Clinical practice guidelines for the prediction and prevention of pressure ulcers

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Abstract

The Pressure Ulcer Interest Subcommittee (PUISC) of the Australian Wound Management Association (AWMA) has prepared *Guidelines for the Prediction and Prevention of Pressure Ulcers*. The Subcommittee, a multidisciplinary panel of health professionals, reviewed available research on pressure ulcer prediction and prevention and developed recommendations based on the best evidence. When good evidence was not available, consensus statements were prepared.

The supporting evidence was rated using the levels of evidence as recommended by the National Health and Medical Research Council (NH&MRC). The major recommendations in the guidelines are:

- Patients unable to independently move or change position should automatically be placed in 'at risk' category *(Level of evidence III-2)*.
- 'At risk' patients should have a comprehensive management plan instigated *(Level of evidence II)*.
- 'At risk' patients should be repositioned as frequently as skin tolerance dictates *(Level of evidence IV)*.
- Replacement mattresses or beds should be used in place of standard hospital mattresses in 'high risk' patients *(Level of evidence I)*.

Specific risk factors for the development of pressure ulcers have been documented in the guidelines with levels of supporting evidence. The guidelines have been prepared as a general guide to appropriate practice and should only be followed subject to the health practitioner's judgement in each individual case.

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Introduction

Pressure ulcers have been identified as a worldwide problem which influences patient/client morbidity and mortality. The literature has identified that the incidence of pressure ulcers in hospitals ranges from 2.7 to 29.5 per cent, with prevalence ranging from 9.2 to 66 per cent. Australian studies have identified prevalence rates at the lower end of this range.

The Australian Wound Management Association Inc. (AWMA) is a national body with membership drawn from health care professionals employed in a range of settings. AWMA is a non-profit organisation that aims to promote increased awareness, knowledge and the application of effective wound management.

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In 1996, the AWMA Pressure Ulcer Interest Subcommittee (PUISC) was formed. This consisted of 19 representatives from nursing, medicine and allied health disciplines, with a wealth of professional expertise in a variety of health care settings. Their objectives were to:

- develop national clinical guidelines to identify adults 'at risk' of developing pressure ulcers and outline interventions for prevention;
- collate national published data on the incidence and prevalence of pressure ulcers in Australia;
- produce an inventory of pressure reducing and pressure relieving equipment; and
- disseminate and update the guidelines.

The group established key clinical practice guidelines which are designed to assist health care professionals and consumers in making appropriate clinical decisions. These guidelines provide recommendations regarding the delivery of quality care across a range of health care settings such as

acute care, post acute care, extended care facilities, nursing homes and home settings. The recommendations were intended for use by health professionals and others who care for persons at risk of developing pressure ulcers.

Methodology

A considerable body of work has been undertaken by other groups in developing guidelines for pressure ulcer prevention and management. In the USA, the Agency for Health Care Policy and Research has published guidelines for the prediction, prevention and treatment of pressure ulcers [1, 2]. The aim of the AWMA PUISC was to build on completed work and update the literature with research performed since other guidelines were prepared, particularly with research from Australia.

A number of working groups were formed from PUISC membership and were allocated responsibility for reviewing specific areas of the literature on pressure ulcer research. The following topics were included:

- prevalence and incidence of pressure ulcers;
- staging of pressure ulcers;
- aetiology and risk factors;
- risk assessment tools;
- strategies for skin care and early treatment;
- support surfaces and interventions for reducing mechanical loading; and
- implementation of a risk management programme.

These were presented to the PUISC for review and discussion to obtain individual consensus on each topic. The PUISC met twice a year to progress the development of the guidelines and members communicated between the meetings.

The levels of evidence to support pressure ulcer risk factors, and the recommendations for prevention strategies, were evaluated according to the quality and quantity of available data. The final version of the guidelines used levels of evidence as recommended by the National Health and Medical Research Committee (NH&MRC) (Table 1). Initial drafts used different levels of evidence; however, in response to subsequent feedback, the NH&MRC levels of evidence were applied to the guidelines. Where there was consensus in the Subcommittee on specific recommendations or risk factors but insufficient data to provide a level of evidence according to the NH&MRC levels, these statements were referred to as consensus statements.

