

Bruin Biometrics, LLC (BBI) is pleased to provide this series of white papers to help lay readers understand commonly debated topics in pressure ulcer research and clinical practice. These papers are the distillation of a comprehensive literature search and review, rather than the result of primary research.



White Paper

OCTOBER 2013

Pressure Ulcer Formation:
Patients Populations at
Highest Risk

Education

Evidence

Evaluation

Pressure Ulcer Formation: Patient Populations at Highest Risk

Pressure Ulcers Are Common

A 2007 study pilot pressure ulcer prevalence* survey conducted across 26 hospitals in Belgium, Italy, Portugal, Sweden and the UK confirmed that prevalence rates across acute and long-term care settings in Europe widely vary. Overall, the survey concluded a pressure ulcer prevalence rate of 18.3% – 1,078 patients out of 5,947 total survey participants had at least one pressure ulcer. By country, the prevalence varied greatly: Italy (8.3%), Portugal (12.5%), Belgium (21.0%), UK (21.9%), Sweden (22.9%).ⁱ In the US, overall prevalence across all facilities was 12.3%.^{xv} Additional research studies have reported pressure ulcer prevalence rates ranging between 14% and 17%.ⁱⁱ However, even some of the most well-regarded, medical centers in the world report pressure ulcer incidences[†] as high as 55%.ⁱⁱⁱ Unpacking these figures exposes the magnitude of the pressure ulcer problem health care facilities face.

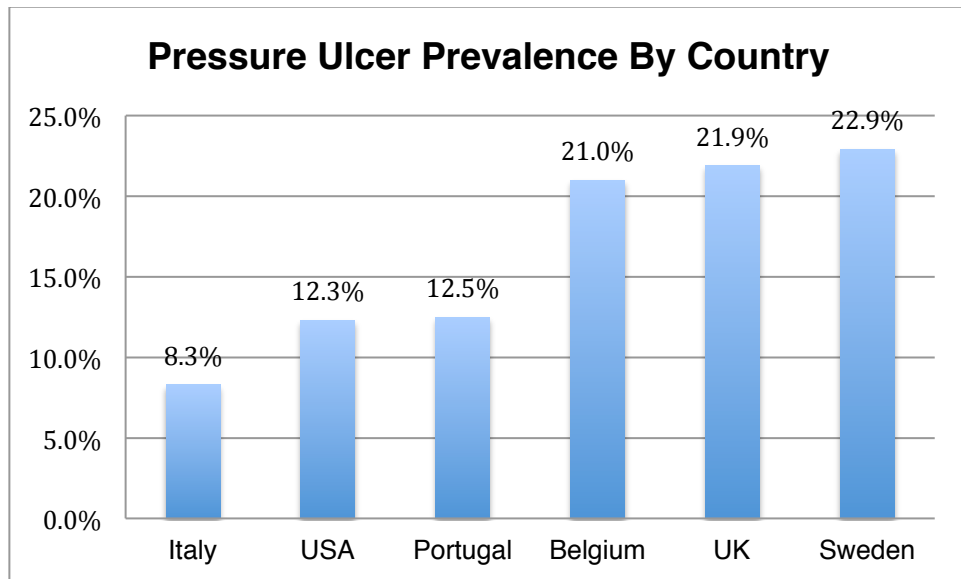


Figure 1: Pressure ulcer prevalence rates across six countries.^{i,xvi}

Pressure ulcers can develop at any time during the course of a patient’s care, but the majority of pressure ulcers are reported to appear within 2-4 days post admission.^{iv,v} Effective risk assessment is challenging, as an individual’s

* Prevalence: The proportion of a defined set of people who have a pressure ulcer at a particular moment in time. It may be expressed as a percentage (i.e. per 100 members of the population studied)

† Incidence: An estimate of the rate of occurrence of new pressure ulcers over time

risk profile is multi-faceted: theoretically every non-ambulatory patient is at-risk for developing a pressure ulcer. Ultimately, a patient’s susceptibility to ulceration comes down to the patient’s inability to buffer the effects of multiple contributing pressure ulcer development factors.^{vi}

Research from across the world provides insight into which patient population are most at-risk of pressure ulcer formation; Figure 2 shows which patient groups are most susceptible. Time and resource constraints often prohibit clinicians to effectively monitor every patient.

