

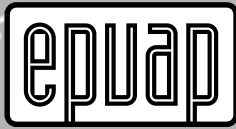
**Mission Statement** The European Pressure Ulcer Advisory Panel's objective is to provide the relief of persons suffering from, or at risk of pressure ulcers, in particular through research and the education of the public.

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Michael Clark: *Recorder* (Wales)  
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## EDITORIAL

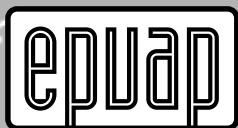


Dr Michael Clark

**T**HE Annual Meeting of the European Pressure Ulcer Advisory Panel is fast approaching. Budapest in September 2002 promises to yet another excellent gathering of your association – with a blend of plenary sessions, debates, free papers and posters and several satellite meetings. Personally the past few months has been a busy time – trying to ensure the flow of material for the *EPUAP Review* while, as Recorder of the association planning the content and logistics of the Budapest meeting. While busy I hope that the combination of roles as Editor and Recorder will help to bring more of the annual meeting into the pages of the *EPUAP Review*. It would be excellent if we could begin to publish more of the content of the conference rather than restricting our reporting of the event to the reproduction of abstracts.

This issue of the *EPUAP Review* reproduces a presentation delivered by Dr Jeen Haalboom, our immediate past President, at the close of the meeting held in Le Mans last year. He urges both us, and our national governments to seek to control the quality of the interventions offered to help pressure ulcer prevention and management. One way in which such control could be exercised lies in the agreement of appropriate standards for the evaluation of devices such as pressure-redistributing support surfaces. One of the current EPUAP Working Groups has been tackling the conduct and reporting of interface pressure measurements. A draft of their report is published in this issue of the *EPUAP Review* and I am sure that the Group would welcome your comments both positive and negative on the content of this document.

***Michael Clark***  
*Editor*

**6TH EUROPEAN PRESSURE ULCER ADVISORY PANEL OPEN MEETING***Hilton Hotel, Budapest, Hungary, September 18–21, 2002*

**T**HE sixth open meeting of the European Pressure Ulcer Advisory Panel will be held in the beautiful and historic city of Budapest, Hungary and will continue to build on the success of the panel's previous annual meetings. The mandate of the panel relates solely to pressure ulcers and this allows a focused approach as well as an excellent opportunity to exchange knowledge with others working actively in this field.

The theme of this year's meeting is '*Pressure Ulcers – a quality of care indicator?*' As at past meetings, this will allow professional health workers an excellent opportunity to improve their knowledge and understanding of the management and prevention of pressure ulcers. In addition there will be an update of the latest research into pressure ulcers included in the programme.

Well known speakers from throughout Europe and the rest of the world will be covering topics on this year's theme as well as other related aspects of pressure ulcers. In addition to the main theme – '*Pressure Ulcers – a quality of care indicator?*', updates on risk factors and risk assessments and ulcer stage reassessment will be presented along with new developments in pressure ulcer management. Free papers will be included in the relevant sessions. Poster presentations will be displayed throughout the meeting and there will be an opportunity for poster presenters to briefly summarize their posters orally. Attendance at the Budapest meeting will allow delegates to take part in shaping the future of pressure ulcer care.



Budapest (*above*), the venue of this year's meeting, is one of the most beautifully situated cities in Europe. The broad Danube river runs through the middle of the city and the Danube panorama has been declared as a UNESCO

World Heritage Site. A number of pre-congress and post-congress tours are offered.

The congress will be held in the Hilton Hotel, overlooking the river and city. The scientific programme will be held in the congress facilities of the Hilton Hotel. The 'Life-time Achievement award' for work related to pressure ulcers will be presented to the recipient at the congress dinner.

The provisional up-to-date programme is as follows:

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**Wednesday, 18th September**

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***Hungarian Pressure Ulcer Meeting***

*(Official language Hungarian)*

***EWMA / EPUAP Joint Educational Session***

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**Thursday, 19th September**

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*Morning: Satellite meetings*

**Smith & Nephew** 'Bacteria in pressure ulcers – the role of silver versus traditional antimicrobial'

**Nutricia** 'Treating pressure ulcers from the inside out'

*Lunch and poster presentation/viewing*

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- Welcome and Introduction  
*(Laszlo Gulacsi and Marco Romanelli).*  
Chair: *Marco Romanelli*
- What do we mean by quality in pressure ulcer prevention and treatment?  
*(Denis Colin, Laszlo Gulacsi and Agnes Jacquerye)*
- European Survey of Quality Measurement in Pressure Ulcer Prevention and Treatment  
*(Marco Romanelli)*
- Measuring how pressure ulcers affect quality of life  
*(Trish Price)*

*Coffee and poster presentation*

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Chair: *Michael Clark and Denis Colin*

- Improving outcomes at the bedside.  
*(Harold Brem)*
- Quality in North America, views of the NPUAP  
*(Courtney Lyder)*

- Pressure ulcers in Japan  
(*Prof Ohura*)
- Presentation of EPUAP Lifetime achievement award.
- Presentation by Lifetime achievement recipient.
- Close of day and welcome reception with Hungarian entertainment

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**Friday, 20th September**

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- The Hip - Anatomy  
(*Prof Karl-Goran Thorngren, Sweden*)
- Hip Fractures  
Chair: *Christina Lindholm and Gerry Bennett*
- The Hip –  
Aetiology and Prevention including case studies  
(*Ami Hommel, Sweden*)
- Results from the PEPUS survey  
(*Christina Lindholm*)

*Coffee and poster viewing*

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- New Dutch pressure ulcer guidelines –  
PARALLEL FREE PAPER SESSION  
1. *Maarten Lubbers* 2. *Ronald Boumans*  
Chair: *Sue Bale*
- EPUAP Strategic review feedback  
(*Keith Harding*)

*Lunch and AGM*

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- PARALLEL FREE PAPER SESSION  
Chair: *Maarten Lubbers*
- Prevalence group  
Chairs: *George Cherry and Courtney Lyder*
- EPUAP Prevalence survey
- Interpreting prevalence and incidence data –  
what can be achieved in the real world?  
(*Jacqui Fletcher*)
- The project methodology  
(*Gerrie Bours*)
- What was it like for you? Experience of the data  
collectors  
(*Alison Hopkins*)

*Coffee and poster presentations*

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- EPUAP Pressure Ulcer Prevalence project:  
The project results (*Tom Defloor*)  
Chair: *Keith Harding*
- Pressure ulcers in Spain  
(*Joan-Enric Torra i Bou*)
- EPUAP statement on incidence monitoring  
(*Gerrie Bours / Lisette Schoonhoven,*  
led by *Keith Harding*)
- **PLENARY LECTURE**  
Case mix Adjustment – ideal and practical limitations  
(*Dan Berlowitz, US*)\*
- Conference dinner and entertainment,  
and awards presentation



**EPUAP activities to watch out for!**

Over the coming months the EPUAP, and this *Review*, will present several major developments! Of course, one of these will be the **Budapest Conference**, held at the Budapest Hilton Hotel between September 18th and 21st 2002. The programme for this event is close to complete and is shown here. This issue of the *EPUAP Review* contains information upon registration for this event. The EPUAP would like to thank all of its corporate sponsors – without your support it would be so much harder to organise our annual meeting. We would also like to thank those companies – **Nutricia**, and **Smith & Nephew Ltd** – who are hosting satellite meetings during the morning of 19 September. Please support these educational events!

Fishermen's Bastion and the Danube, viewed from the conference hotel.

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**Saturday, 21st September**


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Chairs: *Tom Defloor and Alastair McLeod*

- Support Surface Working Group Feedback  
(*Alastair McLeod*)
- Evaluation of mattresses replacements for routine use in a Large General Hospital  
(*Anne Witherow*)
- Prone position and pressure ulcers; State of the Art  
(*Camles Calaf and Joan-Enric Torra i Bou*)
- Risk factors for pressure ulcers  
Chair: *Tom Defloor*
- Predicting pressure ulcers in hospitalised patients  
(*Lisette Schoonhoven*)
- Prognostic factors associated with pressure ulcer development in surgical patients.  
(*Jane Nixon*)
- Non-blanchable erythema as a predictor of pressure ulcer lesions: an alternative approach to risk assessment  
(*Katrien Vanderwee*)

Chairs: *Marco Romanelli and Helvi Hietanen*

*Coffee*

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- Report on Central European Day  
18 September 2002  
(*Laszlo Gulacsi*)
- President's Address  
(*Marco Romanelli*)
- Presentation of Poster Prizes  
(*Denis Colin*)
- Introduction to the 7th EPUAP Open Meeting 2003, Tampere, Finland  
(*Helvi Hietanen*)
- End of conference, closing reception and farewell
- Free papers  
Chaired by *Mark Collier*

*Saturday afternoon – Tours of Budapest*

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**Social Programme during meeting**


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(*All included in registration fee*)

**Thursday evening (19 September)**

- Reception and entertainment at Hilton Hotel overlooking the Danube river

**Friday evening (20 September)**

- Congress dinner and entertainment  
Hilton Hotel, Grand Ballroom  
SPONSORED BY HUNTLEIGH HEALTHCARE

*There will be additional social events organised on Wednesday 18 September and Saturday 21 September, including tours of Budapest.*

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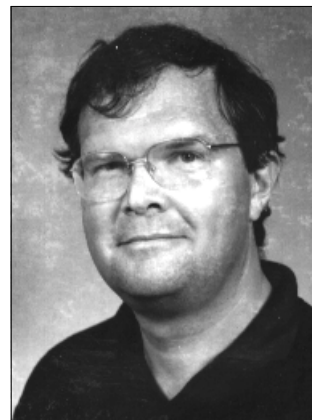
**QUALITY MARKS, A EUROPEAN DREAM**

*A paper presented during the EPUAP conference at Le Mans, September 2001, by*

*Dr J. R. E. Haalboom, the immediate past President of the European Pressure Ulcer Advisory Panel*

**D**URING an excellent conference such as this one expects to hear cool, professional presentations of scientific papers, not an emotional outburst from the association's President. But that is precisely what I will now make! First let me establish my right to make this promised outburst. While my day-to-day work is primarily involved in cardiac medicine, I have some experience with the subject of this conference, namely pressure ulcers. In particular I have been intrigued by the changes in practice that have arisen as the evidence base has grown. Back in 1996, the impact of the available science was not so impressive but this has changed in more recent years. Some interventions we have discarded, for example we no longer use hot air and ice anymore when treating ulcers, nor do we use ultrasound anymore in treatment since prospective, double blind and placebo controlled studies showed that it did not work! Perhaps the greatest challenge now lies not in finding out what interventions work, but to enable the diffusion of these findings to doctors and nurses in all care settings throughout our national countries, both in the cutting edge centres of excellence and in the geographically remote care providers. Regardless of this challenge of ensuring the appropriate diffusion of good practice, let me be clear that in 2001 it is not acceptable anymore either in medicine or nursing that procedures are followed that have not been adequately evaluated.

