

An Australian model for conducting pressure ulcer prevalence surveys

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Abstract

Pressure ulcers are recognised internationally as iatrogenic injuries of the skin and underlying tissues and, in most cases, are seen as avoidable adverse events^{1,2}. They are also seen as clinical indicators^{3,4} of the standard of care provided. Numerous researchers have examined pressure ulcer prevalence within a variety of clinical settings. Meaningful comparison of data is impaired by re-occurring anomalies relating to different methodological approaches used to collect and analyse data. Therefore the conclusions that can be drawn regarding pressure ulcer prevalence and the impact of pressure ulcers on both patients and health care systems are lessened.

This paper describes a subsection of the methodology used in a national multi-centre study which evaluated the efficacy of Australian guidelines for pressure ulcers in improving doctors' and nurses' knowledge of pressure ulcers, and in reducing pressure ulcer prevalence when implemented in conjunction with an education programme. The subsection presented here proposes a standardised model for surveillance of pressure ulcer point prevalence. It addresses discrepancies with data collection methods used in previous Australian studies assessing pressure ulcer prevalence and meets international standards for conducting multi-centre prevalence studies. Using a standardised approach, as this model proposes, ensures a common understanding of pressure ulcer terminology, improved inter-rater reliability (IRR) in classifying pressure ulcers, and less variance in the quality of data collected.

Only a brief summary of the prevalence found in this study will be discussed here. Detailed results of the study will be presented in a forthcoming article. This study, however, has found Australian guidelines for pressure ulcers to be effective in reducing pressure ulcer prevalence from 26.5% to 22% ($p < 0.002$) when implemented in conjunction with an education programme⁵.

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Introduction

Pressure ulcer prevalence surveys are conducted for a variety of reasons⁶⁻¹⁰ (Table 1), and although they may consume considerable time and resources, there are multiple benefits to be gained from conducting them on an annual or biannual basis as described in Table 2¹⁰⁻¹⁴.

Prevalence is defined as "the proportion of individuals in a population who have the disease at a specific instant and provides an estimate of the probability (risk) that an individual will be ill at this point in time"¹⁵. Prevalence (P) can be expressed as the following equation:

$$P = \frac{\text{Number of existing cases of a disease}}{\text{Total population}} \quad \text{at a given point in time}$$

Prevalence as a measure provides a snapshot of the problem overall within a population and is inclusive of old and new cases. It may give an indication of the chronicity of a condition which may be useful for health planning purposes¹⁶.

Pressure ulcer prevalence internationally

The prevalence of pressure ulcers in individual American hospitals varies widely ranging from 4.7% to 29.7%^{17, 18}, whereas the range is much smaller, from 9.2% to 15%, in the national multi-centre studies that have been conducted in the USA between 1990 and 2001^{14, 19-22}.

While there are no reports in the literature referring to a national multi-centre study in the UK, several large multi-centre studies show pressure ulcer prevalence varies from 6.6% to 18.6%²³⁻²⁵, whilst the prevalence in individual hospitals ranged from 7.9% to 32.1%^{7, 26}.

Prevalence data for settings other than hospitals also range widely in the USA; from 6% to 29% in the community and home health care agencies²⁷⁻³⁰. In the UK this has been reported as 2.5%³¹. Within nursing homes in the USA, prevalence ranges between 11.2% to 23%³²⁻³⁴, and in the UK it is 4.6% to 7.5%^{35, 36}. When both hospital and community units have been assessed as one entity in the UK, pressure ulcer prevalence has ranged from 8.8% to 15.8%^{37, 38}. In Europe, pressure ulcer prevalence ranges from 3% in acute care settings to 83.6% in nursing homes^{24, 39-46}.

Only a small number of prevalence studies have been reported on in South East Asia and Africa. The prevalence of pressure ulcers in three Singaporean hospitals caring for acute and rehabilitating patients was 9% to 14%⁴⁷, and in one rehabilitation hospital in Hong Kong this was stated as 21%⁴⁸. Kanagawa *et al.* in Japan⁴⁹ (cited by van Rijswijk) found, via postal mail survey, that pressure ulcer prevalence in the community was 14.6%. Manley's landmark study in South Africa identified a prevalence of 9.7%¹.

Table 1. Reasons for conducting pressure ulcer prevalence surveys.

- Lack of scientific data on pressure ulcers in Australia.
- Identify the severity of the problem in terms of prevalence, location, numbers and stage of ulcers.
- Identify which patient population(s) are most at risk.
- Identify the cost of care of pressure ulcers.
- Identify the opportunistic costs of pressure ulcers.
- Identify deficits in service provision for the prevention and management of pressure ulcers.
- Identify the need to establish pressure ulcers as a clinical or nursing sensitive indicator.
- Quantify and benchmark baseline data within and between individual health care facilities.

Prevalence of pressure ulcers in Australia

Investigations of pressure ulcer point prevalence in Australian tertiary teaching hospitals have been undertaken since 1983⁵⁰. The methodologies used and resulting outcomes of these studies have identified the prevalence of pressure ulcers in the acute care sector as being between 4.5% and 36.7%^{5, 51-59} (Table 3).

In private hospitals the range is 10.6%⁶⁰ to 13.6%⁶¹, and in nursing homes it is 3% to 5.4%⁶²⁻⁶⁴. Amongst patients receiving wound care in the home, pressure ulcer prevalence has ranged from 6%⁶⁵ to 8%⁶⁶ (Table 3). Therefore the overall reported prevalence of pressure ulcers in Australian health care settings, between 1983 and 2002, ranges from 3% to 36.7%.

Measuring the prevalence of pressure ulcers

There have been many different methodological approaches used to monitor the prevalence of pressure ulcers. Factors common to these studies are listed in Table 4^{7, 67, 68}. Within the principle framework of the methods described in Table 4 numerous variations in the manner in which the data are actually collected have been identified.

Table 2. Potential benefits of conducting pressure ulcer prevalence surveys.

- Focuses attention on the problem.
- Engenders reductions in prevalence and incidence.
- Improves patient care outcomes.
- Establishes or improves incident reporting mechanisms.
- Fosters critical review of current pressure ulcer policy and procedures.
- Initiates staff education programmes relating to skin care and pressure ulcers.
- Improves availability and allocation of pressure reducing/relieving devices.
- Engenders multidisciplinary approach to problem.
- Improves documentation of risk and management of pressure ulcers.
- Engenders cultural changes towards pressure ulcers.
- Reduces potential for litigation.
- Reduces cost of pressure ulcers.
- Improves accreditation standing and reputation for clinical excellence.
- Assists in establishing clinical priorities in health planning.

Table 3. Pressure ulcer prevalence studies in Australia.

