Pan Pacific Clinical Practice Guideline for the Prevention and Management of Pressure Injury

Abridged version

AWMA
Australian Wound
Management Association Inc.
National

NEW ZEALAND
WOUND CARE
SOCIETY

Pan Pacific Guideline for the Prevention and Management of Pressure Injury (Abridged Version) (2012)

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Disclaimer:
This guideline was developed by the Australian Wound Management Association in collaboration with the New Zealand Wound Care Society, Hong Kong Enterostomal Therapists Association and Wound Healing Society of Singapore. The guideline presents a comprehensive review of the assessment, diagnosis, management and prevention of pressure injuries within the Australian, New Zealand, Hong Kong and Singapore healthcare context, based on the best evidence available up to August 2011. The guideline is designed to provide information to assist in decision-making and is based on the best information available at the date of compilation. This document is a general guide to appropriate practice, to be implemented by a qualified health professional subject to his or her clinical judgment of each individual case and in consideration of the patient's personal preferences. The guideline should be implemented in a culturally safe and respectful manner in accordance with the principles of protection, participation and partnership.

Copies of this guideline can be downloaded from the following websites:
Australian Wound Management Association: www.awma.com.au
New Zealand Wound Care Society: www.nzwcs.org.nz
Hong Kong Enterostomal Therapists Association: www.etnurse.com.hk
Wound Healing Society Singapore www.woundhealingsociety.org.sg

1. INTRODUCTION

This is an abridged version of the Pan Pacific Clinical Practice Guideline for the Prevention and Management of Pressure Injury. The guideline was developed by the Australian Wound Management Association (AWMA) in partnership with the New Zealand Wound Care Association, the Hong Kong Enterostomal Therapists Association and the Wound Healing Society of Singapore. The guideline aims to optimise the prevention, assessment and management of pressure injuries (PIs) and represents best available evidence available up to August, 2011, and simplify clinical decision–making processes for health care professionals. The guideline offers recommendations to help health care professionals provide quality care for patients of all ages and across a range of health care settings, such as acute care, post-acute care, community settings and long term care. The guideline is not intended to have a regulatory effect.

Despite a general consensus that pressure injuries (PIs) are preventable adverse events, they continue to remain a problem in all health care settings. In addition to the significant financial costs (to health services and patients), PIs are associated with significant social cost in terms of increased morbidity and mortality, pain, discomfort, decreased mobility, loss of independence, social isolation and lost work time. As health care professionals, these are factors that warrant our concern.[1]

Management of PI requires a multidisciplinary approach. This document is a general guide to appropriate practice, to be implemented by qualified health professionals subject to their clinical judgment of each individual case and in consideration of the patient's personal preferences and available resources. The guideline should be implemented in a culturally safe and respectful manner in accordance with the principles of protection, participation and partnership.

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Commonly used abbreviations

ABPI	Ankle brachial pressure index
AWMA	Australian Wound Management Association
AGREE	Appraisal of Guidelines for Research and Evaluation
AS	Australian Standard
BWAT	Bates-Jensen Wound Assessment Tool
BMI	Body mass index
BPUSRAS	Burn Pressure Ulcer Skin Risk Assessment Scale
CRP	C reactive protein
CALD	Culturally and linguistically diverse
CBR	Consensus based recommendation
CI	Confidence interval
CRIES scale	Crying; Requires oxygen for saturation >95%; Increasing vital signs; Expression; Sleepless scale
DAA	Dietitians Association of Australia
EMLA	Eutectic mixture of local anesthetic
EPUAP	European Pressure Ulcer Advisory Panel
ETF	Enteral tube feeding
FLACC	Face, Legs, Activity, Cry, Consolability
FRS	Wong-Baker FACES Pain Rating Scale
GIT	Gastrointestinal tract
GM-CSF	Granulocyte-macrophage colony-stimulating factor
HBOT	Hyperbaric oxygen therapy
HRQOL	Health related quality of life
IFD	Indentation force deflection
ITT	Intention to treat
Kcal	Kilocalorie
Kg	Kilograms
LLLT	Low level laser therapy
m^3	Metres cube
MNA-SF	Mini Nutritional Assessment Short Form
N	Number (of participants)
Nb	Note well
MHz	Megahertz
NHMRC	The National Health and Medical Research Council
MPQ	McGill Pain Questionnaire
NNT	Number needed to treat
NPUAP	National Pressure Ulcer Advisory Panel
NSRAS	Neonatal Skin Risk Assessment Scale
NS	Not statistically significant
NZ	New Zealand
OR	Odds ratio
PI / PIs	Pressure injury / Pressure injuries
PEMT	Pulsed electromagnetic therapy
PUSH Tool	Pressure Ulcer Scale for Healing
P value (p)	Probability value
pps	Pulses per second

PPV	Positive predictive value
QALYs	Quality adjusted life years
QI	Quality improvement
QOL	Quality of life
r	Sample correlation
RCT	Randomised controlled trial
RNAO	Registered Nurses Association Ontario
RR	Relative risk
RRR	Relative risk reduction
SCI	Spinal cord injury
SIGN	Scottish Intercollegiate Guidelines Network
SR	Systematic review
TBPI	Toe brachial pressure index
VAS	Visual analogue scale
WBP	Wound bed preparation
WHO	World Health Organisation
WMD	Weighted mean difference
WOCN	Wound Ostomy Continence Nurses Society

Glossary

Active support surface	A powered support surface that produces alternating pressure through mechanical means, thereby providing the capacity to change its load distribution properties with or without an applied load. This generally occurs through alternation of air pressure in air cells on a programmed cycle time. Also called an alternating pressure support surface or a dynamic support surface.
Air fluidised surface	A reactive (constant low pressure) support surface where a gentle flow of temperature controlled air is projected upward through numerous tiny openings called ceramic microspheres. e.g. a Clinitron™ bed.
Alternating pressure support surface	A powered support surface that produces alternating pressure through mechanical means, thereby providing the capacity to change its load distribution properties with or without an applied load. This generally occurs through alternation of air pressure in air cells on a programmed cycle. Also called an active support surface or a dynamic support surface.
Antibiotic	Substance or compound administered systemically or applied topically that acts selectively against bacteria.[2]
Antimicrobial	A term used to encompass antibiotics, antiseptics and disinfectants. A substance that inhibits the growth of, or eradicates micro-organisms.[2]
Autolytic debridement	The selective process whereby the body releases endogenous proteolytic enzymes and phagocytes that gradually degrade non-viable tissue.[2]
Blanching erythema	Reddened skin that blanches white under light pressure. May be difficult to visualise in darker skin tones.
Bioengineered skin substitutes	Manufactured skin substitutes derived from biological (human or animal cells) or synthetic products.
Bony prominence	An anatomical bony projection.
Bottoming out	When the deepest point of the patient's immersion in a reactive or an active support surface provides insufficient support to adequately redistribute pressure so the patient presents as sitting or lying on the underlying structure of the bed or chair.
Clinical infection	Multiplication of bacteria that overwhelm host defences, resulting in disruption of healing and damage to the wound. Wound infection can result in local and systemic host responses.[3]
Conservative sharp wound debridement	Entails the removal of loose avascular tissue without pain or bleeding using a scalpel, scissors or other sharp, sterile instrument.[2]

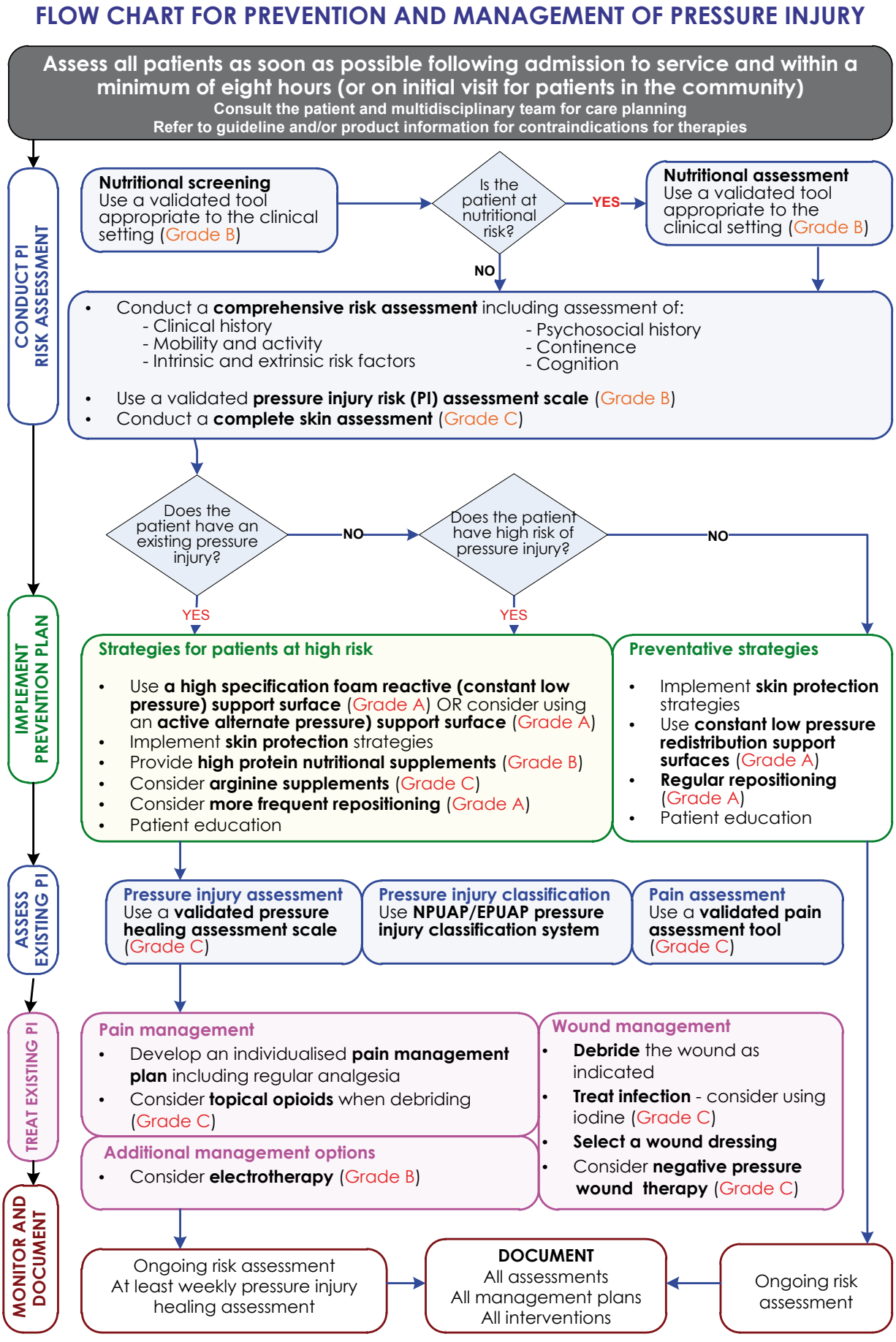
Constant low pressure support surface	A support surface which, in response to applied pressure, distributes interface pressure over a wider body area through immersing and enveloping the patient. May be referred to as reactive support surface or a static support surface.
Debridement	The removal of non-viable or infected tissue from or adjacent to a wound.[2]
Deep tissue injury	Purple or maroon localised area or discoloured, intact skin or blood-filled blister due to damage of underlying soft tissue. Full description in section 7.3.[4]
Density related to foam	Density is the weight of the foam in kilograms per cubic metre kg/m^3.
Dressing selection	A structured approach to choosing the most appropriate dressing for a wound
Dynamic surface	A powered support surface that produce alternating pressure through mechanical means, thereby providing the capacity to change its load distribution properties with or without an applied load. This generally occurs through alternation of air pressure in air cells on a programmed cycle. Also called an active support surface or an alternating pressure support surface.
Electrotherapy	Electrotherapy is the application of electrical stimulation to the body to promote wound healing or relieve pain.
Enteral nutrition	The provision of nutrients through the gastrointestinal tract via a tube, when the patient cannot ingest food and fluids normally.[5]
Envelopment	Refers to how well a support surface moulds to body contours and accommodates irregular areas (such as folds in clothing or bedding).
Enzymatic debridement	The use of products containing proteolytic enzymes designed to enhance naturally occurring wound debridement. [2]
Erythema	Redness of the skin caused by dilatation and congestion of the capillaries, often a sign of inflammation or infection. May be difficult to visualise in darker skin tones.[1]
Eschar	Leathery brown or black necrotic tissue.
Extrinsic factors	Originating outside of the body
Friction	Friction is a mechanical force that occurs when two surfaces move across one another, creating resistance between the skin and contact surface.[1, 4, 6]
Growth factors	Growth factors are naturally occurring proteins or hormones that stimulate cell growth.
Hardness related to foam	Hardness is the ability of foam to 'push back' and carry weight, defined as the amount of force (in Newtons) required to indent a sample of the foam by a specific percentage of the original thickness.
High specification foam mattress	A type of mattress exhibiting density-hardness, support factor and depth characteristics superior to a "standard" mattress. Classified as Type H or HR according to Australian Standards (AS2281-1993).
Hydrocolloid	An adhesive waterproof wound dressing comprised of gel-forming sodium carboxymethylcellulose (NaCMC) and possibly gelatin and or pectin.
Hyperbaric oxygen therapy	Therapy requiring the patient to inhale 100% oxygen at pressures above normal atmospheric pressure.
Immersion	Refers to the ability of a support surface to allow a patient to sink into it.
Incidence	The proportion of at-risk patients who develop a new pressure injury over a specific period.
Indigenous	Original inhabitants such as people from an Aboriginal background, Torres Strait Island background or Maori background.
Infrared therapy	Low-energy laser that uses light in the infrared spectrum.
Intrinsic factors	Originating within the body
Interface pressure	The pressure between the patient's body and the support surface in use.
Laser therapy	A device that emits light (electromagnetic radiation) through a process of optical amplification based on the stimulated emission of photons. The term laser originated as an acronym for Light Amplification by Stimulated Emission of Radiation.
Larval debridement	Involves the application of sterile, green bottle fly (*Lucilia sericata*) maggots to the wound.
Likert scale	An interval-based multiple-choice style question frequently used in questionnaires.