Making sure that such evaluations occur would appear to be a simple matter of legislation, especially in today's climate of the developing European 'super-state'. But this may not be so; although 'Europe' today may be synonymous with organisation and regulation, for many European citizens this new bureaucracy appears to have side-stepped the democratic process and so may frighten more than it reassures. For example, the introduction of the Euro in place of national currencies was not decided by the European people, but organized by politicians. Most certainly no-one asked for my advice before the Guilder was scrapped! Despite these feelings of alienation from decision-making processes, the new Europe has produced some good results, not least when considering the concept of 'quality'. A European mother can be confident that the yellow toy of her child does not contain cadmium. Visitors to the Royal Box in Ascot can be sure that their strawberries are not treated with pesticides and that the champagne does not contain sulphur. These are examples of quality in action through the imposition of a minimal quality standard (or mark), in this case the CE Mark. This quality mark impacts upon each of us in our daily lives, but just exactly what does it mean? In many



Dr Jeen R. E. Haalboom

cases it may simply note that minimal quality control standards have been imposed with self-certification by the manufacturer. Few realise that there are differing levels of conformity to the CE mark, but that only two levels of attainment really denote strong control of quality within the manufacturing process.

What about quality marks in health care? Patients, regardless of their disease or condition can be assured that they are most unlikely to develop serious side-effects from their medications. There is a clear and consistent path to bringing a new medicine to the market-place – controlled clinical trials following a battery of toxicity testing. These procedures consume lots of time and money, explaining at least in part the high prices of drugs! Few would disagree with the need for such caution when developing a new medicine. Few would also disagree with the need for monitoring once a drug is in use to identify unexpected problems and take swift action if problems arise. For example it became evident that the use of cerivastatin, a cholesterol lowering drug, had been implicated in the death of at least fifty-two patients. That is fifty-two out of the more than fifteen million patients using it. The drug was withdrawn and the manufacturer's value in the stock market was significantly reduced. It is perhaps evident that where drugs are concerned quality can be introduced and maintained.

It is evident to me that the system that works for medications should also apply for all aspects of health care, including pressure ulcer care. Static support surfaces – and especially powered support surfaces – should only be used when they have proven to be safe and to be effective following very thorough clinical investigations to the same rigour of drug trials. That is my view which looks simple but this is

not the case. Currently, probably the majority of support surfaces used in pressure ulcer care are self-certificated by their manufacturer as being a Level 1 Medical Device. Such a registration under the CE mark scheme does not call for independent evidence of either safety or effectiveness. It remains possible to both introduce and use support surfaces that may be ineffective or even dangerous. Is this what we want to see in pressure ulcer care? Perhaps you could say that medical devices such as a mattress are inherently less dangerous than a drug and so the processes required to bring both to market should differ? But is this true? The costs of complications such as pressure ulcers can be very high indeed and the use of ineffective interventions will fail to reduce the drain on health service resources. This argument has not yet been explored by our political masters!

Why does the current inequality between the development of drugs and devices continue? Perhaps because device manufacturers are 'poorer' than the drug companies with less money, and smaller returns to be made upon any investment in clinical research? This of course leads to new devices being introduced without prior clinical trials. Perhaps, and let me be controversial, less evidence is demanded from nurses, the purchasers of many of the pressure-redistributing support surfaces? I can only back this up with an observation from my own country, the Netherlands, where a pressure-redistributing overlay was marketed based upon its inclusion within a chapter of a PhD thesis. The data did not support the device as being more effective than the control intervention. However, many nurses were apparently impressed with the concept that a PhD thesis had considered the use of the overlay. Perhaps this reflects a lack of training for nurses in the evaluation of studies, and in particular their statistical tests and conclusions? See I did promise to be controversial in this presentation!

It is evident that European regulations should apply to all pressure-redistributing support surfaces, such a conclusion is logical for the deployment of effective devices should control, or even reduce the costs of pressure ulcer care. EPUAP must play an important role in this process of developing appropriate regulations. However, the role for the EPUAP lies not only in bringing the case for regulations to governments but also in helping manufacturers. We must help our colleagues in industry by agreeing the scientific standards which clinical studies of mattresses and other

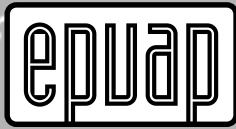
devices should meet. EPUAP should also facilitate these clinical studies but assisting multi-national trials to be planned and executed. Finally we should be clear that groups such as the EPUAP expect medical devices and drugs to meet common standards for safety and effectiveness.

Perhaps the EPUAP could go one step further and instigate its own quality mark? In an ideal world I could see new devices being approved, or not, by a quality approval process controlled by the EPUAP. Why not? We could become a recognised test centre where manufacturers would bring new devices, pay for the clinical studies conducted by EPUAP and at their conclusion be awarded the 'EPUAP quality mark' or not. It is as simple as that.

We, the EPUAP, have grown from a group of enthusiastic people perhaps without much real knowledge to a group of enthusiastic people with scientific knowledge and we should behave accordingly. We must be prepared to state what is important and in line with our scientific knowledge regardless of all the special interests and hidden agendas that surround all human activity. One of these important statements is that pressure-redistributing support surfaces need to be evaluated in a transparent, consistent manner. Knowledge of their effectiveness is required prior to, and as a condition, of their entry into the marketplace. Perhaps we should start our quality mark now without delay. It could be a real success: the EPUAP-mark.

#### *Editor's comment*

Dr Haalboom's call for rigorous evaluation of new pressure-redistributing support surfaces will be welcomed by all members of the European Pressure Ulcer Advisory Panel. Perhaps before setting ourselves up as a testing centre for new products we need to be clear just exactly what we should measure, and how these measurements should be made and reported. The next article from the EPUAP Support Surface Working Group provides a draft statement that may help us deal with the often-misused concept of measurements of the pressures exerted between mattresses and human tissue. The draft report from the Working Group also marks a positive collaboration between academic and clinical researchers within and beyond the health care industry. Perhaps it is only through such dialogue that we, the EPUAP and the industry, will clearly see the shape of the minimum standards required to help establish the quality mark suggested by Dr Haalboom.



DRAFT GUIDELINES FOR THE LABORATORY EVALUATION OF PRESSURE-REDISTRIBUTING SUPPORT SURFACES

OVER the past two years various members of the European Pressure Ulcer Advisory Panel have been working upon a draft guideline for the laboratory evaluation of pressure-redistributing support surfaces. The following document is the product of that endeavour – however, it must be borne in mind that this does not represent the ‘finished’ guideline – merely another step towards that eventual document. Please feel free to comment upon this draft, sending all submissions to the Working Group co-ordinator, Dr Alastair McLeod, at:

<alastair.mcleod@huntleigh-healthcare.com >

I feel confident that all members of the Working Group would like to extend their thanks to Alastair for his commitment to this project.

Michael Clark

Introduction

Purpose

This document is a collection of recommendations compiled from several meetings of interested parties facilitated by the EPUAP (see appendix 1). All were motivated by a common recognition that methodological and technical differences in the interface pressure (IP) measurement protocols used in published laboratory studies on support surfaces makes comparisons virtually impossible. Given the rising number of pressure redistributing (PR) products appearing on the market, there is much sense in future studies adopting a similar protocol and a common reported data set. Whilst this will not completely remove the problem of incomparability, it is an initial step towards a standardised approach which it is hoped will eventually be established.

Scope

Given the large number of possible purposes there are for conducting interface pressure measurements, it was necessary to limit the initial scope of these recommendations to the following:

- 1. Studies where the primary objective is to establish differences in the pressure redistributing properties of support surfaces relative to a ‘standard’ surface
2. Surfaces whose design intent is NOT to vary the interface pressure cyclically over time (e.g., foam mattresses, static air mattresses, NOT alternating or pulsating surfaces)

Limitations

A key limitation to the recommendations contained herein is that no link is established between the IP analysis outcome and likely patient outcomes. Nor is there any data presented which suggests how products may be allocated to different patients for pressure ulcer (PU) prevention or healing purposes based on IP performance. Such relationships can only be established with suitably powered randomised controlled clinical trials. However, if clinically significant differences between PR surfaces are measured in such trials, then adopting these guidelines for subsequent comparative IP testing will allow other surfaces to be compared to those used in such research. This will allow more rapid assessment of new products as they are introduced.

Additionally, implicit in this logic is the fundamental assumption that the primary effect of PR surfaces lies in their ability to modify soft tissue compression patterns in a positive way. Other effects, such as skin micro-climate control and frictional and shearing forces are not quantified in these guidelines.

