QUALITY IMPROVEMENT PROGRAM TO REDUCE THE PREVALENCE OF PRESSURE ULCERS IN AN INTENSIVE CARE UNIT

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Background  Critically ill patients are at increased risk for pressure ulcers, which increase patients’ morbidity and mortality. Quality improvement projects decrease the frequency of pressure ulcers.

Objectives  To improve patients’ outcomes by reducing the prevalence of pressure ulcers, identifying areas for improvement in prevention of pressure ulcers, and increasing the adoption of preventive strategies in an intensive care unit.

Method  Quasi-experimental methods were used for this quality improvement project in which 563 surveys of patients’ skin were performed during 22 audits conducted during a 26-month period. One-on-one clinical instruction was provided to bedside nurses during the surveys, and pressure ulcer data were displayed in the clinical area.

Results  The frequency of pressure ulcers of all stages showed an overall downward trend, and the prevalence decreased from 50% to 8%. The appropriate allocation of pressure-relieving devices increased from 75% up to 95% to 100%. The likely origin of the ulcer (ie, whether it was hospital or community acquired) and the anatomical site of the pressure ulcers did not change during the study period.

Conclusions  This program was successful in reducing the prevalence of pressure ulcers among vulnerable intensive care patients and indicates that quality improvement is a highly effective formula for improving patients’ outcomes that is easily implemented by using clinical expertise and existing resources. (American Journal of Critical Care. 2008; 17:328-337)
Pressure ulcers are a complex clinical problem with a multifactorial etiology. They are nationally and internationally recognized as an adverse outcome of admission to a health care facility and as 1 of the 5 most common causes of harm to patients. In addition, pressure ulcers are key clinical indicators of the standard and effectiveness of care. Pressure ulcers are not a new phenomenon; their occurrence was noted as far back as 2050 to 100 BC. Despite recent major technical advances in health care, pressure ulcers still occur at unacceptable rates within health care facilities, even though such ulcers are largely preventable.

Pressure ulcers markedly affect patients’ quality of life, morbidity, and mortality. Pressure ulcers also account for considerable direct and indirect costs in the health care economy. International publications provide many illustrations of the financial burden of pressure ulcers. The National Health Service in the United Kingdom estimated that direct costs related to treating pressure ulcers were between £1.4 billion and £2.1 billion (year 2000). Data from the Netherlands reveal that pressure ulcer treatment accounts for 1% of the health care budget. Treatment costs in North America appear to be similar. An estimated 95,695 pressure ulcers occur annually in Australia, requiring a median 398,432 extra bed-days and equating to a median cost of A$285 million, without consideration of the costs of litigation brought by former patients.

The incidence and prevalence of pressure ulcers in acute care facilities and countries vary. International health care publications report incidence rates of 1% to 11% and prevalence rates of 3% to 22% in hospitalized patients. The rates are higher in critical care patients (incidence 5.2%-20% and prevalence 14.4%). These values are reflected in Australian hospital data. Yearly prevalence surveys conducted in Victoria, Australia, between 2003 and 2006 revealed prevalence rates for pressure ulcers of 17.6% to 26.5% overall and 14.9% to 47.7% in critical care patients.

Critically ill patients are at a higher risk for pressure ulcers than are patients in general care areas. Several factors increase the risk: greater severity of illness; increased length of stay; poor tissue perfusion due to hemodynamic instability, use of vasoactive medications, and anemia; sensory impairment resulting in a reduced sensitivity and/or reaction to pressure due to sedation or underlying abnormality; skin maceration due to moisture; immobility; and poor nutritional status. These factors all contribute to the mechanical causes of pressure ulcer: pressure, shear, and friction.

