The Unavoidable Pressure Ulcer: A Retrospective Case Series

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Abstract

- *Objective:* To identify medical conditions related to pressure ulcer occurrence when at-risk status is appropriately assessed and preventive measures are in place.
- *Design:* Retrospective chart review.
- *Setting:* Acute care hospital.
- *Methods:* Charts were reviewed for past medical history, activities of daily living, comorbid illness, and physiologic parameters at the time of ulcer discovery.
- *Results:* 20 patients met the inclusion criteria. Average age was 69.2 years and 80% were male. All pressure ulcers were discovered at an early stage. 100% had hypoalbuminemia, 75% had respiratory failure with endotracheal intubation, 70% had anemia, 70% were hypoxic, and 65% were hypotensive at the time of ulcer discovery. Of the patients who were hypotensive, nearly all (92.3%) were on pressor agents. 55% had either infection or sepsis, 50% had malignancy, 50% had diabetes mellitus, and 40% had either acute or chronic renal failure or both. 30% had a clinical diagnosis of congestive heart failure. 30% had undergone a major operative procedure prior to ulcer discovery.
- *Conclusion:* Pressure ulcers remain an important indicator of quality; however, there is a subset of patients where skin breakdown is unavoidable with current prevention technologies.

As of October 2008, the Centers for Medicare and Medicaid Services (CMS) no longer reimburses hospitals for added costs related to preventable outcomes, including stage 3 and 4 pressure ulcers [1]. In FY 2007, 257,412 cases were reported to Medicare, making them the most common entity among the 10 items on the "no-pay" list [1]. It is estimated that the annual cost of pressure ulcers is between $5 and $8.5 billion [2]. Denial of payment for pressure ulcers and related complications will essentially reward institutions with low ulcer rates, providing huge incentives for prevention. The CMS policy will hopefully usher in a new era of accountability regarding pressure ulcer prevention and skin assessment in acute care [3,4].

Despite the best of intentions, many providers are concerned about the avoidability of some outcomes on the Medicare no-pay list, particularly those occurring in high-risk patients [5,6]. CMS has tacitly agreed that these outcomes may sometimes be unavoidable, referring to items on the no-pay list as "reasonably preventable through the application of evidence-based guidelines [1]." Pressure ulcers are a prime example of an adverse outcome that occurs in high-risk patients even when clinical practice guidelines for risk factor assessment and pressure relief strategies are followed [7,8]. They are a recognized geriatric syndrome and commonly occur in all health care settings [9]. In hospitals, their prevalence ranges from 3% to 15%, with higher rates in intensive care units [9].

There are several factors that render a patient at risk for pressure ulcer development, and it is not clear which combination will lead to ulcer formation when prevention measures are in place. It is probable that physiologic factors can push skin and subcutaneous tissues beyond a survivability threshold, causing tissue damage even when prevention measures are employed. In the setting of multiple organ system failure and end-of-life situations, skin has been known to fail despite good care [10]. The purpose of this study was to identify medical conditions and physiologic parameters that are related to the occurrence of pressure ulcers when at-risk status is appropriately assessed and pressure relief measures are attempted.

Methods

Setting

St. Vincent's Hospital Manhattan is a 408-bed nonprofit hospital located in New York City. There are 357 adult and pediatric beds and 35 intensive care beds. St. Vincent's is a state-certified AIDS center, Level 1 regional trauma center, stroke center, a training site for the Queens School of Nursing and the Staten

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Island School of Nursing, and a major affiliate of New York Medical College. St. Vincent's offers a continuum of care for the elderly, including an outpatient practice, acute care for the elderly unit, inpatient consultation program, 3 affiliated nursing homes, home care agency, and an accredited geriatric fellowship program.

Study Sample

A convenience sample of patients was drawn from a list of hospital-acquired pressure ulcers (stage 3, 4, or unstageable) reported to the skin care nurse during the third quarter of 2007. Patients were included if they met the following criteria: (1) no pressure ulcer on admission as defined by specific medical and nursing documentation in the admission assessment; (2) pressure ulcer "at risk" status noted by Braden scale score and pressure relief measures in place at the time risk was determined; and (3) pressure ulcer developed. Pressure relief measures consisted of turning schedule and/or powered pressure redistribution device applied to the bed such as alternating pressure air mattress or low air-loss device. We included patients with stage 3 or 4 pressure ulcers of the torso and did not include patients with lower extremity ulcers so as to exclude ulcers of vascular origin. We did not collect information related to specific location on the torso (eg, buttocks, sacrum, trochanter).

