheliasation (Waldrop and Doughty 2000).
3. **Delayed Primary intention:** wounds that heal in this manner are initially left open, dressed with a suitable dressing and allowed to granulate for a few days due to complications such as wound infection or oedema. These wounds are then closed by primary intention or skin grafts once complications have subsided (Waldrop and Doughty 2000).

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Factors that may adversely effect wound healing:

In order for a wound to be managed in an appropriate manner it is important to understand the normal healing process and the factors that may affect this. Some of these factors will now be outlined.

Intrinsic Factors.

- *Age:* Age effects collagen synthesis, circulation and the rate of repair.
- *Diabetes:* Diabetic patients may have micro and macrovascular disease, which may cause a reduction in blood supply to the tissues. In addition the body's immune responses may be jeopardised affecting the inflammatory phase of wound healing. Susceptibility to wound infection is also increased if blood glucose levels are elevated.
- *Other disease processes:* any disease that effects tissue perfusion and metabolism is likely to delay the healing process. These include:
 - Cardiovascular disorders
 - Endocrine disorders
 - Anaemia
 - Metabolic Disorders
 - Cancer
- *Psychological issues:* Stress and anxiety can have a negative impact on the wound healing process and can delay healing (Kiecolt-Glazer et al 1995).

Extrinsic Factors:

- *Malnutrition:* Nutrition is essential for normal cellular activity and wound repair.
 - Protein requirements increase with illness and tissue damage. A deficiency can contribute to prolonged wound healing and collagen synthesis (Russell 2001)
 - Carbohydrates are required by the body for energy expenditure during cellular activity.
 - Iron is vital for the transportation of oxygen and is also required for collagen synthesis (Russell 2001).
 - Vitamin A is involved in the granulation and re-epithelisation stages of wound healing. It is also a co-factor in collagen cross linking (Reynolds 2001).
 - Vitamin C is an important constituent of many enzymes and is also important for the body's immune response (Reynolds 2001).
- *Drug Therapy:*
 - Corticosteroids reduce fibroblast and collagen synthesis and also suppress the inflammatory response (Morris and Malt 1994). Non-steroidal anti-inflammatory drugs and immunosuppressive drugs reduce white blood cell activity and therefore increase the risk of infection.
- *Smoking:* Nicotine increases the risk of atherosclerosis, reduces peripheral blood flow, inhibits epithelialisation and affects wound contraction (Sieggreen and Kline 2004).
- *Radiotherapy:* Can cause occlusion of the capillaries at the treated site and atrophy of the underlying tissues. It can also effect the proliferation of fibroblasts and endothelial cells (Cutting 1994)
- *Adverse conditions at wound site*
 - Excess exudate or slough
 - Necrotic tissue

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- Metabolic waste products
- Dehydration or local oedema
- Poor blood supply and local hypoxia
- Fall in temperature
- Wound infection
- Further trauma and foreign bodies
- *Poor Wound Care*
 - Inaccurate wound assessment
 - Improper use of topical agents and dressings
 - Careless dressing techniques
 - Lack of knowledge of staff

13.3 Assessment

The starting point in the assessment process is the general assessment of the patient as a whole. Only then will it be possible to maximise outcomes and ultimately improve the patient's quality of life (Rudolf 2002). Optimal healing occurs in a well-nourished individual who has competent immune responses and well-perfused tissues. Wound healing can be affected by a number of physiological, psychological and social factors, which can either, delay or prevent healing from occurring (Pudner 1997). Assessment is about collecting information, which then becomes the basis for care and treatment (Miller 1994). Assessment of the following characteristics is required:

- Overall health and any disease processes that are on going
- Mobility
- Nutritional status
- Sensory Functioning
- Cardiovascular status
- Pain
- Current Medication
- Anxiety, negative psychosocial factors
- Understanding of the wound's aetiology and the associated treatment (Morison et al 1997)

Assessing the wound

Bentley (2001) states that after the cause, aetiology and group of the wound have been established other factors to be alert to include:

- Tissue type
- Exudate
- Size and dimensions
- Signs of clinical infection and state of surrounding skin.

An example of a Wound Assessment Chart can be seen in Appendix One.

- **Tissue types.** These are usually described in terms of colour coding.
 - **Necrotic:** Black, dehydrated dead devitalised tissue that may cover the whole wound or be present as small patches at the base or margins of the wound
 - **Slough** is an accumulation of dead cellular debris, leukocytes and bacteria and rehydrated necrotic tissue

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- **Green Tissue:** Can be a sign of the presence of bacteria with associated malodour (colour may vary depending on invading organism)
- **Red Tissue:** Granulation is the term used to describe newly formed tissue in the wound bed. It is usually highly vascular connective tissue and presents as red moist uneven granular tissue
- **Pink Tissue:** Epithelialising is the stage of wound healing where epithelial cells migrate across the wound bed. It is characterised by the appearance of pink tissue at the wound margins or from the remnants of hair follicles in the wound bed
- **Exudate,** generally described as light, moderate or heavy. A knowledge of the level and type of wound exudate is extremely important, as in conjunction with the type of tissue in the wound bed will influence dressing selection and frequency of dressing changes.

Exudate should be assessed for volume, colour, consistency, corrosive effects and odour. Exudate levels vary with the type of wound present. Venous ulcers tend to produce more exudate than arterial ulcers. The colour and odour of the exudate may provide information on the bacterial balance in the wound.

Different dressing products are designed to manage different volumes of exudate. Dry or minimally exuding wounds require a dressing that will hydrate the wound and maintain a moist wound environment whereas moderate to heavily exuding wounds will require a dressing to absorb and manage excess exudate.

Assessing exudate

The amount of exudate is assessed based on wound appearance and surrounding skin. Inclusion of the amount of exudate in an assessment is only useful if a clear description is provided. When the wound is dry, there is no exudate. When the tissues are only slightly moist with no exudate in the wound bed, the exudate is described as low. The dressing may only require a change every 4-5 days. When the tissues are wet/saturated and there is exudate in the wound bed, exudate amount is described as moderate. The dressing may require a change every 2-3 days. When tissues are saturated and the wound is bathing in fluid, the exudate is considered to be large. Surrounding skin, if macerated, may be included. A daily dressing is usually required.

Size and dimensions

If treatment is to prove cost effective nursing staff must be able to monitor the size of a wound in order to assist in the evaluation of prescribed care. Wound healing is ultimately demonstrated by a reduction in wound size. The easiest way to do this is by assessing the surface area. This can be estimated by multiplying greatest breadth by greatest length (Miller 1994). Other materials that can be used include:

- A purpose made charting device e.g. Flexigrid
 - Acetate sheets
 - Clear packaging from a dressing pack
 - Clear plastic bags/gloves. (Flanagan 1994)
 - Videometry
 - Kunder Guage
 - Photography
- } consent may be required

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Wound Area

Tracing is one of the simplest and most popular methods of assessing the area of a wound.

- Trace the outline of the wound margin on to a clear plastic sheet using an indelible ink marker.
- To avoid the need to disinfect the tracing sheet, which has been in contact with the wound bed, a sheet of clingfilm can be used as the wound contact layer and the acetate sheet placed on top of it. The clingfilm can then be discarded leaving the acetate sheet clean and uncontaminated.
- The outline of the wound can then be transferred onto graph paper or a wound chart and charted together with the maximum diameters of the wound.
- Identify some local anatomical point so that the graph is positioned at the same angle in future.

Wound Depth

- To measure wound depth (the distance from the surface to the deepest point) a sterile flexible 6inch (15cm) cotton tipped applicator should be used.
- Carefully insert into the deepest point of the wound.
- With your thumb and forefinger grasp the applicator at the point that is level with the skin.
- Gently withdraw the applicator and measure from its tip to your fingers.
- If depth appears to vary, measure different areas of the wound bed to determine the deepest point.

Photography

The use of a camera in conjunction with accurate assessment is an extremely useful form of documentation. A number of factors will influence the success of the quality of the photograph:

- Standardisation: where a series of photographs is to be taken over a period of time, the same camera, focal length and lighting need to be used. Having a ruler or measure in the frame also helps.
- Equipment: ideally a medical Polaroid camera or a 35mm single-lens reflex is the camera of choice. A good quality colour film and a reputable film processor are needed.
- It is necessary to position the patient in the same way for each photograph.
- Lighting and background should be such that the wound can be seen clearly against an unobtrusive background. The ideal colour for the background is mid-grey (Morison et al 1997)
- Consent may be necessary
- Photographs should be stored in plastic covers in patients' notes.

13.4 Pain Assessment

In 1994 the International Association for the Study of Pain (IASP) defined pain as “an unpleasant sensory or emotional experience associated with actual or potential tissue damage, or described in terms of such damage”. The IASP noted that pain has many dimensions-social, mental and physical, each contributing to the individual's perception of and reaction to, a pain experience (Hall & Sykes 2004).

Communication skills on the part of both patients and staff are essential for obtaining accurate information regarding the patient's pain experience and for the successful management of pain. The

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single most reliable indicators of the presence and level of pain is the patient's self-report (Bulechek and McCloskey, 1999). The choice of words reflects the physical, psychological aspects of the pain as perceived by each individual.

Assessment of acute pain usually includes an evaluation of pain intensity or severity, for which a number of scales are available. The numeric rating scale (NRS) and the Faces Pain Scale (FPS) are easy-to-use self report measurement tools for assessing pain intensity in adults (Bulechek and McCloskey 1999). Substantial literature supports the reliability and validity of these instruments with adults. Careful explanation of the use of the instruments is necessary to promote patient understanding and accurate use of the tools.

Patient's who are unable to communicate their experience and needs, behaviours (e.g. grimaces, cries, protective posturing) and physiological measures (e.g. heart rate, blood pressure) can provide indirect measures from which presence and intensity of pain are inferred (Bulechek and McCloskey 1999). Therefore, pain must be regularly assessed and documented so that the appropriate pharmacological or non-pharmacological intervention can be evaluated.

Guidelines for the assessment of pain: using Pain Rating Scales

Note: It can be very difficult to convey the precise quality of such a complex and subjective experience of pain. The nurse may find that the use of an assessment tool useful to help the patient communicate his/her needs. When it is obvious that pain is severe a pain rating scale need not be used initially. Analgesia that is already prescribed is administered and a suitable time frame is allowed until the patient is better able to cooperate.

Assessment procedure

1. Discuss the word pain with the patient. Explain that it may have various characteristics such as aching, hurting, pulling, tightness or burning and may be mild or severe. Use the patient's own words/terms that describes pain.
2. Explain the purpose of a pain rating scale:
 - a. allows quick, consistent communication between patient and nurse
 - b. emphasises that the patient must volunteer information because the nurse may not know when the patient has pain. This step also helps establish a pain relief goal that is satisfactory to the patient.
3. Explain the specific pain rating scale (e.g., 0 to 10; 0 =no pain and 10 =worst pain imaginable. When a numerical scale is used, verify that the patient does not have speech or comprehension difficulties. If the patient does not understand the numerical pain scale try using the Faces Pain Scale Assessment Tool.
4. Ask the patient what pain rating would be acceptable or satisfactory while at rest and active in order to set a realistic, initial goal. Once the initial goal is achieved, the possibility of better pain relief can be considered, as a zero pain rating is not always possible.

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Emphasize to the patient that satisfactory pain relief is a level of pain that is noticeable but not distressing and that it enables him/her to sleep, eat, and perform other required or desired physical activities (Ackley and Ladwig, 2002).

(Appendix Two)

13.5 Identification of Infection in Wound Care

Wound infections can be problematic in clinical practice. They are costly in both human and financial terms. Wound swabs should not be routinely taken but should be the result of proper assessment of the wound and the suspicion that there may be infection present. A diagnosis of wound infection is made by using a combination of history, physical examination and laboratory results (Stotts 2000). Wound infection can have 2 effects:

- It can stop wound healing
- It can cause a host reaction

The detection of these host reactions allows the clinician to make a diagnosis of wound infection (Morison et al 1997).

Signs of clinical infection and state of surrounding skin

- Local swelling, heat, pain and / or redness
- Abscess formation
- Granulation tissue that is friable and bleeds easily
- Unexpected pain or tenderness
- Abnormal smell / malodour
- Wound breakdown or delayed healing
- Increased exudate / purulent discharge
- Pocketing at the base of the wound
- Systemic indications – pyrexia, rigours or tachycardia

(Casey 2000, Crest guidelines 1998, Cutting 1997, Morison et al 1997)

13.6 Guidelines for specimen collection

- Collect the specimen using a sterile technique
- The wound should be cleaned with a sterile non-antiseptic solution
- Moisten the swab applicator with normal saline prior to swabbing the wound
- Rotate the sterile swab applicator in 1 cm² of clean tissue in the open wound, applying pressure to elicit tissue fluid
- Insert the swab tip into the sterile container taking care not to contaminate the specimen
- Complete the laboratory slip giving all the relevant data i.e. wound site, pyrexia, antibiotic therapy etc as well as the date and patient details
- Ensure the specimen container is also clearly labelled
- Send the specimen to the laboratory as soon as possible. If unable to send to the laboratory within a short space of time, store in a specimen refrigerator at 4°C
- Document in nursing notes that a specimen has been sent

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- Best practice regarding transporting specimens from outlining hospitals or community areas should be adhered to as per local policy

Points to remember:

- Nearly all chronic wounds are contaminated with micro-organisms. Their presence in the wound does not indicate that the wound is infected nor leads to healing impairment.
(Kingsley 2001, Dow et al 1999, Tonge 1997)
- Diagnosis of a wound infection is based on the presence of clinical features and not on a positive swab result alone.
(Kingsley 2001, Stotts 2000, Cutting 1997)
- A wound swab is performed to confirm the presence of infection, to identify the causative organism and to identify the appropriate antibiotic treatment.
(Kingsley 2001, Stotts 2000)
- General infection control measures such as hand washing, wearing gloves and plastic aprons should be instigated during wound care procedures.

13.7 Wound Cleansing

Why cleanse a wound?

