These Guidelines were originally developed for Mercy Hospice Auckland (formerly St Joseph's Mercy Hospice), New Zealand, but demand from other palliative care providers and a substantial grant from the Genesis Oncology Trust (www.genesisoncology.org.nz) has enabled them to be produced in this convenient and easy to read book.

The Guidelines have been independently reviewed to ensure the information presented within them is accurate and up-to-date. This review was undertaken by Jenny Phillips *MA (Nursing), BSc (Hons), RGN*, Nurse Practitioner™ (Wound Care).

Dedication

To my wonderful wife, Cheryl, who has supported me through many long days and late nights - you are my Angel.

Disclaimer

Every effort has been made in the writing of this document to present accurate and up-to-date information from the best and most reliable sources. However, the result of managing patients' wounds depends upon a variety of factors not under the control of the author. Therefore the author does not assume responsibility for, nor make any warranty with respect to, the outcomes achieved from the information described herein.

About the Author

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Wayne Naylor is a New Zealand registered nurse who began his career in forensic psychiatry before moving into general surgery, and then to reconstructive plastic surgery and burns. After a move to the United Kingdom, Wayne worked for the Royal Marsden NHS Trust in London, where he completed his BSc (Hons) Degree in Adult Cancer Nursing.

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Contents

Contents

Introduction

Wound management can be a challenging area of care given the continuing developments in our understanding of the process of wound healing, and the bewildering array of dressings and devices available for the treatment of wounds. It is an area of care that is predominantly undertaken by nurses, who contribute a great deal to the body of knowledge on wound management through research, practice development and product evaluations.

While wound care in a healthy person can at times be quite difficult, the situation becomes significantly more challenging in patients with life-threatening chronic disease. This situation exists in palliative care patients, who are at risk of a number of complex wounds. These wounds may arise as a direct result of their disease, a complication of their disease or as a side effect of disease modifying treatment. There are often difficult to manage symptoms associated with the wound, which in turn can lead to distressing psychological and social problems. When combined with the other significant issues faced by palliative care patients, wound management for these people represents a unique challenge requiring a holistic and innovative problem solving approach.

These guidelines have been written as a means of accessing up-to-date information on wound management with a particular emphasis on the care of wounds and related symptoms experienced by palliative care patients. The guidelines are separated into three main sections focusing on the basics of wounds care, management of specific wounds and a guide to dressing products. Ease of access and understanding have been key themes underpinning the style and layout of the guidelines, as has the provision of information at a level that will suit all carers. While the guidelines were originally developed for use in the hospice setting, they will be applicable to palliative care patients wherever they receive care.

Structure of the Skin

The skin and its accessory structures make up one of the largest organs of the body – called the integumentary system. It covers the entire surface of the body containing and protecting internal structures, and providing information about the external environment. Skin consists of two main layers, the epidermis and dermis, and is attached to the subcutaneous layer, which in turn is fixed to underlying muscle and bone (Tortora & Grabowski, 2002).

Epidermis

The outer-most layer of the skin is the epidermis, which is in direct contact with, and provides a tough impermeable barrier to, the external environment. Approximately 90% of epidermal cells are keratinocytes, the remainder are predominantly melanocytes that produce pigment, Langerhans cells that are involved in cell-mediated immune responses and Merkel cells, which are involved in touch sensation (Tortora & Grabowski, 2002; Ross, Romrell & Kaye, 1995; Strete, 1995). The cells of the epidermis are organised into four distinct cellular layers (Figure 1):

- Stratum corneum - the outer-most layer, which is comprised of inactive, flat keratinocytes filled with keratin. It is impermeable to water, bacteria and a number of chemicals (Tortora & Grabowski, 2002).
- Stratum granulosum - containing cells in various stages of degeneration.
- Stratum spinosum - an active layer several cells thick in which the cells are tightly bound together by cell membrane processes called desmosomes (Marieb, 2001).
- Stratum basale - the deepest layer consisting of a single layer of cuboidal cells that divide and send new cells upwards to become part of the outer layers. The surface of hair follicles and sweat glands are also lined by the stratum basale (Ross et al, 1995).

The soles and palms have an extra layer between the stratum corneum and stratum granulosum known as the stratum lucidum. It is a specialised layer designed to provide extra cushioning against surface impact (Tortora & Grabowski, 2002). The epidermis is tightly bonded to the dermis by the basement membrane, an acellular layer composed of protein fibres (Stocum, 1995).

Dermis

The dermis provides skin with its strength and flexibility through the combination of two strong elastic fibres, collagen and elastin, surrounded by a gel-like material composed of dermal proteoglycans (Tortora & Grabowski, 2002; Marieb, 2001). The blood vessels, lymphatics and sensory nerve endings of the skin are all found within the dermis (Figure 1). The predominant cells of the dermis are:

- Fibroblasts - produce collagen, elastin and ground substance
- Macrophages - a type of white blood cell
- Mast cells - which release histamine and are responsible for allergic and hypersensitivity reactions
- Adipocytes - fat cells (Marieb, 2001; Ross et al, 1995).

Subcutaneous layer

This layer is a loose connective tissue composed of adipose and areolar tissue (different types of fat). Its main functions are the control of body temperature and as an energy reservoir (Ross et al, 1995). Specialised nerve endings (known as Pacinian corpuscles) in this layer are responsible for the sensation of pressure (Tortora & Grabowski, 2002).

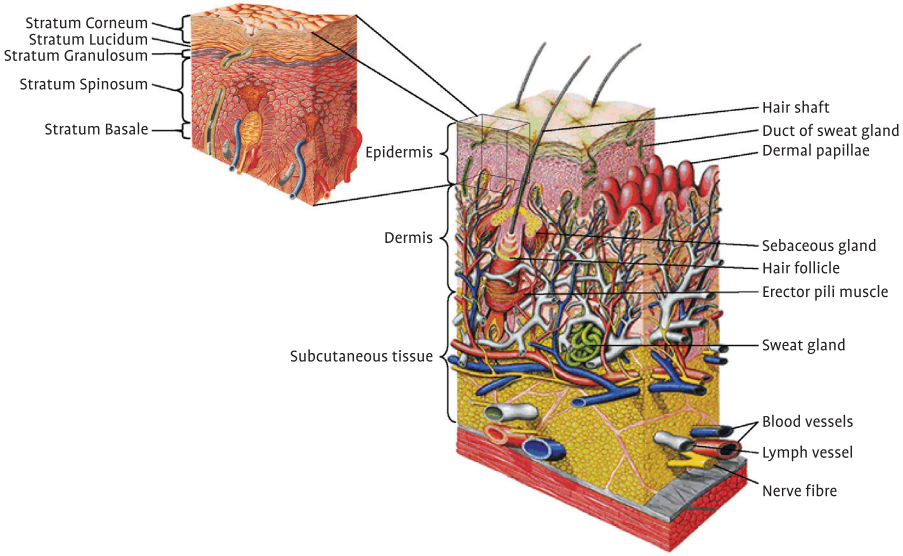

Figure 1. Cross-section of the skin and epidermis (From Global Wound Academy Website, Copyright © 2002 Smith & Nephew, with permission of Smith & Nephew.)

Accessory structures of the skin

As well as the cellular layers described above there are also a number of accessory structures arising from within the dermal layer of the skin. These include:

- Hair – covering almost the entire body, the two main functions of hair are protection and thermal regulation. The visible part of hair is called the shaft and buried within the dermis is the hair follicle and root.
- Erector Pili muscles – attached to hair follicles, these tiny muscles contract to raise hair into a more upright position ('goose-pimples').
- Sebaceous glands – also associated with hair follicles these glands secrete sebum, which has a waterproofing effect on the skin and keeps hair supple.
- Sweat glands – found over most of the skin with the number of glands varying in different body areas. Sweat glands are part of the excretion and temperature control systems of the body.
- Nails – present on the terminal end of fingers and toes, nails provide a protective covering and assist in grasping small objects.

Functions of the Skin

Protection

The skin provides a tough and durable barrier to external hazards, such as bacteria, chemicals and mechanical injury. It also acts as a container to keep in substances needed by the body, for example water and electrolytes (Mortimer & Badger, 2004).

Temperature control

The extensive blood supply and large surface area of the skin play a vital role in regulating body temperature and maintaining homeostasis through heat exchange with the external environment.

Sensation

Skin has a vast array of sensory nerve endings transmitting signals for pain, touch, itch, pressure and temperature, as well sensations of movement, vibration and stretch (Kamel, 2002).

The skin also synthesises Vitamin D, excretes water and salts as sweat and is able to absorb lipid-soluble compounds (Tortora & Grabowski, 2002; Collier, 1996).

Normal Wound Healing

A wound may involve the skin, soft tissues, muscle, bone or other internal structures and organs (Collier, 1996). The formation of a wound is usually the result of trauma, a disease process or as a consequence of treatment, such as surgery. For the purposes of these guidelines a wound will be defined as a break in the continuity of the skin that may extend into deeper tissues or organs.

Any wound to the skin, whatever the cause, will heal, where this is possible, by one of three methods:

- Primary intention healing – the wound edges are brought together and kept in place by the use of sutures, clips, glue or adhesive strips (e.g. surgical incision); there is no visible granulation tissue (Miller & Dyson, 1996).
- Secondary intention healing – the wound is open and heals from the bottom up by filling with granulation tissue (e.g. chronic ulcer (leg, pressure), wide local excision). When new tissue reaches the level of the epidermis re-epithelialisation takes place (Miller & Dyson, 1996; Flanagan, 1998).
- Tertiary (or delayed primary) intention healing – the wound is left open until it is free of necrotic tissue or infection, or has enough new tissue, to allow the edges to be brought together without undue tension (Sussman, 1998).

Wound healing process

Four separate phases occur during the normal process of wound healing; these are haemostasis, inflammation, proliferation and maturation (Figure 2). Although the phases are recognisable and occur in sequence they merge together producing a seamless process.

As soon as tissue injury occurs damaged blood vessels constrict to stem blood flow and coagulation of blood occurs (Flanagan, 2000). This constitutes the first phase of healing, **haemostasis**, which takes around 5 to 10 minutes. Haemostasis results in the formation of a blood clot composed of platelets, fibrin and red blood cells, which will eventually dry to form a scab.

Immediately following injury the **inflammatory phase** begins. Local inflammation is the hallmark of this phase, caused by capillary dilation and increased capillary permeability (Flanagan, 1999). The area around the wound will usually become red, hot, swollen and uncomfortable or painful. Neutrophils and macrophages (activated monocytes) are attracted to the wound to remove bacteria, foreign bodies and devitalised tissue. As the wound is cleared of contaminants, the macrophages also begin releasing a number of factors that stimulate the growth of new blood vessels (angiogenesis) and growth and division of fibroblasts (fibroplasia) (Stocum, 1995; Calvin, 1998; Flanagan, 1996).

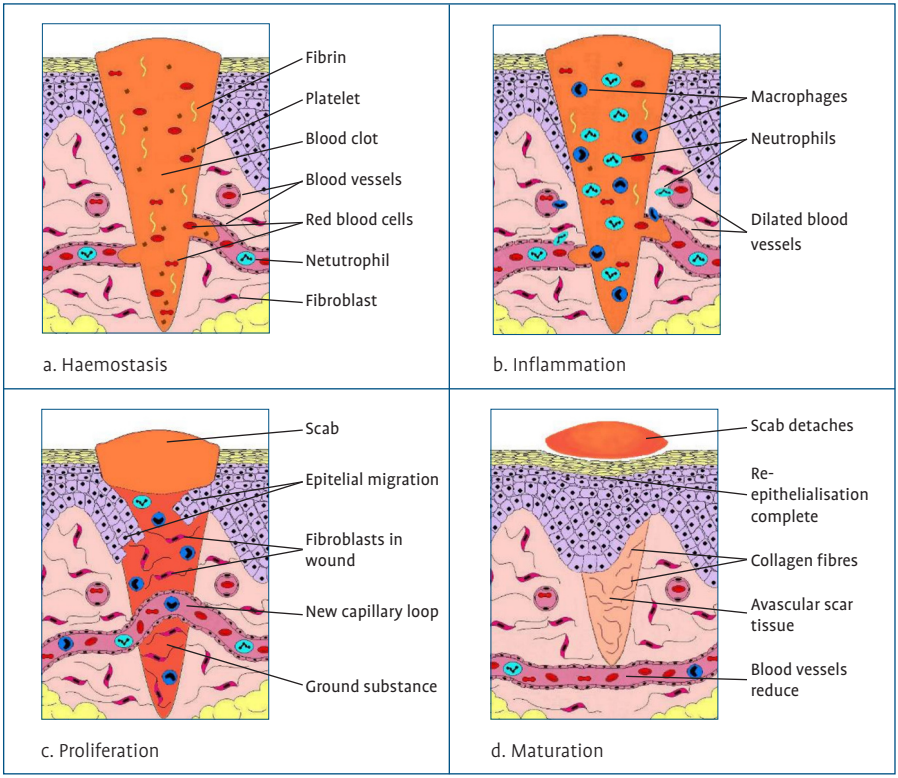

Figure 2. Diagrammatic representations of the phases of wound healing (© 2000 Wayne Naylor).

Once the wound is free of contaminants and devitalised tissue the **proliferative phase** begins. Fibroblasts are attracted to the wound from surrounding tissue

and begin replacing damaged tissue by producing collagen and ground substance (a gel like material that fills the space between collagen fibres) (Flanagan, 1998; Calvin, 1998). At the same time endothelial cells divide to form new capillary loops giving rise to the development of an uneven red granular tissue in the wound bed, referred to as granulation tissue. During this phase wound contraction occurs whereby specialised fibroblasts (myofibroblasts) pull the wound edges inwards (Calvin, 1998; Flanagan, 1996). Epidermal basal cells from the wound margin and hair follicles or sweat glands within the wound, also begin to divide to form a new epidermis. In a moist environment, where there is no scab formation, these processes are accelerated (Flanagan, 1999; Eaglstein, 1985; Winter, 1962).

On completion of the proliferative phase the wound will have filled with new tissue and be covered by new epidermis. The wound now moves into the **maturation phase** where the newly formed tissue is reorganised and remodelled to form a scar, which will obtain around 70-80% of normal skin strength (Calvin, 1998; Ehrlich, 1999).

Impediments to Healing

The process of normal wound healing requires a healthy physiological state along with a wound environment that is conducive to healing. In the presence of chronic and life threatening illness many of the factors important to wound healing are altered. It is important to recognise these factors in the palliative or terminally ill patient so that appropriate action may be taken, either to correct the problem or allow for its influence on wound healing. Also, if good wound care principles and practice are not adhered to, the local wound environment created may be detrimental to healing.

General health

General health problems can have an adverse effect on wound healing, often through effects on blood supply to the wound and an altered inflammatory response. Examples include peripheral vascular disease, heart disease, diabetes and arteriosclerosis, which impair blood supply. The normal inflammatory response may be adversely affected by diabetes and immune disorders. These problems should be addressed by treatment of the underlying health problem if this is possible.