Table 1. Designation of levels of evidence.

I	Evidence obtained from a systematic review of all relevant randomised controlled trials.
II	Evidence obtained from at least one properly designed randomised controlled trial.
III-1	Evidence obtained from well-designed pseudo-randomised controlled trials (alternate allocation or some other method).
III-2	Evidence obtained from comparative studies with concurrent controls and allocation not randomised (cohort studies), case-controlled studies or interrupted time series with a control group.
III-3	Evidence obtained from comparative studies with historical control, two or more single-arm studies or interrupted time series without a parallel control group.
IV	Evidence obtained from case series, either post-test or pre-test and post-test.

The AWMA PUISC circulated the draft guidelines to more than 70 health care associations in Australia for peer review and comment prior to publication. These associations included consumer, nursing, medical and allied health professional organisations, the NH&MRC, health departments, clinical and home care facilities, educational institutions and special interest groups with a focus on pressure ulcer prevention.

Over 30 associations responded with general support for the guidelines. The AWMA is grateful for the time and effort extended by these organisations in providing this valuable feedback. The PUISC considered these comments and included this feedback in the preparation of the published version.

A brief overview of each section of the guidelines as well as the consensus statements and recommendations are contained in this paper.

Incidence and prevalence of pressure ulcers

The reported incidence and prevalence of pressure ulcers varies widely according to population, clinical setting and methodology used in performing studies. The definitions of incidence and prevalence are described in Table 2 [3].

The great variation in reported incidence and prevalence of pressure ulcers reflects inconsistencies in data acquisition and how pressure ulcers are defined and classified. Nevertheless, the occurrence of pressure ulcers remains clinically significant and warrants concern. Reliable data on the incidence and

Table 2. Definitions of incidence and prevalence [3].

Incidence	the number of new cases of a disease or event in a population during a specific period of time.
Prevalence	the number of existing cases of a particular disease or condition in a given population at a designated time.

prevalence of pressure ulcers by stage, type of health care facility, diagnosis and risk factors will permit better planning for the allocation of resources to 'at risk' populations [1].

Staging of pressure ulcers

Pressure ulcers are classified by depth of tissue damage. The staging of pressure ulcers recommended for use by this subcommittee is consistent with the recommendations of the National Pressure Ulcer Advisory Panel (NPUAP) [4].

Stage 1

Observable pressure-related alteration(s) of intact skin whose indicators, as compared to the adjacent or opposite area on the body, may include changes in one or more of the following; skin temperature (warmth or coolness), tissue consistency (firm or boggy feel) and/or sensation (pain, itching).

The ulcer appears as a defined area of persistent redness in lightly pigmented skin, whereas in darker skin tones the ulcer may appear with persistent red, blue or purple hues.

Stage 2

Partial thickness skin loss involving epidermis and/or dermis. The ulcer is superficial and presents clinically as an abrasion, blister or shallow crater.

Stage 3

Full thickness skin loss involving damage or necrosis of subcutaneous tissue that may extend down to, but not through, underlying fascia. The ulcer presents clinically as a deep crater with or without undermining of adjacent tissue.

Stage 4

Full thickness skin loss with extensive destruction, tissue necrosis or damage to muscle, bone or supporting structures (i.e. tendon or joint capsule). Undermining and sinus tracts may also be associated with Stage 4 pressure ulcers.

Aetiology of pressure ulcers

Pressure ulcers occur when soft tissue is compressed between a bony prominence and an external surface for a prolonged period of time [4]. The critical determinants of pressure ulcer development are:

- The intensity and duration of pressure; and
- The tolerance of the skin and its supporting structures for pressure [5].

Capillaries have little resistance to direct external pressure. A threshold of 32mmHg is widely quoted [6-9] as the point at which intracapillary pressure is overcome, resulting in capillary collapse.