The purpose of wound cleansing is to remove debris, excess exudate, necrotic tissue, slough or foreign bodies from the wound bed as these can act as a foci for infection (White et al 2001, Bale and Jones 1997).

Points to remember:

- Wounds **should not** be routinely cleansed at each dressing change. Research has shown that wounds that are clean, healthy and free from debris do not require cleansing as this can damage fragile new tissue (Bale and Jones 1997).
- Wounds should not be dried after cleansing as this contradicts the principle of moist wound healing (White et al 2001, Bale and Jones 1997).
- General infection control precautions should be taken when caring for patients with wounds e.g. hand washing, wearing gloves and plastic aprons.

Cleansing solutions:

- Normal Saline 0.9% is the cleansing agent of choice for wounds that are not grossly contaminated. It is an isotonic solution and therefore does not donate or draw fluid from the wound bed (Morison et al 1997).
- Recent research studies have shown tap water of drinking quality to be as effective as sterile saline for dressing acute traumatic soft tissue wounds (Valanti 2001, Moscati et al 1998,

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Angeras et al 1992). However in the hospital environment, normal saline is the recommended cleanser of choice.

- There is much debate in the literature about the use of topical antiseptic solutions in wound care. The general consensus suggests cautious use of these chemicals in wound care, as their use is not justified in the majority of cases (Lawrence et al 1996). Therefore their use must be subject to a risk – benefit assessment of possible beneficial antibacterial action with possible local toxicity. (White et al 2001). A prescription may be required.

Cleansing Methods:

- Wounds should be gently irrigated rather than swabbed using a 20ml. syringe and a green needle. Swabbing with cotton wool or gauze is not advisable as fibres can be shed into the wound bed. Pressure from swabbing the wound can also cause damage to fragile new tissue (Bale and Jones 1997, Oliver 1997, Thomas 1993).
- Saline should be warmed to body temperature (37° C) as cold solutions cool the wound bed, cause vasoconstriction to occur, thereby slowing cellular division (Russell 2000). As this may be difficult to achieve in practice, cleansing solutions should be stored at a minimum of room temperature (Crest Guidelines 1998).
- Bathing or showering can be an effective method of cleansing chronic wounds such as leg ulcers. However the potential for cross infection should be addressed. Baths must be clean and dry both before and after use. The appropriate disinfectant should be used for cleaning baths at all times. (Refer to local hospital infection control policy).

13.8 Debridement

No wound can heal in an orderly fashion unless it is clean, healthy and free of infection. Debridement is a key to achieving this goal provided that

- The wound is adequately vascularised
- The proper antibiotics are used.
- All other medical aspects of the patient have been addressed (Attinger et al 2000).

Debridement is the removal of nonviable tissue from the wound bed. Various terms are used to describe devitalised tissue. Eschar is the term used to describe dead tissue that is dry, firm, and leathery in appearance. Necrotic is the term used to describe tissue that is brown or black in colour. Slough is the term used to describe devitalised tissue that remains soft and may be yellow or brown in appearance. Debridement is indicated for most wounds where nonviable tissue or foreign bodies are present. However there are two exceptions. Pressure ulcers on the heel, which are covered with dry eschar, should not be debrided, nor should dry stable ischaemic wounds until perfusion to the limb has been improved (Ramundo and Wells 2000).

There are four main methods of debridement. – autolytic, enzymatic, sharp and mechanical

Autolytic debridement: To some extent autolysis occurs naturally in all wounds. Macrophages and proteolytic enzymes in the wound bed liquefy and separate slough, necrotic tissue, and eschar from healthy tissue. This is a selective process. Autolysis is enhanced or supported by applying

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dressings that maintain a moist wound bed. Choice of dressing will depend on the condition of the wound bed, depth of wound and level of exudate produced and the patients overall condition.

Enzymatic debridement: defined as the topical application of ointments containing Proteolytic enzymes, which promote breakdown and separation of devitalised tissue from the wound base (www.woundsite.com). Wounds considered for enzymatic debridements encompass a variety of fluid content, microbial flora, pharmaceutical treatment and ph conditions that may affect the efficacy of an enzymatic debriding agent (Hobson et al 1998).

Sharp / Surgical Debridement is the removal of necrotic devitalised tissue by using a sharp instrument such as a scalpel, scissors, curette or forceps. Wounds with large quantities of necrotic debris are good candidates for surgical debridement (Sibbald et al 2000) but given the theoretic advantages of debridement it is possible other wounds may benefit as well. Control of pain during the procedure is important and can be accomplished with anaesthesia. It can be performed at the bedside and in more extensive cases in the operating room.

Mechanical debridement: This form of debridement physically removes debris from the wound bed. Examples are wet to dry dressings, irrigation, and whirlpool therapy.

Wet to dry dressings: This method consists of applying a saline moistened gauze dressing to the wound bed, which dries out, facilitating mechanical removal of devitalised tissue on dressing change. This is a non-selective method of debridement, which can cause damage to exposed healthy tissue and cause discomfort for the patient. It is mainly used in the USA.

Irrigation: This method involves the irrigation of the wound with a pressurised stream of fluid to remove debris and necrotic tissue from the wound bed. However delivering fluids under pressure may cause dissemination of wound bacteria over a wide area exposing the patient and carer to potential contamination.

Whirlpool therapy: This is another method of powered irrigation, used to loosen and remove necrotic tissue and debris from large wounds (Ramundo and Wells 2000, Morison et al 1997).

13.9 Nutrition and Wound Healing

The nutritional cornerstone to wound prevention and treatment is a well balanced diet. Many nutrients affect tissue viability and play a crucial role in wound healing. Malnutrition and specific nutrient deficiencies can delay wound healing and increase susceptibility to wound or systemic infection. This, in turn, can have significant effects in terms of increased morbidity and mortality.

Ensuring nutritional adequacy is therefore a vital aspect of wound care and the prevention and management of pressure ulcers and leg ulcers (Thomas 2001). Studies have shown that poor pre-operative nutritional status adversely affects wound healing, thereby delaying healing and increasing the risk of wound dehiscence (Cartwright 2002). Early dietary intervention can improve or accelerate wound healing (Marin et al 2002, Rai et al 2002). One of the main objectives of nutritional support in surgical patients is to enhance wound healing. Peri-operative nutritional

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support has been shown to reduce significantly the incidence of wound infections and to improve the rate of wound healing.

The effects of malnutrition include an impaired immune response to infection, loss of muscle power leading to immobility, predisposition to thromboembolism and bedsores and a prolonged recovery time. Wounds are a form of stress to the body, thus a number of nutritional factors need to be considered.

Nutritional Assessment

A comprehensive patient assessment should include a nutritional component to assure the patient's diet can adequately support wound healing. Nutritional treatment of wounds should be individualised, and will depend on many factors including age, weight status, underlying clinical condition, losses from the wound site, pyrexia, mobility and current nutritional intake.

When oral intake is inadequate or if the patient is physically or psychologically unable to eat, adjustments in the approach used to provide nutrition may be required (Smith and Griffin 2001). Early identification and treatment of malnutrition in risk groups will minimise the chance of patients developing wound complications, specific deficiencies or developing wounds such as pressure ulcers.

There are a variety of “**malnutrition screening tools**” available. However, before choosing a screening tool, the tool should show evidence of precision and repeatability in order to validate it e.g. Malnutrition Screening Tool (**MST**) (Ferguson et al 1999) and Mini Nutrition Assessment, (**MNA**) (Guigoz et al 1994). The use of screening tools by nurses during the admission process has been found to highlight those patients at risk and promote early dietary intervention.

Identifying patients with malnutrition or those who could develop malnutrition enables resources to be directed towards patients in most need and highlights those who would benefit from further nutritional assessment by the dietician (Cartwright 2002, McLaren and Green 1998).

Understanding the role of the various nutrients in healing provides the basis for assessment and therapy to optimise wound-healing outcomes (Williams 2002, Todorovic 2002).

Nutrients involved

Energy: - Weight loss and muscle atrophy, resulting from an inadequate energy intake, reduce the effectiveness of the subcutaneous tissue as a mechanical padding between bones and skin, and hence increase the likelihood of pressure ulcers.

An adequate energy intake is also essential in order to prevent dietary and tissue protein being used as a source of energy.

Obesity increases the risk of pressure ulcer development, as adipose tissue is poorly vascularised, resulting in decreased blood flow to the wound (Armstrong 1998), Gray and Cooper 2000). However, it should be emphasised that weight reduction diets should not be instigated until wounds have actually healed.

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Protein: -This is required for collagen synthesis and to prevent hypoalbuminaemia and oedema. The presence of oedema, particularly where the oedematous tissue extends through the wound opening, may aggravate protein losses. A large wound may lose 90-100g protein per day. During wound healing, protein requirements may rise to 1.2-2.0g/kg body weight/day in order to provide the protein necessary for synthesis and to achieve a positive nitrogen balance (Thomas 2001).

Zinc: - This is an essential co-factor in many enzyme systems. Low levels of zinc have been directly associated with poor wound healing and inadequate tissue repair (Brylinsky 1995). Supplementation has been shown to promote the wound healing process, but only in those who are bio chemically zinc deficient.

Iron: - Low haemoglobin levels may be present in patients with established pressure ulcers. Healing is delayed until this is corrected, since an adequate blood flow is essential at the site of the wound. Iron supplements should be given if a transfusion is not indicated.

Vitamin C: -Vitamin C is vital for collagen synthesis. When tissue levels are normal, wounds heal more effectively. However, mega doses have little effect in accelerating wound healing (Gray and Cooper 2002): in fact can have a detrimental effect on the body, increasing oxalate production, which may lead to kidney stones. Vitamin C is also an antioxidant and can therefore combat free radical damage.

Vitamin A: - This is necessary for normal inflammatory response and enhances tensile strength of wounds (Brylinsky 1995).

Vitamin K: -Vitamin K has a role to play in the formation of thrombin and deficiency could lead to the development of a haematoma (Gray and Cooper 2002).

Arginine and Glutamine: -These amino acids play an important role in many physiological processes. Under normal non-stressed conditions, the arginine & glutamine requirements of adults are met by endogenous sources. As this is compromised during times of stress, especially in critical illness, arginine and glutamine thus become conditionally essential amino acids (Schmidt 2002, Partridge 1995, Thomas 1996). Dietary supplementation of arginine and glutamine has been shown to be beneficial in enhancing wound healing.

ω3 Fatty Acids: - Used in the formation of prostaglandins, which have vasodilatory and anti-inflammatory properties and therefore reduce risk of infection in wound.

Fluid: - Adequate hydration is essential for skin elasticity and delivery of nutrients to wound site (Schmidt 2002). Dehydration is a risk factor for pressure ulcers because of its relationship to blood volume and circulation. Older adults are at a higher risk of dehydration, as they have a reduced sensitivity to thirst and may have personal concerns about incontinence (Schmidt 2002). Up to 500mls of extra fluid per day may be required.

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Conclusion

No single food or food group can meet all nutritional needs. A balance of the five different food groups is required to obtain a full range of essential nutrients. Emphasis needs to be placed on offering high-energy snacks, fortified foods and juices. Nutritionally complete supplements may be required where a patient's appetite is particularly poor. Enteral and in exceptional cases Parenteral nutrition may need to be considered in order to meet a patient's nutritional requirements.

It is clear that macro and micronutrients play an important role in wound healing. It is, however not clear that supplementing the diet with particular nutrients in isolation will lead to improved clinical outcomes (Schmidt 2002). Further research is required to identify the levels of supplements required to be of clinical benefit. There is a strong theoretical link, supported by clinical studies, which suggests that providing a balanced diet can improve clinical outcomes. Therefore it is suggested that all patients with wounds have a nutritional assessment. Steps should be taken to correct any malnutrition and daily nutritional needs met. Where possible, this should be done in conjunction with the dietetic service (Brylinsky 1995, Partridge 1998).

Hospital meals provide an average of 1600kilocalories and 50-60g protein. If a patient cannot manage full hospital meals or if their energy and protein requirements are in excess of this, a variety of nutritional supplements are available. Ideally, factors that enhance wound healing should be optimised, and detrimental influences minimised whenever possible (Todorovic 2002, Armstrong 1998). For patients at risk of malnutrition, nutritional intervention should be initiated or pressure ulcers may develop in vulnerable patients.

The primary aim should be to increase awareness and prompt early referral of patients to the dietician, ideally before the development of sores.

Table 1. Colour Classification of the Wound Bed and Treatment Objectives

Colour	Description	Treatment objectives	Management techniques
1. BLACK	Necrotic dehydrated dead devitalised tissue that may cover the whole wound or be present as small patches at the base or margins of the wound	To debride or rehydrate tissue and manage wound exudate	<ol style="list-style-type: none"> 1. Surgical debridement 2. Autolytic debridement – the use of dressings to rehydrate and promote autolysis 3. Enzymatic debridement – topical application of exogenous enzymes to wound 4. Use of larva therapy – if necrosis is soft/wet
2. YELLOW	Slough is an accumulation of dead cellular debris, leukocytes and bacteria and rehydrated necrotic tissue	To cleanse and deslough the wound and manage excess exudate	<ol style="list-style-type: none"> 1. Sharp surgical debridement 2. Autolytic debridement 3. Larvae therapy
3. GREEN.	Can be a sign of the presence of bacteria with associated malodour (colour may vary depending on invading organism)	<p>Early recognition</p> <p>Effective treatment as appropriate</p> <p>Maintain patient comfort</p> <p>Promote healing</p>	<ol style="list-style-type: none"> 1. General infection precautions- handwashing /apron/gloves 2. Wound swab for Culture and Sensitivity 3. Systematic antibiotics 4. Dressing selection based on type of tissue in wound bed 5. Daily dressings
4. RED	Granulation is the term used to describe newly formed tissue in the wound bed. It is usually highly vascular connective tissue and presents as red moist uneven granular tissue	<p>To maintain moist wound interface</p> <p>To manage excess exudate</p> <p>To protect</p>	<ol style="list-style-type: none"> 1. Dressing selection will depend on wound depth and exudate level
5. PINK	Epithelialising is the stage of wound healing where epithelial cells migrate across the wound bed. It is characterised by the appearance of pink tissue at the wound margins or from the remnants of hair follicles in the wound bed	<p>To maintain moist warm wound interface</p> <p>To manage excess wound exudate</p> <p>To protect</p>	<ol style="list-style-type: none"> 1. Dressing selection will depend on wound depth and exudate level
<p>Pictures of these types of Wounds can be seen in Appendix Three, Figures 1 - 5</p>			

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14.0 Dressing Selection

When choosing a dressing consider:

- The underlying cause of the wound, stage of healing and the treatment objective
- The size and shape of the wound, the depth of the wound, and the presence of any sinuses, tracks or tunnels.
- Location of the wound as awkward and difficult to dress areas will require more flexible dressings.
- Level of exudate, different dressings will have different fluid handling capacities.
- Frequency of dressing changes required and who will be carrying them out.
- Patient comfort, preference and tolerance of dressing.