Author (year)	Facility	Exc/incl criteria	Study method IRR	Study no.	Prev %	Stage/grade	Stage 1 yes/no	Severity ulcers %	Location ulcers %
Childs L ⁵⁰ (1983) NSW	AH	X P, DU ✓ All adult inpatients	Skin inspection IRR: Not done	838	4.5	NS	No	4% < 1cm 18% > 2-3cm	NS as a %: sacrum, buttocks, heels
Martin R ⁵¹ (1993) VIC	AH	X NS ✓ All inpatients	Skin inspection 2 nurses in pairs IRR: NS	360	6.7	NPUAP '92	Yes	S1: 28 S2: 53 S3: 11 S4: 8	38 sacrum 41.6 heels 8.3 trochanter 8.3 heels
Wright R ⁵² (1994) VIC	AH	X NS ✓ All inpatients	Skin inspection Team review Chart review IRR: NS Education only	554	5.4	NPUAP '92 and UK Consensus Classification PSS 1994	Yes	S1: 31 S2: 37 S3: 31 S4: 4	38 sacrum 29 heels 23 l tuberosity 7 malleolus
Morey P ⁵⁴ (1994) WA	AH	X Nil ✓ All inpatients	Skin inspection 2 nurses in pairs Chart review IRR: Stated Education & informal test	454	15.6	IAET 1-4	Yes	S1: 51 S2: 37.7 S3: 5.7 S4: 4.9	36 sacrum 27 heels 11 elbows 10 buttocks 9 malleolus
Morey P ⁵⁴ (1995) WA	AH	As above	As above	489	14.5	As above	Yes	S1: 42.5 S2: 49.5 S3: 6 S4: 2	42.5 sacrum 21 heels 10 buttocks 8 malleolus
Davenport J ⁶¹ (1995) VIC	PH	X M, DU ✓ All inpatients	Retrospective chart audit IRR: NS	88	13.6	IAET 1-4	Yes	13.6 > S2	NS
McGowan S ⁵³ (1996) WA	AH	X P, M, DU ✓ All inpatients	Skin inspection Chart review IRR: NS Nurse education	264	14	IAET 1-4	Yes	S1: 80 S2: 12 S3: 2 S4: 6	52 sacrum 32 heels 8 elbows 4 l tuberosity
Madsen W ⁶² (1997) QLD	NH	X Short term X Existing ulcer	Skin inspection IRR: NS	117	3.4	Torrance Grade 0-5	Yes	S1: 50 S2: 25 S3: 25 S4: 0	NS
Eves S ⁶⁰ (1998) WA	PH	X Pd, M, DU X In surgery X Acutely ill ✓ Medical/surgical inpatients	Skin inspection 2 nurses in pairs IRR: Stated Education & informal test only	234	10.6	IAET 1-4	Yes	S1: 57 S2: 14 S3: 5 S4: 0	NS as a %: sacrum, coccyx, heel, elbow
Pearson A ⁵⁵ (1998) NSW	18 PH	X NS ✓ Only patients with pre-existing ulcer	Skin inspection 1 person IRR: NS Education only	634	6.0	NPUAP '92	Yes	S1-S2 < 54	NS as a %: heels, lower spine, buttocks
Pearson A ⁵⁷ J Briggs Inst. (2000) SA	3 AH	X NS ✓ Patients with ≥ Stage 1 ulcer	Skin inspection 1 nurse Chart review	1996: 1588	1996: 4.7	NPUAP '92	Yes	1996: S1: 18.3 S2: 57	1996: 23 sacrum 18.3 heel

Charlier C ⁵⁶ (2000) SA	RH	X NS ✓ All inpatients	Skin inspection 1 nurse IRR: Not done	59	12	NPUAP '95	Yes	1998: 1436 1998: 4.6	S3: 25.2 S4: 6 1998: 7.78 coccyx S1: 11 S2: 45.2 S3: 35.6 S4: 5.5	NS as a %: sacrum, coccyx, heels, buttocks
Young C ⁵⁶ (2000) TAS	AH	X Obs, P, DU, Pd ✓ All inpatients	Skin inspection Chart audit IRR: Stated for 1999 only Education & informal test only	1996: 187 1997: 184 1998: 164 1999: 167	1996: 10 1997: 8 1998: 9 1999: 12	NPUAP '97	Yes	1996: 79 sacrum, coccyx, buttocks 1997: 50 sacrum, coccyx, buttocks 1998: 66 sacrum, coccyx, buttocks 1999: 52 sacrum, coccyx, buttocks	1996: 1996: S1: 50 S2: 11 S3: 23 S4: 16 1997: 1997: S1: 6 S2: 13 S3: 81 S4: 0 1998: 1998: S1: 50 S2: 36 S3: 7 S4: 7 1999: 1999: S1: 33 S2: 63 S3: 4 S4: 0	
Prentice J ⁵ (2000) WA	AH	X Obs, P, Pd ✓ All inpatients	Skin inspection 2 nurses Chart audited IRR: Stated Education & formal testing process	Pre-test: 452 Post-test: 397	Pre-test: 26.5 Post-test: 22	NPUAP '97	Yes	Pre-test: 25 sacrum 20 heels 10 elbows S4: 4 Post-test: 31 sacrum 23 heels 7.5 elbows 38.5 other	Pre-test: 25 sacrum 20 heels 10 elbows S4: 4 Post-test: 31 sacrum 23 heels 7.5 elbows 38.5 other	
McErlean B ⁵⁹ (2002) SA	AH	NS	Skin inspection 1 nurse Chart audit IRR: Not done	216	Dec 2000: 29.6 Data for repeat audits not clear	NPUAP	Yes	S1: 49.1 S2: 46 S3: 5 S4: 0	S1: 49.1 S2: 46 S3: 5 S4: 0	

Key: M=maternity, Ob=Obstetric, P=psychiatry, Pd=paediatric, NS=Not stated
 AH=acute hospital, HHCA=home health care agency, ICU=intensive care unit, NH=nursing home, PCU=palliative care unit, RH=rural hospital
 IRR=interrater reliability, P=prevalence, O/A=on admission, IAEI=International Association Enterostomal Therapists

These variations relate to:

- The time of year i.e. summer or winter.
- The method of surveillance employed when observing the patient's skin i.e:
 - one nurse versus two nurses;
 - inspecting the skin of all consenting patients;
 - only inspecting the skin of those patients identified by ward staff as having a pressure ulcer;
 - re-inspection of patient's skin in the presence of reactive hyperaemia after a stated period of time.
- The recording of all pressure related tissue injury located anywhere on the body or only that which was found over bony prominences.
- The inclusion or exclusion of Stage 1 pressure ulcers.
- The data collection tool(s) used and whether these were tested in a pilot study before being used.
- The degree to which data collectors were educated and tested for their ability to collect the data in a reliable manner.
- The manner in which the data were analysed and reported^{16, 22, 28, 69-71}.

An Australian model for conducting pressure ulcer prevalence surveys

The following model for conducting point prevalence pressure ulcer surveys was developed as part of a broader study, *An Evaluation of Clinical Practice Guidelines for the Prediction and Prevention of Pressure Ulcers*, conducted in 2000⁵ [Prentice J Unpublished thesis, 2003], which evaluated the Australian Wound Management Association's (AWMA) *Clinical Practice Guidelines for the Prediction and Prevention of Pressure Ulcers*⁷². While a short description of the overall study design is provided, the primary focus of this paper is to describe the methods used to assess pressure ulcer prevalence in the above study.

Table 4. Common methodological factors involved in conducting pressure ulcer prevalence surveys^{7, 67, 68}.

- Numerator and denominator for the measure of frequency.
- Sample size or population to be surveyed.
- Inclusion and exclusion criteria.
- Ethical issues.
- Timeframe and endpoints for the study.
- Piloting data collection and analysis methods.
- Pressure ulcer classification system used.
- Conduct a prospective observational audit.
- Conduct a retrospective chart audit.
- Conduct the audit by paper or phone questionnaire.

Overall study design

The above study was a prospective quasi-experimental study with a pre-test/post-test design. Pre-test surveys of staff knowledge of pressure ulcers (n=10 hospitals) and the prevalence of pressure ulcers (n=5 of the 10 hospitals) were compared to the results of post-test surveys. The pre-test/post-test surveys were conducted 6 months apart using the same methodological approach. The interventions used in this study consisted of the AWMA pressure ulcer guidelines and a 6 month education programme to facilitate implementation of these guidelines into only five of the 10 hospitals admitted to the study. The study was designed to ascertain any effect the AWMA guidelines may have on changing staff knowledge and reducing pressure ulcer prevalence when introduced with an accompanying education programme in selected Australian hospitals.

The relationship to this study of the principles, benefits and methods for implementing clinical practice guidelines – inclusive of pressure ulcer guidelines, which have been discussed previously by the author⁷³ – in conjunction with an education programme will be presented as a sequel to this paper at a later date. In addition, limited results of the prevalence survey will be presented for the same reason.

Study hypothesis

The introduction and effective use of the *Clinical Practice Guidelines for the Prediction and Prevention of Pressure Ulcers* can reduce the prevalence of pressure ulcers within Australian teaching hospitals. The aims of this study were:

- To determine whether, with the introduction of Australian guidelines for predicting and preventing pressure ulcers together with an education programme, there was:
 - a reduction in the prevalence of pressure ulcers.
 - a change in the clinical practice and knowledge of medical and nursing staff.