Glossary

- Interface Pressure Perpendicular force exerted by a segment of skin on a support surface divided by the skin contact area (abbrev = IP)
Pressure Redistribution The beneficial modification of pressure patterns on human soft tissues to reduce pressure ulcer risk (abbrev = PR)
IP sensor A device placed between the skin and a support surface whose output is calibrated to represent the perpendicular pressure exerted over the sensor area
Repeatability The variation in pressure measured by a sensor when an identical calibrated, constant pressure is applied and removed several times
Reproducibility The variation in analysis outcomes when a calculation is performed on pressure data derived from a test subject who has repositioned several times
Accuracy The closeness of an IP sensor output to a known applied pressure
Resolution A representation of the smallest area over which each sensor is measuring interface pressure. In this context , ‘high resolution’ means more sensors per square centimetre

<i>Hysteresis</i>	The difference in sensor output measured when the same force is applied gradually from a low and a high starting point
<i>Creep</i>	A slow variation in subject position or sensor output over time
<i>RCT</i>	Randomised Controlled Trial
<i>Scan</i>	The acquisition of pressure data from an array of electronic IP sensors

**Methodology**

**Choice of test body**

Most published work has hitherto employed human subjects for IP measurements. Whilst this is intuitively appealing, there are significant reasons why this approach limits the comparability of IP measurements, including:

- a) Experimental repeatability will be poor, because joint angles and tissue properties will vary over time, thus introducing higher variations in pressure readings
- b) Unless physically identical subjects are used by all researchers in this field, and cross-comparisons are conducted to measure actual differences in subjects, it is not known how comparable any product rankings will be using different human subjects in different test locations
- c) The use of human subjects does not dispose the measurement process to a standardised approach that is eventually desired

It was recognised that for the purposes of exploring the effect of IP on soft tissue blood flow, the use of human subjects, and the use of sensors other than IP remains essential. However, for the limited purposes of comparative ranking of support surface PR quality, it is recommended that a human-like mannequin is employed. This follows a similar approach adopted by ISO committee TC173/SC1/WG11, who recommended the construction of a standard buttock mannequin to conduct IP testing of wheelchair cushions.

**Test Mannequins**

The functional specification for a test mannequin still requires definition. Ideally, these should be constructed to mimic important degrees of freedom found in humans, but should also minimise potential errors deriving from unplanned movements such as sagging or creep. Whilst not exhaustive, essential elements are thought to include:

- 1) Full body mannequin rather than partial mannequin
- 2) Representative of typical height and weight of patients using PR surfaces, with weight distributed in correct anthropomorphic proportions. Ideally, a spectrum of weights and heights should be tested, with both male and female skeletal forms
- 3) Jointed at knees, hips, shoulders and neck. Type and design of joint (planar or rotational) should be sufficient only to allow mannequin to contour with typical profiled hospital bed. High degrees of freedom in joints may reduce experimental repeatability.
- 4) Surface of mannequin to represent 3D shape of bony prominences and soft tissue coverage found in typical patient group. There is still debate over whether a

coverage of artificial soft tissue is necessary in a mannequin. The only way to resolve this is to construct mannequins with and without artificial soft tissue and compare differences in measurements between ‘standard’ surfaces and ‘good’ (ideally via RCT study) surfaces. If the addition of artificial soft tissue increases measurement sensitivity, and brings results significantly closer to those measured on humans, then this should be adopted as a standard requirement

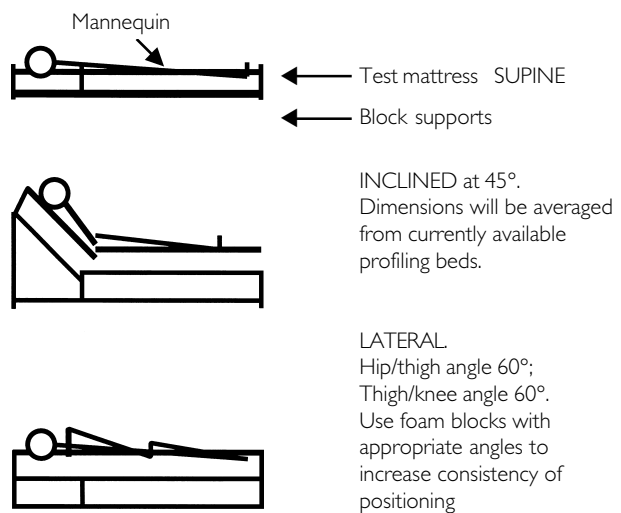
If different test mannequins are developed as a result of ongoing work in different research centres, then it is essential that cross-calibration data is generated and published to ensure future comparability of results. Such data could be derived using an internationally agreed specification of basic foam mattress.

There is also some debate over the usefulness or necessity of heating a mannequin, to achieve skin temperatures at the pressure interface. Some mattresses claim to change their PR properties

**Experimental design**

It is recommended that, as a minimum, the test protocol should incorporate the following elements:

- a) Sensor calibration using reference pressures plus zero. In absence of recommendations from sensor manufacturers, daily calibration is suggested. Sensors must demonstrate a sufficient level of accuracy etc. before any tests are undertaken – see the ‘Instrumentation’ section later
- b) The PR support surfaces, including a ‘standard’ surface, should be tested with the mannequin in at least three positions as follows:



- c) Sensor arrays should either be attached to, embedded in or cover the following areas:
  - i) Heel(s)
  - ii) Ischial tuberosity (ies)
  - iii) Greater Trochanter(s)
  - iv) Sacrum (Centred 1cm above natal cleft)
  - v) Occiput (posterior)

The minimum requirements for sensors are discussed in the next section.

- d) At least 3 scans should be taken in each position and averaged, and the mannequin should be repositioned at least 6 times in each of the above postures. This is to ensure the maximum pressures are captured and will supply data for reproducibility calculations.
- e) Either all mattresses use a standard cover provided by the manufacturer, or all are tested using a standard hospital cotton sheet draped loosely over the surface. If a product is sold with a special cover as standard, then this should NOT be removed from the product during any of the tests.
- f) Test environment temperature should be controlled to  $\pm 2^{\circ}\text{C}$  to avoid thermal drift problems with sensors. The test room temperature should be as close as possible to the temperature during calibration.

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## Instrumentation

### *Accuracy and Calibration*

Accuracy is important if absolute pressures are to be reported. However, it is recommended later in this guideline that only relative results are issued. Thus, provided the accuracy remains consistent throughout testing, then it is probably not necessary to specify this property. It is necessary for the sensor to be able to resolve sufficiently small areas to assess local pressures – this is discussed in the next section.

The system should be calibrated using positive air pressure or weights of known area whose accuracy is traceable to a nationally recognised standard.

### *Resolution*

The sensor matrix must be able to detect changes in IP over small distances – e.g., heels. It is proposed that the technique cited in TC173/SC1/WG11 is adopted here. Thus, a mannequin of known mass is effectively ‘weighed’ by the sensor on a standard surface (sum of all IP’s multiplied by total sensed area = weight on area). If, when three such ‘weighings’ have been performed and averaged, the error is greater than 10% of test weight, then the sensor in question is unlikely to be adequate for test purposes.

### *Repeatability/Reproducibility*

The repeatability of an IP measurement system should be such that, when results are analysed, significant differences between the PR properties of surfaces are not swamped by larger levels of uncertainty caused by instrumentation error. For example, if it is judged that 5 mmHg represents a significant change in pressure in the range 0–40 mmHg, but the measuring instrument or experimental method has a repeatability / reproducibility of  $\pm 5$  mmHg, then we cannot be certain that a 5 mmHg difference is truly significant. It is recommended that the coefficient of variation (SD/MEAN) of a set (minimum 10) of repeated ‘weighings’ as described previously is less than or equal to 10%.

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## Data Analysis

### *Analysis Techniques*

There was much discussion on which is the most appropriate or meaningful set analyses to perform. In common with

the choice of mannequin, this can only be ascertained via correlation of differences in calculated parameters with outcomes of RCT’s using identical products. Since it is comparatively simple for a computer to perform mathematical operations on a sequence of scanned pressure data sets, it is proposed that all the methods listed below are used and tabulated in a final report. A consistent performance by a product across many analysis methods should result in a higher ranking. However, techniques which result in high variation (e.g., peak pressure on heels) may need to be excluded from final ranking calculations. To estimate this, the Coefficient of variation of each analysis technique should be calculated from the six repeats performed. As in previous cases,  $\text{CV} > 10\%$  may indicate poor repeatability. (See Table 1 overleaf.)

### *Statistical Considerations*

Given the small sample size of scans per position, the opportunity for statistical analysis is limited. Differences between paired data sets for different products in different positions can be tested for significance using non-parametric tests such as Mann-Whitney (if data looks skewed) or Students t-test (if data reasonably well behaved). Significance should be set at the 5% level. When processing the data, differences in calculated parameters between different products and the standard mattress should be used. Thus, two questions are answered per test product:

- 1) How different is it from the standard mattress (in each position)?
- 2) How different is it from the other test products (in each position)?