Hydrofibre

This nonwoven product is comprised of fibres of sodium carboxymethylcellulose. This material forms a gel quickly when in contact with wound exudate. It retains moisture over the wound bed and wicks vertically, which prevents peri-wound skin maceration. Available in sheet or ribbon form.

Indications:

1. As it retains high amounts of exudate, it is suitable for moderate to heavily exuding wounds.
2. If used on appropriate wounds it will not adhere to wound bed.
3. It can be used on lesser exuding wounds when extended product wear time is desired
4. Daily dressing changes required if used on infected wounds.

Precautions:

1. Not indicated for use in dry or minimally draining wounds because dehydration of the wound may occur.

Helpful information:

1. Requires a secondary dressing
2. Overlap of surrounding skin of 1cm should be allowed.
3. Occasionally may need irrigation with normal saline to remove from wound.

Example: Aquacel

Hydrocolloids

Hydrocolloids consist of various materials including carboxymethylcellulose, adhesive and gelling agents. The surface is adhesive and they are covered with a thin film that makes them impermeable to fluids. Hydrocolloids form a viscous colloidal gel as exudate is absorbed.

Indications:

1. Hydrocolloids are adhesive and absorbent. Traditional thickness indicated for minimal to moderate exudate levels. Thin formulations absorb minimal exudate.
2. May be used to promote autolysis when the wound is sloughy or necrotic.
3. Suitable for all stages of wound healing.

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Precautions:

1. Different hydrocolloids have different absorption levels – Read Manufacturer’s instructions.
2. If dressing is not changed at appropriate intervals, surrounding skin can become macerated. Particularly when used with hydro gel.
3. Hypergranulation may occur under these dressings.
4. Not recommended for use on wounds infected with anaerobic bacteria.

Helpful information:

1. Hydrocolloid material should extend onto the surrounding skin at least 2.0 cm.
2. Avoid stretching of dressing during application.
3. Warm dressing between hands to aid adhesiveness.
4. Dressing may be left in place for up to seven days.
5. Are waterproof.

Examples: Comfeel, Granuflex, Duoderm, Easyderm, Tegisorb

Alginate dressings

Alginates are primary dressings derived from seaweed. They are spun fibres available in nonwoven pads or ropes and can be divided into type 1 or type 2 alginates. Calcium alginate is a solid that exchange calcium ions for sodium ions when it contacts any substance containing sodium i.e. wound fluid. All alginates transform to gel in the presence of exudate. Alginates are hydrophilic (attract fluid) in nature. Alginates are non-adhesive, non-occlusive, and conformable to wound architecture.

Indications:

1. Absorb moderate to heavy exudate and can be used to pack wounds – therefore indicate for moderate / heavy exudating wounds with or without depth.
2. As a moist wound environment is maintained autolysis is promoted.
3. Can help reduce pain as exposed nerve endings are protected.
4. Type 2 alginates have haemostatic properties.

Precautions:

1. Not suitable for dry wounds-if used on a dry or minimally draining wound fibres can be embedded in the wounds.

Helpful information:

1. Dressings may be cut to fit the size of the wound.
2. For additional absorbency, may be layered.
3. Should ideally be applied dry to wound.
4. Requires a secondary dressing.
5. Irrigate with normal saline to release from wound bed.

Examples: Kaltostat, Sorbsan, Melgisorb, Algosterile, Seisorb

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Semi-permeable film dressings

These dressings consist of thin transparent polyurethane sheets coated with a layer of acrylic adhesive. These film dressings are permeable to oxygen and water vapour but impermeable to fluids and bacteria.

Indications:

1. Can be used for prophylaxis on vulnerable skin.
2. Indicated for use on superficial wounds with little or no exudate.
3. Commonly used as a secondary dressing.

Precautions:

1. Does not absorb exudate.
2. Not for use in infected, deep or heavily exudating wounds.
3. Observe peri-wound skin for signs of maceration.
4. Avoid stretching the film during application.
5. Remove with care to avoid pain or stripping of skin. Remove by stretching.

Examples: Tegaderm, Opsite

Hydrogels

Hydrogels are available in sheet and gel formulations. They are primarily designed to hydrate wounds, and most are indicated for use in dry or minimally draining wounds. Hydrogels are commonly used to promote autolysis, by increasing hydration in dry or minimally draining necrotic wounds. Also can be used in clean granulating wounds to maintain a moist wound environment.

Indications:

1. As they have a high water content they are useful in rehydration of hard eschar.
2. Promote autolysis, therefore useful for desloughing wounds.
3. The sheet formulation provides a moist wound environment in flat wounds such as thermal injuries, fungating lesions, and skin graft donor sites. The gel formulations are suitable for cavity wounds.

Precautions:

1. Generally not suitable for moderate and heavy exudating wounds.
2. Can macerate peri-wound skin if allowed to spill over wound edges.
3. Require a secondary dressing.

Examples: Granugel, Intrasite, Nugel, Purilon

Foams

These are sheets of hydrophilic polyurethane foam. They provide absorbency without compromising the moist wound environment.

Available in adhesive, non-adhesive, traditional, thickness and thin versions. Also foam cavity dressings are available for packing wounds.

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Indications:

1. Is one of the most absorbent materials and are therefore indicated for wound with moderate to heavy exudate (depending on brand).
2. These are easily applied and have a non – adherent surface to the wound bed.
3. Non – adhesive foams are useful for managing wounds with friable peri – wound skin.
4. Can be used as a secondary dressing with a desloughing agent next to the wound bed.

Precautions:

1. Not recommended for non-draining wounds.
2. In low exudating wounds, these dressings may stick to the wound and require irrigation during removal of the dressing.

Examples: Lyofoam, Lyofoam C (contains charcoal), Alleryn and Allevyn Cavity, Tielle, Cavicare

Enzymatic Dressings

Examples: Licenced - needs to be prescribed – Varidase, Iruxol Mono

Varidase:

These are topical exogenous enzymes which breakdown slough and necrotic tissue. These are comprised of a mixture of streptokinase and streptodornase presented as a dry powder.

Indications:

1. Indicated for use on sloughy and necrotic wounds.

Precautions: Licenced - needs to be prescribed

1. Contraindicated for use in wounds with exposed nerve endings, muscle or blood vessels and in fungating wounds.
2. Reconstruct as per manufactures instructions.
3. Store in fridge.

Helpful information:

1. Needs daily dressing change.
2. Needs a secondary dressing.

Low Adherent Dressings

These dressings are manufactured from a variety of materials and can be either low or non adherent to the wound bed.

Indications:

1. Indicated for use in dry to moderate exudating wounds where adherence is a problem.
2. Newer formulations may be left in place for extended lengths of time with only the secondary dressing being changed so useful for very fragile skin.

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Precautions:

Prevent peri-wound skin maceration with a thin layer of barrier cream.

Remove with care; if adherence occurs moisten with normal saline before removal.

Examples: Adaptic, Release, Melonin, NA Dressing, Mepitel

Odour Absorbent Dressings

Depending on brand these dressings contain either activated charcoal, carbon or silver to reduce and control malodour in wounds.

Indications:

1. Indicated for use in infected, malodorous, malignant or fungating wounds.

Precautions:

1. Do not use on patients with known sensitivity to dressing or its components.
2. Read instructions, as some are primary dressings, others are secondary.
3. When used on infected wounds daily changes are required.

Examples: Lyofoam C, Actisorb Plus, Carboflex, Actisorb Silver

Paraffin Gauze Dressing

Paraffin gauze dressings consist of open weave cotton or cotton and viscose fabric impregnated with soft white or yellow paraffin. These are a low adherent dressing and are used as a primary wound dressing.

Indications:

1. Indicated for use in clean superficial wounds, minor burns and on lightly exudating wounds.

Precautions:

1. Use on lightly exudating wounds only. Has no absorbency properties so shouldn't be used on heavily exudating wounds as exudate may pool under dressing due to its semi-occlusive nature.
2. Needs frequent dressing changes.
3. Needs a secondary dressing.
4. May dry out at adhere to wound bed.
5. Multiple layers may cause maceration

Examples: Jelonet, Paratulle

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Polysaccharide Dressings

These dressings consist of highly absorbent hydrophilic beads or paste impregnated with cadexomer iodine. These dressings clean the wound by removing exudate and slough and forms a protective gel over the wound bed. As the dressing absorbs exudate and swells they release iodine killing micro organisms.

Indications:

1. For use on sloughy exudating wounds.
2. For use on infected wounds.

Precautions: Licensed - needs to be prescribed

1. Read manufactures instructions.
2. Contraindicated for use on patients with iodine sensitivity, history of thyroid disorders and children.
3. Should not be used on pregnant or lactating women.
4. Potential risk of interaction with lithium.
5. Use with caution in patients with renal impairment.
6. Maximum single dose not to exceed 50g idoflex or 150g in one week. Therapy should not exceed 3 months in any single course.

Helpful information:

1. Dressing colour changes from brown to white when iodine is used up.
2. Needs a secondary dressing.

Examples: Iodoflex, Iodosorb ointment, Iodosorb powder.

Silver

Silver has been used for thousands of years for its antimicrobial properties. It is known to be effective against a broad range of bacteria and fungi, particularly *Pseudomonas* and *Staphylococcus aureus*.

Many forms of silver are available for dressings wounds. It may be applied as a cream or incorporated into foam, cloth and hydrofibre dressings. There is wide acceptance of the use of silver in patients with burns for the prevention of Gram-negative sepsis.

Indications:

1. Used on infected and colonised wounds.
2. May be used on heavily exuding wounds with more frequent dressing changes.
3. Used in burns and leg ulcer patients mostly but may be used in most types of wound.
4. Flamazine, which requires a prescription, should be used with an absorbent dressing and changed daily for burns and at least three times weekly for leg ulcers.

Precautions:

1. Skin irritation and argyria (irreversible grey to blue-black colouring of the skin and mucous membranes) have been reported in prolonged use of silver nitrate solutions.
2. 50g every two days for two months would be considered excessive use.

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3. Flamazine cream should not be applied to the skin surrounding an ulcer as it may cause maceration.
4. Flamazine should be used with caution if renal or hepatic function becomes impaired.

Helpful information:

1. The make up of silver dressing varies and accompanying instructions for use should be carefully studied.
2. Silver dressings can be expensive and their use should be limited to use in wounds complicated by infection and colonisation.
3. The way in which silver is released from the dressings varies and intolerance of one dressing may not lead to intolerance of all silver products. Any side effects or allergic reactions should be documented.

Examples: Flamazine, Acticoat, Actisorb Silver 220, Aquacel Ag, Avance

Table 2: Dressing selection based on colour classification

Colour of wound	Depth of wound	
	Shallow	Deep
Pink No exudate	Film, skin sealant, thin foam or hydrocolloid	Not applicable
Red Minimal exudate	Film, foam or hydrocolloid	Hydrogel, wound fillers, impregnated gauzes
Red Moderate to heavy exudate	Foam, alginate, hydrofibre, hydrocolloid, wound pouch	Alginate, foam cavity, hydrofibre dressings
Yellow Non or minimal exudate	Hydrogel, hydrocolloid, enzymes	Hydrogel or hydrocolloid
Yellow Moderate to heavy exudate	Hydrofibre, alginate, foam, superabsorbent	Hydrofibre, larvae, alginate rope, foam cavity
Green Infected	Antibiotics as per clinical decision Treat as per tissue in wound bed	
Black	Hydrogel, enzymatic debrider or sharp surgical debridement	
	CAUTION: IF COMPLETELY BLACK UNABLE TO DETERMINE DEPTH	

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15.0 Leg Ulcer Management

15.1 Introduction

Leg ulcers are a common and chronic problem seen in the Irish health care system. International studies estimate that 1-2% of the overall population develop leg ulceration at some point in their lives. The prevalence of leg ulceration increases with age and the condition is characterised by high rates of recurrence. It must be noted however that although the highest prevalence is in very elderly people, 20% of patients develop their ulcer before the age of 40 years.

Leg ulcer disease is typically chronic and a major cause of morbidity, suffering and high health service costs (Morison and Moffat 1994). It is estimated that the cost to the Irish Health Service is in the region of €6.5m per year. Research has shown that a uniformed approach to the management of leg ulcers with agreed guidelines for all involved in leg ulcer care yields the most positive results in terms of healing rates, prevention of recurrence and management of resources.

This section aims to build on the substantial amount of work already undertaken in the region to provide practical guidelines on the management of leg ulcers in the South Eastern Area. It is evidence based to reflect best international practice.

15.1.1 Definition

“A leg ulcer is defined as a loss of skin below the knee on the leg or foot, which takes more than 6 weeks to heal” (Dale 1983).

15.2 Types of Leg Ulcers

Lower leg ulceration is associated with a number of pathological conditions, some acting through more than one mechanism. The latest study on the prevalence and aetiology of leg ulcers in Ireland found that 81 % of leg ulcers are primarily the result of chronic venous hypertension. 10% are due to Arterial Disease and a further 7% of ulcers are of mixed arterial and venous origin, generally referred to as “mixed ulcers” (O’Brien et al 2000). These findings are similar to large-scale studies done in the U.K. (Morison and Moffat 1994).