Aging

Aging causes many changes in the skin, which are accelerated by chronic exposure to sunlight and tobacco smoking. There is a gradual thinning of the epidermis and a slowing of cell proliferation resulting in an increased renewal time for the stratum corneum. The junction between the epidermis and dermis becomes flattened reducing the flow of nutrients to the epidermis and increasing the risk of blistering (Van Onselen, 2001). A change in the organisation of collagen and elastin results in wrinkles and there is a decrease in subcutaneous fat. In older people the function of sweat glands and sebaceous glands is reduced, which may impair the ability to lose body heat and result in dry skin reducing the skin's barrier function (Donaldson & Whitton, 2001; Van Onselen, 2001). A diminished immune response in the skin also weakens its barrier function and predisposes

the elderly to skin infections and skin related malignancies. There is a reduction in the elasticity of elderly skin making it more fragile. The healing process is slowed down due to a reduced metabolic rate and poorer circulation (Bale & Jones, 1997). Nutritional problems, decreased mobility and mental or physical illnesses will also impair wound healing in older people (Mahony, 1999).

Malnutrition

Malnutrition results in poor or delayed wound healing resulting from a lack of essential nutrients such as protein, carbohydrates, fats, vitamins and trace elements. Dehydration will disturb cell metabolism and reduce circulatory blood volume, thereby reducing availability of nutrients to healing tissue. The immune response in malnourished people is reduced putting them at an increased risk of infection (Olde Damink & Soeters, 1997; Wells, 1994). Patients who are malnourished or underweight may experience poor healing due to protein being used for metabolism rather than in the production of new tissue (Cutting, 1994). It is therefore important to identify those at risk of malnutrition and develop an individualised nutritional support plan preferably with the assistance of a Dietician. If appropriate, enteral feeding may be necessary (e.g. percutaneous endoscopic gastrostomy or nasogastric tube).

Advanced malignancy

Advanced malignancy can be associated with a number of adverse effects that have a direct influence on healing, such as malnutrition, cachexia, altered coagulation (disseminated intravascular coagulation), and altered angiogenesis and re-epithelialisation (Lotti, Rodofili, Benci, & Menchin, 1998). While malnutrition may be managed as discussed above, the other effects of advanced malignancy are difficult, if not impossible, to prevent.

Stress

Stress may inhibit the growth of fibroblasts and can adversely affect the immune system causing a delay in healing (Kiecolt-Glaser, Marucha, Malarkey, Mercado, & Glaser, 1995; Moore & Foster, 1998). Inadequate sleep may also have an adverse effect on wound healing (Bale & Jones, 1997; Adam & Oswald, 1983).

Medications

Medications used in the management of cancer and other chronic diseases can have a number of adverse effects on healing. Steroids reduce the inflammatory response and when used over a long period of time may suppress fibroblast function reducing wound strength (Moore & Foster, 1998; Bale & Jones, 1997). Systemic or local Vitamin A may counteract the anti-inflammatory effects of steroids. Both wound contraction and re-epitheliasation may also be affected. Cytotoxic drugs (chemotherapy) inhibit cell division and protein synthesis so will slow the generation of new tissue required for wound healing (Bland et al, 1984). Suppression of the immune system, by immunosuppressant therapy or as a side effect of chemotherapy, will delay the inflammatory response and increase the risk of wound infection (Lotti et al, 1998).

Radiotherapy

Radiotherapy will slow or stop cell reproduction thereby delaying healing in an open wound if it is within the radiotherapy treatment field. It may also cause

permanent damage to local capillaries resulting in delayed wound healing in areas that have previously been irradiated (Sussman, 1998).

Wound

Wound related factors that may adversely affect healing include:

- Temperature – must be maintained at or above 32°C, a drop in wound temperature will delay healing by reducing function of cells within the wound e.g. fibroblasts;
- Desiccation - dry wounds have a longer inflammatory phase and heal much more slowly than wounds maintained in a moist environment;
- Maceration - excess exudate can cause the surrounding skin to become wet, soft and 'boggy', which may cause breakdown of skin and enlargement of the wound;
- Infection – bacteria release proteases into the wound causing tissue damage and prolonging the inflammatory phase (Bowler, 1998; Thomson, 1998). They also compete with healing cells for available oxygen and nutrients (Cutting, 1994).

Wound Assessment

Good wound assessment begins with a full patient assessment, as well as identifying the impact of the wound or associated symptoms on the psychological, social and spiritual well-being of the patient. It is not uncommon for patients with chronic wounds to suffer from social isolation, relationship problems, emotional difficulties and changes in role functions, for example: ability to go to work, care for children, leisure, self-care ability. For patients whose wound is causing considerable distress and/or is unlikely to heal, the impact of the wound on their quality of life is an essential aspect of assessment. Therefore, assessment must include the patient's own concerns, feelings and preferences (Naylor, Laverty & Mallett, 2001).

When examining a wound there are certain parameters that should be assessed, many of which should be rated for severity by both the health care professional and the patient. There are some aspects that can only be assessed by the nurse or doctor, such as the type of tissue present, colour of exudate and size of the wound, and it is important to have a standardised and valid method of measuring and recording these parameters to ensure each assessor is consistent. Patient self-rating will be important when assessing parameters such as pain, odour and exudate leakage, and is essential when assessing the psychosocial impact of the wound. Priorities for wound care should be based on the most troublesome problems identified by the patient along with clinical concerns of health professionals (Grocott, 1995). Feedback from the patient on how well a management plan is working is also vital.

Local Wound Assessment

The parameters listed below should be considered a minimum for accurate wound assessment, and will provide the necessary information for the development of a wound management plan.

None	No odour evident, even when at the patient's bedside with the dressing removed.
Slight	Wound odour is evident at close proximity to the patient when the dressing is removed.
Moderate	Wound odour is evident upon entering the room (1.5 to 3 metres from patient) with the dressing removed.
Strong	Wound odour is evident upon entering the room (1.5 to 3 metres from patient) with the dressing intact.

- **Box 1**: Descriptive odour rating scale (Baker & Haig, 1981; Poteete, 1993).

1) Aetiology or cause of wound – indicates expected outcome and possible management strategy, e.g. fungating wound care is directed towards symptom control, while a pressure ulcer requires pressure relief.

2) Location – will influence the rate of healing and choice of dressing, and may indicate the cause of the wound, e.g. pressure ulcer on sacrum

3) Size, depth and shape – to monitor changes in size to ascertain if the wound is healing or deteriorating. Should employ a combination of manual measurements, such as tracing or ruler (maximum length and width), and photography (Vowden, 1995).

4) Amount and nature of exudate – excess exudate may indicate infection and cause skin breakdown. The amount and nature (colour, consistency) should be recorded. To improve consistency in rating it is also helpful to record if the amount is increasing or decreasing.

5) Odour – often a feature of chronic wounds and may indicate infection. A descriptive rating scale is best when rating odour, as well as noting any increase or decrease in odour and utilising self-assessment by the patient. Box 1 is an example of a descriptive scale.

6) Type of tissue present – influences the choice of dressing. A 'colour coding' system is the most popular method of recording tissue type, using black (necrotic), yellow (sloughy), red (granulating) and pink (epithelialising) (Flanagan, 1997), as these approximate tissue appearance.

7) Signs of infection – usually observed via local and systemic signs and symptoms such as inflammation at the wound site and raised body temperature. However, in chronic wounds or immunosuppressed patients wound infection may present as increasing pain, exudate and odour levels, or friable granulation tissue (Gilchrist, 1999).

8) Nature and type of pain – may be related to the wound itself or dressing procedures. The only way to accurately assess wound pain is patient self-assessment, such as a visual analogue scale (Collier, 1997). Different aspects of pain, such as the nature, severity, site, frequency, impact on daily living and effectiveness of treatments should also be assessed (Stirling, 1996; Benbow, 1995).

9) Condition of surrounding skin – changes in the surrounding skin may indicate infection or dressing / tape allergies (Benbow, 1995). It is also important to

note if the skin is fragile, sensitive or macerated, as it may require extra protection or avoidance of adhesives.

10) Episodes of bleeding – may indicate erosion of blood vessels, particularly in fungating wounds, or trauma from adhesive dressing removal.

11) Other factors – any other factors that may affect wound healing or the choice of dressing should be recorded. For example the presence of a fistula or sinus, proximity of a stoma and current or previous treatments.

Wound Cleansing

Warmed, sterile 0.9% sodium chloride is the preferred solution for cleaning both infected and non-infected wounds (Gilchrist, 1999; Fletcher, 1997; Miller & Dyson, 1996). It is also acceptable to use clean, warm tap water, although it is not recommended for patients with a compromised immune system. Instances where tap water may be appropriate include soaking off large dressings or cleansing extensive chronic wounds (Gilchrist, 1999; Fletcher, 1997).

Gentle irrigation is the currently recommended method of wound cleansing (Hollinworth, 1997). Swabbing the wound with gauze or cotton balls may damage delicate new tissue and cause pain. It is often unnecessary to clean a wound unless it is contaminated or contains necrotic tissue (Dealey, 1999). Cold irrigation fluid or high-pressure irrigation should be avoided, as it can be painful. Using a sterile gloved hand rather than forceps can help reduce accidental wound trauma (Hollinworth, 1997).

Antiseptic and antibiotic preparations are not recommended for topical application to wounds, as almost all of these products are toxic to healthy tissue, may cause skin sensitivity reactions, are rapidly inactivated on contact with organic matter and may encourage bacterial resistance (Gilchrist, 1999; Fletcher, 1997; Oliver, 1997; Thomas, 1997; Trevelyn, 1996; Leaper, 1996). Some exceptions are:

1. Metronidazole gel for deodorising malodorous wounds;
2. Silver sulphadiazine cream (Flamazine) to prevent infection in burns and in some cases to treat Pseudomonas aeruginosa infection (although this is being superseded by silver impregnated dressings);
3. Mupirocin for some wounds infected with Methicillin Resistant Staphylococcus Aureus (MRSA) (Leaper, 1996; Trevelyn, 1996; Morgan, 2000; Miller, 1998).

Wound Bed Preparation

Wound bed preparation (WBP) is a relatively new concept that describes an approach to wound management aimed at removing barriers to healing and/or stimulating the healing process. In some instances this can involve preparing the wound bed for the application of an advanced wound care product, such as bioengineered skin substitutes or growth factors. WBP provides a framework for enhancing wound healing capacity by bringing together key aspects of wound management. There are four main elements to the approach and they are represented by the acronym 'TIME',

1. Tissue management;
2. Inflammation and infection control;
3. Moisture balance;
4. Epithelial edge advancement (Ayello et al, 2004).

While these principles are ideally aimed at promoting an environment for healing, they are nonetheless also valid goals when managing a wound palliatively. Here the goal is not to heal the wound but to control and improve symptoms and if possible and feasible to encourage healing.

Tissue management

This involves the removal of necrotic or compromised tissue to eliminate non-viable tissue, bacteria and cells that are impeding the healing process. This will also allow the full extent of the wound to be visualised. Methods of tissue removal (known as debridement) include:

- Surgical debridement performed in theatre by a surgeon to excise extensive or deep areas of necrosis. This option carries the risks associated with general anaesthesia.
- Sharp debridement, with scalpel, scissors and forceps, performed by an experienced health care professional with training in this method of wound debridement. Sharp debridement is performed at the patient's bedside and aims to remove loose, devitalised, superficial tissue only (Vowden & Vowden, 1999).
- Autolytic debridement using dressing products (such as a hydrogel or semi-occlusive dressing) that promote a moist wound environment (Freedline, 1999; Bale 1997; Hofman, 1996).
- Enzymatic debridement using enzymatic agents that breakdown dead tissue (Freedline, 1999; Werner, 1999).
- Larval or maggot therapy using sterile fly larvae, which are usually *Lucilia sericata*, the greenbottle blowfly, or *Phormia regina*, the blackbottle blowfly. The larvae secrete powerful proteolytic enzymes that breakdown necrotic tissue, which they then ingest along with bacteria.
- Topical negative pressure therapy (also known as V.A.C. therapy) (Ayello et al, 2004; Schultz et al, 2003). Applies a negative pressure (suction) evenly over the whole wound surface, which removes excess exudate, bacteria and tissue oedema, while encouraging blood flow to the wound and the removal of necrotic tissue.

Inflammation and infection control

Chronic wounds are often heavily colonised with a variety of bacteria, although often not in sufficient quantity to cause signs of infection. It has been established that a bacterial load of $\geq 10^6$ organisms per gram of tissue impairs healing. When the burden of bacteria in the wound is high, the bacteria will compete for nutrients and release proteases into the wound environment, damaging healing tissues and stimulating an inflammatory response. A recent discovery is the presence of 'biofilms', a protective polysaccharide coat that encases bacterial colonies within a wound and protects then from antibacterial agents (Falanga, 2003).

The management of colonised or infected wounds involves a number of approaches including:

- Debridement of necrotic tissue;
- Antimicrobial dressings e.g. those containing iodine or silver;
- Systemic or topical antibiotic therapy.
- Anti-inflammatories
- Topical negative pressure therapy;
- Increased frequency of dressing change (Ayello et al, 2004; Schultz et al, 2003).

Moisture balance

A certain amount of wound exudate is normal and performs particular functions of cleansing the wound and providing nutrients to healing tissues. It is important to maintain a moist wound environment to encourage healing and prevent dressing adherence. However, in chronic wounds the wound exudate may delay healing and excess exudate can cause damage to surrounding skin, loss of protein and encourage bacterial growth (Vowden & Vowden 2002; White 2001; Phillips et al., 1998). High exudate levels may be a result of infection, autolytic debridement or as a consequence of the wound aetiology, for example that associated with malignant fungating wounds. Excess fluid in the tissues due to oedema or lymphoedema will also increase exudate. Therefore the control and prevention of these conditions are important steps in reducing exudate production. There are many wound management products designed to assist in containing and controlling exudate, in particular alginate, hydrofibre and foam dressings. A non-adherent wound contact layer (such as Mepitel) with a secondary dressing is also a useful option, as are wound manager bags or ostomy appliances for wounds with small openings and heavy exudate. In some cases V.A.C. therapy may be an appropriate method of exudate control (White, 2001). As well as controlling and containing exudate it is also important to protect the skin surrounding the wound from maceration and excoriation.

Epithelial edge advancement

This is the most recent addition to wound healing theory and has come about through laboratory studies into the microenvironment of chronic wounds. These studies have found an impaired wound 'matrix' in chronic wounds, where changes have occurred in the healing cells causing them to become senescent or unresponsive to growth factors (Falanga, 2003). It is also likely that tissue ischaemia also plays a role, as prolonged hypoxia impairs the healing process. These chronic non-healing wounds become 'stuck' in the inflammatory or proliferative phase of wound healing.

Management strategies to encourage epithelialisation include the application of split or pinch skin grafts, bioengineered skin, growth factors and/or bioactive dressings/ treatments. These treatments provide the wound with a covering epidermis or the structure into which a new epidermis can grow more readily, or they supply necessary growth factors to stimulate healing. The bioactive agents interact with the wound microenvironment to correct abnormal cell or growth factor action.

This section covers the management of specific wounds that may present in palliative care patients. Each wound will be unique with different problems and psychosocial implications for the person with the wound. Thorough wound assessment followed by the development of an individualised management plan will make wound care much easier. The management plan will require regular review to ensure goals of management and the patient's identified needs are being met.

Wound Care in Palliative Patients

Wound management in palliative care patients presents many challenges related to the wound, disease processes and associated psychosocial problems. Not least of these are the types of wounds these people tend to develop. The most common wounds seen in palliative patients are malignant fungating wounds, pressure ulcers, fistulae, radiotherapy skin reactions, and oedema and lymphoedema. They may also develop a number of problematic skin conditions such as itching and sweating. It is also common for these wounds to develop distressing symptoms that can be difficult to control. Of particular concern are high exudate levels, malodour, pain, bleeding, and skin irritation or damage. Wounds tend to be of irregular size and shape and located in difficult to dress places or areas that are highly visible or personal, causing difficulty with cosmetic appearance. They are also prone to wound infection due to the poor state of health of the individual, or to immunosuppression and steroid use. This combination of factors leads to great difficulties in finding suitable dressings of an appropriate size, shape, absorbency, method of fixation, comfort, and cost.