The intensity and duration of pressure has great individual variability and is interrelated with many other factors that influence the individual's capacity to tolerate pressure. Such factors include age, diet, physiological and psychological stressors, poor oxygen saturation and exposure to shear and friction or moisture.

Risk factors

Any factor which exposes the skin to excessive pressure or diminishes its tolerance to pressure is considered a 'risk factor'. Many are mentioned in the literature but few have been rigorously evaluated. More rigorous evaluations would involve a suspected risk factor being consistently demonstrated as an independent factor in prospective, longitudinal studies. Subsequent practice changes and re-evaluation may then demonstrate that elimination or modification of that risk factor reduces the incidence of pressure ulcer development.

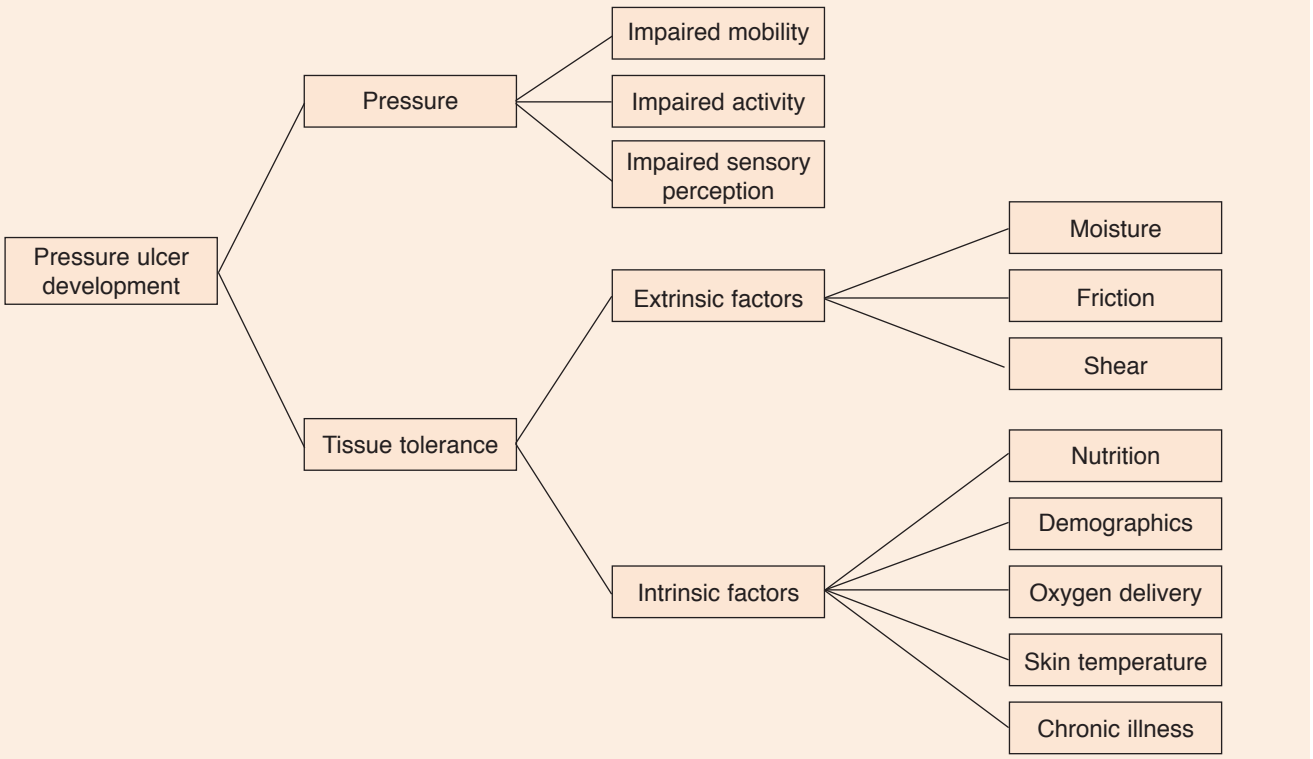
Using the framework described by Braden and Bergstrom [5] (Figure 1), an attempt has been made to evaluate the strength of evidence supporting or discounting each risk factor.

