



Prevention of Pressure Sores: A Topic for Quality of Care Improvement

Pressure sores (also called pressure ulcers, bedsores, or decubitus) are a serious and common but preventable medical problem, encountered mainly in hospitals. They occur most often in elderly and immobilized patients, e.g., at orthopedic wards, in patients with severe, acute illness (e.g., patients in intensive care units), and persons with neurological deficit, such as a spinal cord lesion. Pressure sores are localized areas of cellular necrosis that develop when skin and soft tissue are compressed between a bony prominence and a firm surface. They are classified according to their depth as follows:

Stage I. Erythema that is not blanchable, ie, does not disappear within 30 minutes of the relief of pressure. It is the heralding lesion of skin ulceration.

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

Stage III. Full thickness skin loss involving subcutaneous tissue and extending to, but not through, underlying fascia. The ulcer presents clinically as a deep crater with or without undermining of adjacent tissue.

Stage IV. Full thickness skin loss with damage to muscle, bone or tendon. Muscle and subcutaneous tissue are more susceptible to injury than the skin and, therefore, clinicians need to suspect greater damage than might be indicated by skin surface injury.

Constant pressure on the skin over a bony prominence, due to immobility, is the primary force that precipitates the formation of the lesion; the pressure induces ischemia causing reactive hyperemia. There are also predisposing factors involved, which may be extrinsic (shearing, friction, and moisture) and intrinsic.

Shearing is a force parallel to the plane perpendicular to a bony prominence and causes the skin to remain stationary, while subcutaneous tissue and vessels are stretched and angulated. The pressure needed to reduce blood supply is lesser and ischemia occurs more quickly to muscle, subcutaneous tissue, and eventually skin. *Friction* removes the stratum corneum, causing intra-epidermal blisters and superficial erosions, thereby reducing the time necessary for the development of skin ischemia. *Moisture* often caused by perspiration or urinary incontinence leads to skin maceration and edema, making the epidermis more susceptible to abrasions.

Intrinsic factors are undernutrition, old age, and low arteriolar pressure.

Pressure sores are a recognized problem that warrants concern. Accurate incidence and prevalence rates are difficult to determine. In a UK hospital, 4-10% of newly admitted patients in 1991 developed pressure sores (1). An extensive study of 184 hospitals in the US found an average prevalence rate of 9.2% (2). In US hospitals, 3-14% patients are affected yearly, with 12.4% of all lesions found in patients on medical wards, 20% in patients on geriatric, and 24% in those on orthopedic wards (3). Most pressure sores (70%) occur in patients over the age of 70 and are associated with a four-fold increase in the death rate of elderly patients, with 60,000 of them dying annually in the US from pressure sore-related complications, including sepsis and osteomyelitis (4).

In addition to increased mortality, pressure sores cause great pain and suffering (5). They delay recovery and prolong hospital stay in both acute care hospitals (6) and rehabilitation settings (7). Pressure sores also lead to higher expenditures in actual cost as well as in nursing time. The cost of healing a pressure sore was estimated to be US\$5,000 to US\$25,000 (8), and a 50% increase in nursing time was necessary to treat it. Prevention takes an average 51.5 minutes of nursing time per patient per day (9) and costs between US\$50 and US\$500 per patient, including nursing time, special mattresses, and supplementary nutrition (10). Thus, prevention of pressure sores is significantly less expensive than treatment.

Current literature suggests that pressure sores may never be entirely eliminated, but that their occurrence may be reduced. The appearance of a pressure sore is considered a poor outcome of care and an adverse event (11). Because of the increased mortality involved and the suffering it causes, as well as the high costs of healing compared with low costs of prevention, the prevention of pressure sores is an important topic for a quality of care improvement activity that addresses both the process and the outcome of quality of care. Measures of pressure sores incidence may be used to compare the quality of care over time and among clinical settings, provided that they are adjusted for patient mix (12).

There are various methods for the mitigation of extrinsic and intrinsic factors predisposing to pressure sores, which should be included in a prevention program. Such a program requires resources. It is, therefore, important to ensure that effort and resources are

targeted towards patients at high risk of developing pressure sores. Thus, a prevention program should start with a risk assessment, and proceed with the implementation of mitigating measures to the different categories of patients at risk. Several tools are available for risk assessment. These are scales based on an evaluation of a range of clinical variables, such as mobility, incontinence, activity, and mental condition; the total score is generally compared with a standard reference value to classify the level of risk. The scales were developed on the basis of the relative importance of possible risk factors rather than on hard evidence (12), but are useful in discriminating patients who will from those who will not develop pressure sores. The best-known tools are the Norton, Braden, and Waterflow scales. At present, the most frequently used is the Modified Norton Scale (MNS), which is valid and reliable (13). It uses 5 assessment criteria; a total score of less than 14 indicates warranted intervention, and patients with a score below 12 are at very high risk.