Study background and hospital selection

Between January and December 1999 ethical approval was gained from 10 acute adult tertiary teaching hospitals located in Perth, Melbourne, Brisbane and Sydney. Selection criteria were based on the following demographic factors: the geographical location of the hospital; whether the hospital was public or private; the accreditation status of the hospital; approximate number of inpatient beds; the similarities between patient populations and Diagnostic Related Groupings; the hospitals' experience in managing pressure ulcers; and what pressure ulcer management protocols were in place.

In addition, decisions regarding which of these 10 hospitals (n=5) would be surveyed for pressure ulcer prevalence rested on: patient numbers to meet sample size requirements; the hospital's ability to fund the pre-test set of prevalence surveys; their ability to undertake a 6 month education programme to implement the AWMA guidelines; and the need maintain a balance between the number of public and private hospitals in each group. These same hospitals also had their staff surveyed for their knowledge of pressure ulcers.

The other five hospitals would only participate in the pre/post-test staff surveys. They received the pressure ulcer guidelines to determine if the guidelines alone impact on staff knowledge; however, no assistance to implement the guidelines was given.

Co-investigators

For the purpose of the study the term 'co-investigator(s)' referred to nurses who agreed to facilitate the study in their hospital should ethical and hospital approval be given¹³.

Method: pressure ulcer prevalence surveys

Planning pressure ulcer prevalence surveys

Pressure ulcer prevalence surveys require considerable planning to ensure they are efficiently and effectively executed. Table 5⁷⁴ identifies the processes that need to be considered when planning pressure ulcer prevalence surveys. Similarly, this study established formal protocols that identified:

- A schedule for conducting the pre and post-test prevalence surveys.
- The approximate number of surveyors required to conduct these surveys at each site.
- The format for the education programme for surveyors.
- The need for a post survey debriefing of surveyors.
- The need for meetings with directors of nursing and other hospital personnel before and after each prevalence survey.
- A method for co-investigators to receive and to return study documents by registered mail.
- A fee for service for staff conducting the post-test prevalence surveys as well as a proportion of co-investigators' time in facilitating the study at all 10 hospitals.

Pressure ulcer prevalence survey schedule

When conducting a multi-centre study it is important to specify the data collection period¹⁶ to ensure data are collected within a defined period of time to avoid variations in seasonal activity.

In this study, a flexible schedule for each prevalence survey was provided to co-investigators well in advance of the

survey dates. One week was set aside to prepare and conduct the prevalence surveys at each hospital. Data were collected on a rotational basis across Australia, beginning and ending with hospitals in Perth.

The overall data collection period for the pre-test surveys, however, was 10 weeks. This was due to the need for the author to be available to implement the pressure ulcer guidelines and accompanying education programme (which then continued for the next 6 months) at each hospital in the week immediately after the pre-test prevalence surveys had occurred.

The prevalence surveys were conducted on a Thursday at each hospital between 0600 and 1700 hours. In general all acute surgical, medical, orthopaedic, vascular, renal, respiratory, oncology and aged care and rehabilitation wards at each site were surveyed as were most emergency, intensive and coronary care units. A large acute and rehabilitation spinal unit were also included. Where there were two hospital campuses located on different sites, the surveys either continued over to the next day or were conducted one week apart.

The post-test prevalence surveys were conducted 6 months after the pre-test surveys and the implementation of the guidelines using the same data collection methods and study protocols. The data collection period for the post-test survey was 6 weeks as one facility with two campuses required 2 weeks to conduct their survey.

Table 5. Key concepts or processes in planning pressure ulcer prevalence surveys.

- Identify need or purpose for conducting the survey.
- Develop plan for conducting the survey.
- Develop, validate and print data collection form(s).
- Develop and print prevalence survey protocols.
- Develop education programme and educational resources for surveyors/data collectors.
- Develop interrater reliability test method.
- Compose a patient information sheet.
- Compose a patient consent form (if required).
- Identify how the surveys will be monitored.
- Provide an estimate of the resources required and cost of conducting a prevalence survey(s).
- Submit proposal for prevalence study to relevant ethics committee(s).
- Identify resources and programmes for data entry and data analysis.
- Compose report containing results and recommendations.

Sample size for the pressure ulcer prevalence surveys

In conducting single or multi-centre pressure ulcer prevalence surveys that intend to measure the difference that an intervention may make, calculating the sample size required to show any difference that is statistically significant is important⁶⁹. The sample size of patients required for the pressure ulcer prevalence component of the study was calculated using data collected from the last pressure ulcer prevalence survey conducted at nine of the 10 participating hospitals. From these studies it was estimated that an average prevalence of approximately 12% would be found. Assuming an initial prevalence of 12%, the sample size was calculated to give an 80% chance of detecting a reduction in prevalence of 25% (from 12% to 9%) at 95% confidence intervals. The minimum number of patients required, therefore, was 1700 patients in both the pre-test and post-test prevalence survey groups.

Inclusion and exclusion criteria

All consenting adult inpatients on the day of the prevalence survey were included in the study. Excluded from the study were children, maternity and psychiatric patients, and patients admitted to the emergency department of one hospital (A) during both surveys.

Ethical considerations

Assessment of skin integrity is a fundamental nursing function and a non-invasive investigation²². On this basis, nine Ethics Committees approved patients giving verbal consent to participate in the study. One hospital required patients to sign a consent form for the pre-test survey; a decision which was later reversed for the post-test survey. Approval to collect demographic data and audit the medical and nursing record of patients seen was given. No patient identifying data would be kept and all data would be stored securely.

Patient information letter

A standardised letter of invitation to participate in the study was delivered to all inpatients within the designated clinical areas the day before the survey or on the day of survey if the patient had been admitted to an emergency department, day surgery or short stay unit. The letter explained in simple terms what pressure ulcers are, who they affect, and the nature and purpose of the study. On the survey day, patients were asked if they had understood the letter and whether they would consent to a skin inspection. If patients had not understood the letter or the purpose of the study, further explanation was provided. Where there was a known language barrier, a relative or interpreter was used to communicate with the patient. If the patient was incapacitated due to their medical state, then the letter was given to the next of kin or nearest relative.

Pressure ulcer prevalence data collection form

The pressure ulcer prevalence data collection form was a three page document. Data were collected on 24 different variables. Components of this tool were adapted from McGowan's⁵³, and Morey & Porock's⁵⁴ tools with permission. On the back of the data collection form was a diagram which contained a key to anatomical sites on the body. This was provided as an *aide mémoire* for surveyors to assist them to define the correct location of any pressure ulcers found^{53,75}.

The prevalence data collection form was designed to be scanned electronically using an optical mark recognition program, Remark OMR 5™ [(Windows 95 or later), Principia Products, PA 19301, USA, 2000] to facilitate data entry, data analysis and reduce human error (Appendix 1).

Validity of the pressure ulcer data collection form

Content validity of the pressure ulcer data collection form was assessed by four clinicians experienced in pressure ulcer research; three of whom resided in Australia and one in the United Kingdom. One reviewer was a geriatrician, one a coordinator of nursing research, one a clinical lecturer at a tertiary education facility, and the other a wound care consultant.

They were asked to critique the data collection form for ease of reading and comprehension of questions, and determine if the form was 'user friendly'. No amendments were suggested following this review. The data collection form was also subjected to a pilot study at Fremantle Hospital, following which minor amendments to the order of the questions were made.

Training staff to conduct pressure ulcer surveillance

The importance of training personnel to rigorously conduct pressure ulcer prevalence surveillance can not be overstated. It is critical in ensuring the collection of valid reliable data.

Surveyors/data collectors for the prevalence surveys

Each hospital participating in the pressure ulcer prevalence surveys provided nursing staff to act as surveyor/data collectors. The number of nurses required at each site was based on the number of wards or units to be surveyed; two nurses would be required to examine each patient. In circumstances where there were insufficient nurses to provide two nurses per unit, teams of two nurses surveyed two or more wards or units.