An example of a venous and arterial ulcer can be seen in Appendix Four

15.3 Causes of Leg Ulcers

Principal causes

- Chronic venous hypertension, usually due to incompetent valves in the deep and perforating veins.
- Arterial disease e.g. atherosclerotic occlusion of large vessels leading to tissue ischaemia.
- Combined chronic venous hypertension and arterial disease.

(Morison and Moffat 1994)

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Other causes of leg ulceration include: (2-5% in total)

Neuropathy	e.g. associated with diabetes mellitus, spina bifida.
Vasculitis	e.g. associated with rheumatoid arthritis.
Malignancy	e.g. squamous cell carcinoma, melanoma, basal cell carcinoma and kaposi's sarcoma.
Trauma	e.g. laceration, burns, irradiation injuries, over-tight bandaging
Metabolic	e.g. pyoderma gangrenosum
Lymphoedema.	
Infections.	

Morison and Moffat (1994)

15.4 Venous Ulcer

- History of deep vein thrombosis, swelling of legs, tenderness.
- History of varicose veins.
- Aching and heaviness in legs.
- Ankle swelling.
- History of phlebitis, with associated pain, tenderness and inflammation.

Clinical Signs:

- Obvious varicosities – due to incompetent veins.
- Ankle flare – distended small venules on the medial aspect of the foot.
- Staining – due to blood leaking from the capillaries into the interstitial spaces.
- Induration – fibrin laid down in the gaiter area of the leg, forming hard, inelastic and 'woody' skin.
- Oedema – venous incompetence causes venous hypertension. The capillaries become engorged and dilated, eventually fail and leak fluid into the interstitial spaces – oedema.
- Venous eczema – due to the 'water logging' effect of oedema, which contains proteolytic enzymes that act as irritants. Bacteria and topical agents exacerbate the problem – resulting in wet, irritable venous eczema.
- Atrophie blanche – absent pigment – visible capillary loops.
- Friable skin – thinning due to inadequate blood supply.
- Ulceration – eventual result of the above, usually caused by minor trauma, (knock, scratching).

Signs:

Skin changes:- oedema, staining, induration, eczema and atrophie blanche are known as Lipodermatosclerosis.

Site of the ulcer:

- Most commonly sited near the medial malleolus – however can occur anywhere on the limb.

Ulcer characteristics

- Usually shallow with flat margins – size variable, can be circumferential (encompassing whole of gaiter area).

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Aim of Management

The primary aims of venous ulcer management are to:

- Reduce blood pressure in the superficial venous system.
- Aid venous return of blood to the heart by increasing the velocity of blood flow in the deep veins.
- Reduce oedema.

15.5 Arterial Ulcer

Symptoms

- Intermittent claudication, cramp-like pain in calf or thigh always associated with exertion (walking, hill climbing) relieved by stopping.
- Ischaemic rest pain; aching pain in toes, forefoot. Mostly occurs at night when legs are elevated – relieved by hanging foot over the edge of the bed. Can be relentless (critical ischaemia).

Signs

- Foot cold to touch (not always specific to ischaemia).
- Skin white on elevation – dusky (bluish), rubor on dependency.
- Shiny, taut skin.
- Calf and thigh muscle wastage.
- Dependency oedema.
- Absent foot pulses – require ‘Doppler’ assessment.
- ‘Blackened areas’ – indicating gangrene.
- Ulceration - due to poor arterial supply.

Site of Ulcer

- Anywhere on the foot, toes, in between toes, heel. Can occur anywhere on the lower part of the limb including lateral and medial malleolus.
- In severe cases tendons and muscles can be exposed.

Ulcer characteristics

- Deep with loss of the deep fascia in severe cases.
- Irregular shape – can be multiple ulceration.
- Rapid deterioration if untreated – limb threatened.

N.B. It is essential to take a careful history and assess thoroughly. The ulcer site is not diagnostic. As many as 50% of patients over the age of 70 years may have arterial insufficiency. (South Eastern Health Board 1998)

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Table 3: General Principles of differentiating venous/arterial ulcers

	Venous Ulcer	Ischaemic Ulcer
Cause	Venous Hypertension secondary to valvular incompetence and calf pump failure.	Poor arterial blood supply
Site	In the gaiter area, usually near medial malleolus.	Commonly toes, heels, foot and lateral aspect of leg.
Size	Size variable – develops slowly if untreated	Size variable, develops rapidly.
Oedema	Worse at end of day.	Present only if leg is dependent and client immobile.
Skin	Staining, eczema, atrophe blanche, indurated, warm to touch.	Shiny skin: white no elevation, bluish when dependent. Atrophic toenails. Cold to touch.
Appearance	Shallow, flat margin, looks healthy, deep structures not usually involved.	Often deep with loss of the deep fascia, slough slow to separate. Muscles and tendons later exposed.
Pain	Pain associated with oedema and bacterial infection – relieved by elevation.	Very painful, especially at night in bed – relieved by dependency.
Foot Pulses	Present	Reduced or absent.
Other History	Deep vein thrombosis: swollen leg, especially after surgery or pregnancy: phlebitis, varicose veins.	Intermittent claudication; ischaemic heart disease, hypertension, diabetes mellitus.

(South Eastern Health Board 1998)

Mixed venous / arterial ulcers

These will have the features of a venous ulcer in combination with signs of arterial impairment.

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15.6 Leg Ulcer Assessment

Accurate assessment is the key to identifying the aetiology of a leg ulcer and is a prerequisite to successful management of the patient (Vowden and Vowden 1996).

Copy of Assessment form is available in Appendix Five.

Aim

The aim of the assessment is to identify the appropriate treatment for the patient and to detect any medical conditions such as arterial disease or heart failure or malignancy that makes compression therapy unsafe. A comprehensive assessment allows one to determine:

- The immediate cause of the ulcer
- Local and general factors that may cause delay in healing
- The patient's social circumstances and the optimum setting for care
- The appropriate treatment for the patient

In the case of venous ulceration, the aim of assessment is to identify any medical conditions such as arterial disease, heart failure or malignancy that may make compression unsafe (Vowden and Vowden 1998).

Assessment is an ongoing process and it should be repeated regularly during the treatment of a leg ulcer.

The Five key areas of Patient Assessment:

Before any treatment begins, patient assessment should include general and specific information regarding the patient, the skin, the circulation, the limb and the ulcer:

Table 4: Key Areas of Leg Ulcer Assessment

1.The patient	2.The skin	3.The circulation	4.The limb	5.The ulcer
History	Colour	Pulses	Oedema	Site
Risk factors	Temperature	A.B.P.I.	Shape	Surface
Associated diseases	Sensitivity	Capillary return	Mobility of ankle and patient	Duration
Nutrition	Fragility	Ankle flare		Size
Social circumstances		Varicose veins		Edge
				Infection/pain

(Vowden and Vowden 1998)

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1. The patient:

A full medical history is essential to determine the underlying cause of the ulcer.

A detailed history can provide information on previous treatments. A review of current drug therapy is necessary, as some drugs, e.g. steroids or cytotoxics, will slow wound healing. Allergies must be accurately documented. The presence of risk factors and associated medical conditions e.g. rheumatoid arthritis, diabetes and connective tissue diseases should be noted as it may indicate large/small vessel disease. The social circumstances of the patient can also influence treatment outcome, venous ulcers take longer to heal in the lower social classes (Moffatt and Franks 1994). Nutrition is another important factor in wound healing and must be addressed as part of the overall treatment plan.

2. The Skin:

It is important to document the presence of ankle flare, skin staining, lipodermatosclerosis and atrophe blanche as these signs are indicators of the severity of venous disease (Vowden and Vowden 1996). Frequently, patients with venous insufficiency have fragile, sensitive skin and often develop areas of varicose eczema. Pallor on limb elevation and prolonged capillary return may indicate ischaemia (Vowden and Vowden 1996). Heat can indicate cellulitis or an allergic reaction.

3. The Circulation:

Foot Pulses

The *presence* of palpable foot pulses is not a conclusive sign of unimpaired arterial circulation in the lower limb nor the *absence* of pulses indicative of arterial impairment (Morison and Moffat 1994). The dorsalis pedis pulse is congenitally absent in up to 12% of individuals (Barnhorst and Barner 1968). It is important to palpate the posterior- tibial pulse if the dorsalis pedis pulse is not felt. Oedema is a common problem in patients with ulcers, and this can make pulses difficult to palpate.

Doppler Assessment

Doppler is a tool used to aid in the differential diagnosis of leg ulceration. Of equal importance is the holistic assessment, which identifies other factors, which help in determining the likely cause of ulceration. Without a holistic approach Doppler pressure measurement and the calculation of Ankle Brachial Pressure Index (A.B.P.I.) taken in isolation are meaningless (Vowden 1996).

A.B.P.I. compares a brachial systolic reading to an ankle systolic reading and determines the blood flow to the feet. These readings are expressed as a ratio: ankle systolic pressure divided by the brachial systolic pressure. Patients with normal arterial circulation will have an ankle systolic pressure equal to or higher than the brachial systolic pressure and any deficit in the ankle pressure is indicative of a degree of arterial disease (Vowden 1996).

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Guidelines for the application of compression in the treatment of venous ulceration demand that a doppler assessment be undertaken and the ankle brachial pressure index (A.B.P.I.) calculated (Moffat and Dickson 1993).

The Doppler ultrasound is a cheap reliable method of arterial assessment. Doppler can be used to:

- Establish if arterial disease is present
- Gain some indication of its severity
- Establish whether the patient is suitable for compression therapy
- Monitor the effect of treatment
- Follow the course of arterial disease.

(See Appendix Six for Doppler Procedure)

4. Limb

Oedema

Peripheral oedema of the limb may be due to venous stasis, congestive cardiac failure, liver disease lymphatic disease or malnutrition. It is important to ascertain the likely cause of oedema before treating the ulcer. Patients with oedema caused by cardiac failure may be at risk if there is a sudden return of fluid to the circulation, due to the use of compression bandaging and leg elevation. It is important to re-measure an oedematous limb, as changes in limb circumferences may be sufficient to require changes in the bandaging regimen (Morison and Moffat 1994).

Shape and mobility

It is important to assess and record the limb size, shape and mobility. The circumference of the limb affects sub-bandage pressure. The pressure exerted by the bandage is inversely proportional to the circumference of the leg, the thinner the leg the higher the pressures obtained. Dangerously high pressures can be achieved with compression bandages in frail elderly patients with thin legs. It is important to note bony prominences such as the malleolus and the tibia, and over the tendinous prominences around the ankle (Morison and Moffat 1994).

Studies have demonstrated the deleterious effect of reduced patient and ankle mobility, calf muscle weakness and an abnormal gait on venous ulcer healing times (Moffat et al 1993).

5. Ulcer - Local wound assessment

The site and appearance of the ulcer can give an indication of the underlying aetiology, but the diagnosis should never be based on the ulcer appearance alone (Vowden 1996). The majority of venous ulcers are commonly found in the gaiter area above the medial malleolus (Moffat and Harper 1997). Recording ulcer size, depth and colour will provide an accurate record of a patient's treatment progress. Photography and ulcer tracings may be used to achieve this objective. The appearance of the ulcer, particularly its edge and base, can give clues to the stage of the healing process or to the possible complications such as malignancy.

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The following should be considered:

- Position of wound
- Wound dimensions – length, width, depth
- Nature of wound bed
- Level of exudate
- Nature of exudate
- Wound margins
- Surrounding skin
- Signs of infection
- Photograph / Tracing wound

See Assessing the wound (Section 13.3)

The following should be considered if the ulcer shows no signs of healing:

- Local problems at the wound site
- The underlying cause of the ulcer has not been identified and corrected
- Some other patient factor may be delaying healing (refer to General Wound Healing Section 13.2)

Baseline investigations include:

- Blood pressure measurement
- Weight
- Urinalysis/ Fingerprick Blood Glucose monitoring
- Blood tests may be necessary to exclude conditions such as anaemia, diabetes, renal problems and hepatic failure. Rheumatoid factor and auto-antibodies may be indicated if a vasculitis or undiagnosed rheumatoid arthritis is suspected as the cause of the ulceration (Morison and Moffat 1994).

15.7 Treatment Options

Priorities in leg ulcer management

- To correct the underlying cause of the ulcer. This normally means improving the patient's venous and / or arterial circulation in the effected limb.
- To create the optimum local environment at the wound site.
- To improve all the wider factors that might delay healing, especially poor mobility, malnutrition and psychosocial issues.
- To prevent avoidable complications such as wound infection, medicament dermatitis or tissue damage due to over-tight bandaging.
- To maintain healed tissue.

(Morison and Moffat 1994).

Management of Venous Ulcers

Venous ulcers arise because of venous hypertension. Damaged valves in the deep, superficial and perforating veins are one cause of chronic venous hypertension in the lower limb.

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Aims of Management

- To reduce the high pressure in the superficial venous system
- To enhance venous return of blood to the heart, by increasing the velocity of flow in the deep veins.
- To reduce oedema by forcing fluid into both the venous and the lymphatic systems.

A recent Cochrane Library review by Cullum (2003) summarised the effectiveness of different treatments for venous ulceration as follows:

- Compression increases ulcer healing rates compared to no compression
- Multilayered systems were more effective than single layered systems
- High compression is more effective than low compression

The Physiology of Compression Therapy

Compression therapy reduces the distension in the superficial veins and counteracts the high pressure - Venous hypertension. In addition it:

- Restores damaged valve function in some patients (Sarin et al 1992)
- Encourages and enhances blood flow in the deep veins (Sigel et al 1975)
- Reduces the volume of blood by 62% in the standing position.
- Facilitates the action of the calf muscle pump by providing a skin against which the muscles can expand; restriction of the muscle directs pressure inwards on to blood vessels, thereby increasing venous return.
- Forces fluid into both the venous and the lymphatic system, thus reducing oedema.
- Reduces the symptoms of venous disease such as aching limbs and pain from the ulcer.
- Increases the healing rate of venous ulceration (Duby et al 1993, Callam et al 1992, Blair et al 1998).
- Improves skin condition; some studies report increased removal of fibrin during compression therapy (Vin 1998).