Low air loss	A support surface that allows air to escape from air cells to manage skin heat and humidity. Available as overlays, replacement mattresses or within a whole bed system.
Malnutrition	Malnutrition is a broad term that refers to under-nutrition but technically it also refers to over-nutrition. People are malnourished if their diet does not provide adequate calories and specific nutrients for growth and maintenance or if they are unable to fully utilize the food they eat due to illness. They are also malnourished if they consume too many calories (over-nutrition).[5]
Mechanical debridement	A process that removes tissue and debris via mechanical means including low frequency ultrasound, high pressure irrigation, hydrotherapy (whirlpool) and wet-to-dry dressings.
Medical grade honey	*Honey that is* filtered, gamma irradiated and produced under exacting standards of hygiene.
Medical grade sheepskin	*A sheepskin that complies with* the internationally recognised Australian Standard AS4480.1-1998.
Microclimate	The temperature of the skin or the soft tissues and humidity or skin surface moisture at the interface between the skin and the support surface.[1]
Moisture	Moisture alters resilience of the epidermis to external forces by causing maceration, particularly when the skin is exposed for prolonged periods. Moisture can occur due to spilt fluids, incontinence, wound exudate and perspiration.[1]
Necrosis	Devitalised or dead tissue.
Negative pressure wound therapy	The use of controlled negative pressure to assist and accelerate wound healing. Also known as vacuum assisted wound healing or topical negative pressure.
Non-blanching erythema	Erythema that remains reddened when pressure is applied and removed.[1]
Nutritional assessment	General assessment of nutritional status
Offload	To remove pressure from a skin surface.
Oral nutritional supplement	A commercial or other prepared food or beverage that supplements nutrient and caloric intake.
Overlay	A support surface placed onto a constant low pressure support surface or a 'standard' mattress. Overlays may be reactive (static) or active (dynamic) devices.
Pain	In the context of this guideline pain refers to an unpleasant sensory and emotional experience associated with a pressure injury. Patients may use varying words to describe pain including discomfort, distress and agony.
Patient	For the purpose of this guideline, any individual receiving health assessment, care or treatment in any setting.
pH	A measure on a scale from 0 to 14 of the acidity or alkalinity of a solution, with 7 being neutral, greater than 7 is more alkaline and less than 7 is more acidic.
Period prevalence	Total number of a given population with pressure injuries at any time during a specified period (rather than at one point in time).
Point prevalence	Total number of a given population with pressure injuries at a specific time.
Positioning	Position of normal body alignment to promote comfort, safety and relaxation, prevent deformities and reduce the effects of tissue strain on skin.[4]
Pressure injury	A localised injury to the skin and/or underlying tissue usually over a bony prominence, as a result of pressure, shear and/or friction, or a combination of these factors.[4]
Pressure injury healing assessment scale	Formal tool to assess and monitor condition of PIs.
Pressure ulcer	See pressure injury.
Pressure redistribution	The ability of a support surface on which the patient is placed to reduce the pressure load on bony prominences in contact with the surface by enabling either immersion or envelopment into the surface.
Prevalence	Total number of a given population with pressure injuries.
Pulsed electromagnetic therapy	Pulsed electromagnetic therapy (PEMT) exposes the patient to a magnetic field effect, usually in a pulsed fashion.

Psychosocial assessment	Assessment of an individual's mental, physical, social, emotional, environmental and cultural influences and wellbeing.
Reactive hyperaemia	A reddening of the skin in response to blood reperfusing hypoxic or ischaemic tissues when pressure is eliminated.
Reactive support surface	A support surface which, in response to applied pressure, distributes interface pressure over a wider body area through immersing and enveloping the patient. May be referred to as constant low pressure support surface or a static support surface.
Reliability	Measure of reproducibility of a measure
Repositioning	Changing a patient's body position to redistribute the pressure on the bony points that were in contact with the surface supporting the body. The frequency is determined by skin response, support surface in use and patient's general condition.
Risk assessment scale	Formal scale or score used to help determine the degree of pressure injury risk.
Risk assessment tool	See risk assessment scale.
Seating cushion	Static (reactive) or dynamic (active) cushions on a chair for pressure redistribution purposes.
Skin assessment	General examination of the skin.
Shear	Shear is a mechanical force created from a parallel (tangential) load that causes the body to slide against resistance between the skin and a contact surface. The outer layers of the skin (the epidermis and dermis) remain stationary while deep fascia moves with the skeleton, creating distortion in the blood vessels and lymphatic system between the dermis and deep fascia. This leads to thrombosis and capillary occlusion.[1, 6, 7]
Sinus tract	A blind ended tract into the tissues from the skin and/or wound opening as a result of tissue destruction.
Slough	Moist soft necrotic tissue.
Specialty beds	Powered beds and replacement mattresses that function as a system for redistributing pressure and repositioning (i.e. the bed and mattress work together).
Stage I pressure injury	Pressure injury presenting as intact skin with non-blanchable redness of a localised area usually over a bony prominence. Full description in section 7.3.[4]
Stage II pressure injury	Partial thickness loss of dermis presenting as a shallow, open wound with a red-pink wound bed, without slough Full description in section 7.3.[4]
Stage III pressure injury	Pressure injury presenting as full thickness tissue loss in which subcutaneous fat may be visible but bone, tendon or muscle are not exposed. Full description in section 7.3.[4]
Stage IV pressure injury	Pressure injury presenting as full thickness tissue loss with exposed bone, tendon or muscle. Full description in section 7.3.[4]
Standard care	A term used to describe usual care, most often in research studies. Standard care varies according to the setting and historical context. Within the context of the guideline, a description of the standard care used in research studies has been provided when available.
"Standard" mattress	The definition of a "standard" mattress is variable, and may change between facilities and over time. Classified as Type N according to Australian Standards (AS2281-1993).
Static support surface	A support surface which, in response to applied pressure, distributes interface pressure over a wider body area through immersing and enveloping the patient. May be referred to as reactive support surface or a constant low pressure support surface.
Support surface	A surface on which the patient is placed to manage pressure load by distributing body weight pressure more effectively over the support surface. Support surfaces are classified as reactive (constant low pressure) or active (alternating pressure) surfaces. Includes bed, trolley and operating table mattresses and overlays; integrated bed systems; and seat cushions and overlays.[4]
Surgical debridement	Rapid removal of necrotic or infected tissue performed under local or general anaesthetic.

Suspected deep tissue injury	Purple or maroon localised area of discoloured, intact skin or blood-filled blister due to damage of underlying soft tissue from pressure and/or shear. Deep tissue injury may be preceded by tissue that is painful, firm, mushy, boggy, or warmer or cooler than adjacent tissue. Deep tissue injury may be difficult to detect in individuals with dark skin tones. Evolution may include a thin blister over a dark wound bed. The wound may further evolve and become covered by thin eschar. Evolution to a stage 3 or 4 PI may be rapid exposing additional layers of tissue with or without interventions.[4]
Therapeutic ultrasound	Ultrasound therapy delivers acoustic vibrations in either a continuous or a pulsed manner.
Topical antibiotics	Antibiotics that are applied directly to a wound to reduce bacterial levels.[2]
Topical biological agents	Topical agents that are applied directly to a wound to promote healing.[2]
Tissue tolerance	The ability of skin and underlying tissues to endure pressure without experiencing any adverse effects.
Topical opioids	Topical application of morphine and its metabolites to skin ulcers to provide local relief from pain.
Topical silver	Application of a dressing product containing silver to a wound to manage wound bio-burden.
Ultraviolet light therapy	Ultraviolet light C is a wavelength of ultraviolet light that has been theorised to have a role in wound healing through cell proliferation stimulation, enhancing cutaneous blood flow and inhibiting bacterial growth.
Undermined edge/ undermining	An area of tissue destruction that extends under intact skin parallel to the wound edges.[2]
Unstageable pressure injury	Pressure injury presenting as full thickness tissue loss in which the base of the PI is covered by slough or necrosis that prevents the determination of the true depth, and therefore the stage. Full description in section 7.3.
Validity	How well a tool measures the concept it claims to measure.
Viscoelastic foam	Open cell flexible polyurethane foam with additional chemicals to increase its density and viscosity. It is often referred to as memory, slow recovery, or low resilience foam. Body heat , ambient temperature and humidity affect viscoelastic foam firmness, support and height recovery rate. Comparative laboratory testing must match ambient testing conditions for accurate comparisons and replicability of test results.
Whirlpool	Hydrotherapy or the use of agitated water or saline used to cleanse or debride necrotic tissue.

Quick reference flow chart



2. SUMMARY OF RECOMMENDATIONS

Recommendation grades[8]	
Evidence based recommendations	
A	Excellent evidence - body of evidence can be trusted to guide practice
B	Good evidence - body of evidence can be trusted to guide practice in most situations
C	Some evidence - body of evidence provides some support for recommendation(s) but care should be taken in its application
D	Weak evidence - body of evidence is weak and recommendation must be applied with caution
Consensus based recommendations (CBR)	
CBR	Consensus evidence –a graded recommendation could not be made due to a lack of evidence from SRs. Consensus recommendations are generally supported by international consensus from existing PI guidelines. The CBRs are supported by all members of Guideline Development Steering Committee.

PRESSURE INJURY RISK ASSESSMENT		**Grade**
1	Conduct a comprehensive assessment for <u>all</u> patients to identify pressure injury risk factors. A comprehensive assessment should include: • clinical history, • pressure injury risk scale, • skin assessment, • mobility and activity assessment, • nutritional assessment, • continence assessment, • cognitive assessment, • assessment of extrinsic risk factors.	**CBR**
2	Use a pressure injury risk assessment scale in conjunction with a comprehensive risk assessment to determine the patient's risk of pressure injury and to inform the development of a prevention plan.	**CBR**
3	The Braden Scale, Norton Scale or Waterlow Score are validated and reliable scales for assessing pressure injury risk in adults.	**B**
4	Use a paediatric risk assessment scale in conjunction with a comprehensive risk assessment to determine a risk of pressure injury and to inform the development of a prevention plan for children.	**CBR**
5	Inspect the skin of all patients on admission and at each repositioning to identify indications of pressure injury including: • erythema, • blanching response, • localised heat, • oedema, • induration, and • skin breakdown.	**C**
6	Conduct nutritional screening and assessment using validated screening and assessment tools appropriate to the population and clinical setting.	**B**
7	Conduct a psychosocial history to identify factors that impact on pressure injury prevention and management.	**C**
8	Provide patients with education on the prevention and management of pressure injuries.	**CBR**
PREVENTION OF PRESSURE INJURIES		**Grade**
9	Implement preventative strategies to protect the patient's skin.	**CBR**
10	Provide high protein oral nutritional supplements in addition to a regular diet for patients at a high risk of pressure injury.	**B**
11	Use a high specification reactive (constant low pressure) support foam mattress on beds and trolleys for patients at risk of pressure injuries.	**A**
12	No one specific high specification reactive (constant low pressure) support foam mattress is better than any other.	**A**

13	Active (alternating pressure) support mattresses could be used as an alternative in patients at high risk of pressure injuries.	**A**
14	Only consider using a medical grade sheepskin as an adjunct or when high specification reactive (constant low pressure) or active (alternating pressure) support surface is unavailable/ not tolerated.	**C**
15	Any device used to prevent heel pressure injuries should be selected and fitted appropriately to ensure pressure is adequately offloaded.	**CBR**
16	Use a support cushion for patients at risk of pressure injury when seated in a chair or wheelchair.	**C**
17	Reposition patients to reduce duration and magnitude of pressure over vulnerable areas, including bony prominences and heels.	**A**
18	Frequency of repositioning should consider the patient's risk of pressure injury development, skin response, comfort, functional level, medical condition, and the support surface used.	**CBR**
19	Position patients using 30° lateral inclination alternating from side to side or a 30° inclined recumbent position. Use the prone position if the patient's medical condition precludes other options.	**C**
20	When repositioning the patient in any position always check the positioning of heels and other bony prominences.	**CBR**
21	Limit the time a patient spends in seated positions without pressure relief.	**CBR**
22	Use a high specification reactive (constant low pressure) foam mattress or an active (alternating pressure) mattress on operating theatre tables for patients at risk of pressure injuries.	**B**
23	Position the patient with heels elevated, knees flexed and the weight of the leg distributed along the calf to reduce the risk of pressure injuries in the operating theatre.	**CBR**
ASSESSMENT AND MONITORING OF PRESSURE INJURIES		**Grade**
24	Assess and monitor pressure injuries using a validated pressure injury healing assessment scale.	**C**
25	Consider using the NPUAP/EPUAP 2009 pressure injury classification system to identify and communicate the severity of pressure injuries.	**CBR**
ADDRESSING PAIN ASSOCIATED WITH PRESSURE INJURIES		**Grade**
26	All patients with pressure injuries should be regularly and routinely assessed for presence of pain.	**C**
27	Use a validated pain assessment tool to assist in assessing pain associated with a pressure injury.	**C**
28	Holistic management of a patient with pressure injuries includes development of an individualised pain management plan.	**CBR**
29	Consider using topical opioids to reduce pain associated with stage II to IV pressure injuries.	**C**
INTERVENTIONS FOR THE TREATMENT OF PRESSURE INJURIES		**Grade**
30	Provide high protein oral nutritional supplements in addition to a regular diet for patients with a pressure injury.	**B**
31	Consider multivitamin supplements in patients with a pressure injury who are identified as having nutritional deficits.	**D**
32	Consider arginine containing supplements in patients with a stage II or greater pressure injuries.	**C**
33	Manage patients with existing pressure injuries on a high specification reactive (constant low pressure) or active (alternating pressure) support surface on beds and trolleys and seating surfaces.	**A**
34	Continue repositioning patients with existing pressure injuries with consideration to: • the patient's risk for further pressure injury development, • comfort, • functional level, • medical and general condition, and • the support surface used.	**CBR**