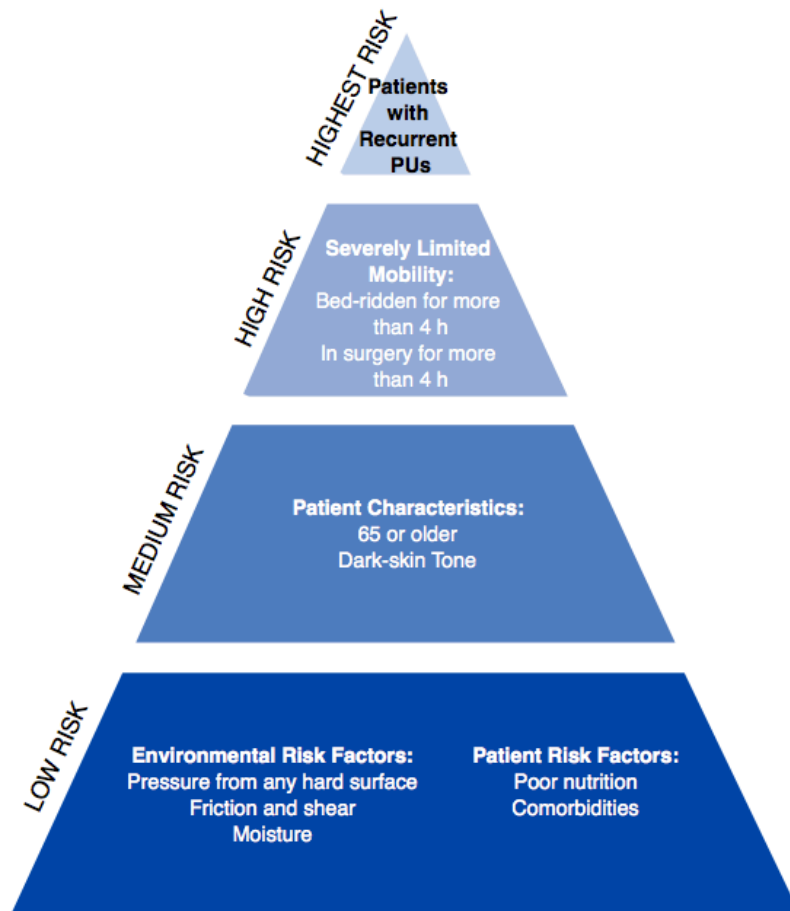


Figure 2: Pyramid of patient groups most at-risk of pressure ulcer development

Highest Risk – History of Pressure Ulcers

Pressure ulcer recurrence rates range from 31%^{vii} to 79%.^{viii} Treatments deployed to heal a pressure ulcer have no bearing on recurrence.^{ix} If up to 8 of every 10 patients who have a pressure ulcer are at risk of developing another ulcer, presence of a pressure ulcer within a patient’s medical history is the most significant pressure ulcer risk factor.

High Risk – Limited Mobility

Immobility is rarely the primary cause of pressure ulcer formation. To cause pressure ulcers independently, immobility must be of a critical duration that causes ischemia.[‡] Studies have demonstrated that bedridden patients and patients undergoing a surgery of more than 4 hours are most likely to be exposed to this level of ischemia. 5 hours of ischemia can lead to a near-total loss of blood flow and microcirculation to skin tissue, resulting in severe damage.^{x,xii} Surgical patients are highly susceptible: over 23% of surgical patients developed a Stage I pressure ulcer after a surgery lasting more than 4 hours deteriorated to a higher stage.^{xii,xiii}

Medium Risk – Age, Mobility and Skin Tone

In the United States, approximately 56% of adult patients with a principal diagnosis of pressures ulcers were 65 or older; further, 72% of adult patients hospitalized with a secondary pressure ulcer diagnosis were 65 years and older.^{xvi}