Every patient at risk should be included in a pressure sores prevention protocol. The protocol consists of the following items.

Positioning and turning. Bedridden patients should be turned every 2 h to minimize constant pressure on bony prominences. They should be turned to a 30° oblique position to relieve pressure on the sacrum, greater trochanter, ischial tuberosities, lateral malleoli, and heels. For this purpose pillows and blankets can be used. Patients who are seated in an armchair or wheelchair should raise themselves, or be lifted, every 10 min for 10 s, to prevent sacral pressure sore.

Avoiding shearing. The head of the bed should be maintained at the lowest degree consistent with the patient's medical condition, because shearing forces increase at 30° elevation.

Avoiding friction. Patients who cannot assist the therapist should not be dragged, but lifted and moved in the bed by use of a bed sheet as a "drag sheet" or a lifting device.

Use of pressure reducing devices. Pillows and foam wedges should be used to keep long bone prominences from direct contact with one another, as well as devices to raise the heels off the bed. Bed surfaces that have been shown to reduce pressure include sheepskin, static air, and water mattresses, or more sophisticated ones, such as air loss alternating mattresses or air fluidized beds. A reasonable approach is starting with a simple, less expensive device and progress to a more sophisticated and expensive one if Stage I develops, since patients at very high risks and with developed pressure sores particularly benefit from such devices (14).

Additional measures. Daily systematic skin inspection, with documentation of findings; cleansing skin at routine intervals and at time of toileting, with a mild cleansing agent; avoiding both hot water and massaging over bone prominences; minimizing skin exposure to moisture, and when sources of moisture cannot be controlled, using underpads and briefs; providing nutritional support or a supplement (in-

cluding parenteral feeding) when indicated. Patients should be inspected for any pressure sore immediately before a surgical procedure, particularly a long one. During the operation pillows and blankets should be used to position and support the patient, and immediately after the procedure, the patient should be inspected for a developing pressure sore.

By applying the two described phases of prevention (risk assessment of patients and implementation of preventive measures to those at risk), it was possible to reduce significantly the incidence of pressure sores (1,6,13,15-17). Because of serious implications of pressure sores and the existing possibility of reducing their occurrence, all hospitals should initiate a prevention program as a quality of care improvement activity, and establish criteria for the process and outcome of care.

Process criteria should include the assessment scale selected for identifying patients at risk and the frequency of its use. The standard established could be that a risk assessment be completed by the department's head nurse for all patients within 48 h after admission. The assessment should be incorporated into the nursing admission diagnosis, forwarded to the head of the department and physician in charge of the particular patient, and documented in the care plan. The assessment could be repeated after 48 h and whenever the patients' condition changes thereafter, including after surgery. It is useful to prepare guidelines for all preventive measures to be used in patients at risk. Physicians, nurses, and dietitians should use the guidelines and understand thoroughly the preventive measures. It would be useful to prepare and provide nurses and physicians with a Pressure Sore Card, which has the assessment scale on one side and the pressure sore classification on the other (13), to facilitate risk assessment and documentation.

Outcome criteria should determine the standard of pressure sores incidence rate acceptable to the hospital. Before the introduction of the program, a prospective study of the incidence during three months should be conducted in the whole hospital or selected departments, to generate the baseline for comparison with the outcome of the program. Three months after the initiation of the program, the incidence of pressure sores in the hospital could be compared with the baseline rate to evaluate the effectiveness of the program; the effectiveness should be expressed as the percentage by which the program reduced the baseline incidence rate.

It is useful to involve as many physicians and nurses as possible in the development of criteria and standards. Educational sessions should be organized, consisting of theoretical and practical issues such as risk factors, the skin of the elderly, nutritional aspects, pressure-reducing mattresses, preventive measures, and documentation. The whole staff should understand and accept a new policy. The nursing personnel undertake most preventive measures. However, pressure sores are not solely a nursing problem, nor do they represent a measure of the quality of nursing care only. Pressure sores are a broad medical problem and indicate the overall quality of care provided by the

hospital. Heads of clinical departments should regard themselves as responsible for pressure sores as they are for all other problems at their departments. Since the prevention of pressure sores requires resources and contributes to cost containment, it is also the responsibility of hospital management, particularly in view of the principle of clinical governance (18).

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