35	When debridement is indicated, select the method of debridement with consideration to: • the patient's condition (including pain, vascular condition, and bleeding risk), • comfort, • type, quantity and location of non-viable tissue; • goals of care; • patient preferences; • health professional training and experience; and • availability of resources.	**CBR**
36	Cleanse the peri-wound skin and pressure injury when wound dressings are changed.	**CBR**
37	Cadexomer iodine could be used to promote healing in pressure injuries when there is a known increased microbial burden.	**C**
38	Consider using topical medical grade honey to promote healing in pressure injuries.	**D**
39	Consider using topical silver to promote healing in pressure injuries.	**CBR**
40	Toxic topical antiseptic agents should not be used in the standard care of pressure injuries. Antiseptic solutions with no demonstrated toxicity should be considered in the treatment of pressure injuries with clinical evidence of infection or critical colonisation.	**CBR**
41	Topical antibiotics are best avoided in the management of pressure injuries as there is a concern that their use is associated with antibiotic resistance and sensitivities.	**CBR**
42	Use systemic antibiotics when the patient with a pressure injury has clinical evidence of spreading and/or systemic infection.	**CBR**
43	Consider using a hydrocolloid dressing to promote healing in non-infected stage II pressure injuries.	**C**
44	Select wound dressings based on: • comprehensive ongoing clinical assessment, • management of pain, malodour, exudate and infection, • wound size and location, • cost and availability, and • patient preference.	**CBR**
45	Consider negative pressure wound therapy as an adjunct for treating stage III or IV pressure injuries.	**C**
46	Consider using electrotherapy as an adjunct for promoting healing in pressure injuries.	**B**
47	Pulsed electromagnetic therapy could be considered as an adjunct for promoting healing in pressure injuries.	**D**
48	Ultraviolet light C therapy could be considered as an adjunct for promoting healing in pressure injuries.	**D**
49	There is insufficient evidence to make a recommendation on the use of ultraviolet light C therapy for reducing bacterial burden in pressure injuries.	**CBR**
50	Education in the prevention, assessment and management of pressure injury should be provided to all health professionals.	**C**
51	Patients with stage III or IV pressure injuries that are non-responsive to contemporary management strategies should be evaluated for surgical intervention.	**CBR**
52	Therapeutic ultrasound does not improve healing in stage I or II pressure injuries.	**A**
53	The effectiveness of therapeutic ultrasound in treating stage III or IV pressure injuries is unknown.	**CBR**
54	There is insufficient evidence to make a recommendation on the use of the following interventions for treating pressure injuries: • hyperbaric oxygen • infrared therapy • laser therapy • miscellaneous topical agents	

3. BACKGROUND

A pressure injury (PI) is a "localised injury to the skin and/or underlying tissue usually over a bony prominence, as a result of pressure, or pressure in combination with shear and/or friction." [4 p.16] Other contributing or confounding factors are associated with PIs; however, the role and significance of these factors requires further research. Previous terms that have been used to describe pressure injuries include pressure ulcers, pressure sores, decubitus ulcers, sores, pressure necrosis and ischaemic ulcers.[1]

It is evident that PIs represent a serious clinical and economic problem, and their prevention and appropriate management is an imperative to promoting patient health outcomes and improving international health budget efficiency.

Aim of the guideline

The aim of the guideline is to increase awareness of PIs amongst health care professionals. The primary objectives are to promote the prevention and optimal care of patients at risk of, or with, PIs. The guideline specifically seeks to assist health professionals to:

- identify patients at risk of PI,
- identify strategies to assess PIs and factors related to their risk,
- prevent or delay complications associated with PIs,
- optimise management of PIs, and
- optimise quality of life.

The guideline may also be used as an educational source and for use by policy developers in developing local practice policies and procedures.

Scope and target population

The guideline is intended for use by health professionals including but not limited to medical and surgical specialists, general practitioners, allied health professionals, nurse practitioners, nurses, pharmacists, rural health workers and Indigenous health workers. The guidelines could also be used as an informative source for consumers and unlicensed carers.

The guideline is intended for use in all health care settings in metropolitan, regional, rural and remote areas of Australia, New Zealand, Singapore, Hong Kong and other regions in the Pan Pacific and refers to people of all ages.

Focus of the guideline

The guideline focus is pressure injuries, excluding those of the mucosa.

The staging system for PI of the skin cannot be used to stage mucosal PIs. The reasons for this is that nonblanchable erythema cannot be seen in mucous membranes, as shallow open ulcers indicating superficial tissue loss of the non-keratinized epithelium are so shallow that they are visually indistinguishable from deeper, full thickness ulcers. Soft coagulum seen in mucosal PIs, which resembles slough in Stage III PIs, is actually soft blood clot. Exposed muscle would seldom be seen and bone is not present in mucosa.[9] Although it is agreed that mucosal injuries may be PIs, anatomically analogous tissue comparisons cannot be made. Therefore, in keeping with the NPUAP Position Statement,[9] the Guideline Development Steering Committee concur that PIs on mucous membranes be labelled as mucosal PIs without a stage identified. It is highly recommended that research into mucosal injuries be conducted.

Clinical questions

The clinical questions that guided the development of the guideline focussed on:

- assessment of patients and their risk of pressure injury;
- prevention of pressure injuries;
- assessment of pressure injuries;
- addressing pain associated with pressure injury; and
- management of pressure injury.

4. GUIDELINE DEVELOPMENT PROCESS

The guideline was developed according to processes defined by the National Health and Medical Research Council (NHMRC). See the unabridged version of the *Pan Pacific Clinical Practice Guideline for the Prevention and Management of Pressure Injury (2012)* for the development processes.

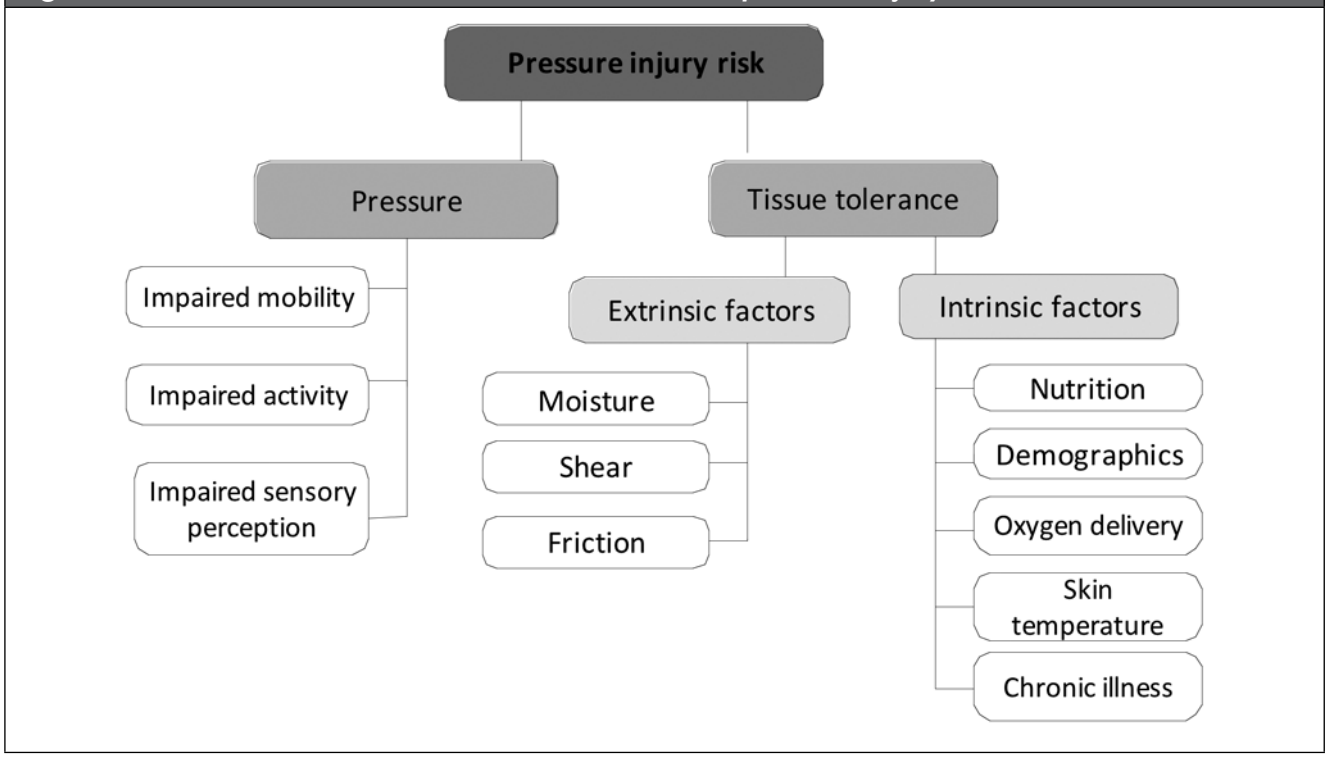
5. PRESSURE INJURY RISK ASSESSMENT

Factors associated with an increased risk of pressure injury

An imperative in the prevention of PIs is the assessment and identification of patients at risk and implementation of an individualised prevention plan. Risk assessment includes consideration of both patient and environmental factors that are associated with the development of PIs.

A risk factor is any factor that either contributes to increased exposure of the skin to excessive pressure or diminishes the skin's tolerance to pressure (see Figure 5.1). The literature search was not designed to retrieve research on factors associated with PI risk; however one SR provided evidence related to patients with spinal cord injury (SCI). Risk factors were presented in previously published guidelines.

Figure 5.1 Factors associated with increased risk of pressure injury[10]



Identifying patients at risk of pressure injury

Recommendation 1

Conduct a comprehensive assessment for all patients to identify pressure injury risk factors. A comprehensive assessment should include: **CBR**

- **clinical history,**
- **pressure injury risk scale,**
- **skin assessment,**
- **mobility and activity assessment,**
- **nutritional assessment,**
- **continence assessment,**
- **cognitive assessment,**
- **assessment of extrinsic risk factors**

Practice points for risk assessment

- Assessment of extrinsic factors should include the impact of environmental factors on pressure, shear and microclimate (e.g. local heating, air-conditioning, electric blankets).[4, 6]
- Findings of a comprehensive assessment should be used to inform development of a PI prevention plan.

- Risk assessments should be conducted as soon as possible after admission and within a minimum of eight hours of admission (or on initial home or clinic visit for patients seen in the community). Risk assessments should be repeated whenever there is a change in the patient's condition and on the patient's discharge.[11]
- Patients presenting with an extremity PI (particularly on the lower limb) should have a vascular assessment to identify co-morbidities. This could include:[4, 12]
  - Doppler ultrasound measurement of ankle brachial pressure index (ABPI),
  - Toe brachial pressure index (TBPI), and/or
  - Pulse oximetry.
- Consider the following patients to be at risk of PIs:[1, 4]
  - Patients with reduction in mobility or activity that prevents independent movement or position change to relieve pressure (e.g. patients with SCI or CVA).[1, 4, 6]
  - Patients with alterations to intact skin.[1, 4]
  - Neonates and young children, particularly in the occipital region.[6]
  - Patients using equipment or devices that come in close contact with the skin (e.g. orthotics, casts, intravenous devices, continuous positive airway pressure equipment).[6]
  - Adults aged over 65 years, particularly those with restricted mobility.[6]

Documentation

- Document all risk assessments, including risk factors and at risk status as soon as possible after admission and within a minimum of eight hours (or on initial home or clinic visit for patients seen in the community), and whenever there is a change in the patient's condition.[1, 4]
- Include the date and time the risk assessment was conducted.

Risk assessment scales

Recommendation 2

Use a pressure injury risk assessment scale in conjunction with a comprehensive risk assessment to determine the patient's risk of pressure injury and to inform the development of a prevention plan.	**CBR**

Recommendation 3

The Braden Scale, Norton Scale or Waterlow Score are validated and reliable scales for assessing pressure injury risk in adults.	**B**

Recommendation 4

Use a paediatric risk assessment scale in conjunction with a comprehensive risk assessment to determine a risk of pressure injury and to inform the development of a prevention plan for children.	**CBR**

Practice points for using risk assessment scales

- Development of a PI prevention plan should be based on a risk assessment scale in conjunction with a comprehensive risk assessment (see section 5.3).
- A risk assessment scale offers a structured approach to assessment, but does not replace a comprehensive risk assessment.[4, 6]
- Use a risk assessment scale that is appropriate to the population (see Appendix E). Validated risk assessment scales are included in the guideline appendices (see Appendix F, G and H).

- Risk assessments should be conducted as soon as possible following admission and within a minimum of eight hours. Risk assessments should be repeated whenever there is a change in the patient's condition and on the patient's discharge.[11]

Documentation

- Document all risk assessments, including risk factors and 'at risk' status as soon as possible following admission and within a minimum of eight hours (or on initial home or clinic visit for patients seen in the community). Document a new risk assessment whenever there is a change in the patient's condition.[1, 4]
- Document the date and time the risk assessment was conducted.

Skin assessment

Recommendation 5

Inspect the skin of all patients on admission and at each repositioning to identify indications of pressure injury including: **C**
- **erythema,**
- **blanching response,**
- **localised heat,**
- **oedema,**
- **induration, and**
- **skin breakdown.**

Practice points for skin assessment

- Conduct a head-to-toe skin assessment.
- Focus particular attention to skin overlying bony prominences including the sacral region, heels, ischial tuberosities and greater trochanters.[1, 4, 6]
- Darker skin tones may be more difficult to assess visually. Pay particular attention to localised heat, oedema and induration in patients with darker skin tones.[4, 6]
- Observe the skin for pressure damage related to medical devices (e.g. braces, splints, harnesses, cervical collars, hip protectors). Where possible these devices should be removed to allow a comprehensive skin assessment at least daily or more frequently in high risk patients.[1, 6]
- Ask the patient to identify areas of discomfort or pain associated with pressure and pay particular attention to assessment of these areas.[4]

Documentation

- Document all skin assessments as soon as possible following admission and within a minimum of eight hours (or on initial home or clinic visit for patients seen in the community), on a daily basis and whenever there is a change in the patient's condition.[1, 4]

Nutritional screening and assessment

Recommendation 6

Conduct nutritional screening and assessment using validated screening and assessment tools appropriate to the population and clinical setting. **B**

Practice points for nutritional assessment

- Consider referring patients to a dietitian for nutritional screening and assessment.
- Consider consulting a dietitian on selection of appropriate nutritional screening and assessment tools (see Appendix E).

Documentation

- Document all nutritional assessments, including referrals.

Psychosocial assessment

Recommendation 7

Conduct a psychosocial history to identify factors that impact on pressure injury prevention and management.	**C**

Recommendation 8

Provide patients with education on the prevention and management of pressure injuries.	**CBR**

Practice points for psychosocial assessment

- Consider the cognitive ability of the patient and their care givers when planning and delivering education on PI treatment and prevention.