Chart Review

Chart review was performed by a geriatric fellow (SH) and an attending geriatrician (JL) using a data collection protocol developed by the coauthors. The reviewers extracted information concerning age, gender, past medical history, activities of daily living (ADLs), and diagnoses. We also noted specific laboratory values including serum albumin, hemoglobin, Pa_{O_2} and oxygen saturation. We defined hypoalbuminemia as albumin level less than 3.4 g/dL, anemia as hemoglobin less than 10 g/dL, and hypoxia as Pa_{O_2} less than 90 mm Hg or oxygen saturation less than 90%. Criteria used for immunocompromise were presence of HIV or hematologic malignancy. Hypotension was defined as systolic blood pressure less than 100 mm Hg. We noted Braden scale score on admission and at the time the ulcer was discovered as well as stage of pressure ulcer at discovery. Pressure ulcer staging criteria were in accordance with currently accepted National Pressure Ulcer Advisory Panel standards [11]. We also noted pressure relief measures and number of days from admission to date of pressure ulcer discovery. We did not collect patient data after the ulcer was discovered. The project was approved by the St. Vincent Medical Center's institutional review board before data collection began.

Results

The convenience sample comprised 23 patients. Three patients were excluded because they were admitted with pressure ulcers or we could not confirm that pressure relief was in place at the time of ulcer discovery. Twenty patients met our inclusion criteria. Average age was 69.2 years (range, 44–89 years) and 80% were male. Relevant aspects of past medical history are shown in **Figure 1**.

All pressure ulcers were discovered at an early stage; 80% were found at stage 1, while 20% were stage 2. All patients were on pressure relief measures. Patients who could be moved were placed on turning schedules. Eighteen patients (90%) had spent some time in an intensive care unit, either surgical or medical. Patients in the intensive care unit who were immobile from multiple life support measures and/or postoperative status were provided with low air-loss mattresses. The low air-loss mattress was the only pressure redistribution support surface used in our study sample. Mean time from admission to ulcer discovery was 12.1 days (range, 3–23 days). ADL status in patients with new ulcers included urinary incontinence (90%), bedbound (90%), indwelling bladder catheter (89%), fecal incontinence (80%), and NPO on enteral nutrition via nasogastric tube or percutaneous gastrostomy (79%).

Comorbidities at the time of ulcer discovery are presented in **Figure 2**. All study patients had hypoalbuminemia, with mean albumin of 2.2 g/dL (range, 1.8–2.7). Seventy-five percent had respiratory failure with endotracheal intubation, and most of these had hypoxia with sedation or chemical paralysis. Seventy percent had anemia with mean hemoglobin of 9.2 g/dL (range, 7.0–12.9). Sixty-five percent were hypotensive, and of these nearly all (92.3%) were on pressor agents. Fifty-five percent had either infection or sepsis, and most common sources were lung and urinary tract. Half of patients had malignancy, including 4 with multiple primaries (**Table**). Of the 8 patients with renal disease, 3 were on hemodialysis. Three patients had cardiac arrest prior to ulcer discovery.

Thirty percent of patients had undergone a major operative procedure prior to ulcer discovery. Operations included coronary artery bypass, toe operation related to peripheral vascular disease, hip replacement, vascular bypass of the lower extremity, and chest tube placement.

Discussion

This study begins to outline specific physiologic conditions to consider when differentiating whether a pressure ulcer is an unavoidable consequence of underlying illness or a symptom of inadequate quality of care. Accepted quality indicators for pressure ulcer prevention include risk assessment and pressure reduction [12]. We reviewed the charts of patients who developed pressure ulcers for presence of these 2 indicators and identified 20 patients. We then reviewed the charts for clinical information including past history, ADL status, comorbidities, and physiologic data.