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## Data Presentation

As a minimum, the following information should be divulged:

- 1) Sensor array description, including: number of sensors, physical dimensions, calibration method & frequency of calibration.
- 2) Description of mannequin, including mass, joint numbers and types, and any areas of compliant material.
- 3) Results of ‘weighing’ test, with statement of error and repeatability.
- 4) Description of ‘standard’ mattress, ideally uniform foam design of 4’–6’ (100–150mm) height. Inclusion of density and hardness data also useful, with description of cover type
- 5) Description of test products, with modes of operation and set up used during tests (if powered surface) together with any adjustments made to products between test positions.
- 6) Statement of number of scan repeats per position, along with indication of statistical methods used to compare results
- 7) Table of analysis results for each mannequin position, showing either absolute results of all products tested including the standard mattress, or results relative to the standard (except 95% CI)

Table 1: Analysis Techniques

Technique Name	Description	Formula
Maximum Pressure	Maximum IP anywhere (mmHg)	MAX(all data)
Mean Pressure	Arithmetical mean (mmHg)	AVERAGE (all sensors in contact)
95% confidence interval	Range of mean (mmHg)	95% CI (MEAN)
Spread	Coefficient of variation (%)	STANDARD DEVIATION (all sensors in contact) / AVERAGE (same)
Pressure Area Index (PAI)	% of all sensors in contact with skin that register < 40 mmHg (other thresholds such as 30 and 20 also used)	(# sensors in contact and <30 mmHg) / (# sensors in contact)
Band Width Index (BWI)	% of all sensors in contact with skin that register < mean IP	(# sensors in contact and < mean IP) / (# sensors in contact)
Half Width Index (HWI)	% of all sensors in contact with skin that register < 1/2 of peak IP	(# sensors in contact and < 1/2 peak IP) / (# sensors in contact)
Contact Area	% of sensors in contact with skin	(# sensors in contact) / (# sensors)

- 8) Statistical analysis of (7), both comparing all test products to the standard mattress and between test products for each position

### Further Research

Key issues in this guideline that require further investigation include:

- Development and specification of minimum complexity mannequin needed to conduct tests. The core question is: 'what specification of mannequin is required to achieve the same relative product rankings that would be established using a large pool of human subjects?' If, as is likely, different mannequins will be used in different parts of the world, will these differences result in different rankings when used to assess identical test products?
- Verification of the '10% rule' for acceptance of accuracy and repeatability of pressure sensing arrays. For a given mannequin design, the core question is: 'what range of sensor accuracy and repeatability does not affect the ultimate ranking of identical test products?'
- Whilst the majority view was that pressure sensing arrays provided larger volumes of useful data than single or small groups of sensors, current technology still has limited resolution. This has implications on their ability to assess accurately the pressure distribution around areas like heels and elbows. It may therefore be necessary to use a different sensing approach in these areas to provide accurate data.
- Further research is needed to establish how much of this guideline can be applied to moving surfaces – i.e., alternating and pulsating designs. There was broad agreement that large sensor arrays are unsuitable for these surfaces because of the degree of hammocking

imposed over deflated cells. In addition, analysis methods would require some form of time integration to assess the effect of cyclically varying interface pressures.

### Appendix

#### 1. Contributors

See list overleaf (page 12).

#### 2. References

EPUAP WG1 is currently conducting a literature survey of all references relating to laboratory assessment of support surfaces. When all comments have been received regarding this guideline and a final draft agreed, a subset of WG1 references relating to interface pressure will be added here. All queries or suggestions for WG1 should be addressed to the chairman, Dr Michael Clark, at the email address given above. Some of these references have already been published in previous editions of *EPUAP Review*, available to all EPUAP members.

#### 3. Comments

Your comments on this document are welcome. Please submit these via email only to the working group chairman, Alastair McLeod, at the following address:

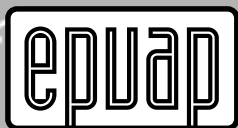
< [alastair.mcleod@huntleigh-healthcare.com](mailto:alastair.mcleod@huntleigh-healthcare.com) >

Thank you for spending time reading this guideline, and I look forward to a lively exchange of ideas as we refine the wording.

*Alastair McLeod*

Appendix I: List of contributors

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DRAFT EPUAP STATEMENT ON PREVALENCE AND INCIDENCE MONITORING

Prepared by Tom Defloor, Gerrie Bours, Lisette Schoonhoven and Michael Clark

PREVALENCE and Incidence are both measures of disease frequency. While both have been used to record the number of people with pressure ulcers, they provide different perspectives on the scale of the problem.

Prevalence

Prevalence is defined as a cross-sectional count of the number of cases at a specific point in time, or the number of persons with pressure ulcers who exist in a patient population at a given point in time (see Table 1).

Table 1: Prevalence

Table with formulas for Pressure Ulcer Point Prevalence and Pressure Ulcer Period Prevalence.

Incidence

Incidence is defined as the number of persons who develop a new pressure ulcer at an initially pressure ulcer free location, within a particular time period in a particular population. Several approaches to measuring incidence have been explored (see Table 2).

Table with formulas for Pressure Ulcer Cumulative Incidence and Pressure Ulcer Incidence Density = Incidence Rate.

Table 2: Incidence (\* Sum of all the days over which each patient participated in the study)

Characteristics of Prevalence and Incidence

As mentioned earlier, prevalence and incidence are different measures of disease frequency. The characteristics of prevalence and incidence are summarized in Table 3.

Purpose

Before deciding to measure either pressure ulcer prevalence

or incidence it is useful to consider the information the different measures can provide.

PREVALENCE measures the number of patients with pressure ulcers at a certain point or period in time. Thus, it provides an institution with insight into the magnitude of the problem of pressure ulcers at a given point in time, and may be an aid in planning for health resources and facilities. For example, during a prevalence survey it is possible to record how many devices (e.g., alternating mattresses) are being used at that specific moment.

Given that many prevalence surveys also collect information upon aspects of prevention and treatment, such surveys may allow inferences to be made regarding the compliance with prevention and treatment protocols at that specific moment.

INCIDENCE measures the number of persons developing new pressure ulcers during a period in time and thereby provides insight into the nature of patient groups who are at risk of pressure ulcer development. Furthermore, incidence may allow inferences to be made regarding the effectiveness of preventive measures and the compliance with prevention and treatment protocols. Also, incidence provides insight into the magnitude of the problem of pressure ulcers developed within the current care provider.

The interpretation of prevalence and incidence data can be challenging

When interpreting particular prevalence or incidence data it is important to understand the factors that may influence the apparent size of the pressure ulcer population.

PREVALENCE will be affected by the number of persons with a pressure ulcer present at admission to the current care provider. If this number is high, prevalence proportions may

Characteristic	Prevalence	Incidence
<b>Purpose</b>	Gain insight into the magnitude of the problem of pressure ulcers Planning for health resources and facilities Compliance with prevention and treatment guidelines / protocols –	Gain insight into the causation of pressure ulcers and into the magnitude of the problem of pressure ulcers Planning for and evaluation of health resources and facilities Compliance with prevention and treatment guidelines / protocols Evaluation of effectiveness of preventive measures and treatment
<b>Figures affected by</b>	Pressure ulcers present at admission Admission and discharge practices – Case mix Effectiveness of the prevention and treatment protocols Compliance to the prevention and treatment protocol	Pressure ulcers present at admission Discharge practices Follow-up period (only for cumulative incidence) Case mix Effectiveness of the prevention treatment protocols Compliance to the prevention protocol
<b>Time investment and cost for research</b>	Low	Higher (lower if electronic records are used)

Table 3: Characteristics of Prevalence and Incidence

be high too. For example, where patients with pressure ulcers are referred to a specific institution, for example because of the expertise of the institution in pressure ulcer treatment, this admission practice will influence the prevalence of pressure ulcers. Prevalence is also influenced by discharge practices. For example, a hospital that is able to quickly discharge patients with a pressure ulcer to a nursing home may have a lower prevalence of pressure ulcers than a hospital that can only discharge patients after the pressure ulcer has healed.

If the prevention and treatment protocols are of low quality or compliance with these protocols is low, then it is likely that both the prevention and treatment of pressure ulcers will be sub-optimal. This may lead to patients experiencing their pressure ulcers for a longer period of time. These patients will then be more likely to be identified during a prevalence survey and hence prevalence may be high.

**INCIDENCE** is affected by discharge practices, given that this rate will be influenced by the length of stay of each patient within the care provider. For example, a hospital that discharges patients within a few days, i.e., before pressure ulcers have a chance to develop, is likely to have a lower incidence than a hospital that admits patients for a longer period of time. It is generally assumed (although unproven) that pressure damage may first appear three to five days after the insult to the skin and soft tissues occurred. In patients with a length of stay of, for example only three days, pressure damage may have occurred but not yet be visible. These pressure ulcers would not be registered, resulting in a lower incidence rate.

If the prevention protocol is of low quality or the compliance with these protocols is poor, then preventive care is not optimal and therefore incidence may be higher. As patients with an existing ulcer but who develop additional pressure ulcers may be included in incidence studies, then adherence to treatment protocols may also influence incidence. Where a pressure ulcer heals quickly due to staff compliance with a high quality treatment protocol, it is possible that a pressure ulcer may then re-occur on the previously injured site and this may then be counted as a 'new'

ulcer. This illustrates the complexity of determining which pressure ulcers, and which patients, to include in any incidence monitoring project.

Both prevalence and incidence are influenced by the case mix of the institution. While variations may arise it is likely that where two institutions provide identical preventative care then the centre with more patients at high risk of developing pressure ulcers may have both a higher incidence of pressure ulcers. In the previous example the prevalence of pressure ulcers within the centre with most high risk patients may also be higher but this indicator will be susceptible to the admission of patients with pre-existing pressure ulcers.

#### *Practical issues related to the collection of prevalence and incidence data*

Measuring incidence rates requires a longitudinal design and in consequence such studies are likely to be more labour intensive, and hence costly than would be a point prevalence survey. The costs of both prevalence and incidence monitoring may be reduced if patient medical and nursing records are held electronically with appropriate fields available for the recording of pressure ulcers. The frequency of patient observation to record incidence of new pressure ulcers may depend upon care setting, but it is likely that in acute care daily observation of the skin would be required. Regardless of whether incidence or prevalence is to be recorded the accuracy of the submitted data needs to be assessed.

Despite the fact that many studies have been performed in various countries to record incidence and (primarily) prevalence, comparison between this data are extremely restricted given factors such as the use of different pressure ulcer classification systems, incomparable patient groups, small samples and differences in data sources.<sup>2-4</sup> Therefore, data must always be examined in light of the specific study methodology.<sup>2</sup> Appendix 1 gives some practical suggestions for measuring prevalence and incidence.

The selection of either prevalence or incidence data as a means of illustrating the occurrence of pressure ulcers should be made following a detailed consideration of the

strengths and limitations of both epidemiological measures.

The European Pressure Ulcer Advisory Panel considers that measuring pressure ulcer incidence is the most appropriate approach if the goal is to understand how the introduction of new protocols and interventions has affected the number of patients with pressure ulcers. Where the goal is to identify the current size and characteristics of the pressure ulcer affected population, then prevalence may be more appropriate. However, the costs associated with the implementation of an incidence monitoring scheme may be prohibitive, and for this reason prevalence may be selected even though it may not be fully appropriate.