(Moffat and Harper 1997 p. 70)

Peripheral Oedema

Generalised leg oedema is usually associated with venous problems whilst a localised oedema around the ulcer is more commonly arterial in origin.

Peripheral oedema of the lower limb delays healing by increasing the diffusion between blood capillaries and the tissues they serve. Tissues become starved of oxygen and nutrients and metabolic waste products build up.

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Bandaging

Graduated compression bandaging properly applied and combined with exercise is the treatment of choice in venous ulceration. It is effective in reversing the effects of chronic venous hypertension and improves the healing of venous leg ulcers (Fletcher et al 1997).

The recommended optimum degree of sub-bandage pressure is 40 mm Hg at the ankle, gradually reducing to 17 mm Hg below the knee.

Compression Bandaging:

- High compression bandages have a higher healing rate than lower compression bandages.
- Compression bandages should only be applied by a suitably trained and experienced practitioner.
- Padding to protect bony prominences is recommended under a high compression bandage system.
- Arterial insufficiency is a contra-indication to the use of compression except in a modified form under specialist supervision.

Graduated multi-layer high compression systems (including short-stretch regimens) with adequate padding, capable of sustaining compression for at least a week should be the first line of treatment for uncomplicated venous leg ulcers (ABPI must be equal or greater than .8)

The Rationale for using multi-layered bandaging vs. other types of compression bandaging:

- It requires infrequent re-application as it sustains its pressure for a week.
- It is a safer clinical practice as use of relatively weak bandages together avoids excessive rises in sub bandage pressure (Morison et al 1997).
- The multi-layered system is adapted to suit different limb sizes, preventing slippage and limb trauma.
- Healing rates of 60-80 % in treatments were reported from centres of excellence (Blair et al 1998, Moffatt and Oldroyd 1994, Callam et al 1992) using four layer graduated compression therapies.

The multi-layers are:

- A padding layer (wool)
- A crepe bandage
- A light compression bandage
- A flexible cohesive moderate compression bandage

Short stretch bandaging:

Short stretch bandages have no elastic component and are made of cotton. They are applied at 90% extension and apply a semi-rigid support to the calf muscle. During rest the sub-bandage pressure is relatively low. This system is suitable for patients with mild arterial disease or ambulant patients who find multi-layer bandage systems a problem at night.

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Factors which determine sub-bandage pressure:

Sub-bandage pressure is determined by the tension in the fabric, the radius of curvature of the limb and the number of layers applied. A bandage with a 50% overlap produces 2 layers of fabric and so generates a pressure twice that produced by a single layer.

Sub-bandage pressure can be calculated using a simple formula derived from the following equation:

P is proportional to $\frac{N \times T}{C \times W}$ **(Laplace's Law)**

P = pressure (in mm Hg)

T = bandage tension

C = circumference of limb (in cm's)

W = bandage width (cm's)

N = number of layers applied

Special Considerations

Limb shape and size can alter the effectiveness of compression and may influence the choice of the compression system:

- If the gradient between the ankle and the below-knee is too steep, as in the classic “ inverted champagne bottle shape of leg, extra padding at the gaiter needs to be applied to prevent bandage slippage.
- If there is little or no change in circumference between the ankle and the calf extra padding should be applied to the calf to facilitate the application of safe, graduated compression.
- If the leg is very thin or below 18cm in limb circumference at the ankle, apply two layers of wool padding.
- Any vulnerable points such as the tibial crest should have extra padding to prevent pressure necrosis

Classification of compression bandages

Light compression

Suitable only for low levels of compression (14-17 mm Hg) at ankle depending on leg circumference. The clinical indications include the management of superficial varicose veins and mild oedema.

Moderate compression

Will exert pressure of 18-24 mm Hg at ankle depending on leg circumference. The clinical indications include the treatment of severe varicose veins, the treatment and prevention of ulcers, reduction of severe oedema and reduction in risk of ulcer recurrence.

High compression bandages

Able to sustain pressure of up to 25-35 mmHg at ankle. The clinical indications include the treatment of very severe varicose veins, post phlebitis/cellulites, the treatment of leg ulcers and lymphoedema.

(Rees 2002)

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15.8 Management of Arterial Ulcers

Arterial ulcers are the result of inadequate tissue perfusion to the feet or legs, due to complete or partial blockage of the arterial blood supply to the legs.

Patients with vascular disease may require further vascular investigations to assess the extent of the disease. The principles of management are control of the symptoms and observation of the limb for deterioration of either the ulcer or the limb.

- Pain and symptom control. Pain may be a difficult problem for these patients and every effort should be made to ensure adequate and appropriate analgesia prior to dressing changes and throughout the day, as well as night sedation for the patients (Bale and Jones 1997).
- Ensure that blood supply to limb is not constricted i.e. no compression bandage should be used.
- Control of oedema is difficult, one should encourage elevation of the legs, the legs should never be above the level of the heart as this will reduce the effect of gravity on tissue perfusion (Moffat and Harper 1997).
- Provide an optimum environment at the wound site. However, debridement should be used with caution. If debridement is undertaken in a poorly vascularised foot, the resulting open wound may become infected and lead to greater tissue loss.
- Observe the wound frequently for any deterioration involving tissue necrosis and the presence of wound infection.
- Patients should be encouraged to mobilise, to stop smoking, to reduce weight, if overweight and to eat a nutritious diet. They should be advised to prevent further trauma to their limbs.

Compression bandaging should not be used as severe damage to the leg can result in amputation

(Morison et al 1997)

15.9 Management Of Mixed Aetiology Ulcers

Where the underlying cause of the ulcers is a combination of chronic venous hypertension and impaired peripheral arterial circulation, it is important to define the predominant factor so that the appropriate treatment may be given. The degree of arterial insufficiency will determine whether it is safe to apply compression and will determine the final regime selected. The exact level of compression depends on the severity of the symptoms and the patient's ability to tolerate compression bandages.

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15.10 Good Practice For Cleansing Leg Ulcers

Most leg ulcers are colonised with non-pathogenic organisms, therefore it is not necessary to cleanse leg ulcers using an aseptic technique associated with surgical wounds (Moffat and Harper 1997). It is important to render the whole of the lower leg socially clean. The leg should be immersed in a plastic bowl, lined with a disposable polythene bag and half filled with lukewarm tap water. This helps to remove debris from the ulcer and the descaling of dry skin. It is also comforting for the patient, especially if the leg has been encased in a multi layer bandage regime for a week. The bowl should be disinfected in accordance with the local infection control policy. (Morison and Moffat 1994).

A simple bland non-sensitising emollient to the skin e.g. 50/50 mixture of soft white paraffin and liquid paraffin should be applied following cleansing and drying of the limb. This helps to lift the skin scales that rapidly build up in the leg. Emollients should be applied in downward strokes to prevent folliculitis, taking care to avoid excess application.

15.11 Dermatology and Skin Care of Lower Limb

It is important to avoid the use of known irritants and allergens in the management of venous leg ulcers. When the barrier function of the skin is disturbed the patient is at risk of developing contact dermatitis. Therefore the following risk factors should be considered:

- The use of ointments instead of creams is advisable, thus reducing the risk of sensitisation.
- Avoid using antiseptics and topical antibiotics
- Protect skin from elasticated bandages.
- Do not use woollen bandages on dry skin.
- Use appropriate dressings to absorb wound exudates.
- Protect surrounding skin with the application of an appropriate barrier.
- Products containing lanolin or fragrances should be avoided.
- Ideally vinyl gloves should be used instead of latex, especially where rubber allergy is suspected.

(O'Sullivan and Powell 2002, Gooptu and Powell 1999, Cameron 1998, Cameron and Powell 1996)

Eczema

Eczema is a common feature in the clinical presentation of chronic leg ulcers. Eczema and dermatitis are terms used to describe the same condition. It is characterised by erythema, weeping, crusting and irritation of the skin. Eczema (dermatitis) is a common complication in the management of venous leg ulcers. It may be due to an irritant or allergic contact dermatitis, or static eczema or of mixed aetiology (Cameron 1995). The early recognition of the signs and symptoms of infection is important in the management of varicose eczema such as:

- Pain
- Erythema
- Increase in the level of exudates
- Malodour

It may be necessary to reserve a swab for culture and sensitivity and treat with an appropriate antibiotic (O'Sullivan and Powell 2002).

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Eczema/dermatitis may be:

- Endogenous and related to constitutional factors such as atopy or venous insufficiency.
- Exogenous and precipitated by irritating substances in contact with the skin (irritating contact dermatitis) or development of allergy (allergic contact dermatitis).

Sometimes elements of both endogenous and exogenous factors combine to produce eczematous change (O'Sullivan and Powell 2002, Cameron 1999).

Common causes of Eczema of lower limbs:

- Asteatotic dermatitis
- Stasis dermatitis (varicose eczema).
- Atopic dermatitis
- Contact dermatitis

Asteatotic dermatitis:

This is a severe form of dry skin of the lower legs where fissuring or cracking of the surface takes place, due to the loss of oily secretions. This poorly recognized condition is particularly common with the elderly. It is pruritic and presents as very dry skin with a network of erythematous superficial fissures which resemble 'crazy paving' (Hunter et al 1989).

Management:

- Use a topical steroid ointment to reduce inflammation and itch.
- Use liberal application of bland emollients to counteract dryness.
- Avoid vigorous washing.

As with all applications of ointments and creams to the skin, it is important to apply these in downward direction, consistent with the angle of growth of the hair follicles.

The topical steroid should be applied twice daily to the skin. This is then covered with an emollient such as 50% soft petroleum jelly/50% liquid paraffin. When eczema clears, continued use of emollients and soap substitutes prevents recurrence (Watts 1998).

Stasis Dermatitis:

This is an endogenous eczema, related to constitutional (internal) factors. It appears in the gaiter area of the lower leg and is associated with venous disease (Cameron 1999). Stasis dermatitis may be acute or chronic.

Acute Phase: Is characterized by pruritus, erythema and scaling.

Chronic Phase: Skin develops a scaly brown pigmentation due to the deposition of haemosiderin from extravasated red blood cells at the surrounding cutaneous surface becomes bound down (indurated). Eczematous skin with its compromised barrier function is vulnerable to irritation by topical medicaments, which may provoke dissemination of the eruption to other skin areas (O'Sullivan and Powell 2002, Cameron 1998).

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Management of stasis eczema:

Health care professionals looking after patients with leg ulcers know the importance of maintaining healthy skin around the leg ulcer. Failure to do so can lead to increased morbidity and a delay in healing (Cameron and Powell 1996).

- Treat venous hypertension with compression therapy or support stockings.

Acute:

- Soak leg in potassium permanganate solution 10 – 15 minutes. (Pale pink solution)
- Apply moderate strength corticosteroid ointment daily until the dermatitis has settled.
- If no response after 10 days, a more potent topical steroid may be required
- Stop steroid and replace with simple emollient (50% white petroleum jelly and 50% liquid paraffin e.g. Paraffin Gel) to lubricate skin (Cameron 1998, 1999).

Chronic:

- 50% white petroleum jelly and 50% liquid paraffin
- Protect surrounding skin with topical barrier
- Systemic antibiotics only for evident infection (O'Sullivan and Powell 2002).

Atopic Eczema

Atopy is a term used for a genetic predisposition to form excessive IgE antibodies and to develop one or more of a group of disorders that include asthma, hayfever, urticaria, some food allergies with a particular type of eczema (Powell 1996).

Management:

- Avoid warm atmosphere – increases skin heat and dryness.
- Avoid woollen clothing – irritates sensitive skin
- Avoid strenuous exercise or prolonged sunlight – increases body heat and perspiration.
- Watch for viral infections – especially herpes simplex and molluscum contagiosum.
- Regular lubrication, mild steroids, antihistamines, systemic antibiotics for established infection.
(O'Sullivan and Powell 2002)

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Contact Dermatitis:

Contact dermatitis is an exogenous eczema caused by external factors that either directly irritate the skin or cause an allergic reaction. Contact dermatitis is normally limited to areas of direct contact with the skin, but if severe or secondarily infected, contact dermatitis may become generalised (O'Sullivan and Powell 2002).

a. Irritant Contact Dermatitis:

Acute irritant dermatitis usually occurs after a short single exposure to a potent irritant e.g. strong acid or alkali. Wound exudate has a very irritant effect on skin surrounding an ulcer and can create an irritant contact dermatitis. Preparations used in the treatment of varicose eczema such as antiseptics, adhesives, bandages applied directly to the skin, may be contributing factors in the production of this type of skin reaction (O'Sullivan and Powell 2002, Cameron 1998).

b. Allergic Contact Dermatitis:

This occurs following exposure to and sensitisation by an agent capable of initiating an allergic reaction (Allergen). Further exposure to the agent in a sensitised person results in an eczematous reaction. This process occurs as a result of cell-mediated immunity and is a type IV hypersensitivity reaction. The occlusive nature of many leg ulcer applications on broken or eczematous skin can create the perfect environment for sensitisation to develop. Patients may become allergic to any component part of their topical therapy, including the dressing, emollient creams, bandages or bath additives. Sensitisation requires exposure to the allergen and about 10 - 14 days later the reaction becomes visible in the skin. The individual may not realise sensitisation has occurred until the exposure to the agents results in a severe reaction. Continued exposure to an allergen results in a progressively deteriorating clinical picture. To investigate patients suspected of having allergic contact dermatitis, referral to a Dermatologist for patch testing is important. Identification of the causative allergen is essential for successful management, which involves its strict avoidance. Patients should be made aware that more than one product may have the allergen as a constituent (O'Sullivan and Powell 2002, Gooptu and Powell 1999, Cameron 1998, Cameron and Powell 1996)

15.12 Wound Dressings

Compression Bandaging is the most effective treatment for venous leg ulceration (Blair et al 1998). A systematic review of dressings and topical agents used with venous ulcers concluded that there was insufficient evidence to promote the use of any particular dressing. A simple, bland and non-adherent dressing is recommended as the primary dressing underneath the compression bandaging system. In highly exudating and malodorous wounds, charcoal and highly absorbent dressings may be used.