Documentation

- Document all psychosocial assessments.
- Document patient education sessions, including the content of education provided to the patient and their caregivers.

6. PREVENTION OF PRESSURE INJURIES

Skin protection

Recommendation 9

Implement preventative strategies to protect the patient's skin. **CBR**

Practice points for skin protection

- Appropriate positioning (see section 6.5) and use of appropriate support surfaces (see section 6.4) help reduce shear and friction.[4, 6, 13]
- Employ appropriate manual handling techniques in line with occupational health and safety guidelines when repositioning and transferring patients.
- Provide transfer assistance devices (e.g. overhead handle) to promote independent patient transferring and reduce shear forces and friction.[4]
- Do not vigorously rub the patient's skin.[4]
- Develop and implement an individualised continence management plan.[4, 6]
- Use a pH appropriate skin cleanser and dry thoroughly to protect the skin from excess moisture.[2]
- Use water-based skin emollients to maintain skin hydration.[4]

Oral nutrition

Recommendation 10

Provide high protein oral nutritional supplements in addition to a regular diet for patients at a high risk of pressure injury. **B**

Practice points for nutrition

- To reduce the risk of PI, patients who have been identified as being malnourished or at nutritional risk require:[4]
  - a minimum of 30 to 35 kcal per kg body weight per day
  - 1.25 to 1.5 g per kg body weight daily of protein
  - 1 ml of fluid intake per kcal per day
- Patients with SCI have reduced energy needs due to decreased activity and muscle atrophy. These patients require:[14]
  - Paraplegic patients: 29.8 ±1.2 kcal/kg body weight per day
  - Tetraplegic patients: 24.3 ± 1.1 kcal/kg body weight per day
- When determining dietary intake requirements, consider concurrent diagnoses.[14]
- Refer to appropriate national clinical guidelines for strategies to improve oral dietary intake.
- When the decision to use enteral feeding in a person at risk of PIs has been made, practice should be guided by relevant evidence based guidelines.
- Consider referring patients with identified nutritional deficits or high risk of PI to a dietitian.[6]

Support surfaces

A support surface is a surface on which the patient is placed to manage pressure load, shear, friction and microclimate. This includes bed, trolley and operating table mattresses; integrated bed systems; and seat cushions.

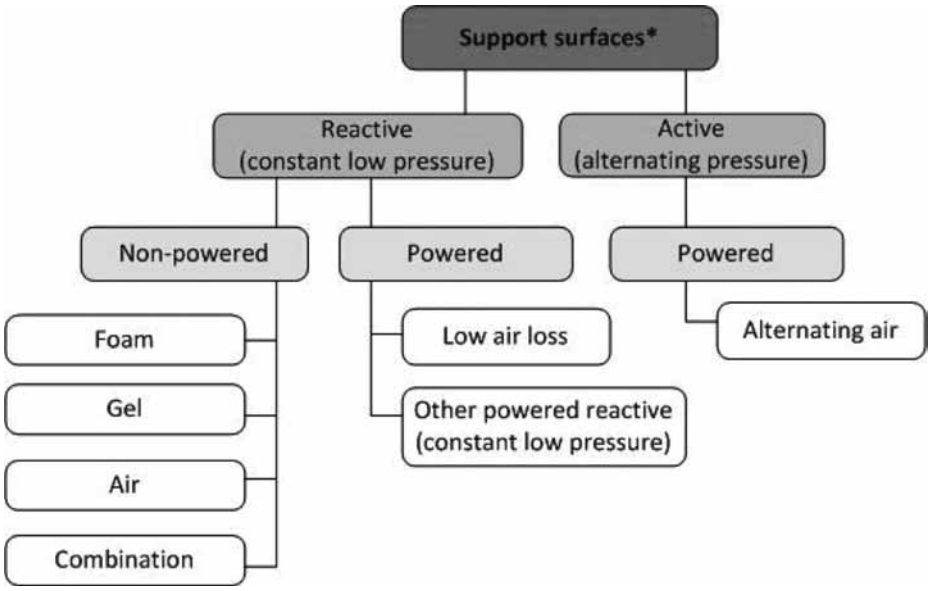
The two primary sorts of support surfaces are reactive (constant low pressure) support surfaces and active (alternating pressure) support surfaces.

A reactive (constant low pressure) support surface can be powered or non-powered and has the ability to change its load distribution properties in response to a pressure load. A reactive (constant low pressure) support surface molds to the patient's shape (immersion and envelopment) in order to redistribute body weight over a larger contact area. The interface pressure remains constant while the patient remains in the one position, but is redistributed over a wider surface area. [4, 15, 16]

Active (alternating pressure) support surfaces produce an alternating pressure through mechanical means regardless of the pressure load. This is usually achieved through alternation of air pressure in support surface air cells on a programmed cycle time. This mechanism continually changes the part of the body supporting higher pressure loads.[4, 15, 16]

Table 6.1 outlines types of support surfaces and their characteristics.

Table 6.1 Types of support surfaces[4, 16]



*** Not a hierarchy**
Nb: suppliers may use a combination of these technologies in some products to produce a hybrid product.

Table 6.1 cont. Types of support surfaces[4, 16]

	Name	Definition	Benefits	Problems
Reactive (constant low pressure)	High specification foam	Foam mattress made to high specifications as outlined in Table 6.2.	• Light weight • Easily customisable • Minimum maintenance	• Fast compression • Increases insulation and temperature
	Gel	Support surface made from gel filled cells.	• Allows posture control • Heat conductor	• Heavy in weight • Requires maintenance • Can experience leaks • Increase skin moisture • Minimal immersion
	Air	Support surface made from air filled cells.	• High level pressure redistribution • Light • Customisable inflation properties	• High cost • Requires staff training • Reduced posture control • Can experience leaks • Can be difficult to transfer in and out of bed • Low air loss pump noise may be problematic • Low air loss may cause dehydration • Requires access to electricity
	Low air loss and other powered reactive	A powered, air filled surface that allows air to escape from air cells. Not all powered reactive (constant low pressure) support surfaces are low air loss (e.g. continuous air flow)		
Active (alternating pressure)		Support surface that produces alternating pressure through mechanical means, generally involving alternating air pressure in air cells on a programmed cycle time.	• Cyclic pressure potentially offloading to a PI site • Customisable inflation properties	• Pump noise may be problematic • Can experience leaks • Can be difficult to transfer in and out of bed • Some patients experience symptoms similar to sea sickness • High cost • Overlays can result in bottoming out • Requires access to electricity

The specifications of a "standard" hospital mattress are rarely reported. The definition of a "standard" hospital mattress is variable, and may change between facilities and over time, confounding the results from these analyses.

The research in this field suggests that high specification foam mattresses are most effective in reducing risk of PIs.[15] With the evolution of more affordable high specification foam mattresses the use of most types of mattress overlay (e.g. egg crate foam) is not recommended in most settings.

The research on high specification mattresses reports a wide variety of products and their specific specifications were generally not provided. The guideline development group has developed table 6.2 to provide an overview of characteristics considered to meet the requirement of a high specification mattress.

Table 6.2 Consensus on minimum recommendations for high specification foam mattresses[17]		
Characteristics	**Explanation**	**High specification mattress**
Classification	Classification according to the Australian Standards (AS2281-1993).[18]	Type H/HR[18] H - conventional resilience, heavy duty HR - high resilience LR - Low resilience
Multi-layering	*Multi-layering* of various grades / types of foam alters design features. Different density-hardness layers produce a harder base that increases upper weight limit. *Slow recovery foam* increases the surface area contact, redistributes pressure, reduces peak pressures and allows immersion of bony prominences. Has potential to increase skin surface temperature.	Common feature
Density – hardness in single layer mattresses	*Density* is the weight of the foam in kilograms per cubic metre kg/m^3. *Hardness* is the ability of foam to 'push back' and carry weight. *Hardness* is defined as the amount of force (in Newtons) required to indent a sample of the foam by a specific percentage of the original thickness. This is known as the indentation force deflection (IFD). In Australia and Europe hardness is measured at 40% IFD. *Density/hardness* defines the grade of foam and is stated with density followed by hardness.	35-130 kg/m^3 (minimum for single layer foam mattress) Variance in the hardness exists in top and middle layers of multilayer designs.[18]
Support factor	An indicator of foam comfort that is calculated as a ratio: IFD at 65% IFD at 25% = support factor A higher value usually indicates a softer feel and good base support.	IFD: 1.6 to 2.6 [18]
Depth	Consider depth of the mattress alongside density/hardness. Different foam grades require different depth to manage upper body weight and prevent bottoming out	150 mm[19] Mattress depth needs to be increased to support bariatric load.[20]
Mattress cover	*Vapour permeability*: the relevant measurement is moisture vapour transmission rate (MVTR). Increasing the MVTR potentially allows the trans-epidermal water loss (TEWL) of intact skin to transpire through the cover.[21] Decreasing the MVTR of the cover protects the foam from moisture degradation. Changing the MVTR becomes a compromise between managing local climatic conditions and the patient's TEWL. *Allows for partial immersion in foam* *Wrinkling:* may add additional pressure at skin surface *Shear resistance:* can be reduced with a low friction fabric.[22] *Infection control:* • water proofing – prevents contamination of foam • welded seams prevent ingress of fluids • waterfall flap cover over zips • cleaning according to facility protocol and manufacturers guidelines *Fire retardant properties:* material must meet local standards	MVTR: minimum 300 g/m^2/ 24hrs[23](equivalent to normal patient TEWL)[21] Often 2 way stretch

Table 6.2 Consensus on minimum recommendations for high specification foam mattresses[17]		
Characteristics	**Explanation**	**High specification mattress**
Other considerations	*Castellated foam*: partial thickness cuts made in a regular block pattern on the top section of the foam increases surface contact area potentially reducing friction and shear.[24] *Side walls*: a border or stiffener along the edge increases firmness and assists mobility and transfers *Safety sides (concave shape)*: may reduce risk of falls but may also reduce bed mobility, need to consider facility restraint policy *Hinging system*: wedges removed on the inner border to allow for folding or bending of mattress to accommodate back rest and upper and lower leg sections to conform to profiling beds	Common features

Recommendation 11

Use a high specification reactive (constant low pressure) support foam mattress on beds and trolleys for patients at risk of pressure injuries. **A**

Recommendation 12

No one specific high specification reactive (constant low pressure) support foam mattress is better than any other. **A**

Recommendation 13

Active (alternating pressure) support mattresses could be used as an alternative in patients at high risk of pressure injuries. **A**

Selecting a support surface

The evidence provides little guidance to selection of the most appropriate high specification support surface for various patients. Table 6.3 outlines factors to consider when selecting a support surface.

Table 6.3 Considerations in selecting a support surface[1]		
Patient factors	• Risk factors - See section 5.2 • Risk and skin assessment • Weight, height and BMI • Age • Incontinence needs • Cognitive ability	• Mobility • Clinical condition • Comfort • Personal preference
Environmental factors	• Shear • Friction • Pressure	• Moisture • Temperature
Equipment characteristics	• Durability • Ability to conform to bony prominences without resistance • Allows immersion without "bottoming out" • Ability to offload body parts • Ability to manage microclimate at the skin's surface • Impermeable to fluid and bacteria • Fire retardant properties • Maximum weight, weight and width limits	• Ease of use • Ease of transferring • Ease of transport • Ability to stabilise • Cleaning and maintenance • Availability • Cost
Service provider factors	• Funding provisions • Ability to provide cleaning and maintenance	• Care setting (e.g. home, residential aged care, hospital)

Sheepskins

A medical grade sheepskin is one that complies with the internationally recognised Australian Standard. The Australia Standard for medical sheepskins defines the minimum quality of leather, wool type, wool density and length. In Australia, medical grade sheepskins are required to be labeled with:[25]

- the manufacturer's identification,
- laundering requirements (e.g. temperature),
- designated size of the sheepskin and
- designation for urine resistance.

Recommendation 14

Only consider using a medical grade sheepskin as an adjunct or when a high specification reactive (constant low pressure) or active (alternating pressure) support surface is unavailable/not tolerated.	**C**

Protecting the patient's heels in bed

Recommendation 15

Any device used to prevent heel pressure injuries should be selected and fitted appropriately to ensure pressure is adequately offloaded.	**CBR**

Seating support cushions

There is a large variety of seating cushions available, ranging from low-end foam slabs to air-filled cushions. There is currently minimal research on the effectiveness of support cushions. Most trials have focused on comparisons of different cushion types; however these trials are small and of low quality and provide insufficient evidence to recommend specific types of support cushions.

Recommendation 16

Use a support cushion for patients at risk of pressure injury when seated in a chair or wheelchair.

<u>Practice points for support surfaces</u>

- Selection of a support surface should not be based solely on the results of risk assessment scores or interface pressure measurements.[26] Consider the additional factors listed in Table 6.3.
- Regardless of the support surface used, regularly reposition the patient at appropriate intervals guided by regular skin assessment.[4]
- To check for bottoming out:
  - Reactive (constant low pressure) mattress: place the hand palm down between the support surface and the patient's lowest bony prominence (e.g. ischial tuberosity or sacrum) and determine how far the patient indents the mattress. There should be at least 5cm between the lowest bony prominence and the bed base when the patient is in a sitting and/or supine position.[17]
  - Active (alternating pressure) mattress: slide the hand between the deflated air cell directly under the patient. If there is sufficient support minimal contact should be felt.
- Avoid excess linen between the support surface and the patient's skin.
- Consider and monitor the skin's microclimate when selecting support surfaces. This especially applicable in enclosed heel protection devices.
- Avoid use of synthetic sheepskins, cut outs/rings/donut devices and fluid filled gloves/bags.[4]
- A sheepskin or non-stretch fabric impedes the function of a high specification mattress and may be best utilised when the primary risk factor for pressure injury is moisture and friction.

- Choose positioning devices and incontinence pads that are compatible with the surface and avoid excess padding on the bed or chair.[4] Where possible avoid plastic products as they increase heat and moisture retention on the skin.[16]
- Do not leave the patient on a bedpan, commode or transferring devices longer than required.[4]

Lower limbs:

- Pillows will only be effective in offloading heel pressure when placed lengthwise under the lower limb so heels are elevated and offloaded.[4]
- Heel protection devices should elevate the heel completely and distribute the weight of the leg along the calf without placing undue pressure on the Achilles tendon. The knee should be in slight flexion.[4] When seated in a chair, any foot stool that is used should comply with the same principles.
- Foam, fibre-filled, sheepskin and air filled boots that secure to the heel should be used selectively. They may be effective in reducing friction and shear but are ineffective if they dislodge. Use with caution in restless patients.
- Consider pressure applied to toes and lower limbs from bedding, medical devices and surgical stockings (e.g. anti-embolic stockings).