Concurrent disease can cause or contribute to wound development and deterioration. In particular, cancer significantly affects bodily function reducing availability of nutrients for healing, especially in advanced cancer cachexia. It may also give rise to a non-healing wound in the form of a malignant fungating wound, where cancer cells have infiltrated the skin. Vascular disease and chronic obstructive airways disease will impair circulation and circulating oxygen. This reduces blood supply to the wound bed, thereby depriving the healing tissues of necessary nutrients and oxygen for healing. Motor neurone disease, multiple sclerosis, stroke and dementia can all result in decreased mobility and self-care ability, as well as reduced nutrition and possibly reduced sensation to warn of tissue damage. HIV / AIDS causes impaired immunity making the person susceptible to poor healing potential and wound infection. Both renal failure and chronic liver disease can cause disrupted metabolite, electrolyte and nutrient levels in the blood. This again will adversely affect healing and may predispose to wound development. Many of the treatments used in the management of these diseases will have detrimental effects on wound healing. Specific problems arise with chemotherapy, radiotherapy, immunosuppressive drugs and steroids. All of these treatments will adversely affect healing due to their effects on healing tissues and the immune system, which is vital for wound healing, and will predispose to infection.

There can be a conflict between the aims of wound care and the time left for the person, as well as the goals of palliative or terminal care. Often wound care goals are set with good intentions, usually to improve or heal the wound, which

is in line with good wound care practice. However, in light of the cause of the wound, concurrent disease and treatment, as well as the time remaining for the patient, these goals may be very unrealistic. Other priorities may exist in terms of symptom control or psychosocial support rather than intensive wound therapy that may achieve very little, especially in the dying patient. In this case wound care goals should be more realistically aimed towards symptom control and promoting comfort.

There are many, many psychosocial issues that arise for palliative care patients with significant implications for the care they receive. This aspect of wound management is relatively under-researched, although some work has been undertaken in people with chronic leg ulcers and pressure ulcers. The most important points to remember are to ensure these issues are explored as part of the wound assessment process, and to utilise patient self-assessment, where possible, to identify those issues that are most distressing to the person with the wound. Specific wound related psychosocial problems include:

- Presence of an unsightly (possibly unnecessary) leaky, malodorous, painful wound; affects body image.
- Range of emotional responses: anger, embarrassment, depression, guilt, disgust, shame, denial.
- Withdrawal and social isolation.
- Relationship problems.
- Social restrictions.

When considering the influence of the many factors discussed above on the palliative patient's ability to heal, and in light of the often short prognosis, wound healing may be an unrealistic goal. When this is the case the objective of wound management moves away from healing and focuses on control of wound related symptoms, promoting independence and maintaining or improving the patient's quality of life. There are times when the principles of wound healing may become less essential and management may be based on what works best for the patient. Some guiding principles for wound management in palliative care are:

- Prevent wound development or deterioration as much as is practicably possible, for example implementing a pressure ulcer prevention plan to reduce the risk of ulcer development.
- Correct or treat underlying causes if possible to allow for the best possible environment for healing or to reduce the impact of wound symptoms, such as increased exudate due to wound infection.
- Control wound related symptoms through the use of appropriate dressing products or the application or administration of appropriate medications.
- Judge the effectiveness of interventions based on a combination of patient self-assessment and clinical assessment.
- Provide psychosocial support, particularly if the wound has a significant impact on body image, emotional state or independence of the person.

Malignant Fungating Wounds

Definition

Malignant fungating wounds arise when cancer cells infiltrate and proliferate within the skin resulting in the development of nodular and/or ulcerating wounds (Figures 3 and 4). This type of wound is generally associated with advanced cancer in older age patients (Haisfield-Wolfe & Rund, 1997). Due to the underlying malignancy and the fact that these wounds tend to occur in terminally ill patients, healing of the wound is very unlikely. In fact the wound will often continue to deteriorate over time.

Description

Malignant fungating wounds tend to occur most commonly in the area of the breast or head and neck, followed by the groin and back (Thomas, 1992; Wilks, White, Smeal, & Beale, 2001). Unsurprisingly, the cancers most commonly associated with these wounds are breast and head and neck, although many cancers, including lymphoma and leukaemia, may give rise to such a wound (Gallagher, 1995).

A malignant fungating wound may develop from:

- An untreated primary skin cancer (such as squamous cell carcinoma or malignant melanoma),
- Invasion of the skin by an underlying locally advanced primary or recurrent cancer (e.g. breast cancer),
- Metastatic spread from a distant tumour, including implantation or 'seeding' during surgery,
- Malignant change in a chronic wound to squamous cell carcinoma (Marjolin's ulcer).

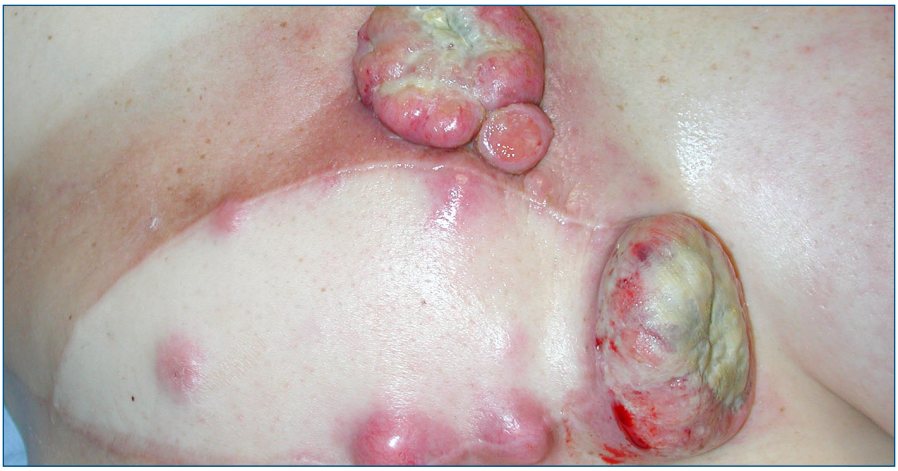

Figure 3. Proliferative fungating malignant wound due to recurrent breast cancer.

In the early stages, skin infiltration presents as discrete, non-tender skin nodules (Manning, 1998). As the nodules enlarge, due to tumour growth, skin capillaries and lymph vessels are disrupted. Combined with abnormal clotting and disorganised blood vessels within the tumour this leads to hypoxia and necrosis of the overlying skin (Mortimer & Badger, 2004).

Symptoms associated with malignant fungating wounds can be distressing and difficult to manage. The most frequently reported wound-related symptoms are odour, exudate, pain, bleeding and skin irritation.

Wound **malodour** is a significant and distressing symptom for the patient, as well as for their family and caregivers. Bacterial activity within the wound and stale exudate in dressings are the most common causes of malodour. Uncontrolled wound malodour can result in the patient feeling embarrassed, disgusted, guilty, ashamed and depressed, leading to social isolation and relationship problems (Van Toller, 1994).

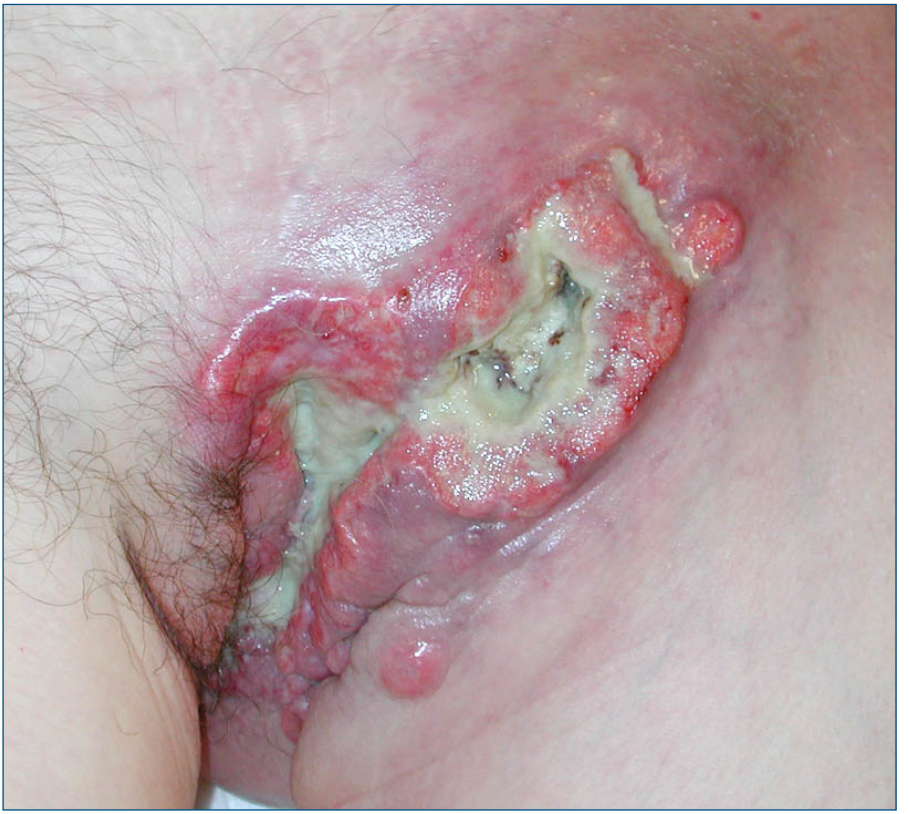

Figure 4. Deep ulcerating fungating malignant wound caused by untreated squamous cell carcinoma of the vulva

Heavy exudate is very common with malignant fungating wounds, often causing problems with leakage onto patient's clothes and bedding. This again leads to feelings of embarrassment, depression, and social isolation. High exudate levels may be due to disorganised and highly permeable tumour blood vessels, secretion of vascular permeability factors by tumour cells, bacterial activity and inflammation (Haisfield-Wolfe & Rund, 1997; Collier, 2000). Tumour necrosis due to cancer therapy may increase purulent exudate.

Damage or infiltration of nerves and blood vessels, exposure of dermal nerve endings and wound care procedures, such as dressing changes or wound cleansing, may cause **pain** in malignant fungating wounds. Nerve damage may result in neuropathic pain presenting as a burning pain with intermittent sharp shooting or stabbing pains.

Malignant fungating wounds have a tendency to **bleed** very easily due to the fragile nature of blood vessels and an altered platelet function within the wound. Spontaneous bleeding may occur, with the potential for major haemorrhage if a deep ulcerating wound erodes a large blood vessel. Dressing adherence and cleansing by swabbing with gauze may also cause bleeding.

Skin irritation may be caused by tumour activity in the skin or excoriation and maceration of the skin by exudate or adhesives.

Another problematic area is **fitting and retaining dressings**, as these wounds present in a wide variety of sizes, shapes and anatomic locations. When added to the difficult symptoms described above, finding a suitable dressing can be a challenge. Adhesive products should be avoided to prevent skin damage and avoid pain related to dressing adherence. The dressing also needs to be cosmetically acceptable to encourage the patient to continue an active social life, maintain a sense of normality and have confidence in social situations.

Principles of Management

The main objective of care for a person with a malignant wound is to maintain or improve their quality of life by promoting comfort, confidence, and a sense of well-being, and preventing social isolation (Naylor et al, 2001). Management is focused on identifying realistic treatment goals, effective symptom control and preventing, as far as possible, further wound deterioration or complications.

Management Strategies

Management of **malodour** is aimed at removing the medium for bacterial growth (moist necrotic tissue), killing the bacteria responsible for odour production or containing or masking the odour.

- Debridement of necrotic tissue using a dressing that provides a moist wound environment, for example a hydrogel, alginate, hydrofibre or hydrocolloid. Be aware that there may initially be an increase in exudate production.
- Topical 0.75-0.8% metronidazole gel kills the bacteria thought to be responsible for odour production (Newman, Allwood & Oakes, 1989). Apply a thin layer over the surface of the wound daily at dressing change.
- Systemic metronidazole can be effective but may produce side effects of

nausea, neuropathy, and alcohol intolerance. In addition, poor blood supply within the malignant wound may reduce the antibiotic's effectiveness (Thomas, Fisher, Fram, & Waring, 1998).

- Silver impregnated dressings kill a wide range of odour-causing bacteria.
- Activated charcoal dressings trap and prevent odour escaping from the local wound area (Williams, 1999; Miller, 1998).
- Sugar paste and sterile honey; although evidence is limited, both of these products are active against many bacteria and have some debriding properties.
- Other possibilities include occlusive dressings to prevent odour escape, commercial deodorisers (e.g. stoma preparations) and essential oils, daily dressing changes to prevent a build-up of stale exudate.

Exudate management requires a balance between exudate absorption or containment and maintaining a moist wound environment to encourage any potential healing and prevent dressing adherence and wound desiccation (drying out).

- Dressings suitable for moderate to high exudate include alginate and hydrofibre dressings, foams, and non-adherent wound contact layers, such as Mepitel or NA Ultra, with a secondary absorbent pad (Grocott, 1999; Pudner, 1998).
- In extreme cases, a highly absorbent incontinence pad can be used as a secondary dressing. These usually have a super-absorbent core and waterproof backing making them ideal for containing large volumes of exudate. It is important to discuss their use with the patient prior to placing them on the wound to prevent any negative connotations of using a product primarily designed to contain bodily excretions.
- Stoma appliance or similar device for wounds with a small opening but heavy exudate.
- Skin care, as excess exudate can damage skin. Use alcohol free skin barrier films (e.g. Cavilon No-Sting Barrier Film) or 'frame' the wound with a thin hydrocolloid sheet / fabric tape.

Bleeding should ideally be prevented as much as possible by using non-adherent dressings, cleaning by irrigation and administering oral antifibrinolytics, such as tranexamic acid, if appropriate.

- Active bleeding – slow capillary oozing may be controlled with sucralfate paste or an alginate (Thomas, Vowden & Newton, 1998; Emflorgo, 1998). For moderate-to-heavy bleeding apply local pressure, topical haemostats, topical adrenaline (as a gauze soak) or topical tranexamic acid (crush a tablet and mix with sterile water). These latter two must be used under medical supervision.
- If massive haemorrhage occurs due to erosion of a major blood vessel, stay with the patient and call for assistance, apply local pressure and packing

to the bleeding point and monitor their pulse. Sedation may be appropriate for distressed patients (usually with morphine IV, IM or SC and/or Midazolam SC). It is useful to have a plan in place if haemorrhage is a potential problem, including easy access to necessary equipment and sedation.

Pain should be managed with the use of analgesia and correct wound care practices. For more in depth information see Managing Wound Pain (pages 43-46).

- Regular analgesia prescribed according to the World Health Organization guidelines for the control of cancer pain (World Health Organisation, 1996).
- Pain at dressing change may be reduced by pre-medication with a short acting opioid or a booster dose of usual opiate, or use nitrous oxide gas (Entonox). also use non-adherent dressings that maintain a moist wound environment. Reduce frequency of dressing changes and employ appropriate complementary therapies, such as relaxation, distraction, or visualisation (Downing, 1999).
- Topically applied opioids can be effective for painful ulcerating wounds. A mixture of morphine or diamorphine and a hydrogel to produce a 0.1% w/w solution (1 mg of morphine per 1 gram of hydrogel) can be applied once a day or as necessary. Metronidazole gel can also be used as a carrier for the opioid.
- (see section on wound pain for more information, pg 43)

Itching and skin irritation management centres on relief of the symptom through the use of topical treatments.