Many of the above risk factors are not independent of each other – for instance, nutritional status may be referred to as malnutrition, inadequate protein/energy intake, hypo-albuminaemia, (recent) weight loss or inability to feed oneself. Malnutrition may also be associated with old age, and/or chronic illness. Old age is associated with increased risk of hospitalisation, chronic illness, poor peripheral perfusion and loss of peripheral sensation.

The above risk factors have a sound theoretical basis but little prospective randomised controlled (interventional) evaluation has occurred. The multifactorial nature of pressure ulcers limits researchers' ability to independently evaluate individual risk factors and controlled trials are often limited to animal models; these diminish the relevance of results.

The guidelines provide the levels of evidence that exist in published studies which support factors that have been

Figure 1. Pressure ulcer development model based on Braden and Bergstrom's conceptual schema for the study of the aetiology of pressure ulcers [5].



considered to indicate a higher risk for developing pressure ulcers. For many of the risk factors, the level of evidence is Level III-2 with data coming from cohort studies comparing the presence of risk factors in patients with and without pressure ulcers. The risk factors that had sufficient evidence to rate on the NH&MRC scale and the consensus statements are listed in Table 3.

Risk assessment tools

The purpose of a risk assessment tool is to identify individuals 'at risk' of developing pressure ulcers. A systematic assessment for pressure ulcer risk factors should be incorporated into the assessment of all individuals in any health care setting. The presence of any condition that reduces mobility or diminishes activity, to the point where the individual is unable to independently move or change positions to relieve pressure, should automatically place the individual in the 'at risk' category [1]. Additional risk factors contributing to pressure ulcer formation should be considered, as they may place the individual at higher risk.

Numerous risk assessment tools for pressure ulcers are used in the UK and the USA, but their use appears to be sporadic and

Table 3. Risk factors for pressure ulcer development with levels of supporting evidence.

Immobility and diminished activity	Level of evidence III-2
Sensory loss due to spinal injury	Level of evidence III-2
Impaired cognitive state/altered level of consciousness	Level of evidence III-2
Anaesthetic time during surgery	Level of evidence III-2
Shear	Consensus statement
Friction	Consensus statement
Urinary incontinence	Level of evidence III-2
Faecal incontinence	Level of evidence III-2
Age	Level of evidence III-2
Male gender and caucasian race	Level of evidence III-2
Chronic illness	Level of evidence III-2
Poor nutrition	Level of evidence III-2
Vitamin C deficiency	Level of evidence III-2
Impaired oxygen delivery to tissues	Level of evidence III-2
Skin temperature	Consensus statement
Dry skin	Level of evidence III-2

limited in Australia. As discussed previously, risk assessment tools are based on risk factors known to predispose an individual to pressure ulcers. Most risk assessment tools utilise a numerical scoring system to place the severity of risk into the categories of; no risk, low, medium or high risk. These tools assist health care professionals to gather information systematically and to identify and categorise individuals 'at risk'. Risk assessment tools are not designed to replace clinical judgement but rather to assist in decision making in order to channel resources appropriately [10].

Few pressure ulcer risk assessment tools described in the literature have been rigorously tested for reliability, sensitivity, specificity or predictive value [11]. The most frequently scrutinised tools are the Norton Risk Assessment Score [12], the Waterlow Risk Assessment Card [13] and the Braden Scale [14].

It is difficult to recommend any one risk assessment tool over the other as there is great variability in reported validity and reliability [11]. This probably reflects differences in study settings, populations and outcome measures (prevalence or incidence rates). There is no firm evidence to recommend adoption of any one assessment tool, nor the assessment of any single risk factor, nor combination of risk factors as better predictors of risk in all health care settings. Health care professionals should adopt or develop the most appropriate risk assessment for their particular patient population [1, 11].

Consensus statement

- Risk assessment should be performed on admission to any health care facility or home care service, following a change of health status and at appropriate intervals throughout the continuum of care.
- The 'at risk' status and risk factors should be documented regularly or following a change in the individual's condition.