Prevention of pressure ulcers is a fundamental aspect of intensive care nursing, and quality improvement methods are arguably the most cost-effective and intuitive approach to addressing this potentially serious problem. Prevalence surveys are often used in quality improvement as a practical means of determining the extent of a problem, identifying at-risk populations and deficits in service provision, measuring clinical and financial outcomes, and monitoring improvement in clinical practice. Such surveys provide a measure of the extent of a disease or health care problem at a particular time and, when performed repeatedly, an indication of trends. The purpose of this practice improvement program was to improve patients’ outcomes by reducing the prevalence of pressure ulcers, identifying areas for improvement in prevention of pressure ulcers, and improving the use of prevention strategies in an intensive care unit (ICU).

Methods

This quasi-experimental practice improvement program was conducted in a 14-bed adult general ICU at the Royal North Shore Hospital, a 600-bed metropolitan teaching hospital in Sydney, Australia. The hospital is a tertiary referral facility for a wide range of speciality services such as spinal, renal,
neuroscience, and burns. In this and other Australian ICUs, an accredited ICU staff specialist is ultimately responsible for the admission and management of all patients. The ratio of registered nurses to patients is 1 to 1 for patients receiving mechanical ventilation, and each nurse performs all the care for his or her patient. Additional clinical support is available during the day, Monday to Friday, including clinical nurse educators, a clinical nurse consultant, and nurse unit managers. Assistance is available 24 hours a day from the after-hours nursing unit manager and patient services assistants. The study was done between November 2003 and January 2006. A baseline hospital-wide prevalence survey was conducted in November 2003, and subsequent surveys were conducted in the ICU each month thereafter.

Sample
The number of potential opportunities for surveying patients’ skin was 601. Skin surveys were performed during audits conducted during the 2-year study period. All patients admitted to the ICU on the day of the audit were included in the surveys. No formal procedure was used to select the day on which the survey was conducted. The availability of the clinical experts to do the surveys was the major factor in the selection of the day; therefore, all surveys were conducted between Monday and Friday. Patients were not included if they had contraindications to movement (eg, severely unstable hemodynamic status), had an unstable spinal injury, were expected to die shortly, had extensive skin grafts, had procedures outside the ICU scheduled during the audit, or refused to participate.

Instruments
The Waterlow Pressure Ulcer Risk Assessment Scale16 was used to assess the risk for pressure ulcers. The cumulative score derived by adding scores for each risk factor gives an indication of the risk for a pressure ulcer. A score is assigned for each of the 10 risk factors: body weight, continence, skin condition, nutritional status/appetite, age, sex, mobility, recent surgery, tissue perfusion, and neurological status. The minimum score for adult patients is 2; the maximum possible score is 90. Low scores (<10) indicate low risk. A patient with a score between 10 and 15 is considered at risk, a patient assigned a score between 15 and 19 is at high risk, and a patient assigned a score greater than 20 is at very high risk.

The purpose of the tool is to provide a practical method of assessing the level of risk for pressure ulcers and to suggest levels of interventions to reduce risk.17

An internationally recognized staging scale18 was used to describe pressure ulcers. The scale ranges from stage I to stage IV; stage I indicates the least skin damage. Stage I is an observable pressure-related alteration of intact skin. The changes may be one or more of the following: skin temperature (warmth or coolness), tissue consistency (firm or boggy feel), and sensation (pain, itching). The affected area is a defined area of persistent redness in lightly pigmented skin; in darker skin tones, the area may be persistently red, blue, or purple. Stage II is a partial-thickness skin loss involving the epidermis and/or dermis. The affected area is superficial and resembles an abrasion, blister, or shallow crater. Stage III is a full-thickness skin loss involving damage or necrosis of subcutaneous tissue that may extend down to but not through underlying fascia. The affected area resembles a deep crater with or without undermining of adjacent tissue. Stage IV is a full-thickness skin loss with extensive destruction, tissue necrosis, or damage to muscle, bone, or supporting structures. Undermining and sinus tracts may also be associated with stage IV damage.