- Hydrogel sheets produce a cooling effect on itching skin.
- Aqueous cream with menthol has a cooling and soothing effect while also moisturising the skin when applied to itchy areas 2–3 times a day, or as necessary (Naylor et al, 2001).
- Transcutaneous electrical nerve stimulation (TENS) has been reported to relieve itching (Grocott, 2000).

The patient may also benefit from assessment for palliative treatment with radiotherapy, chemotherapy or surgery. Radiotherapy will usually reduce the size of the wound, thereby decreasing exudate, bleeding, and pain. Chemotherapy is less effective, but may also reduce wound size and symptoms. Hormone therapy may be of use with hormone sensitive cancers, but has a slow response rate. Palliative plastic surgery may be an option for some patients where the wound can be completely excised followed by reconstruction using flaps or skin grafts. This procedure will improve cosmetic appearance and may provide an extended symptom-free period (Offer, Perks & Wilcock, 2000).

Pressure Ulcers

Definition

Pressure ulcers may also be referred to as bedsores, pressure sores or decubitus ulcers. Regardless of the name they are given, a pressure ulcer is "an area of localised damage to the skin and underlying tissue caused by pressure, shear, friction and/or a combination of these" (European Pressure Ulcer Advisory Panel, 2001a). These wounds have both physical and psychosocial consequences for patients and their families, and financial and litigious implications for health care providers.

Description

Pressure ulcers develop when there is sustained, localised pressure applied to an area of the body not designed to withstand such pressure. Damage to the skin and underlying tissues is linked to the intensity and duration of pressure and occurs as a result of ischaemia due to blood vessel occlusion and microvascular damage (Australian Wound Management Association, 2001; Nixon, 2001). This causes an interruption in the flow of oxygen and nutrients to cells leading to tissue damage (Figure 5). The effects of pressure are compounded by shearing and friction, which are both increased in a moist environment; in particular this is associated with incontinence. Shearing occurs when the patient's body moves in opposition to the surface they are resting on, causing their skin to be pulled in the opposite direction resulting in damage to skin capillaries. Friction causes damage to the skin by stripping the epidermis as the skin is rubbed against another surface (Simpson, Bowers & Weir-Hughes, 1996).

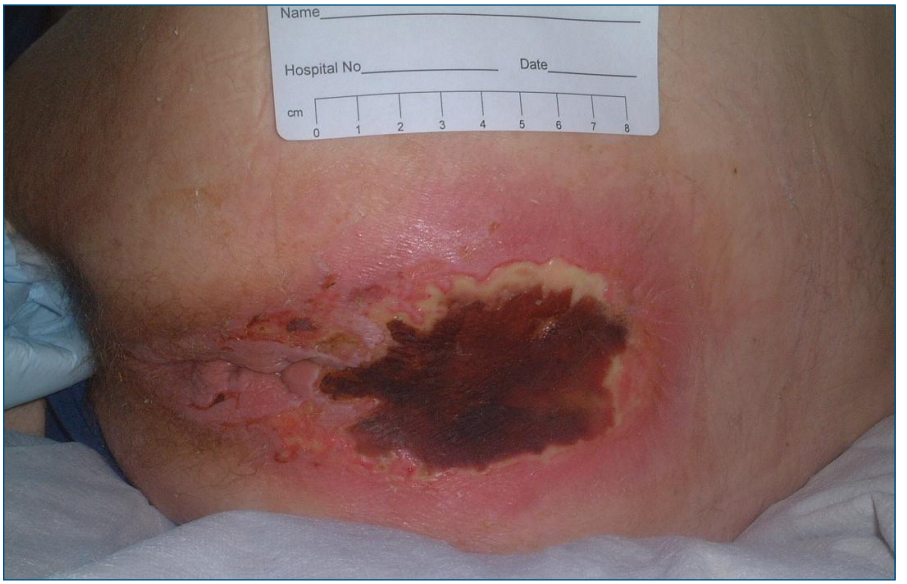

Figure 5. Necrotic pressure ulcer on the sacrum of a patient with spinal cord compression.

Pressure damage and subsequent ulcer formation can be a significant problem for palliative care patients, particularly those with advanced disease who may have poor nutrition, impaired mobility, significant weight loss, cachexia and metabolic disorders (De Conno, Ventafridda & Saita, 1991; Chaplin, 1999). Specific factors that are known to contribute to pressure ulcer formation in palliative care patients include:

- Fragile skin condition;
- Older age;
- Male gender;
- Physical inactivity;
- Immobility;
- Decreasing food and fluid intake;
- Moisture (incontinence, excessive sweating, lymphorrhoea);
- Altered sensation (e.g. due to spinal cord compression);
- Poor general physical condition;
- Lean body constitution (Henoch & Gustafsson, 2003; Chaplin, 1999).

In a study of hospice palliative care patients, Henoch and Gustafsson (2003) found that the three most important risk factors for pressure ulcer development were physical activity, mobility and age. They identified the most vulnerable group of patients as being immobile, bed bound and aged 75 or older.

The areas most commonly affected by pressure ulcers are generally those with little muscle or subcutaneous tissue overlying bone (Figure 6). Pressure ulcers will often develop at specific sites related to the positioning of the patient. For example if the patient lies supine the sites are likely to be the sacrum, heels, elbows, scapula and occiput. If the patient spends most of their time sitting they commonly develop ulcers on the ischial tuberosities.

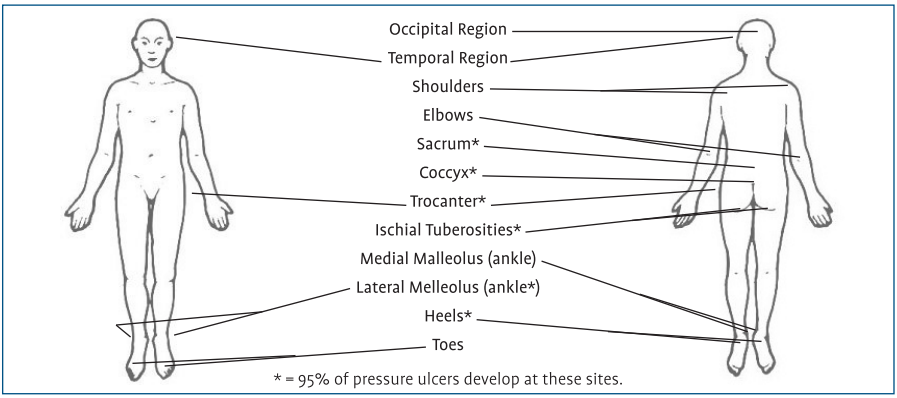

Figure 6. Common pressure ulcer sites (Naylor, Laverty & Soady, 2004).

Principles of Management

In theory, almost all pressure ulcers should be preventable if the principles of pressure ulcer management are applied early and maintained at a high level throughout the patient's episode of care. The principles of pressure ulcer management can be broadly separated into two main aspects of care – prevention and wound management. Pressure ulcer prevention can be further broken down into five main areas:

1. Identifying individuals at risk;
2. Preventative strategies;
3. Nutrition;
4. Skin care;
5. Education and training (National Institute for Clinical Excellence, 2001; European Pressure Ulcer Advisory Panel, 2001b; Rycroft-Malone & McInnes, 2000).

Management Strategies

Due to the high number of risk factors present in palliative care patients the incidence of pressure ulcers in this population is likely to be higher than expected in acute care or rehabilitation settings. One particular issue in terms of pressure ulcer prevention is the balance between preventative interventions and comfort of a dying patient. As the patient's condition deteriorates in the hours to days before death, there is a corresponding increase in pressure ulcer risk (Chaplin, 1999). However, while the patient's risk may indicate the need for intervention, patient comfort should take priority at this time rather than aggressive interventions aimed at reducing risk or preventing pressure damage (Gallagher, 1995).

Identifying individuals at risk

Identifying individuals at risk is the most important aspect of pressure ulcer prevention and should be a combination of patient assessment, professional judgement and scoring on a risk rating scale. Any patient who has reduced mobility and activity, to the point where they cannot change position independently, should be considered at risk. Patient assessment includes a full skin inspection and staging of any current pressure ulcers. All information gained from the patient assessment should be documented and an individualised management plan of prevention and treatment initiated, which is in line with the overall goals of care.

Patients should have a **risk assessment** completed on admission and at regular intervals (e.g. weekly) during their admission (either to an inpatient unit or home based service) (Australian Wound Management Association, 2001; Wiechula, 1997). Re-assessment should also occur following a significant change in the patient's condition. The main pressure ulcer risk assessment scales in common use are the Waterlow, Norton and Braden scales (Waterlow, 1988; Bergstrom, Braden, Laguzza & Holman, 1987; Norton, McLaren, & Exton-Smith, 1962). The Braden scale (Figure 7) may be of most use in palliative care, as it covers the most important risk factors associated with this group of patients and is easy and quick to complete. The descriptions for each risk item ensure better scoring consistency between different people undertaking the assessment (inter-rater reliability) (Simpson et al, 1996).

Another important aspect of patient assessment is a **visual inspection of the skin** to identify signs of early or established pressure damage. The patient's skin should be inspected from head to toe with particular attention to areas of high risk, for example over bony prominences (National Institute for Clinical Excellence, 2001). These areas of skin should be checked each time the patient is turned. Any existing pressure ulcers should be assessed and staged.

Staging is an important part of pressure ulcer assessment as a means of identifying the extent of tissue damage, communicating assessment information to other health care professionals and in formulating a management plan. While a number of classification and staging scales have been developed, the most widely used is the National Pressure Ulcer Advisory Panel Pressure Ulcer Staging System (National Pressure Ulcer Advisory Panel, 1989) (Box 2). Early evidence of potential skin damage associated with pressure, before damage has occurred, presents as flushing of the skin when pressure is removed. This is referred to as reactive hyperaemia and is a normal tissue response to the relief of pressure. The flushing is a result of blood flowing back into skin following a period of reduced perfusion due to pressure (Australian Wound Management Association, 2001). Difficulty in staging arises when a pressure ulcer is covered by necrotic tissue (eschar or slough), and it cannot be accurately assessed for depth of tissue destruction. In this case ulcers are described as "unable to be staged", until such time as necrotic tissue has been removed.

Stage 1
An observable pressure-related alteration of intact skin whose indicators, as compared to an adjacent or opposite area on the body, may include changes in one or more of the following: skin temperature (warmth or coolness), tissue consistency (firm or boggy feel), and/or sensation (pain, itching). The ulcer appears as a defined area of persistent redness in lightly pigmented skin, whereas in darker skin tones, the ulcer may appear with persistent red, blue, or purple hues.
Stage 2
Partial thickness skin loss involving epidermis, dermis, or both. The ulcer is superficial and presents clinically as an abrasion, blister, or shallow crater.
Stage 3
Full thickness skin loss involving damage to, or necrosis of, subcutaneous tissue that may extend down to, but not through, underlying fascia. The ulcer presents clinically as a deep crater with or without undermining of adjacent tissue.
Stage 4
Full thickness skin loss with extensive destruction, tissue necrosis, or damage to muscle, bone, or supporting structures (e.g. tendon, joint capsule). Undermining and sinus tracts also may be associated with Stage IV pressure ulcers.

● **Box 2.** National Pressure Ulcer Advisory Panel (NPUAP) Staging System.

Figure 7.. Braden Scale - for Predicting Pressure Sore Risk

SEVERE RISK: Total score ≤9 HIGH RISK: Total score 10-12 MODERATE RISK: Total score 13-14 MILD RISK: Total score 15-18				DATE OF ASSESSMENT				
SENSORY PERCEPTION Ability to respond meaningfully to pressure related discomfort.	**1. COMPLETELY LIMITED:** Unresponsive (does not moan, flinch or grasp) to painful stimuli, due to diminished level of consciousness or sedation, OR limited ability to feel pain over most of body surface.	**2. VERY LIMITED:** Responds only to painful stimuli. Cannot communicate discomfort except by moaning or restlessness, OR has a sensory impairment that limits the ability to feel pain or discomfort over ½ the body.	**3. SLIGHTLY LIMITED:** Responds to verbal commands, but cannot always communicate discomfort or need to be turned, OR has some sensory impairment that limits ability to feel pain or discomfort in 1 or 2 extremities.	**4. NO IMPAIRMENT:** Responds to verbal commands. Has no sensory deficit that would limit ability to feel or voice pain or discomfort.				
MOISTURE Degree to which skin is exposed to moisture.	**1. CONSTANTLY MOIST:** Skin is kept moist almost constantly by perspiration, urine etc. Dampness is detected every time patient is moved or turned.	**2. VERY MOIST:** Skin is often, but not always moist. Linen must be changed at least once a shift.	**3. OCCASIONALLY MOIST:** Skin is occasionally moist, requiring an extra linen change approximately once a day.	**4. RARELY MOIST:** Skin is usually dry, linen only requires changing at routine intervals.				
ACTIVITY Degree of physical activity.	**1. BEDFAST:** Confined to bed.	**2. CHAIRFAST:** Ability to walk severely limited or non-existent. Cannot bear own weight and/or must be assisted into chair or wheelchair.	**3. WALKS OCCASIONALLY:** Walks occasionally during day, but for very short distances, with or without assistance. Spends majority of each shift in bed or chair.	**4. WALKS FREQUENTLY:** Walks outside the room at least twice a day and inside room at least once every 2 hours during waking hours.				
MOBILITY Ability to change and control body position.	**1. COMPLETELY IMMOBILE:** Does not make even slight changes in body or extremity position without assistance.	**2. VERY LIMITED:** Makes occasional slight changes in body or extremity position but unable to make frequent or significant changes independently.	**3. SLIGHTLY LIMITED:** Makes frequent though slight changes in body or extremity position independently.	**4. NO LIMITATIONS:** Makes major and frequent changes in position without assistance.				
NUTRITION Usual food intake pattern. 1 NBM: Nothing by mouth 2 IV: Intravenously 3 TPN: Total Parenteral Nutrition	**1. VERY POOR:** Never eats a complete meal. Rarely eats more than 1/3 of any food offered. Eats 2 serving or less of protein (meat or dairy products) per day. Takes fluids poorly. Does not take a liquid dietary supplement, OR is NBM[1] and/or maintained on clear fluids or IV[2] for more than 5 days.	**2. PROBABLY INADEQUATE:** Rarely eats a complete meal and generally eats only about 1/2 of any food offered. Protein intake includes only 3 servings of meat or dairy products per day. Occasionally will take a dietary supplement, OR receives less than the optimum amount of liquid diet or tube feeding.	**3. ADEQUATE:** Eats over half of most meals. Eats a total of 4 servings of protein (meats, dairy products) each day. Occasionally will refuse a meal, but will usually take a supplement if offered, OR is on a tube feeding or TPN[3] regimen that probably meets most of nutritional needs.	**4. EXCELLENT:** Eats most of every meal. Never refuses a meal. Usually eats a total of 4 or more servings of meat and dairy products. Occasionally eats between meals. Does not require supplementation.				