Critically ill patients:

- Select an alternating pressure support surface that optimises pressure offloading for patients with poor local and/or systemic oxygenation and perfusion and in patients who cannot be repositioned for medical reasons.[4]
- There should be special consideration to microclimate in this group.
- Consult a medical practitioner before positioning a patient with a recent SCI or pelvic fracture on an active (alternating pressure) support surface.

Equipment:

- Check all support surfaces are functioning and correctly positioned every time a patient is repositioned or transported.
- Any support surface should be used and maintained according to manufacturer instructions. Annual safety audits to ensure the integrity devices are recommended.
- Support surface cushions need to be fitted to the person and the chair/wheelchair in which they are they are seated (wheelchair, bedside chair). Seek advice from a seating therapist (e.g. occupational therapist, physiotherapist) for chair-bound patients or those with limited mobility.[4]
- Do not use small cell (less than diameter of 10 cm) alternating pressure mattresses or overlays as they cannot be sufficiently inflated to ensure adequate pressure redistribution.[1, 4]
- All equipment should be used with an appropriately sized, specified cover as determined by the manufacturer.
- Electrical devices require electrical certification and regular electrical safety inspections.
- Where possible, beds should be sufficiently wide that the patient does not reach the side of bed (or rails) when turned from side-to-side.[4]
- Ensure the support surface and bed are appropriate for use together (e.g. there are no excessive gaps for entrapment) and appropriate for the patient.
- Mattress overlays must be used on top of a mattress. Overlays should never be placed directly onto the bed base. Be aware that overlays will change the height of the bed and potentially reduce the effectiveness of bed rails. Overlays can increase the risk of falls.

Documentation

- Documentation of interventions relating to the support surface, evaluations of effectiveness and changes to the patient's management plan is required.[27]
- Document annual equipment audits.

Patient positioning

Recommendation 17

Reposition patients to reduce duration and magnitude of pressure over vulnerable areas, including bony prominences and heels.	**A**

Recommendation 18

Frequency of repositioning should consider the patient's risk of pressure injury development, skin response, comfort, functional level, medical condition, and the support surface used.	**CBR**

Positioning the patient in bed

Recommendation 19

Position patients using 30° lateral inclination alternating from side to side or a 30° inclined recumbent position. Use the prone position if the patient's medical condition precludes other options.	**C**

Recommendation 20

When repositioning the patient in any position always check the positioning of heels and other bony prominences.	**CBR**

Positioning the seated patient

Recommendation 21

Limit the time a patient spends in seated positions without pressure relief.	**CBR**

Practice points for patient positioning

- Repositioning should be performed regardless of the support surface on which the patient is managed.
- Whenever the patient is repositioned assess the patient's skin condition and general comfort and reconsider frequency and method of positioning if the patient is not responding as expected.[4]
- When repositioning the patient reduce friction and shear forces through use of repositioning or transfer aids.[4]
- Where possible, avoid positioning the patient on bony prominences (including heels) with existing erythema.[4]
- Ensure heels are free of the bed surface[4] and inspect the skin of heels frequently.
- If sitting when head-of-bed elevation is required, use aids such as pillows that support the upper body to reduce additional pressure on the sacrum and coccyx.
- Before raising the head-of-bed, move the patient up the bed and raise the knees. This assists in avoiding shear from the patient slipping down the bed.
- Consider more frequent, smaller shifts in position for patients who cannot tolerate frequent and/or major changes in body position.[4]

Seating in chairs/wheelchairs:

- Position a seated patient in a posture that minimises pressure, friction and shear forces and maintains their usual range of activity.[4]
- When seated in non-reclining chairs ensure the patient's lower limbs are supported in optimal alignment (e.g. 90° at hip, knee and foot) within the patient's range of movement.
- To minimise pressure under ischial tuberosities, avoid positioning hips at greater than 90° when seated.
- Consider adjusting the seat height and depth to improve supported body positioning. All patients should have appropriate seat to floor height to reduce potential for shear and friction.

Documentation

- Document repositioning regimens, including frequency, position and evaluation of the outcome of repositioning.[4]

Support surfaces and positioning in the operating theatre

Recommendation 22

Use a high specification reactive (constant low pressure) foam mattress or an active (alternating pressure) mattress on operating theatre tables for patients at risk of pressure injuries.	**B**

Practice points for operating theatre support surfaces

- Check all support surfaces are functioning and correctly positioned every time a patient is repositioned or transported.
- Any support surface should be used and maintained according to manufacturer instructions. Annual safety audits to ensure the integrity devices are recommended.
- Supports will only be effective in offloading heel pressure when placed lengthwise under the lower limb so heels are elevated and offloaded.[4]
- Heel protection devices should elevate the heel completely and distribute the weight of the leg along the calf without placing undue pressure on the Achilles tendon. The knee should be in slight flexion.[4]

Documentation

- Document any support surfaces and devices used during the surgical procedure.[4]

Positioning the patient for surgery

Recommendation 23

Position the patient with heels elevated, knees flexed and the weight of the leg distributed along the calf to reduce the risk of pressure injuries in the operating theatre.	**CBR**

Practice points for patient positioning in the operating theatre

- Consider using padding to protect bony prominences.[4]
- When positioning the patient reduce friction and shear forces through use of repositioning or transfer aids.[4]

Documentation

- Document position the patient was placed in during the surgical procedure.[4]

7. ASSESSMENT AND MONITORING OF PRESSURE INJURIES

Pressure injury assessment and monitoring

A comprehensive assessment of the PI assists in developing the most appropriate management plan and ongoing monitoring of wound healing.

Recommendation 24

Assess and monitor pressure injuries using a validated pressure injury healing assessment scale.	**C**

Practice points for assessing PIs

- Validated PI healing assessment scales include:
  - PUSH©.
  - BWAT.
  - Sessing Scale.
- Measurement of the wound should include length, width and depth.[4, 28]
- Tracing the wound margins provides a reliable indication of the progress of wound healing. Other techniques for measuring wound size include using a disposable ruler or photography including a calibrated measure.[4, 28]
- Computerised calculation (planimetry) of the wound area from wound tracings or digital photography could be considered if resources are available.[2, 4]
- The patient's position should be replicated as closely as possible when re-measuring the wound to increase the accuracy of results.[2, 4]
- When ongoing assessment indicates that the PI is not healing at an optimal rate (improvement evident within two to four weeks depending on initial condition of the wound[4, 6]) the wound dressing choice and overall management should be reviewed.

Pressure injury classification

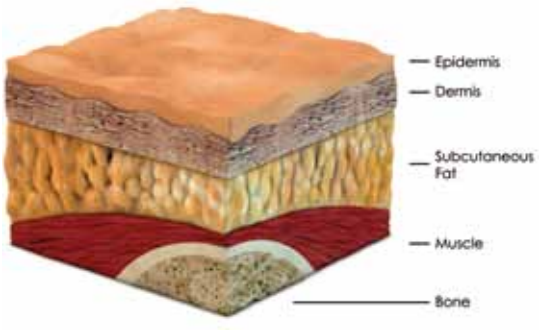
Pressure injury classification systems provide a consistent and accurate means by which the severity of a PI can be communicated and documented. These classification systems are used in PI research as well as in the clinical field to provide a description of the severity of the PI under discussion.

Recommendation 25

Consider using the NPUAP/EPUAP 2009 pressure injury classification system to identify and communicate the severity of pressure injuries.	**CBR**

The following skin anatomy graphic and image are provided as an anatomical reference for staging of pressure injuries as outlined in Table 7.1.

Skin anatomy



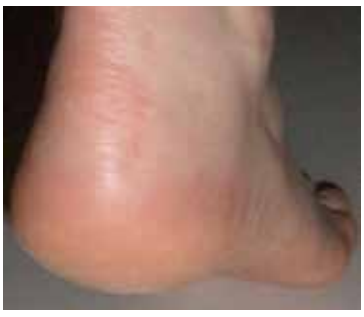
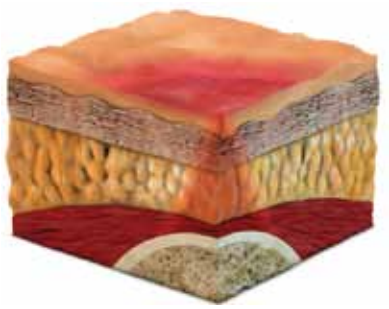
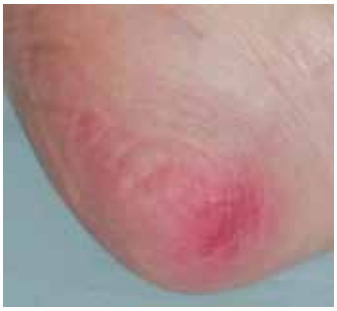


Table 7.1 NPUAP/EPUAP pressure injury classification system[4]

Stage I pressure injury: non-blanchable erythema

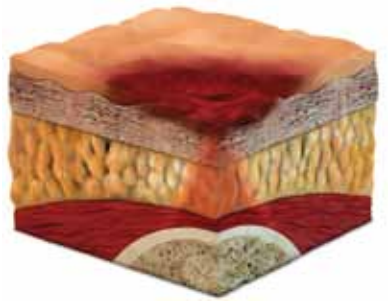
- Intact skin with non-blanchable redness of a localised area usually over a bony prominence.
- Darkly pigmented skin may not have visible blanching; its colour may differ from the surrounding area.
- The area may be painful, firm, soft, warmer or cooler compared to adjacent tissue.
- May be difficult to detect in individuals with dark skin tones.
- May indicate "at risk" persons (a heralding sign of risk).

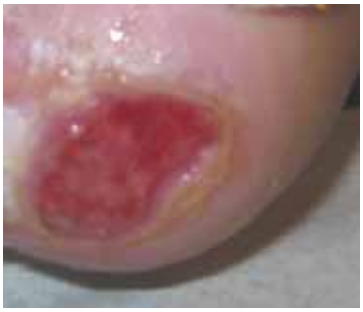




Stage II pressure injury: partial thickness skin loss

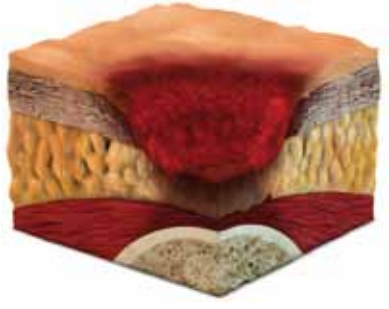
- Partial thickness loss of dermis presenting as a shallow, open wound with a red-pink wound bed, without slough.
- May also present as an intact or open/ruptured serum-filled blister.
- Presents as a shiny or dry, shallow ulcer without slough or bruising (NB bruising indicates suspected deep tissue injury).
- Stage II PI should not be used to describe skin tears, tape burns, perineal dermatitis, maceration or excoriation.

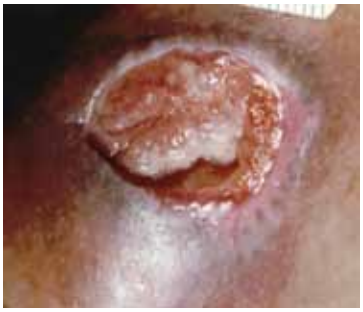




Stage III pressure injury: full thickness skin loss

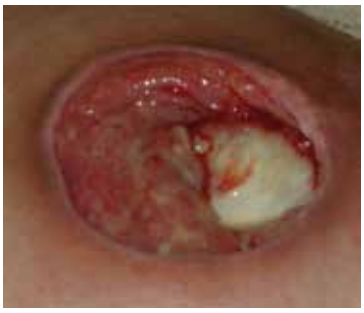
- Full thickness tissue loss. Subcutaneous fat may be visible but bone, tendon or muscle are not exposed. Slough may be present but does not obscure the depth of tissue loss. May include undermining and tunnelling.
- The depth of a stage III PI varies by anatomical location. The bridge of the nose, ear, occiput and malleolus do not have subcutaneous tissue and stage III PIs can be shallow. In contrast, areas of significant adiposity can develop extremely deep stage III PIs. Bone or tendon is not visible or directly palpable.





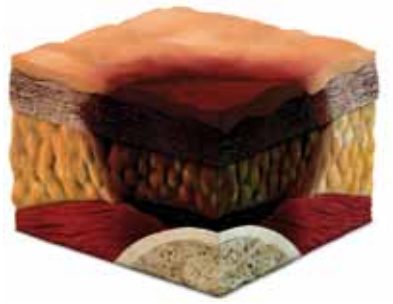
Stage IV pressure injury: full thickness tissue loss

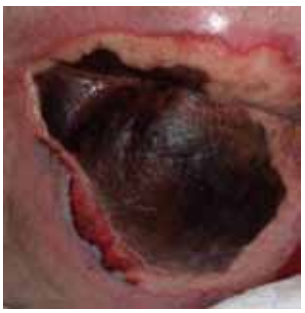
- Full thickness tissue loss with exposed bone, tendon or muscle. Slough or eschar may be present on some parts of the wound bed.
- The depth of a stage IV pressure injury varies by anatomical location. The bridge of the nose, ear, occiput and malleolus do not have subcutaneous tissue and these PIs can be shallow. Stage IV PIs can extend into muscle and/or supporting structures (e.g. fascia, tendon or joint capsule) making osteomyelitis possible. Exposed bone or tendon is visible or directly palpable.



Unstageable pressure injury: depth unknown

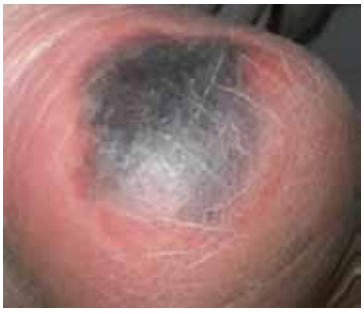
- Full thickness tissue loss in which the base of the PI is covered by slough (yellow, tan, grey, green or brown) and/or eschar (tan, brown or black) in the PI bed.
- Until enough slough/eschar is removed to expose the base of the PI, the true depth, and therefore the stage, cannot be determined. Stable (dry, adherent, intact without erythema or fluctuance) eschar on the heels serves as the body's natural biological cover and should not be removed.