#### *Reference list*

1. Rothman K, Greenland S. *Modern Epidemiology*. 2nd Edition. Philadelphia: Lippincott Williams & Wilkins, 1998.
2. *National Pressure Ulcer Advisory Panel. Pressure Ulcers in America: Prevalence, Incidence, and Implications for the Future*. Cuddigan J, Ayello EA, Sussman C, editors. 2001. Reston, VA, NPUAP.
3. Allman RM. Pressure ulcer prevalence, incidence, risk factors, and impact. *Clin Geriatr Med* 1997; 13(3): 421–436.
4. van-Rijswijk L. Epidemiology. In: Morison M, editor. *The Prevention and Treatment of Pressure Ulcers*. London: Mosby, 2001: 7–15.

## **Appendix I Practical recommendations for measuring both pressure ulcer prevalence and incidence**

### **1) Patient inclusion / exclusion**

Clearly define the population to be surveyed before starting data collection. Be aware that exclusion of certain patients or groups of patients makes comparison with other studies more difficult (problem of generalization). Patients with pressure ulcers at the start of the study should not be excluded, even from incidence studies. They have a high risk of developing new pressure ulcers on other locations. However, only any new pressure ulcers should be counted when calculating incidence figures. Base your incidence or prevalence data upon the number of patients with, or developing pressure ulcers and not upon the number of pressure ulcers that develop.

### **2) Survey methodology – general issues**

It is essential that the assessors are able to distinguish pressure ulcers from other types of wounds, for instance incontinence damage, to prevent misclassification. Therefore observers should be trained in the classification of pressure ulcers using the EPUAP pressure ulcer grading system. In research studies, inter-rater reliability should be formally checked and reported.

Inspect all of the pressure areas of each individual patient. Skin inspection is important for using medical or nursing records is often not a very reliable method of pressure ulcer data collection! Always remember that caregivers are not always aware of the existence of pressure ulcers. Use a transparent device for facilitating the assessment of grade I (non-blanchable erythema).

Assessing the skin of the surveyed patients should be carried out by two observers working independently; ideally one of the observers should not be a staff member of the unit where the patient is located.

Frequently the use of preventive interventions may be recorded during prevalence surveys; if these are to be recorded then note which devices are in place at the bedside or chair of each surveyed patient. Not all preventive measures used are reported in records while not all preventive measures mentioned in the medical and/or nursing records are used as prescribed!

### ***Specific comments regarding incidence monitoring:***

When considering acute care, it may be considered to be a general rule that the less frequently patients are observed, the less reliable the collected incidence data becomes. In acute care, patients should be assessed at least daily if non-blanchable erythema is used as one of the outcome measures. Where only more severe pressure ulcers (grades II and higher) are used as outcome measures then patients should be assessed at least every two or three days in acute care. In non-acute care the interval between skin assessments may be longer dependent upon the logistical aspects of visiting patients.

### ***Reporting of pressure ulcer incidence and prevalence data***

In all cases the population surveyed should be fully described in any report or publication; this facilitates comparison with other pressure ulcer epidemiological data. Among the items that may be described are patient ages, gender, vulnerability to developing pressure ulcers, mobility, activity, expected length of stay and care location (acute, non-acute, and specific populations such as intensive care).

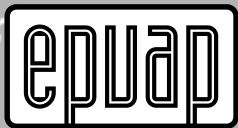
Pressure ulcer incidence and prevalence data should be based upon the number of patients with pressure ulcers. If any individual has more than one pressure ulcer, that person is counted only once.

It may be useful to report data in two formats; the first including all pressure damage (including areas of non-broken skin), the second excluding Grade I pressure ulcers and so reporting only areas where the skin was broken.

Comparison of results (be they incidence or prevalence) between different care providers or within a single provider over time should be done with caution (if at all). In any comparison patient characteristics and case mix should be taken into account.

### ***Specific issues related to the reporting of Incidence data***

After the start of any incidence monitoring project, only 'new' pressure ulcers (pressure ulcers developed after the start of the study) should be recorded. New pressure ulcers may occur in patients who have pressure damage present before the start of the project; record these individuals the first time they develop a new pressure ulcer. It is possible that those pressure ulcers that develop during the first few days that a patient is being monitored were the result of excessive tissue loading prior to the entry into their current care location. This last statement is commonly believed although there is little evidence to support its hypothesis. Measuring incidence in non acute care may be compounded by the relatively low numbers of patients present at the start of the study, this challenge of reporting incidence is further complicated where recruitment to the population is slow. In such circumstances it may be more appropriate to report pressure ulcer prevalence data.



**ABSTRACTS FROM THE FIFTH EPUAP OPEN MEETING**

*Le Mans, France, 2001 (continued from EPUAP Review, Volume 3, Number 3, page 98)*

**NETHERLANDS: IS THERE A BENEFIT FROM SURVEYING?**

*Gerrie JJW Bours and Ruud JG Halfens  
Maastricht University, Dept. Nursing Science, Maastricht,  
the Netherlands.*

*Introduction*

In the Netherlands a national prevalence survey is carried out yearly in different health care institutions, from which the majority are acute care hospitals and nursing homes. These measurements give insight into the prevalence and severity of pressure ulcers.

By giving the settings feedback after each survey about their results, a positive effect on the consciousness of the health care workers to this problem may be obtained. This may result in better prevention strategies and therefore in a decrease of the prevalence. Last year this assumption has been shown that acute care hospitals and nursing homes that participated in the national survey from the first year had lower prevalence rates than those who participated for the first time. However, these lower prevalence rates may be misleading, due to differences in the distribution of patients' risk factors. To adjust statistically for differences in risk factors may be a better strategy to compare the early adopters with those who follow later in participating in the national prevalence survey.

For this the next research questions are formulated:

- Is there a decrease in prevalence rates for acute care hospitals during the years they participate in the national prevalence survey?
- Do settings (acute care hospitals) who participated from the first time (1998) have lower prevalence rates than those who participated last year for the first time?
- Is there a difference in policy conditions and preventive strategies between those early adopters and those who follow later?

*Methods*

The data of the prevalence surveys in 1998, 1999, 2000 (and 2001) are used for answering these research questions. Potential risk factors for pressure ulcers will be assessed by logistic regression if the p-value is less than 0.05 on univariate analyses in the sample. Expected rates of pressure ulcer development will be calculated from the logistic model and compared with the observed rates. The settings will be compared by means of their average predicted probability among their patients.

*Results and Summary*

The analyses are not yet finished. The results and conclusions will be presented at the conference.

**PRESSURE ULCERS IN AMERICA: PREVALENCE, INCIDENCE, AND IMPLICATIONS FOR THE FUTURE**

*Submitted by the NPUAP Board of Directors  
Presented by Janet E. Cuddigan, NPUAP Monograph Editor,  
and Elizabeth A. Ayello, Associate Editor.*

*Introduction*

In 1989, the National Pressure Ulcer Advisory Panel (NPUAP) set a national goal to reduce the incidence of pressure ulcers by 500/0 by the year 2000. During the ensuing decade, the NPUAP engaged in an active program to improve clinical practice on pressure ulcers through education, research, and public policy. At the close of the twentieth century, the NPUAP assessed the progress toward this goal.

*Methods*

A Medline database search for all articles published and indexed between 1 January 1990 and 1 June 2000 (and later updated through 31 December 2000) yielded over 300 studies on pressure ulcer incidence and prevalence over the past decade. Data were analyzed across care settings and in specific populations such as persons with spinal cord injuries, the elderly, infants and children, hip fracture patients, persons of colour, and those at the end of life.

*Results*

Study data presented in the NPUAP monograph, 'Pressure Ulcers in America: Prevalence, Incidence, and Implications for the Future', indicate a wide variation in the range of incidence rates (i.e., acute care, 0.4% to 38%; long term care, 2.2% to 23.9%; and home care, 0% to 17%). Inconsistencies in methodologies used and the populations studied contribute to these differences and make comparisons and analyses of trends problematic. However, many positive developments in prevention and treatment of pressure ulcers have occurred over the past decade, including development of evidence-based practice guidelines, standardization of risk assessment, and improved technologies for prevention and treatment. Small studies from individual settings have shown that 50% reductions in pressure ulcer

incidence rates are possible. A 25% reduction in the rate of pressure ulcer development was reported in a nursing home chain, using the Minimum Data Set (MDS). Several studies reported fewer full-thickness (Stage III or IV) ulcers.

#### Summary

The NPUAP monograph is an important contribution to the literature. The scholarly critique and recommendation for standardizing methods to determine pressure ulcer prevalence and incidence will have a pivotal influence on the pressure ulcer community. The NPUAP reaffirms its mission to improve patient outcomes in pressure ulcer prevention and management through education, public policy, and research by setting new goals to address the unresolved issues and concerns surrounding this international health issue.

### PREVALENCE OF PRESSURE ULCERS IN ELEVEN GERMAN HOSPITALS IN APRIL 2001

*Nils Lahmann and Theo. Dassen*

*Department for the Education of Nurse and Paramedic Teachers; and Nursing Science. Centre for the Humanities and Health Sciences, Humboldt University, Berlin, Germany*

#### Introduction

As the first step of evaluating the quality of care regarding the important nursing care problem 'pressure ulcers' it is necessary to determine the actual prevalence of it. The department of nursing science of the Humboldt University Berlin conducted – as an independent institution – a regional survey in the states Berlin, Brandenburg and Mecklenburg-Vorpommern in April 2001. The survey was conducted with a German version of an instrument, that was developed and already in use in the Netherlands. The German version of the instrument was tested in a pilot study in November 2000 and proved to be reliable and valid.

#### Methods

The study design is a descriptive correlation questionnaire survey. Especially advised ward nurses observed every patient as far as 'informed consent' was obtained. The instrument contains questions regarding prevention, therapy and characteristics of pressure ulcers. For risk assessment, the Braden scale was used. Additional items about falling and the care dependency scale and some German specific information (care insurance, administrative labelling) complete the questionnaire.