Recommendations

- The presence of any condition which reduces mobility or diminishes activity, to the point where the individual is unable to independently move or change positions to relieve pressure, should automatically place the individual in the 'at risk' category [15-18].
  Level of evidence III-2.
- Individuals identified 'at risk' of developing pressure ulcers should have a comprehensive preventative management plan instigated which aims to maintain tissue tolerance to pressure and protect the individual against the forces of pressure, shear and friction [19-25].
  Level of evidence II.

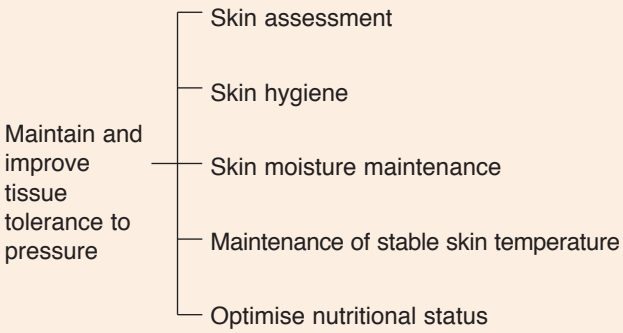
Skin care

All individuals identified as 'at risk' of developing pressure ulcers should have a management plan that aims to improve and maintain the tolerance of their tissue to pressure. The management plan should incorporate the following aspects of care; skin assessment, optimal skin hygiene and skin moisture maintenance and maintenance of a stable skin temperature. In addition to this, the nutritional status of the at risk individual should be monitored and reassessed regularly (Figure 2).

Consensus statements

- Individuals 'at risk' of developing pressure ulcers should have a comprehensive skin inspection at least daily for signs of impaired skin integrity.
- The skin should be kept clean and free from all potentially irritating substances or those that substantially alter the skin's pH.
- All intrinsic and extrinsic factors that result in dryness or maceration of the skin should be eliminated or minimised by:
  - treating dry, flaky or scaling skin with a topical moisturiser;
  - avoiding sustained or excessive contact with body fluids; and/or
  - encouraging continence by employing interventions such as continence training or the use of continence aids.
- Maintain a balanced diet in individuals 'at risk'. They should be assessed regularly and referred to a dietitian if their diet is inadequate.
- Avoid extremes in skin temperature by:

Figure 2. Skin care for pressure ulcer prevention.



- avoiding skin contact with plastic support surfaces; and
- ensuring that turning schedules do not exceed 2 hourly intervals for patients on basic mattresses.

Recommendation

- Avoid high skin temperature by removing warming blankets from beneath patients once core temperature has been normalised and is stable [26].
  Level of evidence IV.

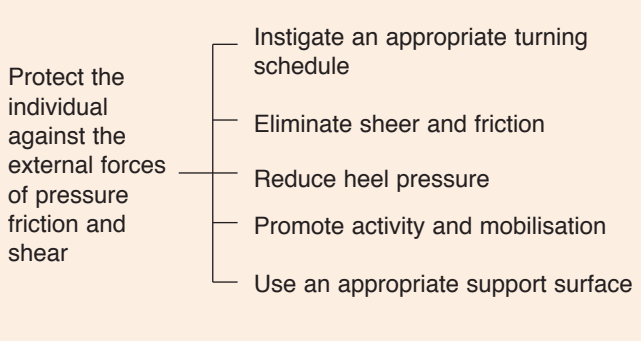
Mechanical loading and support surfaces

To protect the skin from external forces of pressure, shear and friction requires a management plan that incorporates the following: an appropriate turning schedule; elimination of shear and friction; reduction or elimination of heel pressure; promotion of mobility; and activity and the use of an appropriate support surface (Figure 3).