Procedure
The baseline prevalence survey was conducted by clinical experts in skin assessment and prevention of pressure ulcers in 4 separate clinical areas of the hospital, including the ICU and the acute aged care unit. The data from this survey and from subsequent monthly ICU prevalence surveys were used to gauge improvements in pressure ulcer rates after the implementation of a hospital-wide strategy for preventing pressure ulcers. The surveys indicated a higher than acceptable rate of pressure ulcers in the ICU and showed that many ICU patients who were at high risk and very high risk for pressure ulcers were not placed on pressure-relieving mattresses.

To engage our ICU bedside nursing colleagues in the project, we provided one-on-one clinical instruction that included training in the use of the Waterlow Pressure Ulcer Risk Assessment Scale,16 preventive strategies, notification procedures, and skin assessment. During the 26-month study period, the following data were collected each month for each patient assessed: the number, stage, and location of pressure ulcers; the type of strategy used to prevent pressure ulcers; and the most likely location of the patient when the pressure ulcer developed.

The data were entered into an Excel spreadsheet, and the frequency of ulcers was counted. Because
prevalence data violate the assumptions of inferential statistical methods, statistical analysis was not performed; data were reported as raw numbers and percentage rates.

The results of the survey, including raw prevalence data and information about particular areas for improvement and focused interventions, were presented in the ICU’s monthly newsletter. Reminders about how to obtain pressure-relieving devices were also provided, along with positive feedback and encouragement as rates of occurrence of pressure ulcers plummeted. The results of each monthly survey were reviewed, and any areas of concern were emphasized in the one-on-one clinical instruction provided in subsequent months. For example, focused preventive interventions such as a “pillow campaign” (encouraging colleagues to place a pillow under the lower part of each leg of a patient to keep the heel clear of the bed) were used when the number of heel sores was unusually high.

Results

Data were collected between November 2003 and January 2006. A total of 563 assessments of patients’ skin were undertaken. The demographics of the patients assessed during the surveys were similar to the demographics of patients in other studies from Australian ICUs: the mean severity of illness (Acute Physiology and Chronic Health Evaluation II) score was 18, 64% were receiving mechanical ventilation (mean duration, 4.5 days), the mean length of ICU stay was 6.5 days, 60% were male, and the mean age was 58 years (range, 19-91 years).19

All patients surveyed were at some risk (ie, no patients were at no risk) for pressure ulcers. A total of 20% were at risk (score >10), 30% were at high risk, and 50% were at very high risk. The overall rate of pressure ulcers decreased from 50% in 2003 to 8% in 2005. The ICU monthly surveys from 2003 to 2006 revealed an overall downward trend in the severity (stages) of all ulcers (see Figure).

The source (the most likely location of the patient when the pressure ulcer developed) of the ulcer remained constant. A total of 75% were acquired in the ICU; 25% were acquired in other units, other hospitals, or the community. The most common sites of pressure ulcers also remained constant; that is, 60% of pressure ulcers occurred on the heels, 30% on the sacrum, and 10% in other parts of the body, including the occiput (related to cervical spine collars). The use of pressure-relieving devices for patients at high risk and very high risk increased from 75% during 2003 and 2004 to 95% to 100% during 2005 and 2006.

Discussion

During this 26-month quality improvement program, the number of pressure ulcers of all stages, particularly stage I, showed a downward trend. The overall prevalence of pressure ulcers decreased from 50% to 8%. In addition, the use of pressure-relieving devices increased for the high-risk patients, and this increase reflects the experience at other facilities.20

The anatomical site of pressure ulcers and the location of the patient when the pressure ulcer developed remained constant throughout the program. The baseline prevalence of pressure ulcers in the ICU was high by national and international standards; however, the pressure ulcer prevalence trends and final prevalence rate compared favorably with international and national benchmark standards.9-15