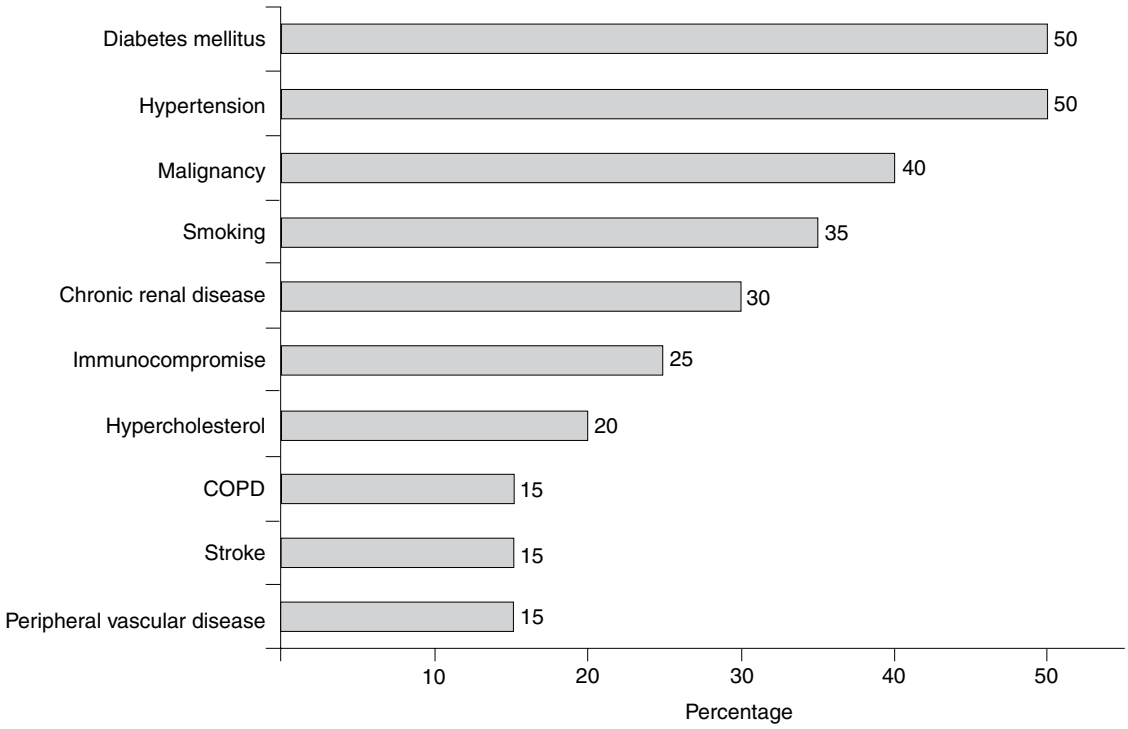

Figure 1. Distribution of medical conditions/relevant history in patient sample. COPD = chronic obstructive pulmonary disease.

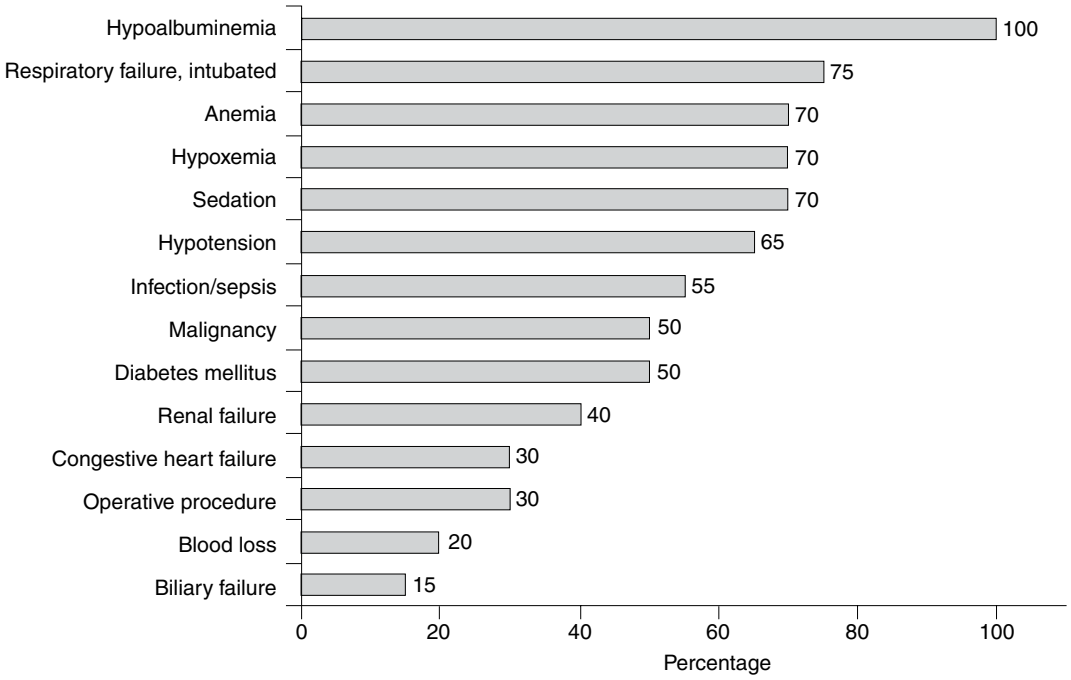

Figure 2. Distribution of select comorbidities in patient sample.