Consensus statements

- The most effective pressure relieving support surface, such as a sophisticated alternating pressure device, should be chosen for those individuals who are unable to tolerate a turning regimen or where a consistent turning regimen (24 hours a day) cannot be guaranteed.
- Support surfaces should be used in conjunction with a comprehensive prevention strategy based on frequent observation and assessment, individualised turning regimen and measures to increase the tissue's tolerance to pressure.
- Pillows and foam wedges can be used to avoid direct contact between bony prominences.
- Avoid prolonged uninterrupted sitting in a chair or wheelchair. Repositioning or shifting of pressure points should occur as frequently as 15 minutely to hourly, depending on the tissue's tolerance to pressure.

Figure 3. Mechanical loading and support surfaces.



- Exposure to shear and friction should be reduced by:
  - employing correct lifting and manual handling techniques;
  - protecting skin constantly exposed to friction with protective dressings, padding or sheepskin;
  - elevating the foot of bed to 20 degrees when sitting to prevent sliding; and
  - maintaining the head of the bed at the lowest possible elevation, consistent with the individual's medical condition and comfort.
- Individuals who are bed bound or have immobilised lower extremities should have total relief of pressure from their heels.
- Individuals should be encouraged to maximise their activity and mobilisation consistent with their medical condition, ability and energy level.

Recommendations

- Any individual who is assessed to be 'at risk' for developing pressure ulcers should be repositioned as frequently as their skin's tolerance to pressure dictates [24].
  Level of evidence IV.
- Replacement mattresses or beds should be used in place of standard hospital mattresses for patients who are assessed as being at high risk of developing a pressure ulcer [11, 25].
  Level of evidence I.