Preventative Strategies

Preventative strategies aim to reduce or relieve prolonged pressure, and prevent skin damage from friction and shearing. One way of preventing prolonged tissue expose to pressure is to institute a **regular turning and repositioning** schedule. Two hourly repositioning is the most common regimen used, but this should be reviewed in response to individual patient needs. Patients who are able should be encouraged with activity and mobilisation in order to relieve pressure and stimulate blood flow. Some basic principles for turning and repositioning are:

- Individualise the turning schedule based on assessment, risk rating, skin response to pressure (i.e. reactive hyperaemia) and patient comfort;
- Use pillows or foam wedges to ensure correct body alignment (e.g. 30^{O} tilt);
- Use pillows or foam wedges to reduce contact between bony prominences, e.g. between knees and ankles;
- Regular repositioning must also take place for sitting patients;
- Patients at risk of pressure damage should restrict sitting to less than two hours;
- Turning and repositioning can be problematic for patients with shortness of breath, pain and nausea;
- Use correct lifting techniques and equipment when repositioning patients to prevent unnecessary friction and shear;
- Do not massage over bony prominences, as this increases damage due to friction and shearing;
- If the patient cannot maintain their own position, ensure they will not slide down the bed;
- Elevate the foot of the bed 10-20^{O} to prevent sitting or semi-recumbent patients from sliding down the bed;
- Ensure bed linen over feet is loose to prevent undue pressure on toes and heels, use a bed cradle;
- When elevating the heel to reduce pressure, use a pillow or foam wedge under the whole length of the lower leg. (Henoch & Gustafsson, 2003; Australian Wound Management Association, 2001; National Institute for Clinical Excellence, 2001; Wiechula, 1997).

Another aspect of pressure ulcer prevention is the correct use of appropriate **support surfaces** – mattresses, overlays, beds and cushions. Ideally, a support surface should reduce pressure, shear and friction, and maintain a stable skin temperature (Australian Wound Management Association, 2001). There are many different devices available for the reduction or relief of pressure and they can be divided into a number of categories depending on their basic function, these are summarised in Table 1. Patients who are assessed as 'at risk' should not be placed on a standard hospital mattress. In fact most institutions now have pressure reducing foam mattresses as the 'standard' mattress on all their beds, and these are usually sufficient for low to moderate risk patients, depending on the brand of mattress.

Those assessed as 'very high risk' should ideally be nursed on an alternating air cell or low air loss mattress (Rycroft-Malone & McInnes, 2001). All patients cared for on a pressure reducing or relieving surface will still require regular repositioning, as even very low pressures can cause damage if sustained for a long period.

It is also important to use **correct seating**, such as pressure reducing, relieving cushions, when the patient is seated out of bed. There is little point having a 'high tech' mattress and then sitting the patient on a hard chair for most of the day. Seating should accommodate the patient properly, especially if they spend a great deal of time sitting. The armchair or wheelchair should be of the correct dimensions for the patient's size and stability, as well as ensuring comfort, maximising their functional abilities and ability to transfer, and reduce pressure over bony prominences (Collins, 2001; Simpson et al, 1996). It would be beneficial to have the patient assessed by an Occupational Therapist in order to ensure correct seating is obtained.

Type	Construction	Use	Advantages	Disadvantages
Foam / Fibre filled overlay	Thin layer of foam or fibre inside a waterproof cover (e.g. 'Spenco')	Placed on top of mattress to reduce pressure and provide comfort. For low risk patients only.	Light and easy to handle, useful for comfort.	Fibre filled overlays wear out quickly (6 months), may impede mobilisation from bed.
Static air-filled overlay	Rubber or plastic with interconnected air chambers. e.g. ROHO	Placed on top of mattress to reduce pressure and provide comfort. For low to moderate risk patients.	Economical, easy to clean and low maintenance. Maintain pressure reducing ability.	Must be checked and adjusted regularly, easily damaged by sharp objects, heavy.
Sheep skin	Natural or synthetic fleece.	As an aid to comfort when placed on top of mattress. For low risk patients only.	Useful for comfort, decreases friction. Natural fleece best.	Require special laundering, do not reduce pressure, and become matted and ineffective. Short lifespan.
Gel pads	Visco-elastic or gel filled pads	Designed to protect areas of high risk, e.g. head, heels, ankles	Useful during long surgical procedures. Easy to clean, durable and reusable.	Heavy and can be hot and retain moisture; may develop creases under the patient.
Ring cushion	Should not be used – these cushions cause an increase in pressure and potentiate pressure damage. Valley cushions can be used for comfort.			
Standard hospital mattress	Single piece of polyurethane foam covered by a non-stretch plastic/nylon cover.	Standard hospital beds, emergency, radiology and operating theatre.	Cheap. Light and easy to handle.	Very little pressure reduction, uncomfortable, hot, bottom out easily, short life span.
Pressure reducing foam mattress / cushion	Foam layers of varying densities, may be sectioned or cubed with gel or air filled inserts.	Replacement of standard hospital mattresses and cushions. Distributes weight over whole surface area. For low to moderate risk patients.	Easy to transport, install and require minimal maintenance.	Limited life span (approx. 5 years). Many mattresses require regular turning to prevent uneven wear.

Low air loss mattress	Cells made of a microporus material that loses air constantly. Air is fed into the mattress by an electronic pump unit.	Available as an overlay, mattress replacement or whole bed replacement. Patients at moderate to high risk.	Produce very little interface pressure. Bed replacement may have variable section pressure settings.	Expensive, and easy to puncture. Require education to use and can be noisy.
Alter-nating air cell mattress	Fabric cells that inflate and deflate on a cyclical basis.	Available as an overlay, mattress replacement or whole bed replacement and cushion. Patients at moderate to high risk.	Easy to clean and durable.	Expensive and easy to puncture. Require education to use and can be noisy. Constant movement of cells can upset patients.
High air loss / air fluidised mattress / bed	Tiny beads contained in a tank and covered with an air permeable fabric. High flow warm air is pumped through the beads to create a dry floatation system.	Very high risk patients or those with large pressure ulcers.	Significantly reduces interface pressure, warm air creates a dry environment reducing effects of sweat, incontinence and exudate on the skin. Air can be turned off to create a solid surface.	Very expensive, large and complex. Patient handling can be difficult and the warm air can cause dehydration.

- **Table 1.** Support Surfaces for Pressure Reduction / Relief (Naylor, Laverty & Soady, 2004; Australian Wound Management Association, 2001; Simpson et al, 1996)

Nutrition

Patients with poor nutrition are at greater risk of pressure ulcer formation due to a lack of essential nutrients to maintain skin integrity and supportive tissues. Weight loss in terminal illness will predispose the patient to pressure damage over bony prominences, as they will have less protective tissues on these sites. Nutrition assessment should be undertaken as part of an overall patient assessment and a nutritional intervention plan developed as dictated by the patient's condition and goals of care.

Skin Care

Skin care is a combination of good skin hygiene and continence management to minimise skin contact with irritating substances and reduce exposure to excess moisture. This follows on from a complete skin inspection as part of the patient assessment, which will identify areas of concern. The skin should be kept clean through regular washing with a mild soap or soap substitute. Dry flaky skin should be managed with a simple moisturiser. Skin that is constantly exposed to excess moisture, for example from heavy sweating, incontinence or wound exudate, should be protected with a skin barrier cream or alcohol free skin barrier film. Incontinence of both urine and faeces can cause significant skin damage and this should be managed by addressing the cause or by using incontinence pads and garments to absorb and keep body fluids away from the skin. Dressings such as thin hydrocolloids and semi-permeable films may be of benefit to reduce skin damage from friction and shear when applied to skin over 'at risk' sites, such as the sacrum, elbows and heels.

Education and Training

An essential part of pressure ulcer prevention is education and training of staff, patients and carers. Education should be tailored to the specific group and should include information on:

- Risk factors for pressure ulcer development;
- Pathophysiology of pressure ulcers;
- Sites at greatest risk of pressure damage;
- Risk assessment;
- Skin assessment and skin care;
- Selection and care of appropriate equipment;
- Positioning to minimise pressure, friction and shear
  (Australian Wound Management Association 2001; National Institute for Clinical Excellence, 2001; Rycroft-Malone & McInnes, 2001).

Management of Pressure Ulcers

The management of established pressure ulcers should be based on a full wound assessment and will depend on the grade of ulcer, type of tissue present, levels of exudate, pain, bleeding and malodour, as well as the goals of overall patient care. The use of preventative strategies must continue to ensure further pressure damage does not occur and to relieve pressure from the already ulcerated area(s).

Wound cleansing should follow the guidance given in the section on Wound Cleansing (page 15), and specific wound management should be guided by the principles of Wound Bed Preparation (pages 15) and the section on wound dressings (pages 47-61).

For patients with a short life expectancy, where healing of the ulcer is not a realistic goal, the methods of wound management described for fungating malignant wounds should be applied (pages 20-24). This includes control of exudate, malodour, bleeding and pain, and promoting comfort (Gallagher, 1999).

Enterocutaneous Fistulae

Definition

A fistula is an abnormal opening that connects two epithelial lined surfaces (Martin, 1996). An enterocutaneous fistula is one that forms between the gastrointestinal tract and the skin.

Description

Enterocutaneous fistula tend to develop most commonly following bowel surgery and are often the result of sepsis, breakdown of an anastomosis or a distal obstruction (Naylor et al, 2001). Enterocutaneous fistula may also develop due to malignancy, radiotherapy, inflammatory bowel disease, diverticular disease or trauma (Bennett & Moody, 1995; Meadows, 1997; Forbes & Myers, 1996). The fistula may be a simple single tract or it may be complex with multiple tracts and skin openings and possibly contain abscesses (Black, 2000).

Principles of Management

Simple fistulae generally heal with supportive care alone, while complex fistulae usually require surgical repair. Supportive care for an enterocutaneous fistula should always include:

- Protection of the surrounding skin.
- Collection and containment of fistula output.
- Control of odour.
- Patient support and information.

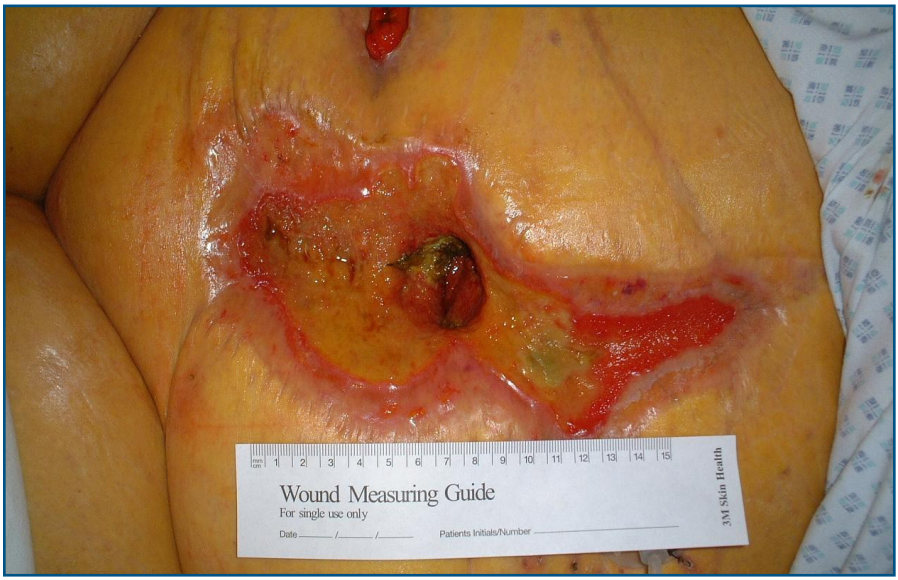

Figure 8. Dehisced abdominal wound with large central fistula to small intestine producing corrosive effluent.

Enterocutaneous fistulae may produce extremely corrosive effluent, especially if drainage is from the upper gastrointestinal tract. This may contain proteolytic secretions that will 'digest' skin causing excoriation, ulceration and pain (Figure 8). Malnutrition and dehydration are potential problems in patients with high output stomas and they may require dietary advice and supportive nutritional supplements (Naylor et al, 2001).

Management Strategies

Skin protection

Strategies include using an alcohol-free skin barrier film (e.g. Cavilon No-Sting Barrier Film) to protect skin from excoriation by fistula secretions. Pastes and powders used in stoma care (e.g. Orabse paste, Orahesive powder) that protect mucous membranes and skin can be effective when applied around the opening of the fistula. They can also be used to build up a flat surface around the fistula to facilitate application of, and prevent leaks from, an ostomy/fistula appliance. Hydrocolloid products, such as flat sheets, or cohesive 'washers' (eg Eakin Cohesive) are also useful and can be applied as a 'frame' around the fistula opening.

Containing effluent

It is important that fistula drainage is contained away from the skin (Black, 2000). Ostomy appliances or specially designed fistula and wound appliances are the most effective way of achieving this. There are a number of products available, especially in the ostomy appliance range, and choice will depend on the volume, consistency and type of effluent.

- Wound management appliances (e.g. ConvaTec Wound Manager) have a wide bore outlet for thicker effluent and may also have an access window to enable cleaning of the wound or fistula opening (Benbow, 2001).
- Fistula bags (e.g. Eakin Fistula & Wound Pouches) are usually smaller and narrower in design, although large sizes are available, and come with either large or small drainage openings that can be attached to a drainage bag for high output fistulae. A urostomy appliance may be sufficient for thin watery effluent. Some of these appliances (in particular ostomy pouches) have a built-in charcoal filter to reduce odour. Alternatively specialist ostomy products designed to control odour can also be used.

  Note: Corrosive secretions will reduce the effectiveness of appliance adhesives and they may need to be replaced more often. Appliances should not be repaired if they leak, as this can result in skin damage from leaked secretions (Meadows, 1997; Forbes & Myers, 1996).
- Vacuum assisted closure (V.A.C.) has also been used successfully in the management of enterocutaneous fistula where it effectively contained fistula drainage and promoted healing (Cro et al., 2002).

Radiotherapy Skin Reactions

Definition

Radiotherapy skin reactions develop as a side effect of external beam radiotherapy due to some of the radiation dose being delivered to the skin as it passes through to deeper tissues. Acute reactions only occur within the radiation treatment field, including the beam exit site, and develop as a result of damage to cells of the Stratum Basale, as well as blood vessels and connective tissue in the dermis and subcutaneous layers (Sitton, 1997).

Description

Up to 95% of patients receiving external beam radiotherapy will develop an acute skin reaction (De Conno, Ventafridda & Saita, 1991). Reactions are more frequent, and often worse, in areas of increased moisture and friction, such as the axilla, inframammary fold and perineum (Blackmar, 1997; Rigter, Clendon & Kettle, 1994). Acute reactions usually appear within the first two to three weeks of treatment (when treatment is given daily during week days) and may persist for up to eight weeks post-treatment if severe (Blackmar, 1997). Factors that increase the risk of acute skin reactions include:

- High total dose of radiation;
- Low energy radiation or electrons;
- Treatment of the head and neck, breast or pelvic area;
- Large volume of normal tissue included in the area of treatment;
- Tangential treatment fields;
- Use of 'bolus' materials (e.g. a wax blanket to increase the dose of radiotherapy to the skin);
- Older age;
- Immunosuppression;
- Concurrent chemotherapy or steroid therapy;
- Poor nutritional status;
- Tobacco smoking;
- Chronic sun exposure
  (Sitton, 1992, Porock & Kristjanson, 1999).

Acute skin reactions are classified according to the appearance of the skin as either erythema, dry desquamation or moist desquamation (Figures 9a and 9b). Very rarely patients will develop skin necrosis, but this may occur if an area is re-irradiated.