Suspected deep tissue injury: depth unknown

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



All 3D graphics designed by Jarrad Gittos, Gear Interactive, http://www.gearinteractive.com.au

Photos anatomy, stage, I,IV, unstageable and suspected deep tissue injury courtesy C. Young, Launceston General Hospital. Photos stage II and III courtesy K. Carville, Silver Chain. Used with permission.

8. ADDRESSING PAIN ASSOCIATED WITH PRESSURE INJURIES

Factors associated with pain

Table 8.1 includes other factors associated with pain reported in the literature.

Table 8.1 Factors associated with pressure injury pain[29, 30]	
Stage or severity of the pressure injury	Increasing stage or severity associated with greater pain levels
Wound dressings	Attendance of the wound associated with greater pain than at rest
Dressing types	Hydrocolloid dressings associated with lower pain levels than any other dressing types including transparent films and wet-to-dry dressings
Ethnic origin	Different ethnic background (particularly non-English speaking) associated with greater pain levels
Patient age	Increasing age associated with greater pain levels
Medication	Patients taking analgesia report greater pain levels
Support surface	Low air loss beds associated with lower pain levels than other surfaces

Recommendation 26

All patients with pressure injuries should be regularly and routinely assessed for presence of pain. **C**

Recommendation 27

Use a validated pain assessment tool to assist in assessing pain associated with a pressure injury. **C**

Practice points for assessing pain

- Select a validated pain assessment tool that is appropriate for the patient population (see Appendix E).
- Offering patients a choice of pain assessment tools may increase accuracy of assessment.[29] Some patients may have preferences between numerical, textual and graphics based tools.
- Use the same pain assessment tool for ongoing pain assessment[13] and reassess pain regularly.
- Pain assessment should include observation of body language and nonverbal cues (particularly in cognitively impaired patients and children).[4]

Documentation

- All pain assessments, including the tool used and the assessment findings, should be documented.

Managing pain associated with pressure injury

Recommendation 28

Holistic management of a patient with pressure injuries includes development of an individualised pain management plan. **CBR**

Topical opioids

Recommendation 29

Consider using topical opioids to reduce pain associated with stage II to IV pressure injuries. **C**

Caution

The small trials reported in the literature reported that no systemic effects occurred when treating patients with PIs with topical opioids.[31, 32] Topically applied opioids may be associated with increased systemic side effects in patients taking systemic opioids.[33] Local itching and irritation has been reported, but not more frequently than when a placebo gel is applied.[33]

Practice points for managing pain

- Refer patients with chronic pain associated with pressure injuries to a pain specialist or service.
- Individualised non-pharmacological interventions and patient preferences should be included in a holistic pain management plan.
- Using morphine topically is off license use and requires prescription from a medical professional.
- Topical opioids could be considered prior to debriding the wound.
- Address factors associated with pain (e.g. positioning, support surfaces, incontinence and increased muscle tone).
- If a patient is experiencing moderate to severe pain, the wound and its management, and the patient's pain management plan should be reviewed.
- Consultation with a pharmacist is advised before preparing a topical morphine preparation.

Documentation

- An individualised pain management plan and interventions implemented to manage pain should be documented.
- Prescription for analgesia should be documented by an authorised health professional and all administration should be recorded.

9. INTERVENTIONS FOR THE TREATMENT OF PRESSURE INJURIES

Nutrition

Recommendation 30

Provide high protein oral nutritional supplements in addition to a regular diet for patients with a pressure injury. **B**

Practice points for nutrition

- Patients with a PI require:[4, 14, 34]
  - a minimum of 30 to 35 kcal per kg body weight per day
  - 1.25 to 1.5 g per kg body weight daily of protein
  - 1 ml of fluid intake per kcal per day
- Patients with SCI have reduced energy needs due to decreased activity and muscle atrophy. These patients require:[14]
  - Paraplegic patients: 29.8 ±1.2 kcal/kg body weight per day
  - Tetraplegic patients: 24.3 ± 1.1 kcal/kg body weight per day
- When determining dietary intake requirements, consider concurrent diagnoses.[14]
- Refer to appropriate national clinical guidelines for strategies to improve oral dietary intake.
- Consider referring patients with a PI to a dietitian.[6]
- When the decision to use enteral feeding in a person with PIs has been made, practice should be guided by relevant national evidence based guidelines, or in their absence, local policy.

Documentation

- Document the patient's oral/enteral food intake and nutritional interventions, including implementation and acceptance or tolerance of oral nutrition supplements.

Vitamin or multivitamin supplements

Recommendation 31

Consider multivitamin supplements in patients with a pressure injury who are identified as having nutritional deficits. **D**

Caution

High levels of zinc supplementation are associated with nausea, vomiting, diarrhoea, compromised wound healing and copper deficiency.[35] High levels of vitamin c supplementation are associated with diarrhoea.

Practice points for oral supplements

- Multivitamin supplementation should be to levels recommended by the Nutrient Reference Values for Australia and New Zealand.

Arginine containing supplements

Recommendation 32

Consider arginine containing supplements for patients with a stage II or greater pressure injuries. **C**

Caution

Arginine containing supplements are generally well tolerated. As nitric oxide may be involved in development of sepsis and inflammation, caution is recommended in patients at risk of infection or sepsis.[14]

Practice points for arginine

- With appropriate concurrent management strategies, improvements in wound healing should be evident after two to three weeks of arginine supplementation.[14]
- Consider arginine supplementation with medical or dietetic consultation.

Support surfaces

Recommendation 33

Manage patients with existing pressure injuries on a high specification reactive (constant low pressure) or active (alternating pressure) support surface on beds and trolleys and when seated.	**A**

Practice points for support surfaces

- The recommendations and practice points outlined in section 6.4 should be followed when managing a patient with an existing PI.
- The use of a support surface does not negate the repositioning requirements of a patient with a PI.
- Select an appropriate support surface for the severity of the PI and the patient's general condition.
- The effectiveness of the support surface should be regularly reassessed and reconsidered if the patient's skin condition is deteriorating and/or showing no signs of improvement.

Documentation

- Documentation of interventions relating to the support surface, evaluations of effectiveness and changes to the patient's management plan is required.[27]

Patient positioning

Recommendation 34

Continue repositioning patients with existing pressure injuries with consideration to: • **the patient's risk for further pressure injury development,** • **comfort,** • **functional level,** • **medical and general condition, and** • **the support surface used.**	**CBR**

Practice points for patient positioning

- The recommendations and practice points presented in section 6.5 for preventing PIs should be applied to patients with an existing PI.
- Where possible patients should not be positioned directly on an existing PI or body surface that remains damaged or erythematous from a previous episode of pressure loading.[4]
- Increase activity as rapidly as the patient with a PI can tolerate.[4]
- Implement a schedule for progressive sitting that details frequency and duration according to tolerance and wound response.[4]
- Avoid seating a patient with an ischial PI in a fully upright position.[4]
- Select a seating cushion that effectively distributes pressure away from existing PIs.[4]

- Use alternating pressure seating devices with caution in patients with existing PIs, with consideration to benefits of offloading compared to the risk of shear forces.[4]

Documentation

- Repositioning interventions (e.g. when and how) and the response to repositioning (e.g. skin assessment) should be documented.

Wound bed preparation

Debridement

Recommendation 35

When debridement is indicated, select the method of debridement with consideration to: CBR
- **the patient's condition (including pain, vascular condition, and bleeding risk),**
- **comfort,**
- **type, quantity and location of non-viable tissue;**
- **goals of care;**
- **patient preferences;**
- **health professional training and experience; and**
- **availability of resources.**

Caution

Use surgical and/or conservative sharp wound debridement with caution in patients with impaired immunity, compromised vascular supply, with bleeding disorders or taking antiplatelet and anticoagulant therapy.[4]

Practice points for debridement

- Debridement is often a painful intervention. Conduct a pain assessment and provide appropriate pain relief before debriding a wound.[4, 13]
- A vascular assessment should be conducted prior to debriding lower extremity PIs.[4, 13]
- Surgical debridement is appropriate when there is an urgent need to remove non-viable tissue (e.g. advancing cellulitis, sepsis, pain, exudate or malodour).[4, 13]
- Conservative sharp wound debridement should only be performed by health professionals with appropriate training.[4, 13]

Skin and wound hygiene

Recommendation 36

Cleanse the peri-wound skin and pressure injury when wound dressings are changed. CBR

Practice points for skin and wound hygiene

Skin hygiene

- Cleanse peri-wound skin with a pH neutral appropriate skin cleanser. To obtain optimal ulcer and wound pH avoid the use of alkaline soaps and cleansers.[2]
- Applying a moisturiser contributes to the maintenance of the healthy skin.
- Consider applying a topical barrier preparation to the peri-wound skin to protect it from exudate.

Wound care

- Cleanse the wound in a manner that prevents damage of healthy granulation tissue.[2, 4, 13]
- Aseptic wound management techniques should be used when the person, the wound and/or the environment is compromised.[2]

- Clean wound management technique (using room temperature potable water) can be used when there is no compromise of the patient, the wound and the environment.[4]

Treating clinical infection

Antimicrobial therapy includes topical agents such as cadexomer iodine, silver, honey and other topical antiseptics, as well as systemic antibiotics. **All products should be used following comprehensive assessment and in accordance with the licensing authority endorsement and the manufacturers' directions.**

Cadexomer iodine

Recommendation 37

Cadexomer iodine could be used to promote healing in pressure injuries when there is a known increased microbial burden.	**C**

Caution

Cadexomer iodine ointments and impregnated dressings should not be used in patients with iodine sensitivity, taking lithium, history of Hashimoto's thyroiditis, Graves disease, non-toxic nodular goitre or thyroid disorders, or impaired renal function, in children or in pregnant or lactating women. Risk of systemic absorption increases when cadexomer iodine products are used on larger or deeper wounds or for prolonged periods.[4, 36]

Practice points for iodine products

- Cadexomer iodine should not be used for longer than three months continuously.[36]
- Cadexomer iodine should not be covered with povidone-iodine soaked gauze/tulle gras as this practice results in the increased release of iodine, increasing toxicity.

Topical medical grade honey

Recommendation 38

Consider using topical medical grade honey to promote healing in pressure injuries.	**D**

Caution

Treating PIs with honey has been reported to lead to pain, deterioration of the wound and an increase in wound exudate.[37] A SR found that adverse events (e.g. pain, deterioration and increased exudate) were more likely to occur in other types of chronic wounds treated with honey compared with those treated with hydrogel or standard dressings and there was no difference in infection rates.[37]

Practice points for honey

- The honey should be specifically indicated for application to wounds (i.e. medical grade). Manuka honey should be rated UMF (Unique Manuka Factor) +12 or above for topical dressing products. Use gamma irradiated honey as other sterilising processes will destroy the UMF in the honey.

Topical silver

Recommendation 39

Consider using topical silver to promote healing in pressure injuries.	**CBR**

Caution

Potential renal toxicity should be considered when using topical silver agents for extended periods (e.g. greater than 4 weeks) on large wound beds. The risk appears to be low but caution is warranted. As with other anti-microbial therapies there is a risk of bacterial resistance with extended use of silver products.[38]

Topical antiseptic solutions

Recommendation 40

Toxic topical antiseptic agents should not be used in the standard care of pressure injuries. Antiseptic solutions with no demonstrated toxicity should be considered in the treatment of pressure injuries with clinical evidence of infection or critical colonisation.	**CBR**

Caution

The Guideline Development Group does not recommend the use of hydrogen peroxide in wound management. Deaths have been reported as a result of irrigation of closed cavity wounds with hydrogen peroxide.[39, 40] Toxic effects of most antiseptic solutions on fibroblasts and macrophages in vitro are well documented.[41-43] Acetic acid at concentrations greater than 3% has been associated with pain at the wound site and skin irritation. There is a risk of acidosis when used for extended periods over very large wound surfaces.[44] It has been demonstrated that there is no dilution of acetic acid that is toxic to bacteria without being toxic to fibroblasts.[42]

Topical antibiotics

Recommendation 41

Topical antibiotics are best avoided in the management of pressure injuries as there is a concern that their use is associated with antibiotic resistance and sensitivities.	**CBR**

Systemic antibiotics

Recommendation 42

Use systemic antibiotics when the patient with a pressure injury has clinical evidence of spreading and/or systemic infection.	**CBR**

Caution

Adverse effects for systemic antibiotics were not reported in the trials. Side effects include GIT signs and symptoms and signs of allergic reaction (e.g. skin rash, itching and rarely, difficulty breathing). Interactions with other medications are common.[45] The development of antibiotic resistance due to overuse of antibiotics is also of major concern.

The Guideline Development Group recommends consulting specific product information, national licensing authorities and therapeutic guidelines before prescribing systemic antibiotics.

Practice points for antibiotics

- All PIs should be assessed regularly for indicators of infection.[2, 3]
- For complex, unresponsive, recalcitrant or recurrent infection, consider consulting a microbiologist or infectious disease specialist.[2, 3]
- Patients should be advised to complete their antibiotic therapy as prescribed to reduce the risk of antibiotic resistance.

Wound dressing selection

Recommendation 43

Consider using a hydrocolloid dressing to promote healing in non-infected stage II pressure injuries.	**C**

Recommendation 44

Select wound dressings based on: • **comprehensive ongoing clinical assessment,** • **management of pain, malodour, exudate and infection,** • **wound size and location,** • **cost and availability, and** • **patient preference.**	**CBR**

Practice points for wound dressings

- Other characteristics that are likely to influence wound dressing selection may include:
  - condition of surrounding skin,
  - ease of application and removal,
  - ability to maintain moisture balance,
  - ability to absorb exudate and odour,
  - pain experienced on dressing changes,
  - infection control and ability to maintain bacterial balance,
  - cosmetic effect,
  - skill and knowledge of the health professional,
  - accessibility and cost effectiveness,
  - suitability of dressing location to wound location, and
  - comfort.
- Continually moist gauze should be used only when other moisture retentive dressings are not available.[4]

Negative pressure wound therapy

Recommendation 45

Consider negative pressure wound therapy as an adjunct for treating stage III or IV pressure injuries.	**C**

Caution

One SR[46] reported adverse events including infection, skin irritation and pain on dressing change occurred with the use of NPWT; however, none of these events occurred significantly more often than in control populations.[46] Negative pressure wound therapy is not recommended in inadequately debrided, necrotic or malignant wounds; where vital organs are exposed; in wounds with no exudate; or in patients with untreated coagulopathy, osteomyelitis or local or systemic clinical infection. Cautious use of NPWT is recommended for patients on anticoagulant therapy, in actively bleeding wounds or where the wound is in close proximity to major blood vessels.[4, 47]

Practice points for NPWT

- Debride necrotic tissue prior to applying NPWT.[4]
- Evaluate the wound and effectiveness of therapy with each dressing change.[4]
- Comply with the health provider's policies and protocols and the manufacturer's instructions for the application, maintenance and removal of NPWT.