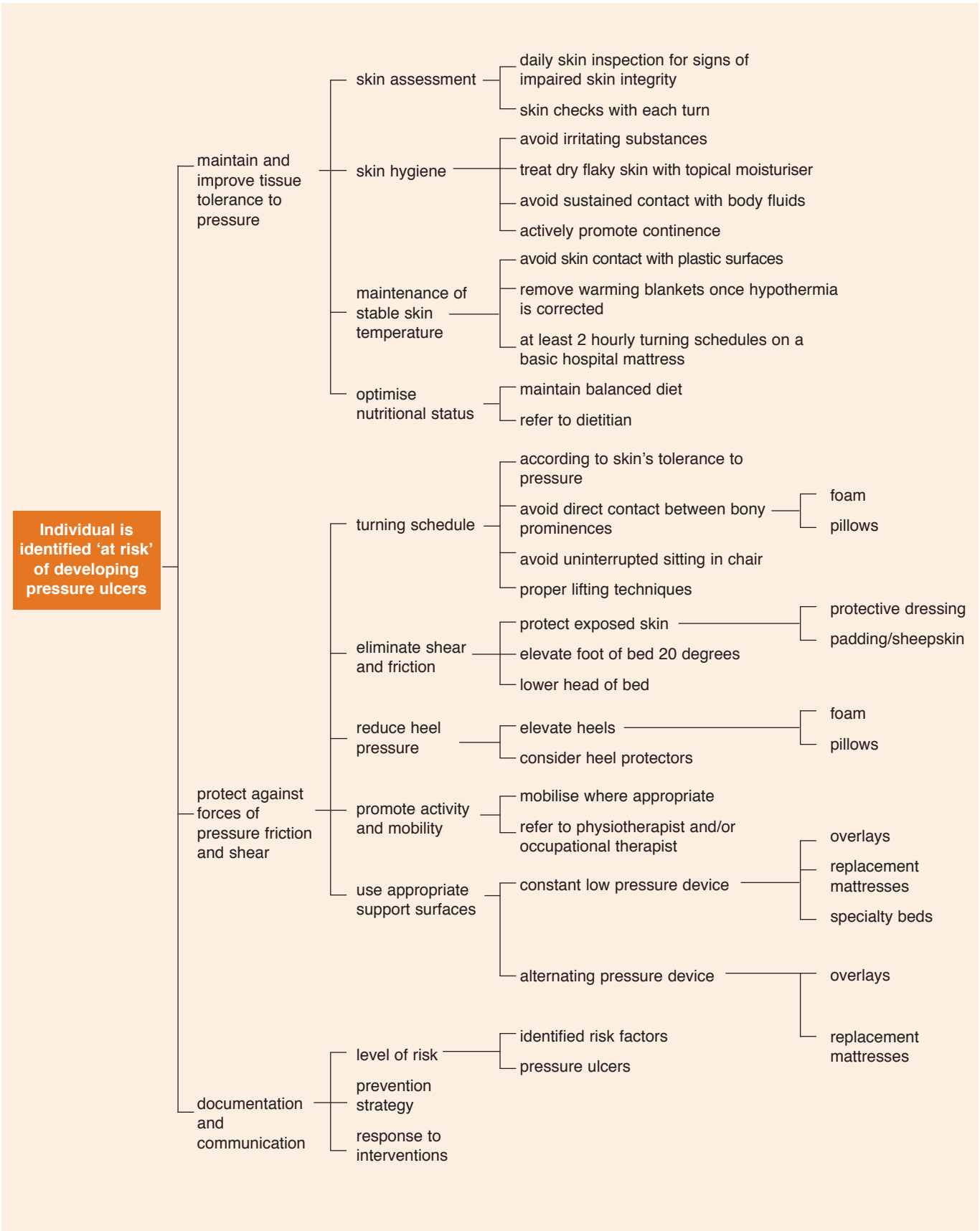
Documentation

The primary aim of documentation in the patient record or management plan is to facilitate communication and continuity of care between health care professionals and across health care settings. The patient record should provide a complete picture of care from admission to discharge and should include evidence of clinical assessment, interventions and outcomes.

All individuals identified as 'at risk' of developing pressure ulcers should have their risk assessment status and risk factors clearly documented and readily accessible for all health care providers. The individual's risk status should be updated as their condition changes.

Clinical interventions, outcomes of care and adjustments to the pressure ulcer prevention/management plan should be regularly monitored and documented. The frequency of assessment will be determined by the clinical setting and the policies of the respective clinical facility or home care agency. For instance, in an acute care setting, documentation of outcomes of care should be documented at least daily.

Figure 4. Flowchart of pressure preventative strategies.



Consensus statement

- All individuals 'at risk' of developing pressure ulcers should have the following details recorded in the patient record on a regular, ongoing basis: risk assessment status (low, moderate or high); identified risk factors; management plan, which includes interventions used such as turning schedules, support surface, referrals; and the individual's response to treatment.

Risk management system for the prevention of pressure ulcers

Pressure ulcers are adverse events which can occur in any health care setting and home environment. A continuous quality improvement approach provides a systematic framework for continuously monitoring and evaluating the impact of any preventative risk management strategy. Figure 4 illustrates strategies for pressure ulcer prevention.

Consensus statements

- Any pressure ulcer risk management programme should be based on a demonstrable need relevant to the health care setting and supported by a policy and protocol based on the best available research.
- All pressure ulcer risk management programmes should include the individual 'at risk' and significant family members. The individual should be considered an active participant in the management plan and should be informed of the relevant risk factors and the strategies employed to reduce or eliminate the risk of pressure ulcer development.
- A pressure ulcer risk management programme should be supported by a continuing educational programme and a multidisciplinary continuous improvement process which can monitor and compare the impact of interventions over time.

Publication

The AWMA *Clinical Practice Guidelines for the Prediction and Prevention of Pressure Ulcers* will be published in the following formats; a full version, an abridged version and a pocket guide. Members of the AWMA should receive copies of the abridged version with this journal. Additional copies, copies of the full version and copies of the pocket guide may be purchased from Cambridge Media (see page 2 for their contact details), or copies of the full version are available to be downloaded free of charge from the AWMA website <awma.com.au>.

Conclusion

The aim of these guidelines is to present current research on the prediction and prevention of pressure ulcers in adults in an Australian context. They have been written by a national multidisciplinary team for all health care professionals across all health care settings. These guidelines are a general guide to appropriate practice to be followed only subject to medical/health practitioner's judgement in each individual case.

The guidelines are designed to provide information to assist decision making and are based on the best information available at the date of publication. The AWMA is hopeful that these guidelines will stimulate further research in all areas of pressure ulcer prevention and management.

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