By understanding the concepts that underpin wound healing, the nurse can implement practice based on the General Principles of Wound Management (Miller 1994).

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Paste Bandages:

Actions and uses

Paste bandages are used in the treatment of skin associated with leg ulcers, e.g. eczema and inflammation. Paste bandages can absorb exudate and separate thick slough. Paste bandages are occlusive and may increase absorption of topical medication e.g. steroids.

Table 5: Types Of Paste Bandages And Indications For Use

Principal Constituents	Examples	Indications
Zinc paste	Viscopaste	Has a soothing effect for leg ulcers, treatment for venous stasis, eczema and chronic dermatitis.
	Zipzoc	Emollient properties, soothing and hydrating for dry scaly lesions surrounding leg ulcer itself.
Zinc paste and Calamine	Calaband	Emollient properties, soothing and hydrating for dry scaly lesions surrounding leg ulcer. Can be applied over ulcer itself.
Zinc Paste and Ichthamol	Ichthopaste	Soothing and mildly keratolytic. Ichthamol has a milder action in less acute forms of eczema.

It is important to follow instructions enclosed with each brand of bandage.

Many patients may be sensitive to some of the constituents in the paste bandage, e.g. preservatives, lanolin. Therefore it is advisable to patch test the patient with a strip of bandage applied to the leg for at least 48 hours.

Infection

Micro organisms may colonise leg ulcers heavily. Swabbing does not need to form part of the routine assessment (Miller and Gilchrist 1997).

Systemic antibiotics are only recommended if clinical signs and symptoms of infection are present (See identification of infection in Wound Care Page 20.). A variety of products may assist in managing an infected leg ulcer (See dressing selection 35).

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15.13 Referral Criteria For Specialist Advice

Some patients with leg ulcers may require further specialist intervention. A Consultant Vascular Surgeon in the South Eastern Health Board has agreed the following criteria:

- Patients found to have a resting pressure index of 0.5 or below should be referred urgently to the vascular surgical service. (No compression to be applied).
- Patients with a resting pressure index between 0.5 and 0.8 or greater than 1.3 should also be referred as soon as possible for vascular opinion (no compression to be applied).
- Young mobile patients should be referred with a view to possible venous surgery.
- Patients with recurrent ulceration should be considered for referral for full venous assessment and possible surgery to avoid further recurrence.
- All ulcers failing to show evidence of progress/healing after 24 weeks in compression treatment.
- Diagnostic uncertainty with a suspicion of malignancy.
- Patients with diabetes mellitus and/or rheumatoid arthritis who have absent distal pulses on palpation.
- Eczema/Dermatitis failing to respond to moderate potency topical steroid to be referred for a specialist dermatologist opinion.
- Severe unresponsive cellulitis.

Endorsed by Mr. S. Cross, Consultant Vascular Surgeon, Waterford Regional Hospital - 30:4:2005

15.14 Prevention of Recurrence of Venous Ulceration

Continuation of compression following healing of leg ulcers is one of the most effective measures in preventing recurrence (Harper et al 1995). The patient's ability and willingness to wear compression hosiery is a key issue in successful management. Graduated compression hosiery is considered to be the single most effective intervention.

A range of compression hosiery is available. Selection of hosiery is influenced by:

- The ease at which the patient can apply and remove the stocking.
- The optimum level of compression that is recommended, balanced with the patients level of compliance.
- What the patient considers cosmetically acceptable.

An accurate measurement of lower limbs for compression hosiery is essential.

The type of stocking depends on the level of compression required. The compression of the stockings ranges from 14 mm Hg to 35 mm Hg at the ankle. Selection of hosiery is individualized and is influenced by:

Compression value at ankle	Benefits
14-17 mm Hg	Light compression suitable for superficial or early varices or mild oedema
18-24 mm Hg	Medium compression suitable for varices of medium severity. Prevention of recurrence of leg ulcers.
25-35 mm Hg	Strong compression suitable for gross varicose veins, post-thrombotic venous insufficiency and gross oedema. For use with dressings in the treatment and prevention of recurrence

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Instruction for wearing compression stockings

1. Stockings should be put on first thing in the morning, ideally before getting out of bed.
2. If using a knee length stocking, the top should reach the crease behind the knee.
3. The stocking should fit smoothly along the leg
4. There should be no creases or wrinkles.
5. The skin on the leg should be moisturised at least one hour before applying stockings.
6. Compression stockings should be hand washed in lukewarm water and should not be dried over direct heat, e.g., on radiators or in front of fire.
7. Stockings must be replaced at least on a 6 monthly basis.

Special Considerations:

- Open toe hosiery may be more suitable for the elderly to apply with the aid of stocking applicators or the assistance of carers. Cotton rich hosiery may be more suitable for patients with a history of allergy to elastic stockings, e.g. Scholl cotton rich.
- Below knee stockings are generally all that is required. Full-length stockings are required in only a few circumstances for e.g. when treating patients with severe post-phlebotic syndrome or lymphoedema with swelling in the thigh.
- For patients whose ulcers are small and lightly exuding and who do not require secondary dressings and absorbent padding, hosiery may be the preferred form of compression.

Strategy for patients who cannot tolerate or apply compression hosiery

- Build up compression gradually
- Supply lighter class of stockings
- Continuation of compression bandaging may be more appropriate
- Arrange for another person to remove/reapply stockings if necessary once or twice weekly as stockings do not have to be taken off at night
- 2 pairs of class 1 stockings supply the same levels of compression as a medilatex class 2 and may be easier to apply

Patient assessment for compression hosiery

- ensure adequate arterial circulation –
Check A.B.P.I
- check skin integrity
- check for known allergies
- examine for joint deformity
- measure limb for hosiery
- check manual dexterity

Action	Rationale
Measure for and prescribe suitable compression hosiery	To increase venous return and reduce venous hypertension.
Moisten skin regularly with bland emollient. Allow skin to dry prior to application of stockings	To help maintain integrity of the skin
Review regularly and re-measure limb	To check compliance
	To review hosiery (should be replaced every six months.

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15.15 Education Is The Key To The Prevention Of Leg Ulcer Recurrence

Patient Education

Taylor (1996) considered that patient education is paramount in assisting patients to comply with treatment. However, Morison and Moffat (1994) added that a successful long- term outcome depends on the success of the health educator in motivating patients to take responsibility for their own health. A therapeutic environment need to be created which encourages the patient to engage in the learning process and motivates the patient to want to change unhelpful behaviour.

Patient education should be an ongoing process and individualised according to the patient's cognitive abilities and learning needs. It should include:

- A simple explanation of the underlying cause of the ulcer.
- Advice on exercise, nutrition, leg elevation to reduce oedema, compliance with treatment, and the importance of wearing compression hosiery when the leg ulcer heals.
- Patients should be made aware of signs and symptoms that may indicate the necessity to remove the dressing or bandage immediately, for example, increased pain, numbness, lack of sensation, coldness in lower limb, redness or itching.
- An education leaflet containing the above information.
- An education package could also contain the following information:
 - The importance of compliance with compression hosiery
 - Care of hosiery
 - Skin care
 - Discourage self treatment with over-the-counter preparations
 - Care of the feet and well fitting shoes and chiropody
 - Avoidance of accidents or trauma to legs
 - Balanced diet/keep weight down
 - Encouragement of mobility and exercise
 - Leg elevation when at rest
 - Early self-referral at signs of possible skin breakdown (the more quickly someone re-attends to receive 4-layer compression bandaging after recurrence the shorter the time to rehealing (Moffatt and Dorman 1995).
 - Contact numbers if required.

Teaching patients the self-help skills to practice for the rest of their lives to promote healing and prevent ulcer recurrence requires skill and an understanding of the individual and their personal circumstances.

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16.0 Pressure Ulcer Prevention/ Management

16.1 Definition

The terms pressure ulcer/ulcer or “decubitus ulcer” are used to describe any localised area of damage to the skin and underlying tissue, caused by direct unrelieved pressure, shearing forces or friction occurring most commonly over a bony prominence. The extent of this damage can range from persistent erythema to necrotic ulceration involving muscle, tendon, and bone (Barton 1981).

16.2 Background

Pressure ulcers occur in both hospitals and community settings, most often in the elderly, immobile and those with severe acute illness and in people with neurological deficits. More people now survive into old age, it is projected that there will be over 521,000 people aged 65 and over (constituting 14.1% of the total population) in the year 2011, an increase of nearly 26% (Fahey 1995). Furthermore, the combination of multiple pathologies and the ageing process has increased the number of potential patients at risk of developing pressure ulcers. In the past, patients and relatives appeared to accept that pressure ulcers were an inevitable result of chronic conditions and reduced mobility. Now they are viewed as evidence of a failure to provide a reasonable standard of care and action can be brought against those responsible, for compensation (Dimond 2003).

According to Fletcher (2001) the true frequency of their occurrence is difficult to calculate but surveys of prevalence vary between 3% and 66%. A recent pan-European survey of 5946 patients identified a prevalence of 18.1% (EPUAP 2002). The only published pressure ulcer prevalence study in the Republic of Ireland identified a prevalence of 12.5 % in an acute hospital setting (Moore and Pitman 2000). Pressure ulcers prevention and management strategies are costly both in financial and human terms. Collier (1994) calculated the cost of managing one patient with a deep pressure ulcer as £44,000 (sterling) and furthermore, the patient may be hospitalised for extended periods of time, suffer additional pain, discomfort, loss of independence and embarrassment due to the malodour and leakage that may occur from their wounds.

Pressure ulcer prevention and management is an integral component of nursing practice. Pressure ulcer prevention is the responsibility of all nurses involved in patient care (Culley 1998). Accountability and quality of care are essential components of nursing practice (Taylor 1994) but practitioners cannot provide patients with the best quality of care if they do not know what this is (Tierney 1996, Lacey 1994). Effective pressure ulcer prevention involves a systematic assessment of risk factors, planned interventions to reduce or eliminate these, and an evaluation of the successes or failure of such interventions (EPUAP 2002). In its most basic definition, evidence based practice aims to provide the best possible evidence at the point of clinical (or management) contact (Dawes et al 1999).

The most cost-efficient method of implementing a pressure ulcer programme is to use a risk-assessment scale so that those patients who are most in need of preventive care can be targeted (Bryant 2000). **However, the tools are an adjunct to and not a replacement for clinical judgement.**

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16.3 Pressure Ulcer Development

A pressure ulcer is damage to skin and underlying tissues caused by pressure, shearing forces and friction. These factors are known as extrinsic factors as they occur externally.

Extrinsic Factors

- **Pressure**

Pressure is the major cause of pressure ulcer formation over a bony prominence or pressure area. However, several factors play a role in determining whether pressure is enough to create an ulcer. The pathological effect of excessive pressure on soft tissue can be attributed to:

- Intensity of pressure (capillary closing pressures 12-32mmHg)
- Duration of pressure
- Tissue tolerance

Aim:

Minimise pressure through the use of repositioning schedules and/or pressure ulcer prevention devices.

- **Shear**

Shear is caused by the interplay of gravity and friction. Shearing occurs if the patient slides down the bed. Shearing causes small blood vessels to kink, stretch and tear. This leads to the disruption of the local blood supply and subsequent ischaemia. If ischaemia is prolonged endothelial damage and thrombosis occurs leading to cell death.

Aim:

Maintain the head of the bed at the lowest possible degree of elevation consistent with medical condition to reduce shearing forces.

- **Friction**

Friction is described as the force generated when two surfaces move across one other.

Alone, its ability to cause skin damage is limited to the epidermis and upper dermal layer. When friction acts with gravity the outcome is shear.

Aim:

All staff and carers should be trained in lifting and handling patients as correct handling reduces friction.

Intrinsic Factors

Intrinsic factors are those affecting either the supporting structures of the skin or the physiological processes in such a way that tissue injury occurs. These factors include:

- **Advanced age**

Changes occur in the skin and its supporting structures with aging. There is less nutrient exchange and less resistance to the forces of pressure, friction and shear. Skin tears occur more easily. Barrier function is decreased, sensory perception is decreased and the hypersensitivity reaction is also decreased. There is loss of subcutaneous fat and vascular fragility is increased (Pieper 2000).

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- **Immobility**

Reduced ability to relieve pressure occurs for many reasons and is one of the greatest risk factors.

- **Moisture/Incontinence**

Moisture alters the ability of the epidermis to resist external forces. Both shear and friction are increased in the presence of mild to moderate moisture (Adams and Hunter 1967).

- **Malnutrition**

Severe protein deficiency renders soft tissue more susceptible to breakdown when exposed to local pressure because hypoproteinemia alters oncotic pressure and causes oedema formation. Oxygen diffusion and nutrient transport are compromised in oedematous tissues. There is decreased resistance to infection in patients with low protein levels because of the effects on the immune system. Malnutrition has also been associated with altered tissue regeneration and inflammatory reaction (Thomas 1996).

Certain vitamin deficiencies, particularly vitamins A, C and E, may also contribute to pressure ulcer formation (Flanagan 1997).

- **Neurological Disease**

There is a reduction in sensory perception and mobility may also be affected. Multiple sclerosis, stroke patients and diabetics may be unaware of pressure and pain.

- **Psychosocial Status**

Motivation, emotional energy and emotional stress have been associated with pressure ulcer formation (Garber et al 1996). Cortisol may be the trigger for lowered tissue tolerance when a person is under stress.

- **Low Blood Pressure**

A systolic blood pressure below 100mmHg and diastolic pressure below 60mmHg have been associated with pressure ulcer formation (Bergstrom 1997). Hypotension may shunt blood flow away from the skin to vital organs and decrease the skin tolerance for pressure.

- **Drug Therapy**

Reduced mobility and awareness with sedatives can contribute to pressure ulcer formation. Steroids dampen the inflammatory response and also contribute to the skin becoming dry and fragile.