The minimum requirement for surveyors was that they be a Registered Nurse Division 1 or a registered Enrolled Nurse (dependent on the Nurses Board classification in each State). Irrespective of their clinical designation, all potential surveyor/data collectors were required to complete the surveyor education programme and competency tests and abide by the study protocols.

Education programme for surveyors/data collectors

An education programme to train nurses to inspect patients' skin for signs of pressure related tissue injury and function as surveyor/data collectors for the pressure ulcer prevalence survey was developed. The purpose of this programme was to ensure consistency in: information given to all potential surveyors; the application of the inter-rater reliability (IRR) education and test methods; processes for skin inspection; and data collection across all sites²².

The education programme (approximately 3 hours' duration) included revision of the:

- Aims of the study.
- Anatomy and physiology of the skin.
- Definition of a pressure ulcer.
- A discussion regarding the IRR testing process^{28, 76}.
- Staging of pressure ulcers according to the National Pressure Ulcer Advisory Panel (NPUAP) classification system⁷⁷.
- Clinical descriptions of pressure ulcers and wounds that could be mistaken for pressure related tissue injury.
- Data collection form and study protocols.

IRR education and testing of surveyors/data collectors

IRR education and testing of nurses was conducted to ensure agreement between surveyors when identifying or subsequently classifying pressure ulcers into a defined stage of tissue damage⁷¹. Staging of pressure ulcers is an acquired skill that encompasses the use of both visual and tactile assessments of the ulcer. The classification system used in this study to identify and stage pressure ulcers was the four-stage system developed and refined by the NPUAP (USA)⁷⁷.

It was impressed upon potential surveyors that, in clinical practice, all defining characteristics of a Stage 1 pressure ulcer needed to be rigorously assessed. In particular, the identification of changes in skin temperature, changes in tissue turgor, and alterations in sensation in or around an affected area were stressed as being equally important as recognition of changes in skin colour. Palpation of discoloured skin and comparison with the opposite or adjacent areas of skin was advocated to determine the presence of these changes in the skin^{77, 78}.

Two other significant clinical parameters in ulcer identification were highlighted. Firstly, in the presence of reactive hyperaemia surveyors (on the day of survey) would be required to reposition patients off the affected area. After a period of 30 minutes, the affected anatomical site was to be re-examined for evidence of residual non-blanchable erythema. This was of prime importance to ensure that

normal reactive hyperaemia was not mistaken for a Stage 1 pressure ulcer⁷⁹⁻⁸².

The second point related to eschar. Eschar was defined as dry necrotic tissue that formed a thick, hard, leathery black membranous cover. The presence of eschar in or covering a pressure ulcer prevents accurate assessment of the depth of the ulcer^{22, 78}. For the purpose of this study, these ulcers were automatically classified as Stage 4 pressure ulcers as opposed to being classified as non-stageable ulcers^{20-22, 72, 78}. Other limitations to staging such as identifying erythema in darkly pigmented skin and the staging of healing ulcers were reviewed in detail^{72, 77}.

IRR test and re-test processes

Two forms of assessment were combined into one test to assess potential surveyors' competency in classifying pressure ulcers. The first component of the test was a written multi-choice test. This required nurses to identify which definition, from a choice of four similarly worded definitions, best described a Stage 1, 2, 3 or 4 pressure ulcer according to the NPUAP's classification system. This was designed to assess nurses' comprehension of pressure related tissue damage in the layers of the skin and the underlying tissues⁸³. This component of the test is a new initiative of the author and has not previously been described in the pressure ulcer literature before now.

The second component of the test, which is the most quoted form of inter-rater assessment used for pressure ulcer prevalence surveys, required surveyors to demonstrate their ability to assess and stage ulcers correctly from clinical slides^{26, 53, 54}. Sixteen slides were shown. Nurses marked their responses to both test methods on a single question and answer sheet (Appendix 2). The test was marked 1 of 20, with one mark assigned to each multi-choice question and slide shown. Surveyors needed to achieve at least 80% in the test in order to function as a surveyor. Those who did not pass the initial test were re-educated and re-tested^{54, 60}.

Educational materials

The materials used in the education programme were drawn from a number of sources. Slides (35mm) on the definition of a pressure ulcer, staging of pressure ulcers and limitations to staging were extrapolated from the AWMA guidelines. The anatomy and physiology of the skin were described using commercially available slides. Senior doctors and nurses, independent of the study, validated the slides used as clinical illustrations of pressure ulcers in the education programme and IRR testing process. Further validation of these slides occurred during the pilot study, after which three slides were removed, replaced and revalidated. Different sets of slides

were used in the education programme and IRR testing to reduce the 'retained image' or memory factor⁷¹ when slides are used in this manner.

An education pamphlet incorporating the NPUAP classification of pressure ulcers, the AWMA's schematic representation of each ulcer stage accompanied by a clinical slide, and a list of the limitations to staging, as described within the AWMA pressure ulcer guidelines, was compiled into a new and unique tool to supplement the education process. This pamphlet was given to each potential surveyor to study prior to completing their competency test on the staging of pressure ulcers. The pamphlet was also used as an *aide mémoire* during the prevalence survey¹⁴.

An overhead projector and acetates of the study protocols and data collection forms were used to review these documents with staff once they had been accepted as surveyor/data collectors for the pressure ulcer prevalence surveys.

Pressure ulcer prevalence survey protocols

Surveyors were issued with a written protocol to follow on the day of survey^{53, 54} (Appendix 3). The first section, the *Survey Protocol and Guidelines*, provided surveyors with guidelines on how to conduct themselves throughout the survey process. The second section, *Guidelines for Data Entry*, provided definitions for terms used on the data collection form and guidelines for entering and checking completeness of data collected. In addition, issues relating to occupational health and safety, infection control and adverse events were discussed. Co-investigators at each site were nominated as contact persons in the event of an adverse event.

Distribution and return of pressure ulcer prevalence data collection forms

Data collection forms for each clinical area were distributed in labelled envelopes to each pair of surveyors. Surveyors recorded in the appropriate place on the label the numbers of: beds in the ward; beds occupied; patients on the ward (obtained from the ward census); patients seen; patients absent from an area; patients who refused a skin inspection and why, and the names of the surveyors. Surveyors delivered their completed forms in their respective envelopes to a central point at each site. Arrangements were made for co-investigators to return data to the author by registered mail.

Skin inspection, identification and recording of pressure ulcers

To prevent bias, surveyors were grouped in pairs^{25, 42} to conduct the skin inspections and, in general, did not survey patients in their own or colleagues wards⁵⁴. Each surveyor independently completed a systematic examination of the

patient's skin, and determined the stage of any ulcers found. Surveyors then compared their findings with one another before completing the form. Where surveyors had difficulty in determining the stage of a pressure ulcer, the author, along with her partner surveyor, provided a second opinion. Before leaving the ward, surveyors were requested to check their forms for missing data.

Debriefing of surveyor/data collectors

After each survey, a debriefing of the survey process occurred, which assisted in identifying any difficulties with the survey process. Secondly, it provided valuable anecdotal information to co-investigators on pressure ulcer management and other pertinent but unrelated information about work processes and patient care in their respective hospitals.

Monitoring of pressure ulcer prevalence surveillance processes

The author supervised and participated in all the pre and post-test pressure ulcer surveys to ensure consistency in the delivery and interpretation of the study methods, protocols and data collection processes¹⁴.

Collation of pressure ulcer prevalence data on site

A simple spreadsheet was devised which allowed the author to manually collate and determine the prevalence of pressure ulcers found immediately after the completion of each survey. This sheet recorded: hospital name; ward; bed numbers; bed occupancy; patients seen; patients with ulcers; ulcer sites; numbers of each stage of ulcer found; the total number of ulcers found, and the individual prevalence found for each ward as well as the overall prevalence for each hospital.