Table. Types of Malignancy in Patients Developing Pressure Ulcers

Metastatic ovarian cancer
Multiple myeloma
Lung, throat, bladder cancer (multiple primaries)
Renal, bladder cancer (multiple primaries)
Chronic lymphatic leukemia
Colon cancer (2 patients)
Lung, bladder cancer (multiple primaries)
Squamous cell cancer of the tongue
Multiple myeloma, prostate cancer (multiple primaries)

We found that most patients developing pressure ulcers were in the intensive care unit and had immobility resulting from a combination of factors, including respiratory failure with endotracheal intubation, sedation, operative procedure, or multiple life support measures. Conditions such as life support modalities, pain, complex operative wounds, and chest tubes may interfere with or prohibit compliance with turning schedules [13]. Other factors such as decreased sensorium, hypotension, and nutritional compromise may have played a part in ulcer genesis. We believe that the combination of immobility in the setting of multisystem organ disease and/or physiologic compromise led directly to pressure ulceration despite recognition of risk and prevention measures.

Our data is similar to that previously published. Mean time to ulcer occurrence in our study was 12.1 days (range, 3–23 days). Allman et al found a mean length of time from admission to ulcer discovery of 9 days (range, 1–59 days) [14]. He also found that the degree of immobility was a predictor of pressure ulcer development. In a cross-sectional study of hospitalized patients, Allman et al found fecal incontinence and hypoalbuminemia to be significantly associated with pressure ulcers [15]. Fecal incontinence causes increased susceptibility to breakdown by maceration and exposure to bacteria [16]. Hypoalbuminemia may contribute to ulceration by the causing interstitial edema that can impede oxygen, nutrient, and waste product exchange, resulting in increased susceptibility to pressure-related damage [17].

Lyder et al, in a multicenter retrospective cohort study of hospitalized patients, failed to find that prevention strategies decreased the incidence of pressure ulcers, demonstrating the multivariate nature of pressure ulcer development and lack of evidence-based research in pressure ulcer prevention [7]. He also failed to demonstrate an association between quality indicator compliance and decreased pressure ulcer development. Baumgarten et al, using a nested case-control study in hospitalized patients, found that patients in the intensive care unit had double the risk for developing pressure ulcers [18]. Among factors suspected were activation of catabolic inflammatory factors and limited effectiveness of the standard pressure-redistributing devices such as low air-loss mattresses.

Other medical and physiologic factors known to contribute to pressure ulcer risk include malnutrition, anemia, hypoxia, hypotension, diabetes mellitus, gastrointestinal disease, renal disease, and neoplasm [6,19]. Reasons for increased risk are heterogeneous and include poor tissue perfusion, inadequate nutrients, impaired healing mechanisms, intestinal malabsorption, and others. It has been suggested that risk-adjusted models with subject-specific risk factors will increase the efficiency of assessment for development of pressure ulcers [20,21].

This study has several weaknesses that should be addressed in future research on the unavoidable pressure ulcer. We used a retrospective convenience sample with only 20 patients, which confers limited statistical significance. There was no independent verification of the presence of preventive measures, the stage of ulcer at its inception was not verified by direct observation of the investigators, and there was no interrater reliability testing for chart review. Some ulcers that were stage 1 or 2 may actually have been suspected deep tissue injury—a recently added entity on the pressure ulcer staging system [11]. Also, stage 1 ulceration is sometimes confused with reactive hyperemia. New ulcers diagnosed in our patient sample were not followed to observe healing or evolution into more serious stages. Future studies should cross tabulate variables such as nutritional status with subsections of the Braden scale. In addition, patients with similar Braden scale scores who do not develop pressure ulcers should be included in future research.

The era of "pay for performance" for hospitals has arrived, spearheaded by the new CMS reimbursement guidelines. Although well intentioned, this new policy has come under criticism because of the unavoidable nature of some listed adverse outcomes in high-risk patients, even when evidence-based guidelines are implemented. In addition, this policy may impart the public with an unrealistic view of health care outcomes, thereby increasing liability risk for both physicians and the institutions that care for very sick patients. The medical malpractice risks related to pressure ulcers have already been well described [22,23]. It is certainly possible that currently available prevention technologies are inadequate for preventing ulcers in patients at severe risk with forced immobility due to multiple physical injuries or ongoing life-support measures.

Summary

This study begins to define physiologic factors associated with unavoidable pressure ulcers. This information has important implications in light of the new pay-for-performance initiative by CMS which denies reimbursement for added

costs related to hospital-acquired ulcers. Our results also spotlight the unrealistic implication that all pressure ulcers are preventable. Traditional risk-assessment scales are helpful in defining patients who are prone to developing pressure ulcers, but these scales do not address underlying physiology impacting tissue tolerance and skin perfusion, and may not be applicable to patients in intensive care units [4,24]. In addition, currently available pressure relief and redistribution technologies need reevaluation with regard to efficacy in preventing pressure ulcers. Whether avoidable or not, pressure ulcers remain an important indicator of quality, and caregivers must remain vigilant in preventing this common adverse outcome. This includes skin assessment, risk factor measurement and documentation, and implementation of pressure relief strategies for persons at risk.

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