#### Results

3012 Patients of an absolute 3516 patients (85,7%) of eleven hospitals took part in the research. First results of data-analysis show:

- Defining patients 'at risk' for pressure ulcer with value of Braden 20 or less (increases sensitivity of the instrument) 38,4% of Patients are 'at risk'.
- Prevalence in the 'at risk' group in all eleven hospitals ranges from 12% to 53.5%. Significant differences in groups with/without pressure ulcers regarding body mass.
- Index and care dependency scale.

- High association between Braden scale and care dependency scale ( $r = 0.85$ ). Data analysis still in progress. Scheduled results for illness, age, sex, operation, falling, etc.

#### Summary

Conducted survey in eleven German hospitals showed 28.3% average prevalence and high range of pressure ulcers in the group of patients at risk.

### PROGNOSTIC ABILITY OF RISK ASSESSMENT SCALES (The prePURSE study)

*L. Schoonhoven<sup>1</sup>, J.R.E. Haalboom<sup>2</sup>, E. Buskens<sup>1</sup>, M. T. Bouserna<sup>3</sup> and D.E. Grobbee<sup>1</sup>.*

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#### Introduction

Patients admitted to a hospital have an increased risk of developing pressure ulcers. In 1999 the prevalence of pressure ulcers stage 2 and higher was 8.3% – 10.2% in hospitalized patients in the Netherlands<sup>1</sup>. Most pressure ulcers may be prevented if preventive measures are taken in time. These preventive measures are expensive and sometimes also labour intensive, and should therefore only be given to patients who are at risk for pressure ulcer development. Risk assessment scales are used to identify patients at high risk for pressure ulcer development.

At least seventeen risk assessment scales have been described in literature. The Norton scale and the Braden scale are the most tested and best-documented scales. Most scales are opinion based, rather than evidence based, and most are not or minimally evaluated. Yet, expensive preventive measures are based upon their outcome. In this study we evaluated the predictive value of the Norton scale, the Braden scale, the Waterlow scale and the CBO scale in hospitalized patients.

#### Methods

A prospective cohort study was conducted, including patients from two large hospitals in the Netherlands. Patients admitted to the Neurology, Internal, Surgical and Geriatric wards for more than five days were included in the study. Patients were visited within 48 hours of admission and subsequently once a week until discharge or admission for twelve weeks. Patients were observed for the occurrence of pressure ulcers and information on risk assessment scales and other risk indicators from literature was collected. A total of 1,229 patients were included in the study. The scores on the Norton scale, Braden scale, Waterlow scale and CBO scale were calculated at admission and for the first follow up visit. The ability of the scales to discriminate between patients at risk and not at risk for pressure ulcer development at admission and at the first follow-up visit was determined by calculating the area under the Receiver Operating Characteristic curve (AUC). The AUC can range from 0.5 (no discrimination) to 1.0 (perfect discrimination).

### Results

The incidence of pressure ulcers stage 2 and higher after the first week of admission was 6.3%. The AUC's (95%CI) at admission were:

- 1) Norton scale: 0,502 (0,437–0,568);
- 2) Braden scale: 0,514 (0,447–0,581);
- 3) Waterlow scale: 0,593 (0,525–0,661); and
- 4) CBO scale: 0,537 (0,475–0,599).

The AUC's (95%CI) for the first follow up visit were:

- 1) Norton scale: 0,690 (0,631–0,748);
- 2) Braden scale: 0,674 (0,614–0,734);
- 3) Waterlow scale: 0,797 (0,750–0,843); and
- 4) CBO scale: 0,669 (0,611–0,727).

### Summary

The results show that the risk assessment scales (within 48 hours after admission) are not able to discriminate between patients at risk and not at risk for pressure ulcers at first follow up visit (AUC: 0,502–0,593). The scores, calculated within 48 hours after admission, do not predict which patients will and which patients will not develop pressure ulcers stage 2 or higher in the first week of admission. However, the risk assessment scales (at first follow up visit) are able to discriminate moderately between patients with and without pressure ulcers at first follow up visit (AUC: 0,674–0,797). The scores, calculated at the first follow up visit, do predict which patients have and which patients do not have a pressure ulcer stage 2 or higher at that moment. The scales are therefore better diagnostic than prognostic instruments. Taking preventive measures based solely on the results of a risk assessment scale at admission should be avoided. A risk assessment scale with better predictive value should be developed.

1. Bours, G.J.J. W., Halfens, R.J.G., Joosten C.M.C. (1999) *Landelijk Prevalentie Onderzoek Decubitus* [National prevalence survey pressure ulcers]. University of Maastricht, Nursing Science, Stuurgroep Decubitus, Maastricht, the Netherlands

## AN ALTERNATIVE DESIGN TO STUDY THE VALIDITY OF PRESSURE ULCER RISK ASSESSMENT SCALES

*T. Defloor, PhD, RN and M.H.F. Grypdonck*

### Aim

To compare the predictive value of two pressure ulcer risk assessment scales (Braden and Norton) and to evaluate the effect of effective preventive measures on the predictive validity.

### Methods

314 out of the 1,772 participating geriatric patients were randomly selected and assigned to the 'turning' group; 1,458 patients were assigned to the 'non-turning' group.

### Intervention

Each patient in the 'turning' group with a Braden score <17 or a Norton score <12 was randomly assigned to a two-hour turning schedule or to a four-hour turning schedule in combination with a pressure-reducing mattress. The 'non-

turning' group received preventive care based on the clinical judgement of the nurses.

### Data Collection

Pressure ulcer risk was scored twice weekly during a four-week period. The nurses were blinded for the Braden and Norton scores for their individual patients. Clinical risk assessment, pressure ulcer development, friction, spontaneous movements, sitting posture, skin condition, skin circulation, extra nutrients / fluid intake, pain were monitored daily.

### Results

With exception of turning, no statistically significant relation was found between pressure ulcer development and the preventive measures used. Turning patients decreased the number of pressure ulcer lesions significantly (5.1% instead of 10.6%) ( $X^2 = 12.042$ ;  $df = 1$ ;  $p < 0.001$ ). It did not lead to a reduction in non-blanchable erythema (19.4% and 20.7%).

The diagnostic accuracy given by the area under the ROC curve was similar for both scales (between 0.74 and 0.77) and did not help to discriminate between the Braden and Norton scales. If nurses act according to risk assessment scales, 80% of the patients would receive preventive measures, although not needed. Only 20% of the patients who should receive preventive measures, according to the risk assessment scales, would develop pressure ulcers if they did not. A lot of needless work is done and expensive material is wrongly allocated.

The use of effective preventive measures decreased the predictive value of the risk assessment scales. The area under the ROC curve decreased with 4 to 5%, the sensitivity decreased with 16 to 24%, and the specificity remained constant.

Nurses predicted pressure ulcer development even worse than the Braden and Norton scale. In only 46.6% of the patients that nurses considered as at risk, preventive measures were taken.

Only activity (OR 0.76, 95%CI = 0.47–0.96) and sensory perception (OR 0.73, 95%CI = 0.55–0.95) of the Braden scale, skin condition (OR = 1.63, 95%CI = 1.25–2.12) and existence of old pressure ulcers (OR = 1.85, 95%CI = 0.1.13–3.04) were significant predictors of pressure ulcer lesions (stage 2 and higher).

### Conclusion

Sensitivity and specificity are not the most appropriated methods to evaluate the predictive value of risk assessment scales. The effectiveness of the Braden and the Norton scale seems to be very low, and the development of a new adapted scale is of the utmost importance.

## THE DARK AREAS OF PRESSURE SORE COUNTRY

*M.J. Lubbers, AMC, Amsterdam, Holland*

- The risk of decubitus development is everywhere.
- Hard data is only available from a few areas (Hospital Ward / ICU / Nursing Homes).
- What about the other areas?

- Good literature or hard data about these areas does not exist. These are dark spots.
- A survey of these forgotten and neglected places will be presented.
- The P.S. equipment of Ambulances, Emergency Rooms, Diagnostic Centres and Operation Rooms will be discussed.
- Much work has to be done by the EPUAP

### **PRESSURE ULCER PROJECTS: IMPLEMENTATION AND PITFALLS**

*F.M.J. Hortag, Research Nurse, B.F.G. Apotheker, Pressure Ulcer Consultant, Th. Bots, Pressure Ulcer Consultant, Academic Medical Centre, University of Amsterdam, The Netherlands*

#### *Introduction*

'Why does implementation of new ideas or projects need commitment from management, ward executives and bedside nurses?' The Dutch Government has recently made the creation of a national pressure ulcer policy a priority and the Academic Medical Centre has therefore decided that they would like to actively participate in its development.

#### *Methods*

The AMC has already started several implementation projects aimed at lowering the overall prevalence of pressure ulcers, including: a Quasi-experiment within six wards; prevention of heel pressure ulcers during an operation and the use of risk scales by bedside nurses. The project leaders have one goal in mind: how to involve and commit managers, ward executives and bedside nurses to prevent pressure ulcers in patients.

#### *Results and Discussion*

At this point, a number of difficulties or pitfalls during the implementation are worth mentioning.

1. Development of a pressure ulcer policy must be implemented on a multidisciplinary basis with the organisation. However, managers, ward executives and bedside nurses have different priorities. Some managers will use results of the national pressure ulcer measurement in the development of their policy while others will simply ignore them; bedside nurses think of patient centred quality of care; ward executives think of hospital costs. So employees in different settings have different interests. Friction becomes inevitable along with passivity. Nobody feels directly responsible in implementing new ideas or policies.
2. Diversity in interests will greatly hamper the implementation. Therefore it is important that all interests have a place within the overall concept.
3. Participants want to see results from their efforts. No supervision or feedback means no results. No results means no commitment and the loss of the patient centred approach.