This enabled results of surveys to be given to each co-investigator the next day facilitating communication of results to directors of nursing, ward staff and other relevant personnel. This information formed the basis for discussions for identifying potential strategies for change in pressure ulcer management in each facility and for refining the content of the education programmes. Secondly, it enabled scrutiny of the data collection forms and identification of missing data or other discrepancies which allowed missing data to be retrieved where possible and for any discrepancies to be investigated and corrected.

Meetings with hospital personnel

Meetings with members of the hospital executive, nursing executive, coordinators of education or quality assurance units and the author occurred during each survey period. The purpose of these meetings was to:

- Revisit the aims of the study.
- Formally present the AWMA guidelines and generate support for their implementation during the study.
- Discuss the prevalence found and other deficits of care in relation to pressure ulcers.
- Discuss recommendations and potential strategies for change in relation to the prediction and prevention of pressure ulcers.

Data analysis pressure ulcer prevalence data

All qualitative and quantitative data, which could not be scanned using Remark OMR 5 was entered into Microsoft Excel (Windows 2000) spreadsheet. All quantitative data, which could be scanned from the prevalence surveys, was scanned and processed in Microsoft Excel prior to being imported into SPSS for Windows Version 10. The qualitative and quantitative data were combined to form one database for each survey in SPSS in preparation for data analysis. SPSS was used for descriptive statistics and Chi square analyses.

Results

This report provides only a limited summary of the findings of the reliability for the data collection method and the prevalence of pressure ulcers. A full report of these results will be provided in a separate article.

IRR testing

Only 49% (n=52) of nurses achieved an 80% or higher pass mark in the pre-test survey IRR test. Fifty one percent (n=54) achieved less than 80%. When these nurses were re-educated and re-tested, the overall pass rate rose to 97%. Three nurses failed the second test. In the post-test survey IRR test, 83% of nurses (n=85) achieved a pass mark of 80% or higher. Only 1 of the 17 nurses (17%) who were re-educated and re-tested failed to achieve the required 80%. Therefore, 99% of nurses tested met the study requirements in relation to IRR (Table 6).

The above results have been refined further to ascertain nurses' understanding of the definitions of each stage of pressure ulcer and their ability to stage pressure ulcers from 35mm slides. Only 57.5% of nurses in the pre-test survey correctly identified all four NPUAP definitions for Stage 1 to 4 pressure ulcers. This rose to 71.5% in the post-test survey (Table 7).

In regard to staging ulcers from 35mm slides, only 5% (n=5) of nurses identified all 16 images correctly on the initial test in the pre-test survey. Overall in this section just 44% (n=47) achieved a total of 80% correct responses, whilst 56% (n=59) scored less than 80%. In the post-test survey (initial test) 11%

(n=11) of nurses achieved 100% in staging all ulcers; 81% (n=83) scored 80% or more and 17% (n=17) achieved less than 80% (Table 8).

Hospital demographics

Approximately 2207 beds across five hospitals were made available for the pre-test survey. The bed occupancy was at 90%. Over 85% of the patients in these beds were included in the prevalence survey (n=1706) (Table 9). In the post-test survey, 90% of the occupants (n=1807) agreed to a skin inspection. Slightly fewer people declined to participate than in the pre-test survey (Table 10). The main reasons given for non-participation in the study included imminent death, too ill, no particular reason and no interest in research.

Pressure ulcer prevalence

In the pre-test prevalence survey, a total of 1706 patients were seen, 452 of whom had one or more pressure ulcers giving a prevalence of 26.5% (range 13.5% to 36.7%). Six months post implementation of the AWMA guidelines and education programme, the post-test prevalence was 22% (range 16.9% to 31.9%) with 397 patients having a pressure ulcer from a total of 1807 patients seen (Table 11). The difference in pressure ulcer prevalence by Pearson Chi-Square analysis is statistically significant; $p < 0.002$ (Table 12).

Discussion

Variations in methods used to conduct pressure ulcer prevalence surveys have contributed to significant differences in the reported results of previous surveys^{10, 22, 69, 84}. These variations include skin inspection versus retrospective chart audit for detecting pressure ulcers; paper surveys or telephone questionnaires; inclusion and exclusion criteria; the stage or grading systems used to classify pressure ulcers; and decisions to exclude Stage 1 pressure ulcers from the data collection or analysis processes. Study instruments, staff training, measures of IRR, sources and completeness of data examined and demographic differences in observed populations are other compounding factors^{7, 16, 22, 28, 69, 70}. That the terms 'prevalence' and 'incidence' are used interchangeably in study designs and study results, and the manner in which prevalence is calculated and reported, adds to the confusion^{6, 69, 85}. Notable authors in the field of pressure ulcers have identified the need to address this issue and eliminate some of these reoccurring anomalies^{86, 87}.

The methodology, data collection tools and survey protocols, which were developed and used in this study to conduct the pre-test/post-test pressure ulcer prevalence surveys, aimed to reduce the number of methodological anomalies described

above. Pressure ulcer prevalence survey methods used by other researchers, which had produced consistent results or whose methods were frequently referred to in the literature, were examined for common characteristics^{19-22, 41, 42, 53, 54}.

Common characteristics found were the use of either NPUAP⁷⁷ or IAET⁸¹ method of classifying pressure ulcers; inclusion of Stage 1 pressure ulcers; the importance of distinguishing between normal reactive hyperaemia and a Stage 1 pressure ulcer; descriptions of the processes used to educate and assess IRR; two people to independently inspect the patient's skin, and that nurses did not survey patients under their care or within their own ward area.

The pressure ulcer prevalence survey tool described in Appendix 1 was designed to capture generic patient data such as age, gender, admission type, diagnosis and medical specialty. The tool was also designed to reflect and assess features of the AWMA guidelines for pressure ulcers⁷² by asking specific questions relating to; skin colour (white, black, light olive or dark olive); pressure ulcer risk assessment status between the first and third day of admission; which risk assessment tool was used; patients' ability to reposition themselves; the presence and type of support surface in use, and evidence of documentation of the existence and management of the pressure ulcer.

Although most pressure ulcers are located over bony prominences, the list of potential sites was expanded to capture data on other areas of the body where the reported incidence of pressure ulcers has risen i.e. the ears and chin. Provision was also made for pressure ulcers found on less usual sites of the body to be recorded. This list corresponded with the *aide mémoire* of anatomical sites described earlier^{53, 54, 75}. The number of ulcers found and whether they were hospital acquired or not were also recorded.

The layout of the tool was designed to facilitate ease of data collection and data extraction and was formatted to be read by an optical mark recognition program (Remark OMR).

The pressure ulcer prevalence survey protocols and guidelines for data entry were produced to facilitate a standardised approach to the survey and data collection processes, to facilitate a common understanding of the terminology used in the data collection tool, and to ensure patient comfort was maintained at all times. Elements of these tools were adapted with permission from those used by McGowan⁵³ and Morey & Porock⁵⁴ in conjunction with the authors' knowledge of such surveys.

High levels of agreement between surveyors, when identifying and classifying pressure ulcers during pressure ulcer prevalence surveillance, is essential. This reduces the margin for error in misdiagnosing pressure related tissue damage, particularly Stage 1 pressure ulcers, and in misclassifying

Table 6. Overall results of IRR tests: initial tests.

Overall IRR test results $\geq 80\%$	% nurses			
	Pre (n=106)		Post (n=102)	
100	5	5	11	11
95	4	4	12	12
90	12	13	28	29
85	15	16	21.5	22
80	13	14	11	11
<80	51	54	16.5	17
Total	100	106*	100	102

* Missing data =1

Table 7. Nurses' ability to comprehend the definition of Stage 1-4 pressure ulcers: initial test.

NPUAP definitions Ulcer Stages 1-4 (%)	% nurses			
	Pre (n=106)		Post (n=102)	
100	57.5	61	71.5	73
75	27	29	21.5	22
50	11	11	5	5
25	3.5	4	2	2
0	0	1	0	0
Total	99.5	106*	100	102

* Missing data =1

Table 8. Nurses' ability to correctly stage 16 images of pressure ulcers: initial test.