- Erythema – transient erythema may be seen 24 to 48 hours after the first treatment related to a local inflammatory reaction and capillary dilation. After 2-3 weeks a more pronounced erythematous reaction will develop, which may be accompanied by oedema and skin irritation. Inflammation may be noticeable more around hair follicles (folliculitis).
- Dry desquamation – skin is dry and flaky or peeling due to rapid keratinisation of basal cells and a decrease in the production of sweat and sebum. This

may be associated with itchy and irritable skin. Hair loss may occur within the treatment field.

- Moist desquamation – Loss of the epidermis resulting in exposure of the dermis with associated exudate production, pain and the risk of infection.

Patients may also notice pigmentation of skin within the treatment field, which is thought to be due to radiation stimulating the production of melanin by melanocytes (Sitton, 1997). Pigmentation may take up to six months to fade and in some cases may take longer.

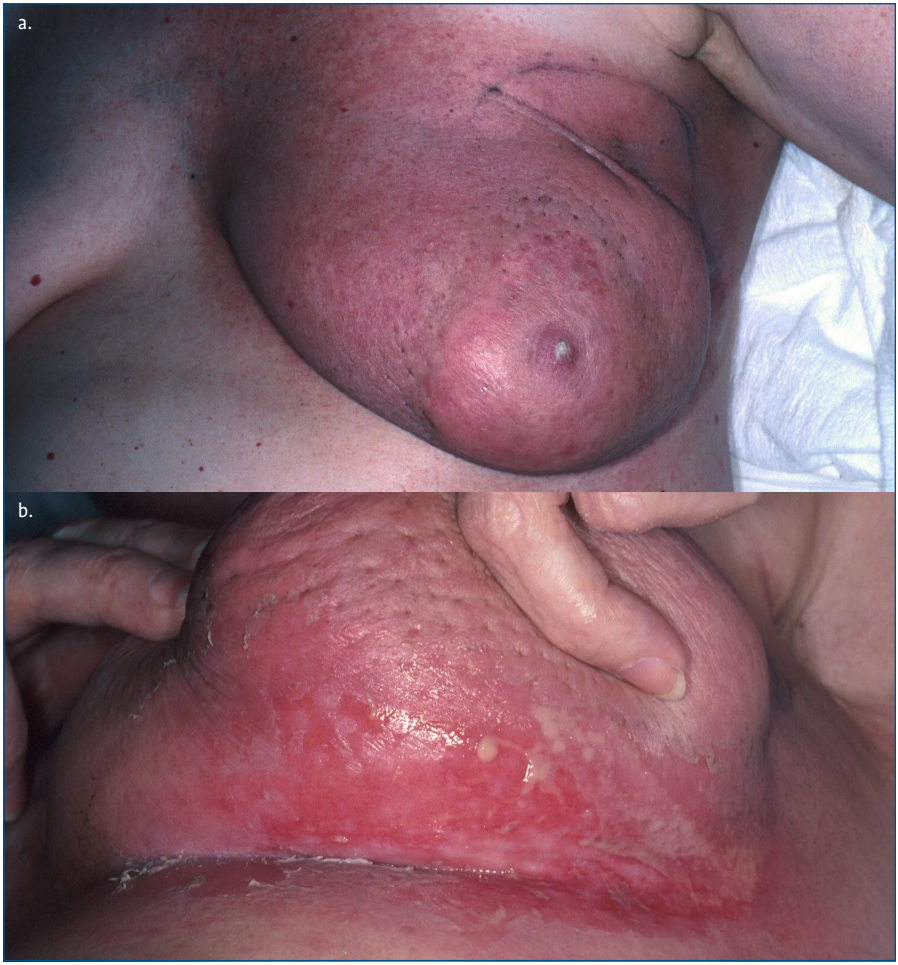

Figure 9. a) Erythema of the breast on completion of radical breast radiotherapy.
b) Moist desquamation in the inframammary fold of the same patient.

Late changes

Damage to connective tissue and blood vessels of the skin may induce chronic skin changes, which can appear months to years after treatment. Late skin changes can include:

- Atrophy of the skin related to the loss of fibroblasts and collagen;
- Fibrosis and thickening of skin as a result of tissue repair following radiation exposure;
- Xerosis (dry skin) due to the reduction in sebaceous gland function;
- Pigmentation changes as a result of changes in the number or function of melanocytes (hypo- or hyperpigmentation);
- Telangiectasia may develop after one to two years and present as multiple small, dilated red blood vessels within the skin;
- Necrosis and ulceration can occur following minor trauma to the area of treated skin as a result of vascular insufficiency within the irradiated skin;
- Radiation induced skin cancers have been reported, although they are rare and have a long latency period (Mortimer & Badger, 2004; Sitton, 1992; McDonald, 1999).

Principles of Management

The management of radiation-induced skin reactions is based upon symptom control, promoting comfort and preventing infection. The majority of strategies are aimed at maintaining the integrity and barrier functions of the epidermis through appropriate hygiene practices and the use of topical skin care and dressings products. With regard to late skin changes there are limited treatment options available and again any measures are directed at maintaining skin integrity and preventing further skin damage. Surgery may be warranted for chronic radiation induced skin ulceration (Sitton, 1997).

Management Strategies

Preventative measures should be commenced at the start of treatment and continued for up to four weeks post treatment. These measures are designed to delay the onset, and reduce severity, of acute skin reactions:

- Wash normally using warm water;
- Use non-perfumed, mild soap on the treated skin;
- Pat skin dry with a soft towel;
- Apply a recommended moisturising cream to the skin two to three times a day to help maintain its softness (examples: E45 cream, Aqueous cream);
- Avoid the use of deodorants and perfumed skin care products in the treated area;
- Avoid the use of flannels, brushes, loofah etc. on the treated area;
- Wear loose comfortable clothing, underwear should be the correct size and natural fibres such as cotton are recommended;

- Protect the treated skin from extreme cold and sunlight during treatment;
- Continue your usual activities during treatment whenever possible (activities such as swimming should be discussed);
- Eat a balanced diet and drink plenty of fluids throughout treatment (Mortimer & Badger, 2004; Sitton, 1992; McDonald, 1999).

When skin reactions do develop they must be managed in a way that will continue to maintain skin integrity as much as possible, while providing comfort and protection to the damaged skin. Table 2 presents treatments for the different categories of skin reaction.

There are also a number of products that, although still used in some radiotherapy centres, are not recommended for application to the skin during radiotherapy. These include petroleum jelly (Vaseline), prophylactic topical antibiotics, gentian violet, talcum powder and corn starch.

Skin reaction type	Treatments
Erythema and dry desquamation (may be managed in the same way)	Simple, non-perfumed moisturising cream should be applied two to three times a day, as these provide symptomatic relief and may help maintain skin integrity (e.g. E45 cream, Aqueous cream). For itchy, irritable or burning feelings of the skin within the treatment field, apply 1% hydrocortisone cream sparingly, two to three times a day; should not be used on areas of broken or infected skin. Fixomull tape can be applied to deep erythema or dry desquamation to provide an 'artificial' Stratum Corneum. The tape is left in place for the duration of the treatment and then removed with adhesive remover (e.g. Remove), or oil soak two weeks post treatment completion.
Moist Desquamation	Hydrogel sheets may be applied to areas of moist desquamation to reduce discomfort and promote healing; their soothing and cooling properties are also beneficial for patient comfort. Amorphous (liquid) hydrogels may be used in skin folds or the perineum, and may be covered with a low-adherent dressing and secondary dressing pad. Hydrocolloid sheet dressings may be applied to areas of moist desquamation once radiotherapy treatment has finished. These provide an aesthetically acceptable dressing that promotes comfort and healing. Other modern dressing products such as semi-permeable films, alginates, hydrofibre or foams may also be used and should be selected based on the presenting characteristics of the wound. Infected areas may respond to silver impregnated dressings or honey, as well as systemic antibiotic therapy.

Table 2. Treatments for acute radiotherapy skin reactions (Glean et al 2001; Naylor & Mallett 2001).

Oedema and Lymphoedema Management

Definition

Oedema is the accumulation of excessive fluid in the body tissues (Martin, 1996) and has a number of causes. When the main cause is damage or obstruction of the lymphatic system the limb swelling is called lymphoedema.

Description

Lymphoedema can be due either to congenital abnormality or long-term effects of impaired lymph flow (primary lymphoedema), or by injury to the lymphatics, which may result from surgery, radiotherapy or tumour infiltration (secondary lymphoedema) (Penzer, 2003).

When a person has restricted mobility the combined effects of gravity, an inactive calf muscle pump and the stasis of lymph flow, results in fluid accumulation in the interstitial space of the leg tissues. This is known as dependent or gravitational oedema, or may also be referred to as "armchair legs". This is commonly seen in people who sit in chairs for long periods or who have neurological deficits. Venous hypertension (increased pressure in the veins due to pooling of blood) also increases the formation of lymph fluid, as the capillaries become dilated with increased permeability (Mortimer & Badger, 2004; Board & Harlow, 2002; Hofman, 1998). Additionally, hypoproteinaemia (low level of protein in the blood) can contribute to oedema, as interstitial fluid is not pulled back into the venous system (Williams, 2003). If the volume of fluid in the interstitial space exceeds its capacity to retain it, blistering and leakage of interstitial fluid onto the skin can occur. If the fluid is due to increased capillary pressure (due to gravity, hypoproteinaemia, etc) the fluid is clear and is called transudate. If it is the result of gross lymphoedema the fluid is usually straw coloured and is referred to as lymphorrhoea (Anderson, 2003).

Excessive limb oedema has a number of important consequences for the patient, including:

- The limb feels heavy and can be difficult to lift;
- Impaired mobility;
- Increased risk of falls;
- Inability to wear normal footwear;
- Restricted blood flow to skin resulting in poor wound healing;
- Risk of infection;
- Transudate or lymphorrhoea makes the limb feel wet and it becomes cold quickly;
- Soiled clothes and bed linen.
  (Anderson, 2003; Grieveson, 2003).

Principles of Management

The mainstays of treatment for oedema are elevation, exercise, compression and skin care. This is similar for lymphoedema with the addition of manual lymphatic drainage (MLD), a specialist form of massage to encourage movement of lymph

fluid (Penzer, 2003). A combination of these aspects of care is often employed for the management of lymphoedema and is known as 'complex decongestive therapy' consisting of skin care, MLD, multi-layer compression bandaging and exercise therapy (Mortimer & Badger, 2004; Penzer, 2003; Williams, 2003). A specially-trained individual must carry out this therapy.

Management Strategies

In order to make a correct diagnosis, and therefore institute the correct treatment, assessment of oedema is very important. The first step in assessment is to review the person's medical history to check for possible causes of oedema, such as heart failure, venous disease, thrombophlebitis, low albumin or renal disease, and cancer or cancer therapies, in particular surgery and radiotherapy. It is also useful to record details about the onset and duration of oedema, the presence of pain and discomfort associated with it and any psychosocial problems arising, such as depression or altered body image. Deep vein thrombosis (DVT) should be ruled out, especially if oedema has developed suddenly or oedema is worsening. Physical examination should include:

- Is it unilateral or bilateral swelling;
- Limb circumference / volume;
- Skin integrity, dryness, texture (e.g. fibrosis, pitting, in advanced lymphoedema may notice hyperkeratosis, papillomatosis);
- Photographs (Penzer, 2003; Williams, 2003; Board & Harlow, 2002).

Leg elevation is vital to reduce oedema, as this reduces venous and lymph congestion by encouraging the flow of fluids towards the heart. It is important that the limb is elevated above the level of the heart. Care needs to be taken with patients who have heart failure, as a sudden increase in fluid return to the circulation can be dangerous (Anderson, 2003). Exercise will activate the calf muscle and 'foot pump' to increase venous and lymphatic return (Hofman, 1998). Walking is ideal, but simple flexing of the foot when at rest, or even passive exercises will help, while strenuous exercise should be avoided. Compression bandaging also increases fluid return in the limb by increasing tissue pressures forcing fluid back into vessels (Brown & Marshall, 2001). The bandages work as either a rigid or elastic cylinder around the leg increasing the action of the muscle pumps (Williams, 2003). Short stretch (inelastic) bandages produce high working pressures but little pressure at rest, while long stretch, or elastic bandages (such as Profore) produce pressure even at rest (Moffatt, 2000).

For patients who cannot tolerate compression bandaging, intermittent compression may be applied with a pneumatic compression device (Hofman, 1998). This involves the patient wearing an inflatable garment that is attached to a pneumatic compression pump and applies alternating pressure to the limb stimulating blood and lymph circulation (Grieveson, 2003). An example of such a device is the Flowtron, which is available from Huntleigh Healthcare in New Zealand.

Skin care aims to maintain skin integrity and involves daily skin hygiene cares, such as careful washing and drying, application of simple moisturisers and

regular skin inspection. Fluid leakage (transudate or lymphorrhoea) requires prompt treatment to reduce the risk of infection. The best method of treatment is compression, which is usually effective in stopping leakage within 24-48 hours (Mortimer & Badger, 2004). A non-adherent dressing should be placed over the leaking site prior to bandage application. In some instances of excessive fluid leakage absorbent dressings may be required, such as a foam, alginate, hydrofibre or burn dressing. Adhesive products should be avoided as they can damage fragile skin (Anderson, 2003).

Managing Wound Pain

Definition

Pain associated with a wound may be comprised of one or all of the following three components:

- Non-cyclic acute pain – a single episode of pain, for example as may occur with sharp debridement, may also be described as 'operative' pain;
- Cyclic acute pain – occurs on a regular basis and may be associated with wound care procedures, such as dressing removal or wound cleansing (procedural pain), or related to movement/activity (incident pain);
- Chronic pain – background pain that persists without any manipulation of the wound (World Union of Wound Healing Societies, 2004; Gallagher, 1998; Krasner, 1995).

Description

Pain has a protective function, providing information about actual or potential tissue injury in order for the body to protect itself from greater damage (Tortora and Grabowski, 2002). Injury to the skin causes a 'cutting' or 'burning' pain, but when blood vessels are damaged a 'throbbing' pain occurs. If peripheral nerves are damaged, compressed or infiltrated by malignant cells, the patient may experience neuropathic pain, characterised by burning, stabbing or stinging pain. Patients may also experience hyperalgesia (increased pain response to noxious stimuli) and allodynia (pain in response to non-harmful stimuli) (Regan & Peng, 2000). Exposure of the dermis, wound cleansing and manipulation of dressings can also be a source of wound pain due to peripheral nerve exposure (Manning, 1998).

Principles of Management

As with any other form of pain, accurate assessment is essential and should include all relevant factors that will influence the choice of pain management interventions. Parameters to include are the type and frequency of pain, what relieves and what worsens the pain and the effectiveness of interventions (Naylor, 2001). The accurate assessment of pain can be made easier through the use of a validated and reliable assessment tool, such as the visual analogue scale (VAS). Changes in wound pain, for example sudden onset or increasing levels of pain, may indicate complications such as infection or ischaemia (Bale & Morison, 1999).

There are a number of strategies available for the management of wound pain, including commonly used pharmacological approaches, which are more useful for chronic pain, and non-pharmacological options based on good wound care techniques and altering the psychological response of the patient to the painful stimulus.

Management Strategies

Pharmacological

Pharmacological methods of pain management involve the use of analgesic and adjuvant analgesic drugs. Analgesics include non-opioids, opioids for mild

to moderate pain and opioids for moderate to severe pain (Downing, 1999). The World Health Organisation (1996) has developed an analgesic ladder to guide the use of pain medications in cancer patients (Figure 10) and this ladder may also be used for other types of chronic and acute pain (World Union of Wound Healing Societies, 2004).