The pitfalls mentioned above can be tackled. One of the methods to tackle low involvement and commitment is to

impose a policy from above. To impose implies sanctions: rewarding or punishing participants. A point of discussion is whether the board of an organisation has to use this kind of method.

### **EVALUATING THE CLINICAL AND ECONOMIC OUTCOMES OF IMPLEMENTING A STANDARDIZED ALGORITHM TO HEAL STAGE II PRESSURE ULCERS**

*Courtney H. Lyder, Ophelia Empleo-Frazier<sup>1</sup> and Doreen McGee<sup>2</sup>*

*1) Yale University, New Haven, Connecticut, USA.*

*2) West Haven Veterans Administration Hospital, New Haven, Connecticut, USA.*

#### *Introduction*

Pressure ulcers remain a major health condition in nursing homes in the United States. The pressure ulcer incidence rate in nursing homes have consistently ranged from 2.2% to 23.9% with a conservative annual cost of \$1.5 billion. Due to changes in government reimbursement rates, it has become imperative for nursing homes in the United States to heal these ulcers in a timely and cost-effective manner. Thus, the purpose of this study was to evaluate the clinical and economic outcomes of implementing a standardized algorithm to heal Stage II pressure ulcers in nursing homes.

#### *Method*

The SOLUTIONS program is based on the principle of moist wound healing and evidenced based assessment tools with corresponding plans of care. Two nursing homes were used in this two phase study. In Phase I, a retrospective chart review of all residents with pressure ulcers was conducted to ascertain standard of care and baseline healing rates. In Phase II, a prospective double cohort repeated measures design was used to implement the SOLUTIONS program over a five-month period. An activity-based costing model was used to ascertain the cost to heal the pressure ulcers in Phase II.

#### *Results*

The baseline pressure ulcer data (N = 81) found that wet to dry gauze dressings and various hydrocolloids were the standard practice at both nursing homes with a mean healing rate of 10.19 weeks. After standardizing wound care (control cohort) and the implementation of SOLUTIONS (intervention cohort), the mean healing rate for Stage II pressure ulcers was significantly different in the control cohort 7.14 (n = 32) compared to 3.64 weeks (n = 40) for the intervention cohort (p. ≤0.0009). The activity-based costing model revealed that the total cost to heal the ulcers in the control cohort was \$22,140 compared to the intervention cohort \$4,918 (p. ≤0.0009).

#### *Summary*

This study concluded that the SOLUTIONS program was significantly more effective in healing Stage II pressures ulcers as compared to the standard intervention.

This research was funded by ConvaTec and Meade Johnson

## **BARTS AND THE ROYAL LONDON TISSUE VIABILITY WEBSITE. AN OPPORTUNITY FOR OFFERING ON-LINE EDUCATIONAL EXPERIENCES FOR TRUST STAFF**

**Ramona Buchan**

*Barts and the Royal London Hospital, London, UK*

### *Introduction*

Our aim in Tissue Viability was to launch a hospital website, which goes beyond providing information about our service. I saw it as an educational opportunity to provide information on aspects of wound care and equipment usage in pressure damage prevention. The information is updated with new articles and information on a monthly basis.

### *Brief content*

The home page contains a Tissue Viability 'staff profile' together with basic information including service philosophy, annual reports, and audits findings. There is a 'product focus' section where we look at a particular wound care product, and we also include the results of recent research. We also focus on a particular type of wound i.e., the diabetic foot. This information is updated on a monthly basis. Recently we have just added an article on mattress testing procedures.

We have a section on the link nurses complete with their names and contact numbers. We plan to commence link nurse web page interviews, so that the link nurses can have the opportunity of sharing with others about how they fulfil their roles and any good ideas they may have.

The information is presented with good use of visual displays etc., and is kept fairly lively and interesting. All wards and most departments now have access to computers, and many areas now produce all their careplans on the computers, so it is fairly easy for staff to access this information. We are in the process of designing an interactive chat page. This will enable staff to ask any questions regarding tissue viability and for us to share our answers with all that are interested. We do plan to research peoples opinions of the web pages usefulness as an educational resource in the future once it is more established as it is still very much in its infancy stage.

## **HOW TO IMPROVE THE QUALITY OF CARE TO PATIENTS AT RISK OF DEVELOPING OR ALREADY SUFFERING FROM PRESSURE SORES.**

**Agnes Jacquerye**

*Quality Adviser, Erasmus Hospital, Free University of Brussels, Brussels*

### *Introduction*

Measuring the quality of care is essential to know the extent of a problem. A regular measurement of the quality of care helps monitor its development and its improvement. However, simply measuring and fixing objectives and then quietly waiting cannot achieve any real improvements. Quality improvement still is a real challenge to take up. The Belgian pilot study illustrates this problem as far as pressure sores are concerned and tries to find solutions.

### *Methodology*

The Belgian Ministry of social Affairs, Public Health and the Environment gave its support to five pilot studies on the prevention of pressure sores. These national audits were coordinated in 1995, 1996, 1997, 1998 and 2000 by the Free University of Brussels, Erasmus Hospital, the Katholiek University of Leuven, and by a national working group. The five national audits were each carried out one day per year. These measurements concerned resources (seven indicators), the process of care (five indicators), and outcomes (five indicators). More than 200 health institutions participated on a voluntary basis, and around 30,000 patients were included in the study.

### *Results*

The results showed a significant improvement from 1995 to 1996, and from 1996 to 1997. This could be explained by the fact that measuring was starting, and by the fact that an awareness environment and action plans were being implemented. On the contrary, the results were less convincing between 1998 and 2000. For example, the pressure sores developed in the care units represented 57% of the existing pressure sores in 1995, then 55% in 1996, 51% in 1997, 52% in 1998, and finally 50% in 2000. The stagnation of these results shows the difficulty faced when trying to implement lasting change oriented towards improvement.

Piloting change requires serious thought on the 'know how' necessary to transform a project in a motivating and operationally viable way. To accomplish this, Jacquerye (1999) suggests taking into account the VIP model. The VIP model has two components: the first is to consider everyone as Very Important. The second consists in taking the following three elements into account: values, interest and pleasure. This is because the project has to be in concordance with the values accepted by others (Values), to bring specific interest to others (Interest) and give rise to Pleasure.

To make the model operational the author also suggests an agreement on the upholding and the improvement of quality. The aim of this agreement is to bring together the targeted action plans and the means commonly negotiated by care unit executives and staff on the field. This agreement leads to a dynamic environment based on confidence and is one of the keys of change. Health institutions have applied these two models with success.

### *Summary*

Measuring quality of care in the area of pressure sores gives a snapshot of the situation and the extent of this public health problem. Improving the quality of care still stays a challenge to take up. The five Belgian and national audits (1995, 1996, 1997, 1998 and 2000) carried out in more than ten thousand care units, and involving, on a voluntary basis, more than 200 health institutions, brings this problem to the fore.

The VIP model (Value, Interest and Pleasure) is suggested to help bring about change. To be operational, this model is combined with an agreement of confidence between executive and staff personnel showing the responsibilities of each, the plan of actions decided, the means needed and the recognition of the work done.

## THE DIFFICULT WAY TO A QUALITY MARK: LINKING PATIENT CHARACTERISTICS TO PRODUCT PROPERTIES

Ronald Boumans, Rom Perenboom, JeUe Gerritse and M.J. Lubbers

### Introduction

The Dutch Health Insurance Council (CVZ) would like to rationalise the way support surfaces are being prescribed. Just like in medicine prescription patient characteristics should generate a clear indication for the choice of intervention. CVZ asked TNO Prevention and Health to do a first step towards this goal by defining relevant patient characteristics, matching product properties and methods for measuring these. These results could be an essential basis for developing a quality mark. This could be developed by follow-up projects after this project.

### Methods

Literature search has been done into the aetiology of pressure ulcers, systems of describing patient characteristics and prevention protocols. This search has been supplemented by expert interviews and panel discussions with experts. Evaluation by experiments was not included.

Results and conclusions Some conclusions:

- Tissue distortion during time is in the cause and prevention of pressure ulcers much more important than interface pressure-
- It might be necessary to use different definitions for damage to weak tissue in order to distinguish pressure ulcers from other skin damage. This is necessary for prescribing the right prevention or treatment.
- Beds don't cure pressure ulcers. However, if a patient has a pressure ulcer the chances of developing more ulcers may have significantly increased. Patients with ulcers should therefore, in most cases, be put on systems meant for people with a higher risk.

Beds or mattresses are split up in three main groups: non/low risk surfaces, medium risk surfaces, and high risk surfaces. The right level for an individual patient is selected by looking at the general risk, the presence of ulcers and other relevant factors. A distinction is made between factors and indicators. Factors have a causal relation in the development of pressure ulcers with regards to the support surface. Indicators help to predict a risk, but don't necessarily have anything to do with the aetiology For example, if it is impossible to turn a patient, this fact alone could be a reason to select an other product category. The mental state is an example of an indicator.

The product categories have different relevant product properties. Within the categories it is possible to look at specific properties that are linked to specific factors. For example, if it is not possible to turn a patient the support surface should compensate in such a way that tissue deformation during time is kept within certain limits.

## AN EVALUATION OF THE SYSTEMATIC USE OF HYPEROGINATED FATTY ACIDS IN THE PREVENTION OF PRESSURE ULCERS, AND

## THE TREATMENT OF STAGE I PRESSURE ULCERS IN PATIENTS OF THE INTERNAL MEDICINE WARD OF THE UNIVERSITY HOSPITAL CLINICA PUERTA DE HIERRO, MADRID

Joan-Enric Torra I Bou, Teresa Segovia Gómez, Mariana Bermejo Martínez, Remigia Molina Silva and Justa Rueda López

Chronic Wounds Unit, Hospital de Terrassa, Terrassa, Barcelona, Spain.