Decreased activity and limitations in mobility; urinary and fecal incontinence; abnormalities in nutritional status; and, altered consciousness – all of which are common in elderly patients – are confounding factors that directly contribute to an elderly patient's increased risk of pressure ulcer formation. However, the distribution of other common concomitant diagnoses was not specific to elderly patients. Among hospital stays that were principally for pressure ulcers, other concomitant conditions included anemia (31.2%), urinary tract infections (30.5%), paralysis (29.2%), fluid and electrolyte disorders (26.1%), nutritional deficiencies (23.4%), diabetes without complications (20.6%), and dementia (20.4%). Paralysis and spinal cord injury were prominent among younger patients, while fluid and electrolyte disorders, nutritional disorders, diabetes without complications, and dementia were more often seen among patients 65 and older.^{xvi}

Patients with darkly pigmented skin are also at increased risk of pressure ulcers. A study of over 1900 nursing home patients determined overall pressure ulcer incidence to be 38 per 100 persons per year; however, nursing home residents with dark skin tones had a significantly higher incidence of 56 per 100 persons per year.^{xiv} A second study also demonstrated that the difference in prevalence between Stage I and Stage II pressure ulcers is greatest for dark-skin tone – Stage II incidence is more than twice the incidence of Stage I.^{xv} These disparities exist because Stage I pressure ulcers are diagnosed by observing non-blanchable erythema, redness of the skin that does not fade when pressed; but redness nor blanching are always evident in patients with dark skin tones. Therefore clinicians are unable to identify Stage I pressure ulcers via visual inspection, and ulceration is only

[‡] Ischemia: A restriction in blood supply to tissues, causing a deficit of oxygen and glucose to keep tissue alive

apparent once the ulcer has advanced to partial thickness loss, a Stage II pressure ulcer.

Low Risk – Environmental and Patient Factors

Elderly, stroke victims, patients with diabetes, those with dementia, and patients with impaired sensation demonstrate increased intrinsic risk factors.^{xvi} Serum albumin levels of less than 3 (74%), fecal and/or urine incontinence (73%), fragile skin (67%), and being immobile or bed bound (63%) are additional intrinsic risk factors.^{xvii}

Patient factors that increase a patient's risk for pressure ulcer formation include septicemia (16.1% of all pressure ulcer-related hospitalizations had this principal diagnosis), pneumonia (6.3%), urinary tract infection (5.6%), respiratory failure (4.3%), and aspiration pneumonitis (3.7%). Furthermore, 13.5% of all stays principally for septicemia had pressure ulcers noted as a co-existing condition, and 10.7% of all stays principally for aspiration pneumonitis had pressure ulcers noted as a secondary condition.^{xvi}

Compromised nutritional status presenting as unintentional weight loss and dehydration is also a known risk factors for pressure ulcer development.^{xviii} Adequate nutrition is important in wound healing; sufficient fluids, calories, protein, vitamins, and minerals in a daily diet are important for maintaining healthy skin and improving its ability to avoid injury and fight infection.^{xix} Patients suffering from poor nutritional status are more likely to develop pressure ulcers.

Bruin Biometrics Solution

Aside from the innate pressure ulcer development risk factors discussed herein, hospital nursing staff are continuously challenged to effectively manage all risk factors. Pressure ulcer mitigation requires a regimented set of guidelines alongside diagnostics and treatments that can minimize their burden.

Bruin Biometrics, LLC has created the SEM Scanner, a novel device that can detect tissue damage. When used as an adjunct to the current standard of care in pressure ulcer risk assessment, the SEM Scanner can minimize pressure ulcer incidence even in patients presenting the highest risk profiles.

The SEM Scanner measures sub-epidermal moisture (SEM), a biophysical measure associated with the inflammatory changes that occur before a pressure ulcer forms. Because the SEM Scanner enables detection of tissue damage up to a week before the damage is visible at the skin surface,^{xx} the device provides an evidence-based, objective method to target patients at higher risk for incipient pressure ulcer formation. Furthermore, by tracking

SEM Scanner readings over time, clinicians can assess the efficiency of their treatment methods. Each year, approximately 1.6 million patients develop pressure ulcers in acute care settings, representing a cost of \$2.2 to \$3.6 billion to the U.S. health care system.^{xxi} By adopting the SEM Scanner into pressure ulcer risk assessment protocols, hospitals now have the power to make pressure ulcer prevention possible.

Endnotes

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