- **Vascular Disease**

There may be insufficient blood flow in patients with Peripheral Vascular Disease and microvascular disease in Diabetics.

- **Debilitating Disease**

The multiple factors associated with debilitating diseases such as chronic obstructive pulmonary disease, rheumatoid disease, renal and cardiac disease and other terminal illnesses are thought to increase the patient's risk of pressure ulcer development.

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16.4 Skin Care And Pressure ulcers

Healthy skin has been defined as skin that is fulfilling all its functions in such a way that an individual's quality of life is not affected.

The skins functions are:

- Physical protection (from pathogens, trauma, irritants and UV light and immunological protection)
- Sensory perception
- Preservation of water balance
- Regulation of temperature

(Penzer and Finch 2001)

Promoting Healthy Skin

As well as treating specific conditions, there are many strategies that can be used to prevent skin breakdown and to promote skin health.

The overall aims of skin care should be to:

- Prevent skin breakdown through promoting effective skin barrier function
- Promote comfort for the older person
- Encouragement wherever possible (Penzer and Finch 2001)

Hygiene and Total Emollient Therapy

Over washing can be detrimental to the maintenance of healthy skin. Hygiene and total emollient therapy are at the centre of any strategy for promoting good skin health. These strategies improve skin barrier function and comfort and can promote a sense of well being. Emollient therapy is particularly beneficial for older people. Their skin produces less of the natural oils to protect the outer layer of skin, thus preventing moisture loss and flexibility. Applying emollients helps to mimic the actions of these natural products. Decreasing dryness will also help to reduce itching. Total emollient therapy involves incorporating the use of emollients into the daily care of patients.

There are 3 steps to total emollient therapy:

1. Soap should be avoided where possible
2. Bath oils can be added to wash basin. Care needs to be taken to avoid accidents, as surfaces may be greasy. Water should be warm not hot.
3. After washing the application of a moisturiser helps to maintain the quality of the skin. The moisturiser should be applied by stroking movement in the direction of the hair growth.

(Penzer and Finch 2001)

Incontinence

Incontinence is commonly cited as an important risk factor but research findings are inconclusive as to the relative significance of this in pressure ulcer development (Penzer and Finch 2001). However, moisture and acid from urine and faeces can cause skin maceration and tissue damage from friction becomes more likely (Kelly 1994). Overflow incontinence from faecal impaction can also be a

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problem and hard faecal bulk in the rectum might affect pressure distribution (Torrance 1983). The addition of dietary fibre, use of aperients or suppositories or enemas might be indicated.

The skin has a barrier of epithelial lipids, sebum and sweat from the skin glands, which is relatively impermeable to water. The use of soap can strip away this protection, encouraging skin dehydration and increasing the frictional coefficient. Skin has an acid pH which when washed with soap, can shift to alkaline, causing skin dryness. If cleansing the skin is necessary, a mild soap should be used and thoroughly rinsed off (Clay 2000). Skin should be dried well using a patting motion because rubbing has been associated with deep tissue damage. Although numerous creams, lotions and sprays are advocated for pressure ulcer prevention, few have been clinically evaluated, but the use of barrier creams may help give some protection from the patient's own excreta. If required patients should have their own small pots or tubes as 93% of large stockpots have been found to be highly contaminated (Torrance 1983).

Skin should be kept well hydrated and talcum powder used sparingly, because flaky or cracked skin is more susceptible to damage. Dehydration should be corrected by increased fluid intake and a topical moisturiser should be applied.

Massage

Vigorous skin massage is another traditional practice, which can be dangerous to vulnerable tissues, particularly where non-blanching erythema suggests early damage (Torrance 1983). Dyson (1978) reported a reduction of 38% in the incidence of pressure ulcers in a group of elderly patients whose skin was not rubbed, compared with a group who received the usual area massage.

16.5 Risk Assessment

Risk assessment tools are seen as the backbone of any pressure ulcer prevention programme. Screening distinguishes between those who are at risk of developing pressure ulcers and those who are not, allowing for allocation of resources. Assessment identifies specific risk factors and allows the carer to initiate individualised preventative measures (Pieper 2000).

The accuracy of using clinical judgement and intuition alone to identify those at risk has not been studied extensively. Research studies have shown that using a risk assessment tool more accurately identifies those at risk of developing pressure ulcers. Clinical judgement should be used in conjunction with a risk assessment tool that has been tested for reliability and predictive validity (Bergstrom et al 1998).

According to Schoonhoven et al (2002) over 40 risk assessment scales exist. Most reflect expert opinion, literature review or adaptation of existing scales. In the Draft European Pressure Ulcer Advisory Panel (EPUAP) Position Statement on risk assessment in pressure ulcer prevention and management (De Floor et al 2000) PROPOSITION 3 states that "Current risk assessment scales often over and under represent the risk of pressure ulcer development" and PROPOSITION 4 states "it is not possible to recommend a specific risk assessment scale". They state in relation to previous research into risk assessment tools, that "sensitivity and specificity are influenced by the preventative measures taken, the length of the observation period and the nature of the group

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studied. Therefore sensitivity and specificity are not straightforward measures that can be used to judge the performance of risk assessment scales”.

As the evidence from research does not support any one specific tool for risk assessment and given that pressure ulcer prevention is reliant on so many complex variables, other than tools that culminate in a numerical score, the best practice outcome can be achieved when the ethos of the care setting fully reflects a holistic and multidisciplinary approach to preventing pressure ulcers.

Braden and Bergstrom (1999) suggest that risk assessment should take place on admission and reassessment should be carried out at 48 and 72 hours following admission, as carers become more familiar with patient characteristics e.g. incontinence and dietary problems. The level of risk and associated factors should be identified. Reassessment should take place at regular intervals and when there is a change in the condition of the patient.

The Norton Scale (1962)

The first risk assessment scale to be developed has been studied extensively. It consists of five parameters: physical condition, mental state, activity, mobility and incontinence. Each parameter is rated on a scale of 1 to 4, with one or two word descriptors for each rating. The sum of the ratings for all five parameters yields a score that can range from 5 to 20, with lower scores indicating increased risk. Norton found an almost linear relationship between the scores of the elderly patients and the incidence of pressure ulcers, with a score of 14 indicating the “onset of risk” and a score of 12 or below indicating a high risk for pressure ulcer formation (Norton 1996). (Appendix Seven)

The Braden Scale (1986)

For identifying those at risk of developing pressure ulcers, is commonly used with medically and cognitively impaired older adults. It has been used extensively in long term care settings but is also used in acute and community care. The Braden Scale has been tested in numerous settings for reliability and validity (Bergstrom et al 1998, Braden and Bergstrom 1994, Bergstrom et al 1987). Specificity of scores 16 or below ranges from 83% to 100% and 17 and higher ranges from 64% to 90%, supporting the predictive validity of the tool (Ayello 2003).

It requires less than 1 minute to complete.

The Braden Scale assesses:

- Sensory Perception
- Moisture
- Activity
- Mobility
- Nutrition
- Friction and Shear

Pressure ulcer risk increases as scores on the Braden Scale decrease.

- 15-18 indicates mild/low risk
- 12-14 indicates moderate risk
- 12 or less indicates high risk

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Mild/Low Risk

Mild/low risk is present when mobility is scored as 2 (Chairfast) or 3 (Walks Occasionally). If other factors not measured by the Braden Scale are present (low blood pressure, advanced age, faecal incontinence, severe emaciation) strategies used for moderate risk patients should be used. Repositioning should be planned around meal times, hygiene needs and therapies.

All staff caring for the patient should be aware of individualised, repositioning strategies. Patients who are very thin with poor muscle tone should be nursed at a 30-degree angle. The 30-degree tilt is particularly effective since the pressure is transferred to low risk “soft” areas, such as the gluteal muscles. These can tolerate pressures up to three and a half times higher than those tolerated over a bony prominence (Preston 1988). Heel and elbow pads may be of benefit to those having difficulty with bed mobility. A monkey pole will help reduce friction when repositioning. Pressure reduction and comfort can be achieved by using pillows or soft padding in thin patients.

Moderate Risk

Mobility score is no greater than 2 in patients at moderate risk. Attention should be paid to good body mechanics when repositioning the patient. Avoid dragging the patient and increasing the shearing forces. Pillows and soft padding may be used to protect bony prominences. Heel and elbow protectors may also be used.

Lateral positioning should not exceed 30 degrees. Legs should be supported on pillows with the heels off the mattress when lying in the recumbent position. A pressure reducing/relieving support surface should be used. Support surfaces do not reduce the importance of repositioning the patient and using protective devices. The possibility of friction must also be addressed and treated.

High Risk

Mobility and Activity scores are 1 and 2. The level of risk is even greater when other risk factors are present (low blood pressure and hyperpyrexia). There should be an increase in the frequency of repositioning, and body shifts. Lateral positioning should not exceed 30 degrees. Pillows and soft wedges can be used for positioning. An appropriate support surface is absolutely essential. Continuous attention should be paid to suspending heels off the bed and other high-risk areas should also be monitored continuously.

(Appendix Eight)

The Waterlow Scale (1984)

Was developed as the result of a pressure ulcer audit and was designed to be more than a risk assessment tool. It offers guidelines on the selection and use of preventative equipment and dressings, together with a pressure ulcer classification model for grading and auditing tissue breakdown (Flanagan 1995).

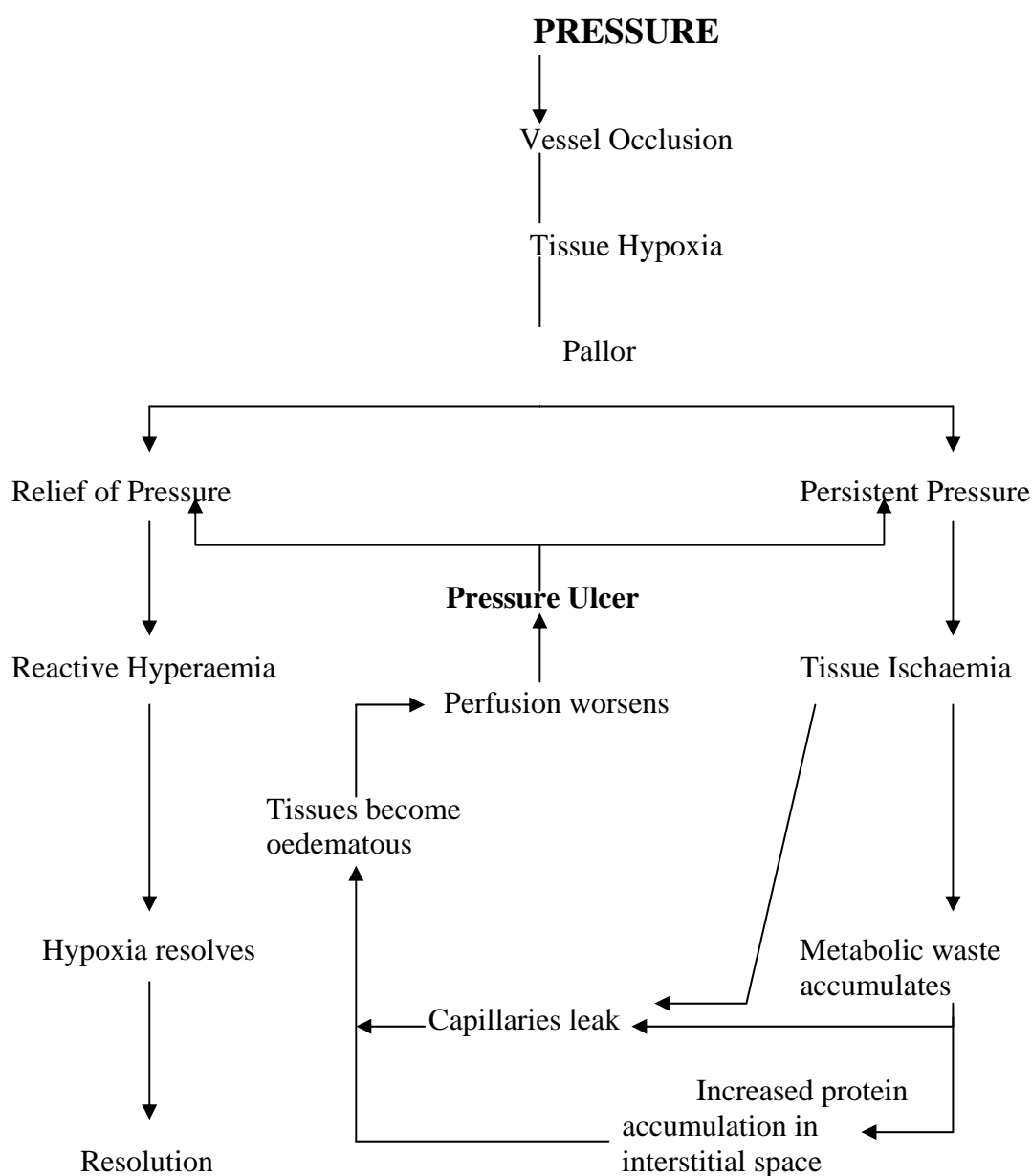
The Waterlow Scale was developed for use in both medical and surgical settings. Predisposing factors include build/weight, continence, skin type, mobility, sex, age and appetite. The addition of

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a special risk category subdivided into tissue malnutrition, neurological deficit, major surgery/trauma and medication enables the carer to make a detailed assessment of these factors and, if necessary, award several scores in each category to reflect the patient's risk status accurately. It is difficult to predict the maximum score, but more than 20 is recognised as "Very high risk", 15-20 "High risk" and more than 10 "At risk".

Waterlow designed this assessment tool to meet a variety of clinical situations, she encourages practitioners to adapt it to their own needs and report back so it can be developed further. It is interesting to note that many carers are still using the outdated version. (Appendix Nine)

Figure 1: Cellular Response to Pressure



(Pieper 2000)

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16.6 Pressure Ulcer Prevention Guidelines

(Adapted with the kind permission of the European Pressure Ulcer Advisory Panel)

Pressure damage is common in many healthcare settings across Europe affecting all age groups and is costly in terms of human suffering and use of resources. With an ageing population in the South East and changes in patterns of sickness this problem will increase unless action is taken. In all care settings and among all age groups, damage should be highlighted. Most pressure damage could be prevented and it is important to have prevention and educational strategies in place. These should be based on the best available evidence. All interventions and outcomes should be documented.