### Introduction

Corpitol® (Sanyrene® in France and Germany) is a topical product composed by hyperoxygenated fat acids (HFA) rich in essential fat acids (60% of linoleic acid). The HFA are used in the prevention of pressure ulcers and in the protection of skin areas because their effect at different levels: resaturation and maintenance of the lipidic skin film, improving of cells cohesion, increase of cellular renovation in the epidermis, as well as antiradical and antisichemic effect.

Since 1996 the pressure ulcers prevention and treatment protocol of the Clinica Puerta de Hierro includes the systematic use of HFA in the prevention of pressure ulcers and the treatment of Stage I ulcers

### Material, Patients and Methods

We have done a retrospective survey in order to evaluate the efficacy of the systematic use of HFA in the pressure ulcers protocol of the Clinica Puerta de Hierro. We have studied patients from the Internal Medicine Ward. We have included in the evaluation patients with a punctuation in the Norton scale modified by the INSALUD of 14 or less, or patients that presented pressure ulcers when admitted. According with the protocol these patients received:

- (prevention): two daily topical applications of HFA in the at risk areas for pressure ulcers.
- (treatment): three daily topiad applications of HFA in stage I pressure ulcers.

In both cases the application of the product was done without massage in the affected areas.

### Results

We have included: 853 patients (25.11% of the total admissions during 1999 and 2000). 524 (68%) patients were admitted without pressure ulcers. Five of these patients developed pressure ulcers while admitted to the ward (0.95% of incidence).

While the period surveyed there were 163 Stage I pressure ulcers (78 in 1998 and 85 in 1999) 129 of these pressure ulcers (79.1%) were fully healed with the HFA, 14 (8.6%) improved reducing their surface, 7 (4.3%) had a bad evolution, 6 (3.7%) remained equal and in three cases (1.8%) the patient died.

### Discussion

The systematic use of HFA in a whole pressure ulcers prevention and treatment protocol has been shown to be a cost effective option for managing the problem of pressure ulcers, with a very good acceptance by patients and caregivers.

## CLINICAL VARIANCE IN THE ASSESSMENT OF PATIENTS TO IDENTIFY THOSE AT RISK OF PRESSURE ULCER DEVELOPMENT

*Catherine Sharp, Margaret Broadbent, Marianne Cummins, Annette Archer, Gayle Burr, Hellen Casey and Amelia Merriman*

### Introduction

The incidence and management of pressure ulcers in hospitalised patients concerned clinical nurses in the Central Sydney Area Health Service (CSAHS), Australia for some time. Anecdotal evidence suggested that a variety of approaches were used to assess patients. METHODS: A survey questionnaire of 26 items was distributed to all registered nurses (N = 2113) in clinical settings within the CSAHS.

### Results

The response rate was 35.6% (N = 850), of which 444 were useable. Data were analyzed using frequency distribution. Less than one quarter of respondents (95) indicated that they used a risk assessment tool. The most common tool was the Norton (79%). The majority of respondents (349 or 79%) did not routinely use a risk assessment tool. These respondents were asked when did they assess patients for pressure ulcer risk. Of the 349 respondents, 238 did not answer the question. The remaining 111 conducted a risk assessment without the use of a tool and the timing of this assessment, generally mirrored the responses given by those who did use a tool. Responses for when the risk assessment tool was used varied widely and ranged between the time of admission of the patient (40%) to when a pressure ulcer was noticed (1%). With regard to how patients were assessed as being at risk if a recognized tool was not used, 166 nurses responded. Answers were coded as experience if one or more risk factors were identified i.e., immobility, bedrest, age, or observation if words such as observation, inspection, looking, were used. Mobility (or lack of) was the most frequently cited factor that alerted nurses to the patient's risk potential.

### Summary

The majority of respondents did not use an assessment tool. There is no accepted tool, no guidelines and no consistent approach to assessment of patients in CSAHS. Of the respondents who indicated they did use a tool most used the Norton Scale, and to a lesser degree the Waterlow Scale. It may be assumed that nurses in the CSAHS do not routinely assess their patients for pressure ulcer risk.

## MONITORING THE PREVALENCE OF PRESSURE ULCERS: DOES IT SUPPORT IMPLEMENTATION PROJECTS?

*J F Wendte*

*Department of Social Medicine, Academic Medical Centre, University of Amsterdam, The Netherlands*

### Introduction

From 1992 in the Academic Medical Centre, the teaching hospital of the University of Amsterdam (AMC/UvA), the

prevalence of pressure ulcers is measured annually. The main goal is to inform the hospital staff with the outcome of their pressure ulcer policy. The most important research question is which trends can be observed in the prevalence of pressure ulcers over the past ten years. It will be discussed which contribution the outcome has had on the pressure ulcer policy of the hospital. Moreover, the future role of monitoring will be discussed.

### Methods

In the first year much effort has been paid to produce reliable estimates of the prevalence, within practical limits. The ulcers were observed indirectly through the sister in charge. The researchers did not check patients. A national risk scale (CBO), as routinely used in the AMC, was used. From 1998 onwards the methodology of the Dutch National Pressure Sore Project was followed, with direct observation and the use of the Braden scale.

### Results

A difference can be observed between the periods 1992–95 and 1998–2001 (Table 1). The overall prevalence increased with more than 13%, mainly due to an increased detection of stage I and II ulcers. In general the figures show over time a stable pattern.

Table 1  
Prevalence of pressure ulcers in the AMC/University of Amsterdam

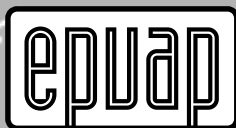
	1992–95	1998–2001
Overall prevalence	7,0% (5,8–10,0)	20,4% (17,4–22,4)
Prevalence related to patients at risk	17,0% (14,6–20,8)	31,0% (26,1–32,4)
Overall prevalence Stage I & II	3,6% (2,3–6,0)	16,7% (13,0–18,9)
Overall prevalence Stage III & IV	3,3% (3,0–4,2)	3,7% (3,3–4,4)

### Discussion

The difference between the two periods can be explained by the different measurements and an increased awareness of stage I. But the overall prevalence of stage III and IV did not change over time. This was not expected since all kinds of activities were undertaken like hospital wide introduction of new mattresses, intensifying the educational training and special attention to the risks of surgical patients during and around their time spent in the operating theatre. This shows that pressure ulcers are a persistent and complicated problem. Integrated and continuous implementation projects are required, with involvement of staff, patients and management. In such a policy annual prevalence measurement will play an important role to prevent a break down in attention.

### Note:

The remaining abstracts from the Le Mans meeting will be published in the next issue of the *EPUAP Review*.



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**SEPTEMBER 2002**

- 11 – 12 Education in Wound Care, an update**  
Monte Carlo, France  
Contact: Luc Téot  
Tel: 00 33 467 33 82 31  
Fax: 00 33 467 04 10 62
- 12 – 15 Wound Healing Oxygen and Emerging Therapeutics – International Conference on Oxygen Sensing, Signalling and Therapeutics, Gene Therapy, Angiogenesis and Clinical Care**  
Columbus, Ohio, USA  
Conference Co-chairs:  
Chandan K. Sen PhD, Ohio State University  
Thomas K. Hunt MD, University of California, San Francisco  
Further information:  
[@compuserve.com](http://www.oxygenwoundhealing.org)
- 13 – 14 ETRS Focus Meeting on the status today of new technologies in tissue repair: growth factors, gene therapy, stem cells, tissue engineering and xenotransplantation.**  
Nice, France  
Contact: Jane Green  
ETRS Business Office  
Tel: +44 (0)1865 228264/69  
Fax: +44 (0)1865 228233  
E-mail: [OxfordWoundHealingInstitute@compuserve.com](mailto:OxfordWoundHealingInstitute@compuserve.com)
- 18 – 21 6th European Pressure Ulcer Advisory Panel Open Meeting** · Budapest, Hungary  
Further information: Jane Green  
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Fax: +44 (0)1865 228233  
E-mail: [EuropeanPressureUlcerAdvisPanel@compuserve.com](mailto:EuropeanPressureUlcerAdvisPanel@compuserve.com)

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**OCTOBER 2002**

- 13 – 16 3rd Smith & Nephew International Symposium Translating Tissue Engineering into Products**  
Georgia Institute of Technology, Atlanta, USA  
Contact: Georgia Tech  
Web: <http://www.gtcc.gatech.edu>  
Tel: 001 404 385 0216

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**APRIL 2003**

- 8 – 9 Tissue Viability Society Spring Conference**  
Blackpool, UK  
Tel: 01722 429057  
E-mail: [tv@s@dial.pipex.com](mailto:tv@s@dial.pipex.com)

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**MAY 2003**

- 3 – 8 Wound Healing Society Annual Meeting**  
Seattle, Washington, USA  
<http://www.westin.com>  
Abstract deadline: 13 December 2002  
Co-Chairs:  
Paul Erlich, MD Hershey Medical Center  
Nicole Gibran, MD University of Washington
- 22 – 24 13th European Wound Management Association Meeting**  
Team-work in wound care – The art of healing  
Pisa, Italy  
Congress Consultants  
Tel: +45 70 200 305  
Fax: +45 70 200 315  
E-mail: [ewma@congress-consult.com/ewma2003](mailto:ewma@congress-consult.com/ewma2003)

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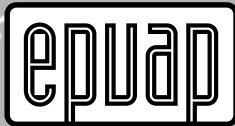
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- 3 – 6 7th European Pressure Ulcer Advisory Panel Open Meeting**  
Tampere, Finland  
EPUAP Business Office  
E-mail: [EuropeanPressureUlcerAdvisPanel@compuserve.com](mailto:EuropeanPressureUlcerAdvisPanel@compuserve.com)

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**JULY 2004**

- 8 – 13 2nd World Union of Wound Healing Societies Meeting**  
Paris, France  
MF Congress,  
Contact: Mr Bia  
8 rue Tronchet, 75008 Paris, France  
Tel: +33 140 07 11 21  
Fax: +33 140 07 10 94  
Web: <http://www.wuwhs.org>

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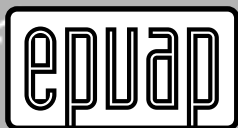
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