Images of ulcers Ulcer Stages 1-4 (%)	% nurses			
	Pre (n=106)		Post (n=102)	
100	5	5	11	11
95	6	6	12	12
90	4	4	28	29
85	16	17	21.5	22
80	14	15	11	11
75	20	21	6	6
70	18	19	5	5
65	8	9	2	2
60	1	1	1	1
<55	8	9	3	3
Total	100	106*	100	102

* Missing data =1

ulcers between Stages 1 and 2, and Stages 3 and 4. Acceptance of the validity of the prevalence data is greater where the methods for IRR and data collection processes have been well described^{7,88}.

The education and testing of surveyors and the use of two surveyors per patient, for instance, has been described in more detail in pressure ulcer prevalence studies conducted in Western Australia^{53,54,60} than in other studies conducted in Australia. This may account for the lower prevalence of pressure ulcers found in these studies^{51,52,55-57,61-64}. The exception to this is a later study conducted by McErlean *et al.*⁵⁹ where pressure ulcer prevalence was noted to be higher (Table 3).

The protocol for this study required nurses to achieve an 80% pass in the IRR test for the following reasons:

- Each of the participating hospital's experience in conducting pressure ulcer prevalence surveys varied, as did the processes used to ascertain agreement between surveyors when classifying pressure ulcers, if they were used at all.

- Not all hospitals were using the NPUAP classification system which was the protocol stipulated in this study.
- Nurses' knowledge of the integument has been described as questionable^{83,70}.
- The importance of stipulating a minimum level of agreement for surveyors to meet to ensure reliability and validity of the data collected.

As a result of the above, it was surmised that there would be significant variations in the knowledge, skill and experience of individual nurses in classifying pressure ulcers. This would also fluctuate between hospitals⁸⁹. A pass mark of 80% in this study was therefore seen as an achievable goal given the confounding factors listed above and the limited time and resources available with which to educate over 100 potential surveyors Australia wide; this level of agreement had been cited previously in the Australian literature^{54,60}.

The results of the IRR tests in both the pre and post-tests surveys of this study would indicate that Australian nurses have a significant deficit in knowledge in relation to

Table 9. Pre-test survey: hospital demographics.

Hospital code	No beds in survey	Bed occupancy (% B O/R)		No patients whose skinl examined (R/R %)		No patients refused skin examination (% B O/R)		Patients absent from ward (% B O/R)		% total patients examined
A	725	629	87.0	579	92.0	27	4.0	23	4.0	34.0
B	342	308	90.0	231	75.0	39	13.0	38	12.0	13.5
C	420	393	93.5	332	84.0	31	8.0	30	8.0	19.5
D	393	359	91.0	307	85.5	33	9.0	19	5.5	18.0
E	327	306	93.5	257	84.0	32	10.5	17	5.5	15.0
Total	2207	1995	90.0	1706	85.5	162	8.0	127	6.0	100.0

B O/R = Bed occupancy rate R/R = Response rate

Table 10. Post-test survey: hospital demographics.

Hospital code	No beds in survey	Bed occupancy (% B O/R)		No patients whose skinl examined (R/R %)		No patients refused skin examination (% B O/R)		Patients absent from ward (% B O/R)		% total patients examined
A	721	648	90.0	599	92.0	25	4.0	24	4.0	33.0
B	364	307	84.0	248	81.0	15	5.0	44	14.0	14.0
C	425	378	89.0	342	90.5	21	5.5	15	4.0	19.0
D	394	350	89.0	318	91.0	19	5.0	13	4.0	18.0
E	342	319	93.0	300	94.0	11	3.5	8	2.5	17.0
Total	2246	2002	89.0	1807	90.0	91	4.5	104	5.0	100.0

B O/R = Bed occupancy rate R/R = Response rate

understanding the morphological differences between a Stage 1 to 4 pressure ulcer and the accompanying clinical definitions. Nurses appeared in many instances to have had difficulty in relating the definition of Stage 1 to 4 pressure ulcers to the image of the ulcers shown. This is evidenced by the number of nurses who failed to achieve an 80% pass mark in the first test in the pre-test survey. A significant improvement in the results of the IRR process was seen in the second survey, where fewer nurses (many of whom had participated in the pre-test survey) were required to undergo re-education and re-testing. These results reinforce the above arguments for the adopting the protocols used to assess IRR in this study and highlights the need for future studies to adopt the same degree of rigour.

The methodology used in this study to assess the prevalence of pressure ulcers was consistent with that used in Western Australia^{53, 54, 60} and with major international multi-centre prevalence studies^{19-22, 41, 42}. This approach identified consistent ranges of pressure ulcer prevalence between four of the five hospitals (Table 11). One hospital in Western Australia (A), which had considerably lower prevalence range in the pre-test survey compared with the other four hospitals, had been proactive in pressure ulcer prevention strategies over many years. Their data, however, are comparable to other teaching hospitals in Western Australia^{5, 53, 54}. In the post-test surveys, data from hospitals D, C and E are more comparable with hospital A.

The results of this study have identified that the prevalence of pressure ulcers in acute tertiary teaching hospitals in Australia is much higher than previously thought⁵. The results of the McErlean *et al.* study⁵⁹ are consistent with the results found in this study. Secondly, this methodology has been proved successful in assessing the effectiveness of the AWMA guidelines in reducing the prevalence of pressure ulcers in adult patients in acute teaching hospitals. Those hospitals which have continued with their education programmes and annual prevalence surveys using these methods have experienced further reductions in pressure ulcer prevalence [personal communication] Graham, NSW and N Cruickshank, Western Australia].

Additional benefits from this study relate to improvements in pressure ulcer risk assessment, use of support surfaces and documentation of pressure ulcers between the pre-test and post-test surveys. All of which may, in conjunction with the education programme, have contributed to the reduction in pressure ulcer prevalence⁵ (Prentice JL, unpublished thesis 2003).

This model is suitable for single facility use; State-wide assessments of public health facilities; corporate hospital groups in the private sector; nursing homes and community care agencies. It could also be adapted to develop a national framework for conducting compulsory audits of pressure ulcer prevalence surveillance as it has been tested nationally. If used as the basis for larger multi-centre studies, the pressure ulcer prevalence data collection form would need some modification as it currently captures information that the author would deem to be superfluous to such studies.

The validity of this methodology overall and its applicability to other patients populations is currently being tested by other researchers in a domiciliary environment (Lewin G & Carville K, Silver Chain Nursing Association, Western Australia), and in a residential home care setting for high care, low care and young disabled patients (Harris S, Brightwater Care Group, Western Australia).

Successful adoption of clinical practice guidelines depends on many factors, mainly institutional support, but inclusive of human and financial support, the use of a dedicated education programme to facilitate guideline implementation and the championship of clinical or opinion leaders⁹⁰⁻⁹². In this study, the hospitals that devoted the most time and resources to the education programme achieved the greatest reductions in pressure ulcer prevalence⁵ [Prentice J, unpublished thesis, 2003]. The education programme must involve all relevant hospital personnel not just clinicians in order that the CPG is effectively adopted into clinical practice.

Study limitations

This study was subject to a number of limitations. In relation to the pressure ulcer prevalence surveys, these were as below.

Financial constraints

Finite financial resources were available to conduct this study. Lack of funds prohibited a randomised controlled trial of the efficacy of the AWMA guidelines in reducing pressure ulcer prevalence and improving staff knowledge in the 10 hospitals enrolled in the study. It was for this reason that a pre-test/post-test study design was chosen, and why only five hospitals were selected to be surveyed for pressure ulcer prevalence and receive the education programme to facilitate guideline implementation as described.