This program had many strengths that warrant consideration. The methods used for the program were highly effective and contributed directly to improving patients’ outcomes. The program comprised all aspects of recommended methods of implementing evidence-based health care and sustaining practice over time. A multifaceted approach was used: one-on-one clinical instruction (with the aim of reaching 80% of all nurse clinicians at any time), reminders, and presentation of raw data on the prevalence of pressure ulcers on notice boards and in the ICU newsletter. Providing clinicians with feedback on patients’ outcomes is particularly influential because it gives objective data about the effect of the clinicians’ performance and provides a powerful reminder of the importance of preventive measures.9 Therefore, collection of the prevalence data not only was useful in monitoring progress with the education campaign, but also allowed clinicians to see the effect of adopting rigorous strategies for preventing pressure ulcers. The straightforward methods and the prudent use of resources were the most appealing features of this program and are characteristic of other effective programs for preventing pressure ulcers.15,20,22-24

We collected data on all stages of pressure ulcers, including stage I, which is often excluded from reports in international health care publications. Arguably, this approach allowed us to effectively monitor and manage all levels of skin damage and ensure that the ulcers did not become

Busy bedside clinicians are positively influenced by feedback on patients’ outcomes.
Prevalence surveys provide great opportunities for quality improvement.

Figure Number of ulcers by stage.

worse. In one observational study,25 13.7% of stage I pressure ulcers deteriorated to a higher stage. We monitored the data constantly for areas of skin at high risk for damage. We quickly identified pressure ulcers on the heel as a priority and continued to target this area with poster campaigns and by providing practical tips in the ICU newsletter on how to relieve pressure on the heels.

The program also had several limitations. Prevalence data are a snapshot in time and are therefore considered less reliable than incidence data. Prevalence data are not useful for identifying problem skin areas or the likely location of a patient when skin damage occurred.26 However, collection of incidence data is more labor intensive and costly than collection of prevalence data.26 A recent study20 performed in a comparable ICU in the Netherlands in which the investigators used more rigorous methods and more extensive resources (ie, the employment of a specific wound care nurse specialist) than we used yielded results similar to ours, albeit in a shorter time frame. Prevalence data are less onerous to collect and offer an achievable alternative to collecting data daily from skin assessments of all patients admitted to the unit. Because we collected data repeatedly, we could appraise the general trends in pressure ulcer prevention and focus our efforts on particular areas of concern, as described in the study performed in the Netherlands.20

The group of clinical experts who conducted the skin surveys changed slightly during the 26-month program; however, the leader and at least 2 members of the group of experts remained the same. Although all surveyors knew how to use the audit tool and were provided with the same information on skin assessment, assessments by those who were less familiar with pressure ulcer prevention may have been less accurate than assessments by those more familiar with pressure ulcer prevention. This diminished accuracy may have been more likely when the clinicians were differentiating between (1) sluggish capillary return associated with reactive hyperemia and (2) stage I pressure ulcers. Clinicians often have difficulty discerning stage I ulcers from reactive hyperemia, resulting in overdiagnosis of stage I ulcers.14,25

Other benefits have emerged from this program. We noted an apparent lack of confidence among some nursing colleagues about removing cervical collars and checking occiput skin areas while caring for areas subject to pressure. The nurses admitted that they lacked the confidence to remove collars in certain circumstances. We were able to address these concerns by offering opportunities to practice collar
removal and neck stabilization on healthy volunteers. This training has been incorporated into the regular education service for all nurses working in the ICU.

The results and information on the simple design of this program (eg, use of expertise expected of most nurse clinicians and the existing infrastructure within the ICU) have been disseminated locally. Other clinicians in other contexts and organizations have expressed an added confidence in their ability to lead similar programs to prevent pressure ulcers. We plan to use similar methods to improve clinicians’ adherence to hospital policy on medication administration in order to reduce medication errors.

**Conclusion**

This program emphasizes the value of using quality approaches to practice improvement (ie, plan, do, study, act) and the incorporation of evidence into practice.27 The multifaceted approach to providing information together with the timely feedback of providing actual outcome data appears to have resulted in a significant change in culture. In addition, the program has highlighted the value of emphasizing the essential aspects of care that ensure patients’ safety and recovery within a health care environment that has increasingly given technology greater importance.27 The nurses who undertook this important improvement in care have reclaimed the responsibility for ensuring that essential aspects of care are given appropriate priority.