For acute non-cyclic and acute cyclic pain, especially related to wound care procedures, a normal release opioid, such as Sevredol or morphine elixir, can be administered as a PRN dose to give effective but relatively short-acting pain relief (Naylor et al, 2001). Local anaesthetic agents, which block conduction of the action potential, may be injected around a nerve to produce a local nerve block or applied topically to the wound (eg Emla). Entonox can be used for rapid but short lasting pain relief during painful procedures, such as dressing changes, with no lasting side effects (Hollinworth, 2000).

Topical Morphine

There has recently been interest in the use of opioids applied directly onto the wound surface. This has stemmed from research, conducted mainly on animals, that has shown the presence of opioid receptors on peripheral nerves (Stein, 1993). The manifestation of these receptors is enhanced during inflammation. Opioid receptors on the peripheral terminals of primary afferent nerves can be activated by exogenous opioids (i.e. externally applied). The activation of these receptors has an inhibitory effect on nerve excitability, action potential conduction and the release of neuropeptides (Stein, 1995). A more recent study has found that there is little systemic absorption of topically applied morphine, suggesting that the analgesic effect is indeed due to a local effect rather than a systemic, or central, effect (Ribeiro, Joel & Zeppetella, 2004).

There is growing evidence that topically applied opioids can be an effective form of pain management for painful ulcerating wounds. Two recent randomised, double-blind, placebo-controlled, crossover trials have evidence from a small number of patients that topically applied morphine reduces pain associated with ulcerating wounds (Flock, 2003; Zeppetella, Paul & Ribeiro, 2003). These studies also found that this method of pain relief produced little or no side-effects. A number of published case studies also provide evidence of the clinical efficacy of topical opioids in significantly reducing wound pain (Watterson, Howard & Goldman, 2004; Ballas, 2002; Grocott, 2000; Twillman et al, 1999; Krajnik & Zylicz, 1997; Back & Finlay, 1995). Treatment is usually with a mixture of morphine and a hydrogel to produce a 0.1% w/w solution (1mg of morphine per 1g of hydrogel). Metronidazole gel has also been used as a carrier for the opioid to provide combined pain and odour control (Flock et al, 2000; Grocott, 2000).

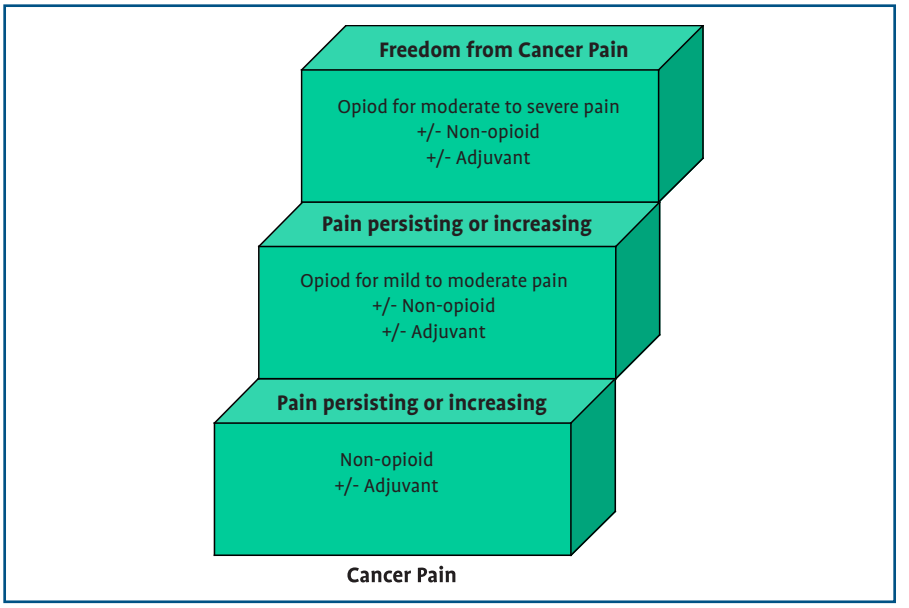

Figure 10. World Health Organisation (1996) Analgesic Ladder.

Non-pharmacological

Non-pharmacological methods of wound pain management are a useful adjunct to pharmacological treatments and include wound cleansing techniques, wound dressing products and complementary therapies.

Wound Cleansing

See page 15.

Wound Dressings

The types of dressing used on a wound can significantly influence pain experienced by the patient, particularly when pain is associated with dressing changes. Dressings such as gauze and paraffin tulle are not recommended for direct contact with the wound surface, as they frequently adhere to the wound causing significant tissue damage and pain on removal (Emflorgo, 1999). Soaking these dressings to aid removal is rarely effective (Hollinworth, 1997). Similar problems can occur with dressings classified as 'low-adherent', such as Adaptic and Cuticerin. Care is needed with these dressings when used on fragile or painful wounds. Newer, non-adherent silicone dressings (eg Mepitel, Mepilex) have been specifically designed to provide 'pain-free' removal. These dressings are coated with a soft silicone and are available in a number of different forms, including netting, and thin or thick foam.

The use of other more modern dressings such as hydrocolloids, semi-permeable films, alginates, hydrofibre, foams and hydrogels will assist in reducing wound pain. These dressings maintain a pool of exudate or gel next to the wound surface

reducing dressing adhesion and preventing any exposed nerve endings from drying out (Emflorgo, 1999). Some dressings with an 'all-over adhesive' require extra care on removal to prevent pain, although most have an adhesive that is inactivated by exudate so will not stick to the wound bed.

If the wound is producing a high level of exudate, it can cause skin damage around the wound with resultant irritation and pain. The skin around the wound can be protected with a skin barrier film, preferably alcohol-free, such as Cavilon No-Sting Barrier Film. Alternatively, the wound may be 'picture-framed' using a hydrocolloid wafer, fabric tape or adhesive film (Hollinworth, 2000). These products will also help to prevent skin damage by the repeated removal of adhesive tape. It is also better to select dressings that can stay in place for longer periods of time as this reduces the number of potentially painful dressing changes necessary. If the patient is willing, they may wish to participate in their wound care, especially the removal of dressings, as this will give them some control over a painful procedure and help to lessen anxiety and therefore reduce their response to pain (Hollinworth, 2000). Another useful technique is to offer the patient 'time-outs' during the wound related procedure. This allows the patient time to recover some level of comfort and any additional pain relief can be administered (World Union of Wound Healing Societies, 2004).

Complementary Therapies

Therapies that may be of benefit in the management of wound pain include relaxation, massage, visualisation, imagery and distraction (Ryman & Rankin-Box, 2001; Downing, 1999). These therapies can be used alongside conventional pain management treatments to help in reducing pain or the response to pain. Complementary therapies should only be administered by someone with the relevant training and qualifications (Stone, 2001).

- Relaxation and massage help to reduce tension and anxiety, which in turn improves the patient's pain tolerance by breaking the anxiety-pain cycle.
- Visualisation and imagery focus the patient's attention away from the painful stimulus by creating images that are either consciously selected (visualisation) or spontaneously occurring from the unconscious (imagery) (Van Fleet, 2000).
- Distraction also draws attention away from pain but utilises a specific physical stimulus to do so, such a television, music or conversation (Cancer-Pain.org, 2000).

Other complementary therapies that may be useful in the management of wound pain include acupuncture, acupressure, autogenic therapy, biofeedback and hypnosis. (Rankin-box, 2001, Cancer-Pain.org, 2000). Aromatherapy may help to disguise wound odour or promote a relaxing atmosphere.

The array of wound dressings and devices available today is vast and they are becoming more complex in the way they interact with the wound environment. Dressings are also being developed with specific and unique properties designed to meet the needs of specific patient groups or types of wounds. Almost all new dressings are backed by in-depth research and clinical trial data supporting their wound healing abilities. Consequently, the cost of modern dressing products is also increasing, as is the knowledge required to employ these modern dressing products in a cost-effective manner.

This increasing variety of expensive wound care products puts both nurses and doctors in what can be a difficult and confusing situation of trying to decide which product to use and when. This section of the Guidelines is designed to be an aid to dressing and treatment selection. It explores different wound management products, what they are and when to use, and not use, them. While products are grouped under generic names, such as hydrocolloids or alginates, each product within a category will have different performance characteristics. The products covered include dressings and treatments that have definite applications in cancer and palliative care patients, but not those that have little, if any, application in cancer and palliative care, such as growth factors or skin substitutes.

Selecting an Appropriate Dressing

The selection of any dressing should be based on an in-depth wound assessment that incorporates patient needs, health professional opinion and the goals of patient care. Dressing selection should also incorporate the basic principles covered in the earlier units on Wound Cleansing and Wound Bed Preparation. Other important criteria for selecting the right dressing include the appearance of tissue in the wound bed, depth of the wound and the amount of exudate, as well as the need to maintain a moist wound environment.

Wounds with heavy exudate will require an absorbent dressing to prevent exudate leakage and subsequent maceration of surrounding skin (Bale & Jones 1997). Low exudate wounds require a less absorbent dressing that will maintain a moist wound bed and prevent the wound from drying out or the dressing adhering to the wound bed.

Choosing a dressing regimen that can be left in place for a number of days will be beneficial to allow healing in an undisturbed environment and help reduce patient distress or pain associated with dressing change. Table 3 gives suggested dressings or devices that can be used for each of the main wound bed appearances.

Wound Tissue type	Appearance	Aim of Management	Suggested Management
Necrotic	Dry black / brown tissue (eschar) composed of dead, dehydrated epidermis and underlying tissue.	Rehydration and removal of necrotic tissue to promote healing, or Maintain dry eschar (in dying patient).	Surgical or sharp debridement. Autolytic debridement with hydrogel, hydrocolloid dressing. Non or low-adherent dressing with a dry secondary dressing.
Sloughy	Moist, soft, stringy white to yellow coloured necrotic tissue.	Removal of necrotic tissue, prevention of infection.	Surgical or sharp debridement. Autolytic debridement with hydrogel, hydrocolloid. If heavy exudate is present, a foam, hydrofibre or alginate dressing may be appropriate. If the wound is a cavity, then a foam cavity dressing can be coated with hydrogel to aid debridement. V.A.C. therapy.
Granulating	Firm, red to pale pink tissue with a bumpy or 'cobblestone' appearance.	Protection and encouraging further healing.	Depends on exudate: If moderate to heavy exudate is present, use a foam, hydrofibre or alginate dressing. If light exudate use a hydrocolloid, hydrogel or semi-permeable film dressing. V.A.C. therapy.
Epithelialising	Pale pink to white tissue spreading from the wound edges or as islands within the wound.	Protection and encouraging re-epithelialisation.	Depends on exudate: If moderate to heavy exudate is present, use a foam, hydrofibre or alginate dressing. If light exudate use a hydrocolloid, hydrogel or semi-permeable film dressing.
Infected	Any of the above tissue types with associated signs of infection, including purulent discharge, surrounding erythema, pain, etc.	Treat infection; prevent wound deterioration.	Depending on cause of infection and treatment goals: • Systemic antibiotics (based on wound swab results) with a suitable dressing depending on wound characteristics; • Iodine dressings; • Silver dressings; • Honey / Sugar paste; • V.A.C. therapy.

Table 3. Suggested Management According to Wound Bed Appearance.

Index of Wound Dressings / Devices

The array of wound dressings and devices available today is vast and these products are becoming more complex in the way they interact with the wound environment. Dressings are being developed with unique properties designed to meet the needs of specific patient groups or types of wounds. Almost all new dressings are backed by extensive laboratory research and clinical trials supporting their wound healing abilities. Consequently, the cost of modern dressing products is also increasing, as is the knowledge required to employ these products in a cost effective manner. The wound management products listed in this section should always be used according to the manufacturer's instructions.

Information contained in this section has been drawn from the following resources: Morgan, 2000; Surgical Materials Testing Lab, 2006; Naylor et al, 2001; Miller & Dyson, 1996; Thomas, 1990; Manufacturers Product Datasheets.

Activated charcoal dressings

Composition
Many simple and combination products that all contain a layer of activated charcoal, which traps volatile, odour-causing molecules.

Product Example(s)
Clinisorb (secondary dressing), Actisorb Plus, CarboFlex, Carbonet, Kaltocarb, Lyofoam C (primary wound dressings).

When to use
Malodorous wounds including:
- Fungating tumours.
- Faecal fistulae.
- Necrotic pressure ulcers and leg ulcers.

When not to use
- Depends on dressing constituents (see other appropriate category), secondary dressings have no contraindications.
- Known hypersensitivity to dressing or its components.

Precautions
- Some dressings cannot be cut to shape.

Adhesive island dressings

Composition

A low adherent, absorbent pad located centrally on an adhesive backing consisting of either a non-woven polyester fabric tape or a semi-permeable film.

Product Example(s)

Mepore, Opsite Post-Op, Primapore, Tegaderm + Pad

When to use

- Post-operative suture lines or low exudate superficial wounds.

When not to use

- Heavily exuding wounds.
- Fragile or easily damaged skin.
- Known hypersensitivity to dressing or its components.

Precautions

- Do not apply the dressing under tension as the shearing forces produced may damage the skin.

Alginates

Composition

A fibre dressing made from the calcium salt of an alginic acid polymer derived from brown seaweed. They contain mannuronic and guluronic acids in varying amounts and are available as a sheet, ribbon or packing.

Product Example(s)

Comfeel Seasorb, Curasorb, Kaltostat, Sorbsan, Tegagen.

When to use

- Moderately exuding wounds containing sloughy or granulating tissue, including infected and/or malodorous wounds.
- Can be useful in light to moderately bleeding wounds, such as malignant fungating wounds.
- May be helpful for painful wounds, as it can be easily irrigated out of the wound with 0.9% sodium chloride solution.

When not to use

- Dry wounds and those with eschar.
- Known hypersensitivity to dressing or its components.

Precautions

- Patients can experience a mild tingling sensation on application of the dressing due to 'drawing up' of surface exudate. If this occurs moisten the wound surface with a little sterile 0.9% sodium chloride solution before application of the dressing.

Burn dressings

Composition
A multi-layer dressing composed of a highly absorbent rayon / cellulose blend sandwiched with a layer of anti-shear high density polyethylene, a high density polyethylene outer and a wound contact layer of high density polyethylene. Available in different sized dressings, bed sheets and garments.

Product Example(s)
EXU-DRY

When to use
May be used in the management of superficial to full thickness wounds with moderate to high exudate, such as:

- Leg ulcers (venous, arterial, diabetic).
- Pressure sores.
- Donors Sites, skin grafts.
- Surgical incisions and excisions.
- Bio-engineered skin substitutes.
- Burns.
- Draining wounds.
- Moist skin desquamation.
- Fungating wounds.
- Chemotherapy extravasation.
- Kaposi's sarcoma.
- Lymphoedema.
- Graft Vs Host Disease.
- Dermatological wounds.
- Skin sloughing disorders.

When not to use

- Known hypersensitivity to dressing or its components.
- Petroleum jelly-based impregnated dressings (e.g. paraffin gauze) should not be used with EXU-DRY, as this may interfere with its absorbency.

Precautions

- Should any signs of irritation (redness, swelling, increased burning sensation), maceration (over-hydration of the skin), hyper-granulation (excess tissue) or sensitivity (allergic reactions) appear, discontinue use and consult an appropriate healthcare professional.