Electrotherapy

Recommendation 46

Consider using electrotherapy as an adjunct for promoting healing in pressure injuries. B

Caution

No major adverse effects of electrotherapy were reported in the research included in this review. Electrotherapy is contraindicated in patients with electrical implants (e.g. pacemakers), epilepsy, malignancy or who are pregnant. Electrotherapy should be used with caution in patients with impaired circulation.[48]

Pulsed electromagnetic therapy

Recommendation 47

Pulsed electromagnetic therapy could be considered as an adjunct for promoting healing in pressure injuries. D

Caution

No major adverse effects of electromagnetic therapy were reported in the research included in this review. Manufacturers of devices used to administer electromagnetic therapy do not recommend their use in patients with pacemakers or other implanted devices, diabetes, cancer, epilepsy, cardiac infarction less than 2 months ago, congenital pathology of central nervous system or kidney disease or in pregnant women.[49, 50]

Ultraviolet light therapy

Recommendation 48

Ultraviolet light C therapy could be considered as an adjunct for promoting healing in pressure injuries. D

Recommendation 49

There is insufficient evidence to make a recommendation on the use of ultraviolet light C therapy for reducing bacterial burden in pressure injuries. CBR

Health professional education

Recommendation 50

Education in the prevention, assessment and management of pressure injury should be provided to all health professionals. C

Practice points for education

- Health professionals require appropriate education and training before performing conservative sharp wound debridement. [4, 13]
- Health professionals should receive appropriate education when the service introduces new PI protocols or equipment/products.[51]
- An accredited or endorsed program should be sought as such programs promote sound education and practice advice.

Surgery

Recommendation 51

Patients with stage III or IV pressure injuries that are non-responsive to contemporary management strategies should be evaluated for surgical intervention. CBR

Practice points for surgery

- Evaluation for surgical interventions should include multidisciplinary collaboration including the patient and consider his or her preferences.[4, 13]
- In evaluating appropriateness for surgery consider the patient's:[4, 13]
  - medical stability,
  - nutritional status,
  - capacity for recovery and rehabilitation, and
  - likelihood of improvement in overall wellbeing and QOL.
- Following surgery, protect the wound from pressure, sheer forces and friction using the recommendations and practice tips outlined throughout this guideline.[4, 13]

10. ORGANISATIONAL AND COST IMPLICATIONS

Introducing pressure injury reduction initiatives in the organisation

This review[51] highlighted that introduction of QI initiatives for reducing PI incidence should be consistent with QI methodology. Quality improvement processes are more likely to have a demonstrable effect on PI incidence when the full Plan, See, Action Do (PDSA) QI cycle is implemented and performance monitoring and feedback are incorporated into the change process. Findings from the review also indicated that adequate health professional education may be associated with more successful PI reduction QI initiatives.

Implications of a new classification system

In 2011 the AWMA conducted a survey in the Pan Pacific region to gauge clinician preferences for terminology to refer to PIs. This was promoted by the release of the NPUAP/EPUAP international PI guideline including the classification system adopted in this guideline. The proposal to adopt the NPUAP/ EPUAP classification system in the Pan Pacific regions and work towards an international consensus on PI terminology received overwhelming support from over 400 respondents.

The survey offered a timely opportunity to canvass opinion on the adoption of the term pressure injury as a replacement for pressure ulcer. In 2009, Dunk and Arbon[52] argued for Australian adoption of terminology that referred to condition causation (injury) to replace a range of often inaccurate terms (e.g. pressure sore, pressure ulcer). The change in terminology is intended to more accurately reflect cause and effects, and highlight the preventable nature of most pressure injuries. Respondents to the 2011 provided overwhelming support for this change.

The recommendation to consider using the NPUAP/EPUAP PI classification system may require organisational changes for services using other classification systems. Health professional education should be concurrent to any change in classification systems.

This recommendation has implication for national health coding systems. Current ICD-10-AM coding conventions dictate how pressure injuries are defined and coded. The Guideline Development Steering Committee recognise that until codes and definitions are changed there will be an anomaly between clinicians documented descriptions of pressure injuries and what the coder can generate. The AWMA is working with appropriate bodies to attain changes to the ICD-10-AM coding that reflect the NPUAP/ EPUAP PI classification system.

Cost implications of the recommendations

Support surfaces

The vast majority of economic modelling related to support surfaces has been conducted in the UK. Two SRs[53, 54] reported on these papers and concurred that the reduction in PI incidence associated with high specification support surfaces was associated with an overall reduction in health care costs.

One SR[53] reported on the cost-effectiveness of various support surfaces. The paper used a previously published review[55] that reported on the effectiveness of different support surfaces as the basis for development of a decision model for cost effective pressure management. An additional study[56] was used to provide estimates of reduction on pressure risk. The pressure reduction estimates provided in this study were established in a large population (n=2507) in UK acute care settings. Cost estimates of support surfaces were made through contact with device manufacturers, and the paper provided cost comparisons in UK dollars. Based on the review by Cullum et al.[55] that established effectiveness of alternating pressure mattress replacements and alternating pressure overlays, the cost of these devices was compared to high-specification foam mattress. The analysis considered costs, PI free days and quality adjusted life years (QALYs) for each device for one week, four weeks and 12 weeks of use.[53]

The SR[53] concluded that alternating pressure mattress overlays appear to be cost effective for preventing PIs (about a 45% probability of reducing costs over 12 weeks) and alternating pressure mattress replacements appear to be cost effective for treating existing PIs (about a 60% probability of reducing costs over 12 weeks). The "standard care" for cost comparison was a high specification foam mattress,[53]

which is likely to be used in most acute care settings, but may not be used in other care settings. Costs were relevant to the UK setting in 2005, and but are likely to represent the cost of these treatments in other international settings.

A second SR[54] presents an economic analysis of support surfaces for preventing PIs. Where there was sufficient evidence on the comparative clinical effectiveness between alternative pressure redistribution devices, economic modelling was undertaken to assess comparative cost effectiveness. The review, which included three economic modelling papers, showed that managing patients at high risk of PIs on high specification mattresses significantly reduced their risk of developing a PI compared to management on a standard hospital mattress. The pooled estimate of the four studies yielded a relative risk of 0.29 (95% CI 0.19–0.43), or a relative reduction in PI incidence of 71% (95% CI 57–81%). Cost effectiveness modelling indicated that, because of savings accrued through the treatment of fewer PIs, high specification foam mattresses are likely to cost less overall. The studies were all conducted in the UK; however, the financial benefits reported in this SR are likely to be relevant to other first world countries.[54]

Wound dressings

One SR[57] on the use of hydrocolloids in managing PIs also reported a cost analysis for the dressings. Three comparing hydrocolloids to saline gauze found that hydrocolloids were a more cost effective alternative when considering the cost of materials, cost of staffing and frequency and time taken for dressing changes. Studies were conducted in a hospital and nursing home settings more than ten years ago. Hydrocolloids were also related to statistically significant greater wound healing than saline gauze dressings. Currency and brands of product was not reported.[57]

11. INTERVENTIONS NOT CURRENTLY RECOMMENDED

Therapeutic ultrasound

Recommendation 52

Therapeutic ultrasound does not improve healing in stage I or II pressure injuries.	**A**

Recommendation 53

The effectiveness of therapeutic ultrasound in treating stage III or IV pressure injuries is unknown.	**CBR**

12. INTERVENTIONS FOR WHICH THERE IS INSUFFICIENT EVIDENCE

Recommendation 54

There is insufficient evidence to make a recommendation on the use of the following interventions for treating pressure injuries:

- **hyperbaric oxygen**
- **infrared therapy**
- **laser therapy**
- **miscellaneous topical agents**

13. EMERGING INTERVENTIONS

Topical biological agents

Growth factors are naturally occurring proteins or hormones that stimulate cell growth. Keratinocyte growth factor stimulates epithelialisation.[58] Granulocyte-macrophage colony-stimulating factor (GM-CSF) reportedly stimulates neutrophils, macrophages and keratinocytes, all of which promote wound healing.[59, 60] Protein-derived growth factors are topical biological agents containing proteins that are reported to play a role in blood vessel formation in the wound base. The products generally contain an extracellular matrix that provides a framework within the wound onto which cells can attach during healing.[61] Tissue plasminogen activator is a topical product containing proteins that assist in the breakdown of blood clots.[62]

The vast majority of these products are not available in Australia, New Zealand, Singapore or Hong Kong, therefore it was inappropriate to make a recommendation on the use of these emerging therapies.

Support surfaces

Support surface technology continues to advance and an increasing variety of reactive (constant low pressure) and active (alternating pressure) support surfaces are available. However, these newer support surfaces have no high level evidence and minimal low level evidence in support of their effectiveness in preventing or treating PIs.

Some of the systems have benefits beyond PI management (e.g. occupational health and safety advantages). In particular, systems that incorporate lateral rotation or seating position features, and bed systems that are able to be lowered or raised to facilitate patient transfers reduce the need for manual repositioning, but as yet there is no clear evidence as to their overall effectiveness in reducing PI's.

14. IMPLICATIONS FOR FURTHER RESEARCH

The development of these guidelines highlighted the paucity of research at low risk of bias investigating the management of PIs. Much of the research appraised in this guideline was at a moderate to high risk of bias. The Guideline Development Steering Committee recommends that future research related to PIs focus on:

- Implementation of study designs and processes that are at low risk of bias
- Research specific to Aboriginal and Torres Strait Island populations, New Zealand Maori populations, Pacific Island populations and Asian populations
- Research on the cost effectiveness of interventions to manage PIs in the Pan Pacific region
- Further research into areas with limited existing consistent, good quality evidence including:
    - The validity and reliability of non-numerical pressure injury risk assessment scales or algorithms.
    - The most effective repositioning regimens.
    - The most effective and cost effective support surfaces, including bed systems and lateral rotation devices.
    - The role of multivitamin and arginine supplementation in PI healing.
    - The role of HBOT in PI healing.
    - The effectiveness of infrared therapy, ultraviolet light therapy and laser therapy.
    - The effectiveness of patient and health professional education programs in preventing the development of PI.
    - The most effective and cost effective wound dressings for promoting healing of PIs.
    - The role of topical agents, particularly silver, cadexomer iodine and honey in managing PIs.
    - The role of traditional treatments such as Chinese traditional medicine in healing PIs.
    - The most effective strategies and analgesic regimens to manage pain associated with PIs.
    - The importance of extrinsic factors such as moisture to the assessment and management of PIs.
- Further discussion on the avoidable/unavoidable nature of PIs in some patients is warranted. Following recent publication by the NPUAP of a consensus statement[63] that most PIs are avoidable and not all PIs are unavoidable, a Pan Pacific survey or consensus conference to provide guidance on concerns over the potentially unavoidable nature of some PIs is strongly recommended.
- Development of standardised approaches to measuring and reporting PI prevalence and incidence to facilitate national and international benchmarking. A standardised approach should include:[64, 65]
    - common use of a validated tool for PI prevalence or incidence data collection on which all definitions and data fields are the same;
    - a common tool to educate and test surveyors' proficiency in classifying PIs in order that PIs are recorded correctly; and
    - consistent use of a PI classification system and definitions (we recommend the NPUAP/EPUAPs classification system).

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APPENDIX A-D

See the unabridged version of the *Pan Pacific Clinical Practice Guideline for the Prevention and Management of Pressure Injury (2012)* for Appendices A-D.