IRR testing

This again was limited by insufficient financial resources and time to independently verify, in the clinical setting, the IRR and intra-rater reliability of each individual nurse or team of

nurses in staging pressure ulcers. This was assessed from a theoretical perspective only as previously described. However, in the few instances where the author was asked to independently assess and stage an ulcer to verify the surveyor's assessment, there was complete agreement with the original assessment made (n = 6).

Conclusion

This paper aimed to describe a proven methodology for conducting point prevalence pressure ulcer surveys in Australian health care settings. The methodology discussed was part of a larger study assessing the efficacy of Australian guidelines for pressure ulcers on pressure ulcer prevalence and staff knowledge of pressure ulcers when implemented in conjunction with an education programme.

The advantage of standardising the methodology for this multi-centre study is that data from the pre-test/post-test pressure ulcer prevalence surveys can be compared between each participating facility and between each survey. These data can also be compared at a future date with data obtained from other studies currently in progress that used these same methods. This will give rise to a situation where, for the first time in Australia, there will be a substantial national bank of pressure ulcer prevalence data that can be benchmarked between different patient populations and between different clinical settings. This will significantly improve our understanding of the magnitude of the problem of pressure ulcers in Australia. Furthermore, greater insight into the potential ramifications of these iatrogenic injuries to patients, patient care activities and health care providers will be afforded.

The findings of this study highlight the need to formally sanction the assessment of pressure ulcers as a clinical indicator in Australian health care settings, and add weight to the argument for the establishment of a national database for pressure ulcer prevalence. It also reinforces the need to use uniform pressure ulcer prevalence surveillance methods that meet international standards.

Table 11. Distribution of pressure ulcer prevalence by hospital by survey.

Hospital code and location	Patients seen		Patients with pressure ulcers		% pressure ulcer prevalence	
	Pre	Post	Pre	Post	Pre	Post
A (Perth)	579	599	78	101	13.5	16.9
B (Melbourne)	231	248	72	79	31.2	31.9
C (Sydney)	332	342	122	101	36.7	29.5
D (Brisbane)	307	318	100	55	32.6	17.3
E (Perth)	257	300	80	61	31.1	20.3
Totals	1706	1807	452	397	26.5	22.0

Table 12. Pressure ulcer present on skin examination by survey.

Pressure ulcer present?	Pre-test survey (%)		Post-test survey (%)		χ^2 (Pearson)
Yes	452	26.5	397	22	p<0.002
No	1254	73.5	1410	78	
Total	1706	100	1807	100	

Finally, the methodology used in this study has been shown to be an effective way of implementing and assessing the efficacy of Australian clinical practice guidelines for pressure ulcers. These guidelines, in conjunction with an education programme, were motivational in changing hospital policy and clinical practices which resulted in a statistically significant reduction in pressure ulcer prevalence.

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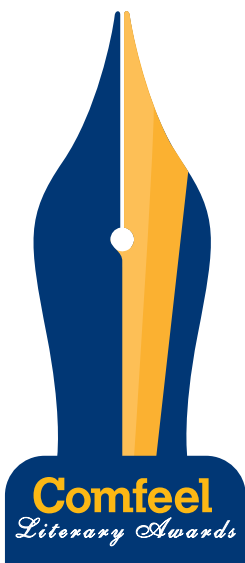
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Manuscripts are to relate to a case study, clinical research or a subject review.

Authors are required to be members of the Australian Wound Management Association (AWMA), and their work must have been undertaken within Australasia.

Awards will be made annually, based on published articles in each calendar year. The Editorial Board of *Primary Intention* will judge the manuscripts. One award will be for the best scientific paper and one for the best case study/review article. The judges' decision will be final.

Coloplast Pty Ltd manufactures the Comfeel Plus, Biatain, Contreet, SeaSorb and Purilon Wound Care dressings. Each dressing is part of the Coloplast wound care family, enabling an integrated solutions approach to wound healing. Coloplast Wound Care is committed to the development of excellence in wound management practices.

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Appendix 1. Pressure ulcer point prevalence survey tool.

Pressure ulcer point prevalence survey tool

Instructions: Please fill in the appropriate circle(s) using a dark pen e.g. Do not tick the circle. Complete this page for all survey patients.

1. Date of Survey: _____

2. Hospital Name: _____

3. Ward/Unit: _____

4. Date of Admission: _____

5. Age: _____ years

6. Type of Admission: Emergency Elective

7. Gender: Male Female

8. Skin Colour: White Black
Light Olive Dark Olive

9. Principal Medical Diagnosis: _____

10. Medical Speciality:

General Medical	<input type="radio"/>	General Surgery	<input type="radio"/>	ENT	<input type="radio"/>
Haem/onc/pall	<input type="radio"/>	Ophthalmology	<input type="radio"/>	Orthopaedics	<input type="radio"/>
Vascular	<input type="radio"/>	Cardiovascular	<input type="radio"/>	Gynaecology	<input type="radio"/>
Plastics	<input type="radio"/>	Urology	<input type="radio"/>	Respiratory	<input type="radio"/>
Neurology	<input type="radio"/>	Geriatric Medicine	<input type="radio"/>	Renal	<input type="radio"/>
Rehabilitation	<input type="radio"/>	Longterm Care	<input type="radio"/>	Interim Care	<input type="radio"/>
Spinal	<input type="radio"/>	Critical Care	<input type="radio"/>	Other:	<input type="radio"/>

(Please state): _____

11. Is there documented evidence of an assessment of the patient's level of risk for developing a pressure ulcer between the first and third day of admission?
Yes No N/A patient mobile, not at risk

12. If a risk assessment score or category of risk has been identified, which assessment tool was used?
Braden Norton Waterlow
Other (Please state) _____

12a. If a risk assessment was completed state the last date _____, patient score _____ and category of risk (e.g. High, Moderate or Low if using Braden Scale) _____

13. Can the patient independently reposition themselves?
Yes No

14. Is there evidence of the use of pressure reducing/relieving devices Yes No

15. Are pressure reducing/relieving device(s) currently insitu?
Yes No

16. If pressure reducing/relieving device(s) are present, please indicate TYPE of device(s) in use:

Foam overlay	<input type="radio"/>	Spenco mattress	<input type="radio"/>	Roho mattress	<input type="radio"/>
Egg crate mattress	<input type="radio"/>	Sheepskin	<input type="radio"/>	Roho boot	<input type="radio"/>
Foam boot	<input type="radio"/>	Sheepskin boot	<input type="radio"/>	Spenco boot	<input type="radio"/>
Gel protector	<input type="radio"/>	Roho cushion	<input type="radio"/>	Gel filled cush	<input type="radio"/>
Elb filled overlay	<input type="radio"/>	Vaperm mattress	<input type="radio"/>	Vaperm cush	<input type="radio"/>
Unidown	<input type="radio"/>	Transoft	<input type="radio"/>	Adapt 11	<input type="radio"/>
Ultra-Form	<input type="radio"/>	Maxifloat	<input type="radio"/>	Improtec	<input type="radio"/>
Starcare	<input type="radio"/>	Dynamic mattress e.g. Nimbus 11	<input type="radio"/>		
Pegasus Biwave Plus	<input type="radio"/>	Quattro Deep Cell 1000	<input type="radio"/>		
Accumax	<input type="radio"/>	Carewave Therapy	<input type="radio"/>	AlphaXcell	<input type="radio"/>
Speciality bed e.g. KinAir 111	<input type="radio"/>	Therapulse	<input type="radio"/>		
Clinitron	<input type="radio"/>	Static Overlay e.g. Therarest	<input type="radio"/>		

Other (Please state) _____

Addressograph
Write UMRN, Name and DOB if label not available

Complete physical skin examination as per guidelines (use 'key' diagram)

17. Is there evidence of a pressure ulcer on skin examination?
Yes No

Instructions: ONLY complete the next page if you have identified that the patient has a pressure ulcer(s).

18. Skin inspection: Refused (Please fill in circle)

OFFICE USE ONLY

	0	1	2	3	4	5	6	7	8	9
Q4	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Q5	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Q12a(i)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Q12a(ii)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Q12a(iii)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Only complete the following if pressure ulcer(s) is present

19. State site and classification of ALL pressure ulcers present on examination: (if site covered by a dressing ask nursing staff to describe ulcer and classify according to description given).