**ACKNOWLEDGMENTS**

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**FINANCIAL DISCLOSURES**

None reported.

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**REFERENCES**


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CE Test  Test ID: A0817042: Quality Improvement Program to Reduce the Prevalence of Pressure Ulcers in an Intensive Care Unit. Learning objectives: 1. Describe how quality improvement can be achieved without large expenditure by using existing resources. 2. Understand that prevalence surveys provide great opportunities for quality improvement. 3. Recognize that bedside clinicians are positively influenced by data feedback.

1. Which of the following is correct about pressure ulcers?
   a. Pressure ulcer treatment accounts for 10% of the Netherlands’ health care budget.
   b. An estimated 56% of pressure ulcers occur annually in Australia.
   c. International incidence rates of pressure ulcers are higher in critical care patients.
   d. Pressure ulcers are recognized as the 10th most common cause of harm to patients.

2. According to yearly prevalence surveys conducted in Victoria, Australia, between 2003 and 2006, what overall prevalence rates for pressure ulcers were revealed?
   a. 1% to 11%
   b. 3% to 22%
   c. 17.6% to 26.5%
   d. 14.9% to 47.7%

3. Which of the following is a mechanical cause of pressure ulcers?
   a. Poor tissue perfusion
   b. Friction
   c. Anemia
   d. Sensory impairment

4. Which instrument was used to assess pressure ulcer risk in this quality improvement program?
   a. The Braden Scale
   b. The Modified Norton Scale
   c. The Waterlow Pressure Ulcer Risk Assessment Scale
   d. The Douglas Scale

5. In this quality improvement program, a patient with a pressure ulcer risk score of 21 was considered which of the following?
   a. Low risk
   b. At risk
   c. High risk
   d. Very high risk

6. An observable pressure-related alteration of intact skin describes which pressure ulcer stage?
   a. Stage I
   b. Stage II
   c. Stage III
   d. Stage IV

7. Which of the following best describes the affected area of a stage II pressure ulcer?
   a. It is a defined area of persistent redness in lightly pigmented skin.
   b. It is superficial and resembles an abrasion, blister, or shallow crater.
   c. It resembles a deep crater with or without undermining and sinus tracts.
   d. It may be persistently red, blue, or purple in darker skin tones.

8. The demographics of the patients assessed in the skin surveys included which of the following?
   a. Sixty-four percent were receiving mechanical ventilation.
   b. The mean length of stay in the intensive care unit was 2.5 days.
   c. Sixty percent were female.
   d. The mean age was 68 years.

9. Patients excluded from this quality improvement program included those with which of the following?
   a. Anemia
   b. Sensory impairment
   c. Poor nutritional status
   d. Extensive skin grafts

10. What was the most common site of pressure ulcers in this quality improvement program?
    a. Sacrum
    b. Heels
    c. Occiput
    d. Greater trochanter

11. During this quality improvement program, the number of pressure ulcers of all stages showed a downward trend, particularly which stage?
    a. Stage I
    b. Stage II
    c. Stage III
    d. Stage IV

12. According to this quality improvement program, the overall prevalence of pressure ulcers decreased by what percentage?
    a. 11%
    b. 26%
    c. 32%
    d. 42%

13. When compared with incidence data, what are prevalence data considered to be?
    a. More reliable
    b. More labor-intensive
    c. More costly
    d. More practical in identifying at-risk populations

Test ID: A0817042  Contact hours: 1.0  Form expires: July 1, 2010  Test Answers: Mark only one box for your answer to each question. You may photocopy this form.

1. a  2. a  3. a  4. a  5. a  6. a  7. a  8. a  9. a  10. a  11. a  12. a  13. a

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