APPENDIX E VALIDATED ASSESSMENT TOOLS

Table E.1 Validated assessment tools	
Nutritional screening tools	
Acute care settings[66]	Mini Nutritional Assessment-Short Form (MNA-SF)(for older adults) Malnutrition Universal Screening Tool (MUST) Simplified Nutritional Appetite Questionnaire (SNAQ) Malnutrition Screening Tool Nutritional Risk Screening
Residential care[66]	MNA-SF(for older adults) MUST SNAQ Simple Nutrition Screening Tool
Rehabilitation settings[66]	MNA-SF Rapid Screen
Community settings[66]	MNA-SF (for older adults) MUST SNAQ Seniors in the Community: Risk Evaluation for Eating and Nutrition Short Nutritional Appetite Questionnaire
Nutritional assessment tools	
Acute care settings[66]	MNA-SF (for older adults) Subjective Global Assessment (SGA) Patient Generated Subjective Global Assessment
Residential care[66]	SGA Mini Nutritional Assessment (MNA)
Rehabilitation settings[66]	SGA MNA
Community settings[66]	SGA MNA
Pressure injury risk assessment scales	
Adult populations[67]	Braden Scale for Predicting Pressure Sore Risk (Braden Scale) Norton Scale Waterlow Score
Intensive care unit	Glasgow Scale Cubbin and Jackson Scale
Paediatric populations[68]	Neonatal Skin Risk Assessment Scale for Predicting Skin Break down (NSRAS) Braden Q Burn Pressure Ulcer Skin Risk Assessment Scale (BPUSRAS) Starkid Skin Scale Glamorgan Scale
Pressure injury healing assessment scales	
All populations[4, 28]	Pressure Ulcer Scale for Healing (PUSH) Bates-Jensen Wound Assessment Tool (BWAT) Sessing Scale
Pain assessment tools	
Adults with PI[4, 29, 31]	Visual analogue scale (VAS) Wong-Baker FACES Pain Rating Scale (FRS) McGill Pain Questionnaire (MPQ)
Paediatric populations[4, 32]	0 to 10 pain rating scale Wong-Baker FRS Face, Legs, Activity, Cry, Consolability (FLACC) scale Revised-FLACC Crying; Requires O2 for Saturation >95%; Increasing vital signs; Expression; Sleepless (CRIES) scale

Cognitively impaired adults[69]	MPQ Assessment of Discomfort in Dementia (ADD) protocol Abbey Pain Scale Pain Assessment Checklist for Seniors with Limited Ability to Communicate Proxy Pain Questionnaire Pain Assessment in Advanced Dementia

BRADEN SCALE FOR PREDICTING PRESSURE SORE RISK

Patient's Name _____ Evaluator's Name_____ 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 con-sciousness or sedation. OR limited ability to feel pain over most of body	**2. Very Limited** Responds only to painful stimuli. Cannot communicate discomfort except by moaning or restlessness OR has a sensory impairment which limits the ability to feel pain or discomfort over ½ of body.	**3. Slightly Limited** Responds to verbal commands, but cannot always communicate discomfort or the need to be turned. OR has some sensory impairment which limits ability to feel pain or discomfort in 1 or 2 extremities.	**4. No Impairment** Responds to verbal commands. Has no sensory deficit which 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 room at least twice a day and inside room at least once every two 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 Limitation** Makes major and frequent changes in position without assistance.				
NUTRITION <u>usual</u> food intake pattern	**1. Very Poor** Never eats a complete meal. Rarely eats more than ⅓ of any food offered. Eats 2 servings or less of protein (meat or dairy products) per day. Takes fluids poorly. Does not take a liquid dietary supplement OR is NPO and/or maintained on clear liquids or IV's for more than 5 days.	**2. Probably Inadequate** Rarely eats a complete meal and generally eats only about ½ 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 optimum amount of liquid diet or tube feeding	**3. Adequate** Eats over half of most meals. Eats a total of 4 servings of protein (meat, dairy products per day. Occasionally will refuse a meal, but will usually take a supplement when offered OR is on a tube feeding or TPN regimen which 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.				
FRICTION & SHEAR	**1. Problem** Requires moderate to maximum assistance in moving. Complete lifting without sliding against sheets is impossible. Frequently slides down in bed or chair, requiring frequent repositioning with maximum assistance. Spasticity, contractures or agitation leads to almost constant friction	**2. Potential Problem** Moves feebly or requires minimum assistance. During a move skin probably slides to some extent against sheets, chair, restraints or other devices. Maintains relatively good position in chair or bed most of the time but occasionally slides down.	**3. No Apparent Problem** Moves in bed and in chair independently and has sufficient muscle strength to lift up completely during move. Maintains good position in bed or chair.					
				Total Score				

The Norton Scale

NOTE: Scores of 14 or less rate the patient as "at risk"

	Physical Condition	Mental Condition	Activity	Mobility	Incontinence	Total Score
	Good 4 Fair 3 Poor 2 Bad 1	Alert 4 Apathetic 3 Confused 2 Stupor 1	Ambulant 4 Walk/help 3 Chairbound 2 Bedridden 1	Full 4 Slightly Limited 3 Very Limited 2 Immobile 1	Not 4 Occasional 3 Usually-urine 2 Doubly 1	
Name: Date:						
Name: Date:						
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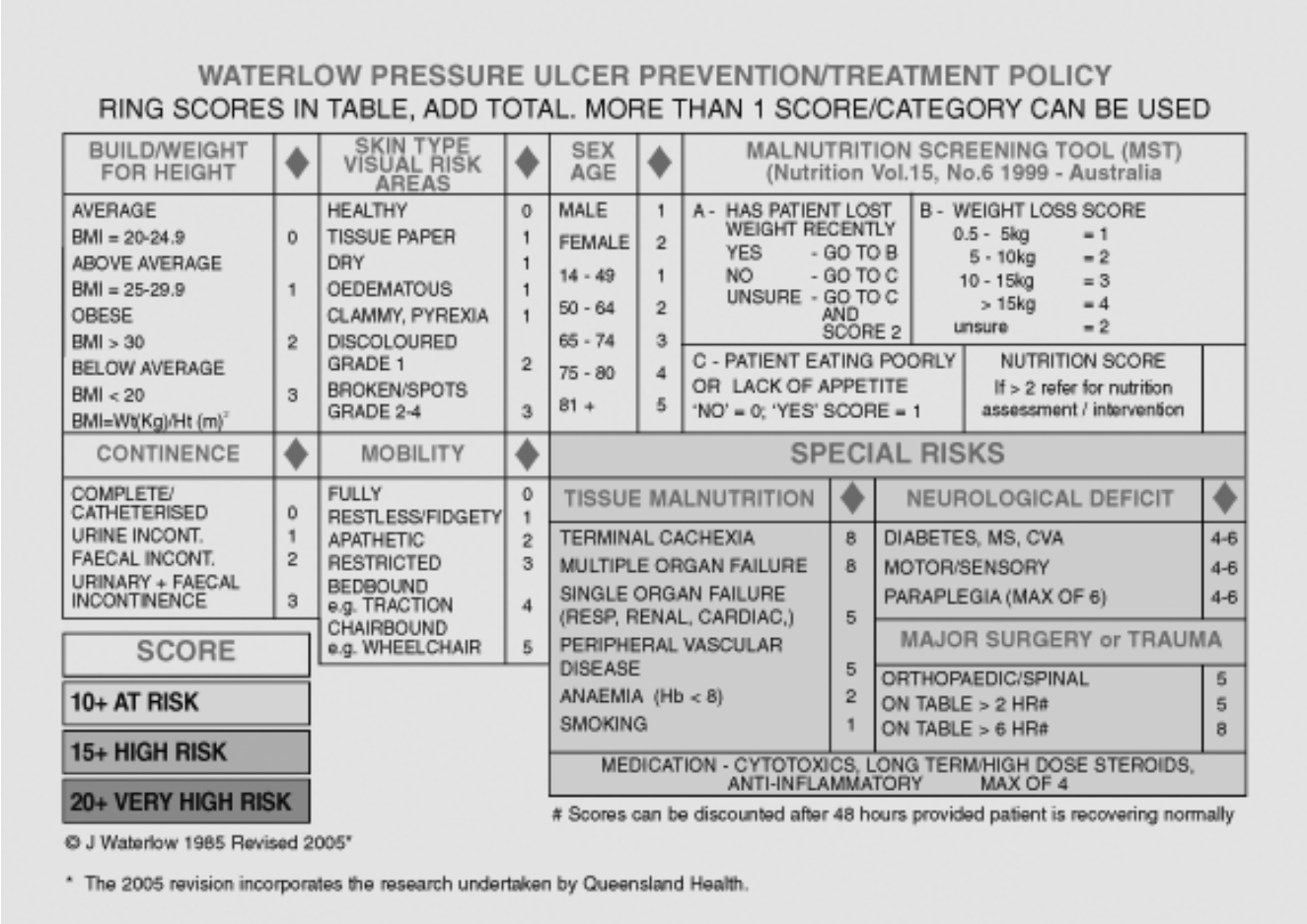
Source: Doreen Norton, Rhoda McLaren, and A.N. Exton-Smith. An Investigation of Geriatric Nursing Problems in the Hospital. London. National Corporation for the Care of Old People (now the Centre for Policy on Ageing); 1962. Adapted with permission of the publisher.

APPENDIX H WATERLOW SCORE



WATERLOW PRESSURE ULCER PREVENTION/TREATMENT POLICY

RING SCORES IN TABLE, ADD TOTAL. MORE THAN 1 SCORE/CATEGORY CAN BE USED

BUILD/WEIGHT FOR HEIGHT		SKIN TYPE VISUAL RISK AREAS		SEX AGE	
AVERAGE		HEALTHY	0	MALE	1
BMI = 20-24.9	0	TISSUE PAPER	1	FEMALE	2
ABOVE AVERAGE		DRY	1	14 - 49	1
BMI = 25-29.9	1	OEDEMATOUS	1	50 - 64	2
OBESE		CLAMMY, PYREXIA	1	65 - 74	3
BMI > 30	2	DISCOLOURED GRADE 1	2	75 - 80	4
BELOW AVERAGE		BROKEN/SPOTS GRADE 2-4	3	81 +	5
BMI < 20	3				
BMI=Wt(Kg)/Ht (m)^2					

MALNUTRITION SCREENING TOOL (MST)
(Nutrition Vol.15, No.6 1999 - Australia

A - HAS PATIENT LOST WEIGHT RECENTLY
YES - GO TO B
NO - GO TO C
UNSURE - GO TO C AND SCORE 2

B - WEIGHT LOSS SCORE
0.5 - 5kg = 1
5 - 10kg = 2
10 - 15kg = 3
> 15kg = 4
unsure = 2

C - PATIENT EATING POORLY OR LACK OF APPETITE
'NO' = 0; 'YES' SCORE = 1

NUTRITION SCORE
If > 2 refer for nutrition assessment / intervention

CONTINENCE		MOBILITY	
COMPLETE/ CATHETERISED	0	FULLY	0
URINE INCONT.	1	RESTLESS/FIDGETY	1
FAECAL INCONT.	2	APATHETIC	2
URINARY + FAECAL INCONTINENCE	3	RESTRICTED	3
		BEDBOUND e.g. TRACTION	4
		CHAIRBOUND e.g. WHEELCHAIR	5

SPECIAL RISKS

TISSUE MALNUTRITION		NEUROLOGICAL DEFICIT	
TERMINAL CACHEXIA	8	DIABETES, MS, CVA	4-6
MULTIPLE ORGAN FAILURE	8	MOTOR/SENSORY	4-6
SINGLE ORGAN FAILURE (RESP, RENAL, CARDIAC,)	5	PARAPLEGIA (MAX OF 6)	4-6
PERIPHERAL VASCULAR DISEASE	5	**MAJOR SURGERY or TRAUMA**	
ANAEMIA (Hb < 8)	2	ORTHOPAEDIC/SPINAL	5
SMOKING	1	ON TABLE > 2 HR#	5
		ON TABLE > 6 HR#	8

MEDICATION - CYTOTOXICS, LONG TERM/HIGH DOSE STEROIDS, ANTI-INFLAMMATORY MAX OF 4

SCORE
10+ AT RISK
15+ HIGH RISK
20+ VERY HIGH RISK

Scores can be discounted after 48 hours provided patient is recovering normally

* The 2005 revision incorporates the research undertaken by Queensland Health.

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APPENDIX I BRADEN Q SCALE

BRADEN Q SCALE: A risk assessment to be completed on admission and each 24 hours for patients with decreased level of mobility in relation to developmental age. Evidence of pressure ulcers will be defined using the classification system stage I to 4.

Intensity and Duration of Pressure					Score
Mobility – Ability to change & 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 completely turn self independently	**3. Slightly Limited** Makes frequent though slight changes in body or extremity position independently	**4. No Limitation** Makes major and frequent changes in position without assistance	
Activity – The degree of physical activity	**1. Bedfast** Confined to bed	**2. Chair Fast** Ability to walk severely limited or non-existent. Cannot bear own weight &/or must be assisted into chair	**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. All patients too young to ambulate *OR* walks frequently** Walks outside the room at least twice daily and inside room at least once every 2 hours during waking hours	
Sensory Perception – The ability to respond in a developmentally appropriate way to pressure related discomfort	**1. Completely Limited** Unresponsive 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 sensory impairment which limits the ability to feel pain or discomfort over half of body	**3. Slightly Limited** Responds to verbal commands but cannot always communicate discomfort or need to be turned **OR** has sensory impairment which limits the ability to feel pain or discomfort in 1 or 2 extremities	**4. No Impairment** Responds to verbal commands. Has no sensory deficit, which limits ability to feel or communicate pain or discomfort	
Tolerance of the Skin and Supporting Structure					
Moisture – Degree to which skin is exposed to moisture	**1. Constantly Moist** Skin is kept moist almost constantly by perspiration, urine, drainage, 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 every 8 hours	**3. Occasionally Moist** Skin is occasionally moist, requiring linen change every 12 hours	**4. Rarely Moist** Skin is usually dry, routine nappy changes, linen only requires changing every 24 hours.	
Friction – Shear *Friction* – occurs when skin moves against support surfaces. *Shear* – occurs when skin and adjacent bony surface slide across one another.	**1. Significant Problem** Spasticity, contracture, itching or agitation leads to almost constant thrashing and friction	**2. Problem** Requires moderate to maximum assistance in moving. Complete lifting without sliding against sheets is impossible. Frequently slides down in bed or chair, requiring frequent repositioning with maximum assistance.	**3. Potential Problem** Moves feebly or requires minimum assistance. During a move skin probably slides to some extent against sheets, chair, restraints, or other devices. Maintains relative good position in chair or bed most of the time but occasionally slides down.	**4. No Apparent Problem** Able to completely lift patient during a position change. Moves in bed and chair independently and has sufficient muscle strength to lift up completely during move. Maintains good position in bed or chair at all times.	
Nutrition	**1. Very Poor** NBM &/or maintained on clear fluids, or IV's for more than 5 days **OR** albumin < 25mg/l	**2. Inadequate** Is on liquid diet or tube feedings/TPN which provide inadequate calories and minerals for age **OR** albumin < 30mg/l	**3. Adequate** Is on tube feedings or TPN which provide adequate calories and minerals for age	**4. Excellent** Is on a normal diet providing adequate calories for age. Does not require supplementation	
Tissue Perfusion and Oxygenation	**1. Extremely Compromised** Hypotensive (MAP < 50mmHg; < 40mmHg newborn) **OR** the patient does not physiologically tolerate position changes	**2. Compromised** Normotensive; Oxygen saturation may be < 95% **OR** haemoglobin may be < 100mg/l **OR** capillary refill may be > 2 seconds; Serum pH is < 7.40	**3. Adequate** Normotensive; Oxygen saturation may be < 95% **OR** haemoglobin may be < 100mg/l **OR** capillary refill may be > 2 seconds; Serum pH is normal	**4. Excellent** Normotensive; Oxygen saturation >95%; normal haemoglobin; & capillary refill < 2 seconds	

Patient 'At Risk' / Mild Risk	'Moderate Risk'	'High Risk'	'Very High Risk'
16 - 23	13 – 15	10 - 12	9 or below

NOTES

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Australian Wound Management Association

New Zealand Wound Care Society

Hong Kong Enterostomal Therapists Association

Wound Healing Society Singapore