Four Main Objectives

1. Identify at risk individuals needing prevention and the specific factors placing them at risk.
2. Maintain and improve tissue tolerance to pressure to prevent injury.
3. Protect against adverse effects of external mechanical forces: pressure, friction and shear.
4. Reduce the incidence of pressure ulcers through educational programs.

Guidelines are based on the following evidence:

- A. Results of two or more randomised controlled trials on pressure ulcers in humans provide support.
- B. Results of two or more controlled trials on pressure ulcers in humans, or where appropriate, results of two or more controlled trials in an animal model provide indirect support.
- C. This rating requires one or more of the following:
 1. results of one controlled trial,
 2. results of at least two case studies/descriptive studies on pressure ulcers in humans or
 3. expert opinion.

Risk assessment tools and risk factors

Risk assessment must serve as a basis to identifying measures that will alleviate, reduce or minimise the negative effects of identified factors. Risk assessment tools should be used as an adjunct to clinical judgement and not in isolation from other clinical features. Risk assessment should not lead to an inflexible and prescriptive approach to patient care. (C)

1. Identify “at risk” individuals needing prevention and the specific factors placing them at risk.

- (a) Use the Braden Risk Assessment Tool or other similar tool to aid in identification of at risk individuals. (A)
- (b) Risk assessment should be performed immediately on entry into an episode of care, this assessment may take time to fully complete if information is not readily available. Assessment should be ongoing and frequency of reassessment be dependent on change in the patient’s condition. (C)

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- (c) Consider all bed or chair bound patients, or those whose ability to reposition is impaired, to be at risk of pressure ulcers. (A).
- (d) Identify individual risk factors to direct specific preventive treatments. Modify care according to the individual factors. (A)
- (e) All assessments of risk should be documented. (C)

2. Maintain and improve tissue tolerance to pressure in order to prevent injury

Every effort should be made to optimise the condition of the patients skin. Assessment of patients with dark or tanned skin is especially difficult.

- (a) Skin condition should be inspected and documented daily and any changes should be recorded as soon as they are observed. Inspection must be documented.
- (b) Initial skin assessment should take into account the following:
 - Bony prominences (sacrum, heels, hips, ankles, elbows, occiput) to identify early signs of damage.
 - Identify the condition of the skin- dryness, cracking, erythema, maceration, fragility, heat and induration. (C)
- (c) Avoid excessive rubbing over bony prominences as this does not prevent pressure damage and may cause additional damage. (C)
- (d) Find the source of excess moisture due to incontinence, perspiration, or wound drainage and eliminate this where possible. When moisture cannot be controlled, interventions that can assist in preventing skin damage should be used.
- (e) Skin injury due to friction and shear forces should be minimised through correct positioning, transferring and repositioning techniques. (C)
- (f) Following assessment nutritionally compromised individuals should have a plan of appropriate support and/or supplementation that meets individual needs and is consistent with overall goals of therapy. (C)
- (g) As the patient's condition improves the potential for improving mobility and activity status exists, rehabilitation efforts may be instituted if consistent with overall goals of therapy. Maintaining activity level, mobility, and range of movement is an appropriate goal for most individuals. (C)
- (h) All interventions and outcomes should be monitored and documented.

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Skin Care and Early treatment

- (a) The frequency of skin cleansing should be individualised according to need. A mild cleansing agent should be used to minimise irritation and prevent drying of the skin. Avoid hot water and excessive friction. (C)
- (b) Dry skin should be treated with moisturisers. Emollient therapy is particularly beneficial for older people. Minimise environmental factors leading to dry skin such as cold air and low humidity. (C)
- (c) Assess and treat incontinence. When incontinence occurs, cleanse skin at time of soiling and apply a moisture barrier. Select underpads that are absorbent and provide a quick drying surface to the skin. (C)
- (d) Avoid massage over bony prominences. (B)
- (e) Minimise skin injury caused by friction and shear by handling and positioning the patient correctly. Friction may be reduced by using protective films (transparent films) and dressings (hydrocolloids). (C)

External Pressure and Support Surfaces

Any individual who is assessed to be at risk of developing pressure ulcers should be repositioned if it is medically safe to do so. Frequency of repositioning should be consistent with overall goals. Documentation to record positioning should be completed. Correct positioning and support is important to minimise friction and shear in both bed and chair.

3. Protect against the adverse effects of external mechanical forces: pressure, friction and shear.

- (a) Any patient who is acutely ill and at risk of developing pressure ulcers should avoid uninterrupted sitting out of bed. The period of time should be defined in the individualised care plan but generally will not be more than 2 hours. (B)
- (b) Individuals considered to be at risk of pressure sores should have a personalised written prevention plan which may include a pressure redistributing device. Choose mattress and cushion appropriate for risk. (C)
- (c) Consider postural alignment, distribution of weight, balance and stability and pressure relief when positioning persons in chairs or wheelchairs. (C)
- (d) Teach chair bound patients, who are able, to shift weight every 15 minutes. (C)
- (e) Use lifting devices for movement rather than drag the patient during transfers and repositioning. (C)

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- (f) Use pillows or foam wedges to keep bony prominences from direct contact with each other (e.g. knees and ankles). (C)
- (g) Use devices that totally relieve pressure on the heels (e.g. pillow under calf to raise heels off bed). Do not use doughnut type devices or water bags.
- (h) Avoid positioning directly on the trochanter when using side lying position (use the 30 degree lateral inclined position, an example can be seen in Appendix 10).
- (i) Maintain the head of the bed at the lowest degree of elevation consistent with medical conditions and other restrictions. Limit the amount of time the head of the bed is elevated.

Education

4. To improve the outcome for patients at risk of pressure damage through educational programmes.

- (a) Implement educational programs for the prevention of pressure ulcers that are structured, organised, comprehensive and directed at all levels of health care providers, patients, family and caregivers. (A)
- (b) Include information on:
 - a. aetiology of pressure ulcers and risk factors
 - b. risk assessment tools and their application
 - c. skin assessment
 - d. selection of support surfaces
 - e. development of individual programs of skin care
 - f. demonstration of positioning to decrease risk of tissue breakdown
 - g. accurate documentation of pertinent data

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16.7 Pressure Ulcer Classification

European Pressure Ulcer Advisory Panel

Grade 1

Non-blanching erythema of intact skin.

Discolouration of the skin, warmth, oedema, induration or hardness may also be used as indicators, particularly on individuals with darker skin.

Grade 2

Partial thickness skin loss involving epidermis, dermis, or both.

The ulcer is superficial and presents clinically as an abrasion or blister.

Grade 3

Full thickness skin loss involving damage or necrosis of subcutaneous tissue that may extend down to, but not through underlying fascia.

Grade 4

Extensive destruction, tissue necrosis, or damage to muscle, bone, or supporting structures with or without full thickness skin loss.

(Stirling Scale can be seen in Appendix Eleven)

16.8 Pressure Ulcer Prevention Guidelines

(Adapted with the kind permission of the European Pressure Ulcer Advisory Panel)

Guidelines are based on the following evidence:

- A. Results of two or more randomised controlled trials on pressure ulcers in humans provide support.
- B. Results of two or more controlled trials on pressure ulcers in humans, or where appropriate, results of two or more controlled trials in an animal model provide indirect support.
- C. This rating requires one or more of the following:
 - 1) results of one controlled trial,
 - 2) results of at least two case studies/descriptive studies on pressure ulcers in humans, or
 - 3) expert opinion

16.8.1 Assessment

Assessing the pressure ulcer

Assess the pressure ulcer(s) initially for location, grade, size, wound bed, exudate, pain and status of surrounding skin. Care should be taken to identify undermining and sinus formation. (C)

Reassess pressure ulcers daily when possible or at least weekly. If the condition of the patient or wound deteriorates, re-evaluate the treatment plan as soon as any evidence of deterioration is noted. (C)

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History and Physical Examination

Perform a complete history and physical examination, because a pressure ulcer should be assessed in the context of the patients overall physical and psychosocial health. Address identified needs. (C)

Nutritional assessment and management

Ensure adequate dietary intake to prevent malnutrition to the extent that this is compatible with the individual's wishes or condition. (B)

Pain assessment and management

Assess all patients for pain related to the pressure ulcer or its treatment and document. (C)

Manage pain by eliminating or controlling the source of pain (e.g., covering wounds, adjusting support surfaces, repositioning). Provide medication or other methods of pain relief as needed and appropriate. Seek specialist advice if necessary. (C)

Psychosocial assessment and management

Assess resources (e.g., availability and skill of caregivers, home conditions, equipment, patients preference) for individuals being treated with pressure ulcers in the home (C).

16.8.2 Managing Tissue Loads

Managing tissue loads can be achieved in a variety of ways including:

1. manual repositioning
2. use of specialist equipment

and is a 24-hour provision whether the patient is in a chair or bed. Periods spent immobile in chairs should be limited to two hours or less per session, unless their clinical condition prevents doing so. (B)

Following assessment of the patient and pressure ulcer, a plan of treatment consistent with the overall goal of therapy should be developed. (C)

Whenever possible avoid positioning patients directly on a pressure ulcer or directly on a bony prominence unless this is contraindicated by their general treatment objectives, in which instance an adequate pressure relieving device should be used (C).

16.8.3 The use of pressure ulcer prevention devices

There is no agreed definition of the terms of Pressure Relief – Reduction - Redistribution

Therefore, for simplicity, the term pressure ulcer prevention device will be used.

Consider postural alignment, distribution of weight, balance, stability, and pressure ulcer risk reduction when positioning patients or selecting equipment. This is especially important in the sitting position whether in bed or chair. (C)

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Reposition, or where possible teach the patient to reposition themselves at frequent intervals to redistribute pressure. (C)

Benefit may be derived from a variety of pressure ulcer prevention devices but information on patient outcomes and information on the cost effectiveness of any of these devices is scarce. (B)

It is necessary to develop international and European standards to which these devices should perform. (C)

16.8.4 Wound treatment

Debridement is defined as the removal of devitalised tissue from a wound. The rationale for removing such tissue is that:

1. it removes a medium for infection
2. it facilitates healing
3. it aids assessment of wound depth (C)

Remove devitalised tissue in pressure ulcers when appropriate for the patient's condition and consistent with the patient goals. (C)

With the terminally ill patient their overall quality of life should be taken into account when deciding whether to debride the wound and the manner in which this should be accomplished. (C)

Surgical, enzymatic and/or autolytic debridement techniques may be used when there is no urgent clinical need for drainage or removal of devitalised tissue. (C)

If there is an urgent need for debridement, as with advancing cellulitis or sepsis, surgical debridement should be used. Surgical debridement must be performed by a competent person. (C)

Methods of debridement include surgical, enzymatic, autolytic, larvae or a combination. Dry eschar need not be debrided if oedema, erythema, fluctuance or drainage are not present. Dry eschar may be removed with dressings, which provide a moist environment to encourage autolysis. They include hydrogels and hydrocolloids. (C)

These wounds should be assessed daily to monitor pressure ulcer complications which would require debridement. (C)

Prevent or manage pain associated with surgical debridement. (C)

16.8.5 Wound cleansing

Cleanse wounds as necessary with tap water or water suitable for drinking or with saline. (C)

Use minimal mechanical force when cleansing or irrigating the ulcer. Showering is appropriate. Irrigation can be useful for cleaning a cavity ulcer. (C)

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Antiseptics should not routinely be used to clean wounds but may be considered when bacterial load needs to be controlled (after clinical assessment). Ideally antiseptics should only be used for a limited period of time until the wound is clean and surrounding inflammation reduced.

16.8.6 Dressings

Use a dressing that maintains a moist environment at the wound/dressing interface. (A)

Determine the condition of the wound and establish treatment objectives before selecting a dressing- e.g., grade, wound bed, infection, level of exudate, pain, surrounding skin, position and patient's preference. (C)

Dressings should be maintained in situ as long as is clinically appropriate, and in line with manufacturers recommendations. Frequent removal could damage the wound bed. Dressings that harden should not be used since they may cause pressure injuries. (B)

Dressings may need to be removed daily to ensure that the wound is not getting worse due to inadequate pressure relief.

If there is leakage or strike through, it causes a break in the barrier that the dressing provides to external contamination, and so it should be changed. If this occurs frequently it may be appropriate to reconsider dressing choice. (C)

The use of wound protocols based on good evidence will avoid unnecessary changes of dressing. (C)

Regular observation will demonstrate the progress of healing and if there is a need to change treatment objectives. (C)

16.8.7 Managing Bacterial Colonisation and Infection

Pressure ulcer colonisation and infection

Reduce the risk of infection and enhance wound healing by hand washing, wound cleansing and debridement. (A)

If purulent material or foul odour is present, more frequent cleansing and possibly debridement are required. (C)

All pressure ulcers are colonised. Therefore do not routinely take a swab. If there are clinical signs of infection present cultures may be taken. Seek advice from the pathologist/ microbiologist. (C)

Where there are clinical signs of infection, which do not respond to treatment, radiological examination should be undertaken to exclude osteomyelitis and joint infection. (C)

Institute, where appropriate, systemic antibiotic therapy for patients with bacteraemia, sepsis, advancing cellulitis or osteomyelitis. (A)

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Systemic antibiotics are not required for pressure ulcers that exhibit only clinical signs of local infection. (C)

Protect pressure ulcers from exogenous sources of contamination (e.g. faeces) (C)

16.8.8 Infection control

Follow body substance isolation precautions or an equivalent system appropriate for the healthcare setting and the patient's condition when treating pressure ulcers. (C)

Use clean gloves for each patient. When treating multiple ulcers on the same patient, attend to the most contaminated ulcer last (e.g. in the perianal region). Remove gloves and wash hands between patients. (C)

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