SITE: Please FILL the circle for the site AND L or R or Both where applicable. (See attached diagram).

CLASSIFICATION (Stages 1-4 see definitions). Fill the circle for the appropriate classification.

Site	Ulcer	L	R	Both	S1	S2	S3	S4
a. Occiput	<input type="radio"/>				<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
b. Ear	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
c. Chin	<input type="radio"/>				<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
d. Scapula	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
e. Spinous process	<input type="radio"/>				<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
f. Sacrum/Coccyx	<input type="radio"/>				<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
g. Iliac Crest	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
h. Elbow	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
i. Trochanter	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
j. Knee	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
k. Ischium	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
l. Lateral malleolus	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
m. Medial malleolus	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
n. Heel	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
o. Other (state site)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

20. Total number of pressure ulcers present following a skin examination _____

21. Were any of these pressure ulcers present on admission? (Ask patient or check documentation)
Yes No Unsure

22. If Yes, how many were present on admission? _____

22a. If Yes, state site of pressure ulcer present on admission:

1 _____ 2 _____
3 _____ 4 _____

23. State the date when the existence of the current pressure ulcer(s) was first documented _____

24. Is there regular documentation related to the progress or management of the pressure ulcer within the last 5 days?
Yes No

Thank you for your assistance with this survey. Your participation will make a significant difference to the body of knowledge that exists regarding the epidemiology and management of pressure ulcers in Australia.

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Appendix 2. Pressure ulcer prevalence survey IRR testing tool.

Pressure ulcer prevalence survey IRR testing tool

Date: _____ Hospital: _____
 Name: _____ Designation: _____

Pressure ulcers are classified by the depth of the tissue damage present. For the purpose of this study the staging of pressure ulcers will be consistent with the recommendations of the Australian Wound Management Association and the National Pressure Ulcer Advisory Panel, USA¹.

Q	Statement	Answer								
Q 1	Which statement best describes a Stage 1 pressure ulcer?	A	B	C	D					
	A Inflammation with local heat, erythema, oedema and possible induration – more than 15mm diameter.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>					
	B Discolouration intact skin (light pressure applied to the site does not alter the discolouration).	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>					
	C 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 or purple hues.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>					
	D Discolouration of skin, with persistent erythema after pressure is released. A blister maybe forming ^{1,2} .	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>					
Q 2	Which statement best describes a Stage 2 pressure ulcer?	A	B	C	D					
	A Partial thickness loss of skin layers involving epidermis and possibly penetrating into but not through the dermis.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>					
	B Partial thickness skin loss or damage involving epidermis and/or dermis. The ulcer presents clinically as a blister, abrasion, shallow ulcer, without undermining of adjacent tissue. Any of these may have underlying blue/purple/black discolouration or induration.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>					
	C Epidermis and/or dermis ulcerated with no subcutaneous fat observed.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>					
	D Partial thickness skin loss involving epidermis and/or dermis. The ulcer is superficial and presents clinically as an abrasion, blister or shallow crater ^{1,2} .	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>					
Q 3	Which statement best describes a Stage 3 pressure ulcer?	A	B	C	D					
	A Full thickness tissue loss extending through dermis to involve subcutaneous tissue. Presents as a shallow crater unless covered by eschar.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>					
	B Fat obliterated; limited by deep fascia; undermining of the skin.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>					
	C 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.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>					
	D Full thickness ulceration through to the junction with subcutaneous tissue ^{1,2} .	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>					
Q 4	Which statement best describes a Stage 4 pressure ulcer?	A	B	C	D					
	A Full thickness skin loss with extensive destruction, tissue necrosis or damage to muscle, or bone, or supporting structures (for example, tendon or joint capsule).	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>					
	B The lesion extends into the subcutaneous fat with lateral extension of the sore over the deep fascia.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>					
	C Penetration of the skin (epidermis and dermis) with a clearly visible cavity (with or without necrotic tissue) more than 5mm at surface.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>					
	D A lesion that extends into the subcutaneous tissue and may penetrate into the fascia and muscle ^{1,2} .	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>					
Q 5	Identify the stage of the ulcer on each slide shown									
	Stages 1-4	1	2	3	4	Stages 1-4	1	2	3	4
	Slide 1	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Slide 9	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Slide 2	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Slide 10	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Slide 3	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Slide 11	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Slide 4	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Slide 12	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Slide 5	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Slide 13	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Slide 6	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Slide 14	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Slide 7	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Slide 15	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Slide 8	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Slide 16	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

1. Australian Wound Management Association Pressure Ulcer Interest Sub-committee. Clinical Practice Guidelines for the Prediction and Prevention of Pressure Ulcers. Draft 5, 1999.

2. Reid J & Morison M. Towards a consensus: classification of pressure sores. J Wound Care 1994; 3(3):157-160.

Appendix 3. Pressure ulcer survey protocol and guidelines for data entry.

Pressure ulcer prevalence survey

Survey protocol and guidelines

Please use this tool to assist you to conduct the prevalence survey and complete all data entry.

Survey protocol

1. The surveyors will approach the shift coordinator and/or nurse (caregiver) and explain the purpose of the survey.
2. The surveyors may approach the patient, with or without the nurse (caregiver).
3. The surveyors will ask the patient if they have received and read a Patient Information sheet regarding the prevalence survey.
4. The surveyors will explain the purpose of the survey to the patient, answer any questions and proceed to obtain verbal permission for a skin inspection.
5. The surveyors will ask the patient: "Do you have any sore areas of skin where you have been sitting or lying, or when you move about in bed (e.g. tailbone, heels, elbows)?"
6. The surveyors will conduct an examination of the patient's skin, paying particular attention to bony prominences. During this process please remove and replace any anti-embolic stockings or other items of clothing to gain full visibility of the skin. Please do not disturb intact wound dressings. If required, ask the nurse to identify if the dressing is covering a pressure ulcer and if so to identify the stage of the ulcer.
NB: For the purpose of this study, patients who are identified as having an area of reactive hyperaemia will need to be repositioned off the affected area. The patient's skin will need to be re-inspected 30 minutes later for evidence of a Stage 1 pressure ulcer.
7. The surveyors will ensure that the patient is left in a comfortable position after the skin inspection. Please thank the patient for their participation in the survey.
8. The surveyors will record findings on the data collection sheet provided.
9. The surveyors will ensure that all data entry is complete prior to leaving the ward.
NB: Exemption from skin inspection: If the patient is young (25 years of age or less), mobile, self caring and oriented, and the nurse concurs that they have no pressure ulcers then a skin inspection may not be necessary.

Guidelines for data entry

1. Use a dark pen to fill in the survey forms.
2. Completely fill in circles e.g.
3. Please do not tick the circles.
4. Question 9.
Principal Medical Diagnosis: Means the current diagnosis for which the patient is being treated for at the time of the survey.
5. Question 10.
Longterm Care: Means the patient is permanently placed in care.
Interim Care: Means awaiting placement in Rehabilitation or Longterm care or is receiving Respite Care.
Rehabilitation: Means an active programme of restorative rehabilitation.
6. Question 15.
Insitu means in place, under or around the patient to assist with pressure reduction or relief. For example, a pillow between the knees preventing skin-to-skin contact or under the lower limb to elevate a heel free of the mattress surface means that a device is 'insitu'.
7. Please state under 'other', if a pillow or other devices were used and where they were used.
8. Question 18.
Please indicate on the data collection sheet if the patient refuses a skin inspection.
9. Question 19-24.
Only proceed to these questions if a pressure ulcer(s) is identified during the skin inspection.
10. Check all survey forms for completeness of data before leaving the ward area.
11. Place completed survey forms in addressed envelopes provided and return to the office of the co-investigator for this hospital.

Thank you for your very valuable time and assistance with this survey.

Mrs Jenny Prentice BN, RN, STN
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