Foams

Composition
Generally made from polyurethane foam with one or more layers and may have a semipermeable film backing and adhesive border. Foam dressings are absorbent, non-adherent and provide a moist, thermally-insulated wound environment. The outer film prevents strike through of exudate and the passage of microorganisms. They are also available as cavity dressings (e.g. Allevyn Cavity).

Product Example(s)
Hydrocellular foams – Allevyn (Adhesive), Allevyn Plus, Allevyn Cavity (Plus Cavity), Lyofoam
Hydropolymer Foam – Tielle, Tielle Plus

When to use
- Depending on the dressing foams may be used for light (Lyofoam) to moderately or heavily (Allevyn, Tielle) exuding superficial wounds. Cavity wounds can be managed with Allevyn cavity dressings.
- Tracheostomy and drain sites can be dressed with Lyofoam T or Allevyn Tracheostomy.
- Foams can be used under compression bandages.

When not to use
- Wounds that have low exudate or dry necrotic wounds.
- Known hypersensitivity to dressing or its components.

Precautions
- Allevyn Cavity should not be re-used, cut open or exposed to oxidising agents, such as Eusol or hydrogen peroxide.

Hydrosorbtive dressing

Composition
Consist of several layers; a non-adherent wound contact layer, a central core composed of super-absorbent granules in powder form and a backing layer of a thin hydrocolloid sheet. Exudate is absorbed and locked into the dressing's central core.

Product Example(s)
CombiDerm

When to use
- Chronic or acute moderately exuding wounds.
- Clean granulating wounds.
- Necrotic or sloughy wounds.
- Infected wounds (Not an ideal choice, as it needs to be changed daily making treatment expensive).

When not to use
- Heavily exuding wounds.
- Known hypersensitivity to the dressing or its components.

Precautions
- Do not cut the dressings.

Honey

Composition
Natural honey produced by bees. Available as a wound care product in the form of impregnated dressings or tubes of liquid honey. Manuka honey has been most widely researched to show its positive effects on wound healing.

Product Example(s)
Pure honey: Woundcare™ 18+ Active Manuka Honey, Medihoney, SummerGlow Sterilized UMF16 Manuka Honey
Honey impregnated dressings: Activon Tulle, Apinate

When to use
Can be use on most types of wounds, but particularly suitable for:
- Infected wounds (including abscesses).
- Necrotic and sloughy wounds (including gangrenous wounds).
- Burns.
- Surgical wounds, in particular infected surgical wounds and vulvectomy wounds.
- Fungating malignant wounds.

When not to use
- Known hypersensitivity to bee products or pollen.

Precautions
- Always use a medical grade, sterile honey.
- Although not proven, there is a theoretical risk of absorption of glucose and fructose through the wound bed, which may affect blood sugar levels in diabetics. Use under medical supervision.
- Mild stinging can occur on application.

Hydrocolloids

Composition
Varying amounts of gelatin, pectin and carboxymethylcellulose combined with adhesives and polymers to form an adhesive, absorbent wound contact layer. This is then bonded to a semi-permeable film.

Product Example(s)
Comfeel Plus, Duoderm Extra Thin, Granuflex, Hydrocoll, Tegasorb.

When to use
- Light to moderately exuding wounds that may range from clean and granulating wounds to necrotic or sloughy wounds.
- Thin hydrocolloids may be useful to protect areas of skin exposed to friction and moisture (such as elbows or the sacrum) to prevent skin breakdown.

When not to use
- Known hypersensitivity to hydrocolloid or its components.

Precautions
- Infected wounds.

Hydrofibre dressing

Composition
A soft, non-woven dressing composed of 100% hydrocolloid fibres (sodium carboxymethylcellulose). Able to absorb up to 22 times its own weight in fluid, becoming a gel on contact with fluid.

Product Example(s)
Aquacel (Aquacel Ag)

When to use
- Suitable for moderate to highly exuding acute and chronic wounds, both superficial and deep cavities.
- Wounds prone to bleeding.

When not to use
- Dry, necrotic wounds.
- Known hypersensitivity to hydrofibre or its components.

Precautions
- None known.

Hydrogels

Composition
Amorphous (liquid) hydrogels contain differing quantities of water and propylene glycol plus other components, such as sodium carboxymethylcellulose or alginate, depending of the product. They are capable of absorbing a small amount of exudate, or donating fluid to dry necrotic areas.

Product Example(s)
Aquaform, Granugel, Intrasite Gel, Solugel, Purilon, Sterigel

When to use
- Re-hydrating and debriding wounds with dry eschar or slough.
- Deep and superficial granulating wounds.
- Acute radiotherapy skin reactions, especially moist desquamation.

When not to use
- Known hypersensitivity to the gel or its components.
- Heavily exuding wounds

Precautions
- Infected wounds (hydrogels can be used alongside systemic antibiotic treatment with close monitoring for any deterioration of the wound).
- Occlusion is not recommended in the presence of anaerobic infection.

Hydrogel sheets

Composition
Hydrogel sheets generally contain about 96% water, the remaining 4% being composed of polyethylene oxide, agar and/or polyacrylamide. They are permeable to oxygen, water vapour and small protein molecules, but impermeable to bacteria. They provide a moist, well-oxygenated environment and have cooling properties.

Product Example(s)
Nu-Gel, Clearsite

When to use
- Light to moderately exuding wounds.
- Acute radiotherapy skin reactions.
- Superficial nodules of fungating lesions causing irritation.
- Split skin donor sites, graft recipient sites.
- Superficial pressure ulcers.
- Deep chronic wounds extending to muscle, tendon or bone.

When not to use
- Wounds known to be infected (particularly with *Pseudomonas aeruginosa*).
- Deep narrow cavities or sinus wounds.

Precautions
- Known hypersensitivity to the dressing or its components.

Iodine dressings

Composition
Various base material, e.g. hydrophilic cadexomer beads or knitted viscose, impregnated with iodine. Allows slow release of antimicrobial iodine into the wound environment.

Product Example(s)
Iodosorb, Inadine

When to use
For prophylaxis and treatment of wound infection, especially in chronic wounds such as:
- Leg ulcers.
- Diabetic foot ulcers.
- Small pressure ulcers.

When not to use
- Known or suspected allergy to iodine.
- Known thyroid disease.

Precautions
- Patients may experience a 'drawing' sensation on application of Iodosorb.
- Use only a small number of dressings or paste at one time (e.g. 4 Inadine at most).

Low-adherent wound contact layer

Composition
Knitted acetate fabric mesh, impregnated with a water repellent ointment.

Product Example(s)
Cuticerin, Adaptic

When to use
For the treatment of extensive, exuding wounds, for example:
- Superficial and partial thickness burns.
- Abrasions.
- Radiation injuries.
- Split-thickness skin graft donor sites.
- Chronic Ulcers.
- Surgical wounds.

When not to use
- Known hypersensitivity to dressing or its components.

Precautions
- May adhere to wound if dries out or thick exudate is present. Can also become incorporated into granulation tissue.

Metronidazole gel

Composition
Metronidazole for wound care is available as a clear, colourless, sterile gel containing 0.75 or 0.8 percent w/v metronidazole.

Product Example(s)
Anabact, Metrotop, Rosex

When to use
Malodorous chronic wounds, such as:
- Fungating wounds
- Pressure ulcers
- Leg ulcers.

When not to use
- Known hypersensitivity to metronidazole.

Precautions
- There is a very small possibility of systemic absorption of metronidazole and therefore systemic side effects such as nausea.

Non-adherent wound contact layer

Composition
Fabric net (e.g. polyamide or knitted viscose) coated with a non-adherent substance such as silicone or hydrocolloid.

Product Example(s)
Mepitel, N-A Ultra, Urgotul, EXU-DRY Wound Veil

When to use
Specifically designed to be non-traumatic and provide pain-free removal, therefore of particular use on painful wounds and wounds with fragile skin, such as:

- Fungating wounds.
- Acute traumatic wounds.
- Dermatological skin conditions (e.g. GvHD, blistering).
- Fixation of split skin grafts.

When not to use

- Known hypersensitivity to dressing or its components.

Precautions

- When used on bleeding wounds or wounds with very viscous exudate, cover with a moist absorbent pad dressing.

Paraffin gauze

Composition
Sterile cotton/rayon open weave cloth impregnated with soft paraffin.

Product Example(s)
Jelonet, Paranet, Unitulle

When to use
Clean superficial wounds, such as

- Minor burns and scalds.
- Donor and recipient graft sites.
- Skin loss wounds, lacerations and abrasions.
- Leg ulcers.

When not to use

- Known hypersensitivity to dressing or its components.

Precautions

- Requires changing daily or more often according to the condition of the wound to prevent dressing drying out or becoming incorporated into granulation tissue.
- For leg ulcers, only use under medical advice.

Semi-permeable films

Composition
A polyurethane film with a hypoallergenic acrylic adhesive presented in a variety of application methods, such as a plastic or cardboard carrier. These dressings are permeable to water vapour and oxygen but impermeable to microorganisms.

Product Example(s)
Opsite Flexigrid / FlexiFix, Opsite IV3000, Tegaderm, Tegaderm IV

When to use
These dressing cannot absorb exudate, therefore are for use on:
- Superficial, low exudate wounds.
- Surgical wounds healing by primary intention.
- As a secondary retention dressing.
- Can also be use to prevent skin breakdown in high friction areas (sacrum, elbows, heels).
- Opsite IV3000 and Tegaderm IV are specifically designed for central venous catheters and long-term peripheral intravenous (IV) catheters.

When not to use
- Should not be used over deep cavities, full thickness burns or infected wounds.
- Known hypersensitivity to dressing or its components.

Precautions
- If used on exuding wounds excess exudate can accumulate under the dressing causing skin maceration.
- Allows cooling of the wound surface.

Silver impregnated dressings

Composition
These dressings are composed of a number of different primary dressing components, such as hydrofibre, alginate, foam, hydrocolloid or polyethylene mesh, coated or impregnated with ionic silver. Silver is known to exhibit antibacterial activity against a wide range of bacteria including many antibiotic resistant strains, as well as some strains of yeasts and fungi.

Product Example(s)
Aquacel Ag, Acticoat (7, Absorbent), Avance, Contreet

When to use
Can be used prophylactically as an antimicrobial barrier or to treat infection in the management of partial and full-thickness wounds such as:
- Burns.
- Donor sites and graft recipient sites.
- Leg ulcers.
- Pressure ulcers.
- Other granulating wounds.

When not to use
- Wounds that are very dry or covered with eschar.
- Known hypersensitivity to dressing or its components.

Precautions
- Wounds with clinical infection should have daily dressing changes and systemic antibiotic therapy should be considered.

Skin barrier films

Composition

Liquid polymer that form a protective film on the skin. Newer products are alcohol free so do not sting if applied to raw areas of skin.

Product Example(s)

Cavilon No-Sting Barrier Film, No-Sting Skin-Prep, SuperSkin

When to use

- These films have a high wash off resistance and protect the skin from body fluids (including urine, diarrhoea, saliva and wound exudate), friction and shear, as well as the effects of adhesive products.
- Artificial skin openings such as fistulae, stomas and tracheostomies (particularly if the drainage from these sites is corrosive to the skin, such as from an ileostomy).
- Wound margins, to prevent maceration of the skin by exudate and to reduce skin stripping by adhesive tapes. The films also provide an excellent base for adhesives to stick to.
- Moisture-damaged skin (i.e. areas that are prone to, or have become damaged by moisture such as sweat).

When not to use

- Do not apply directly to the surface of an open wound.
- Known hypersensitivity to film or its components.

Precautions

- May cause a warm feeling on skin when applied, warn patient.

Sugar paste

Composition

Sugar paste used in wound care is a mixture of icing sugar, caster sugar, propylene glycol and hydrogen peroxide combined to form either a thin or thick consistency.

Product Example(s)

Northwick Park Hospital Sugar Paste Recipe (Morgan, 2000)

Ingredients	*Thin*	*Thick*
Caster sugar (fine granular sucrose)	1200g	1200g
Icing sugar (additive-free, powdered sucrose)	1800g	1800g
Polyethylene glycol 400	1416ml	686ml
Hydrogen peroxide 30%	23.1ml	19ml

When to use

- Infected wounds (in particular pressure ulcers and vulval wounds), including malodorous wounds, abscesses and cavity or sinus wounds.
- Burns.
- Thin version can be used for cavity or sinus wounds with small openings.
- Thick paste is similar in consistency to modelling clay and can be moulded into shape and used in open cavities or more superficial wounds such as leg ulcers.

When not to use

- Known hypersensitivity to components of sugar paste.

Precautions

- Impaired renal function, as the polyethylene glycol may be absorbed and high levels can be nephrotoxic.
- Diabetic patients who may absorb sugar through the wound bed.

Topical negative pressure therapy

Composition

Topical negative pressure therapy (also called Vacuum Assisted Closure – V.A.C.) involves the application of topical negative pressure uniformly across the wound surface by a vacuum device (Banwell 1999, Collier 1997). Topical negative pressure therapy has been shown to improve blood flow, promote formation of granulation tissue, and reduce bacterial colonisation (Morykwas et al, 1997). Components of the system include a sterile foam sponge, occlusive film drape, suction tubing, suction canister and vacuum unit.

Product Example(s)

V.A.C. Classic, V.A.C. A.T.S., Mini V.A.C., V.A.C. Freedom.

When to use

Topical negative pressure therapy can be used on both acute and chronic wounds including:

- Venous and diabetic ulcers.
- Pressure ulcers.
- Surgical flaps.
- Dehisced surgical wounds.
- Fixation of meshed split skin grafts.
- Fistulae of known origin.
  (Collier 1997, Argenta & Morykwas 1997, Morykwas & Argenta 1997)

When not to use

- Fistulae of unknown origin.
- Any wound that contains dry necrotic tissue.
- Malignant fungating wounds.
- Actively bleeding wounds.
- Patients taking anticoagulants.

Precautions

- Fistulae, exposed organs (such as intestines).

Secondary dressings

Composition

A secondary dressing overlies the primary wound contact dressing and is not in direct contact with the wound bed. They are usually composed of cotton wool and non-woven gauze.

Product Example(s)

Low-linting gauze squares, Orthopaedic wadding bandages (e.g. Soffban, Artiflex), Combine, Mesorb

When to use

- Holding a primary dressing in place.
- Providing extra absorbency.
- Providing extra protection from infection and trauma.
- Retaining moisture in low exuding, or dry wounds.
- Containment of malodour.

When not to use

- None

Precautions

- May adhere to wound edges if primary dressing does not cover and slightly overlap whole wound bed.

Tapes / fixation

Composition
There are a large variety of tapes available. They are commonly composed of plastic, paper or fabric and use a range of adhesive substances, which are usually hypoallergenic.
Fixation devices include elastic conformable netting and simple crepe bandages.

Example(s)
Tapes: Micropore, Transpore / Fabric tapes: Hypafix, Fixomull
Elastic netting: Surgifix, Stockinet, Netelast, Tubifast

When to use
- Tapes are used to retain dressings, bandages or other medical appliances in position. When used to secure dressings, tapes should only be fixed to healthy normal skin, as they may cause trauma upon removal from fragile or diseased skin. Dressings should be large enough to extend over the whole wound and onto healthy skin to allow for this.
- Elastic netting can be used to secure large or bulky dressings, or when tape is unsuitable or inappropriate.

When not to use
- For patients with very sensitive and/or diseased skin, or with an allergy to adhesives, tape should be avoided. Instead, plain bandaging or elastic netting should be used to secure dressings.

Precautions
- Known hypersensitivity to adhesive or components of tape or nettings.

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