

## Intraoperatively Acquired Pressure Ulcers: Are There Common Risk Factors?

The image displays a collage of research paper pages. Key elements include:

- KEY POINTS:** A box highlighting the study's findings, such as the prevalence of intraoperatively acquired pressure ulcers and the need for further research.
- TABLE 1:** STUDY POPULATION CHARACTERISTICS (N = 252). A table listing various comorbidities and their prevalence in the study population.
- TABLE 2:** STUDY PARTICIPANTS BY STATE. A table showing the distribution of participants across different states.
- TABLE 3:** STUDY POPULATION PRESENT DEMOGRAPHICS. A table providing demographic data for the study population, including mean age, weight, and height.
- TABLE 4:** PREVALENCE OF INTRAOPERATIVELY ACQUIRED PRESSURE ULCERS. A table detailing the prevalence of pressure ulcers across different patient groups.
- TABLE 5:** NUMBER OF ANESTHETIC AGENTS ADMINISTERED. A table showing the number of different anesthetic agents used during the procedures.

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Descriptive studies<sup>1-4</sup> related to contributory factors in pressure ulcers conducted in long-term care and acute care settings have led to the development of many well-known skin risk assessment tools (ie, Gosnell's Assessment of Patient Potential for Pressure Ulcer, Braden Scale of Pressure Ulcer Risk Assessment, the Norton Score, Abruzzese's Modified Assessment of Decubitus Ulcer Potential Tool). Several descriptive studies<sup>5-10</sup> examining factors associated with pressure ulcer development in the surgical population have demonstrated some consistency among variables associated with pressure ulcer formation and documented that even patients with a low assessment tool-based risk score may develop a pressure ulcer within the operative period.<sup>11-13</sup> However, no specific skin risk assessment tool for the intraoperative patient population is available.

### Literature Review

**Pressure ulcer prevalence.** Pressure ulcers have been reported in most patient care environments; accurately ascertaining the prevalence of pressure ulcers in the operating room has been difficult. One descriptive study involving 1,128 patients reported intraoperatively acquired pressure ulcer prevalence to be 8.5%.<sup>12</sup> However, the results may have included existing pressure ulcers (prevalence) as well as newly acquired ulcers (incidence). Documented incidence for intraoperatively acquired pressure ulcers is as low as 12% and as high as 66%.<sup>5,14,15</sup> In a descriptive study involving 136 adult patients undergoing elective cardiac surgery, Papantonio<sup>6</sup> found that 37 patients (27.2%) developed Stage I and Stage II pressure ulcers. Of the 24 patients

who received general anesthesia for spinal disc herniation repair or abdominal surgery in Sanada's<sup>7</sup> 3-month descriptive study, nine (36%) developed either a Stage I or Stage II pressure ulcer.

**Cost.** The cost of managing pressure ulcers in all settings ranges from \$1.335 billion to \$8.5 billion per year.<sup>16-18</sup> Beckrich and Aronovitch<sup>18</sup> calculated the cost of treating pressure ulcers using previously published data, including the 1998 *Universal Healthcare Almanac*<sup>19</sup> and 1998 *Hospital Statistics*<sup>20</sup> by the American Hospital Association. Using these data, the overall cost of treating hospital-acquired pressure ulcers in 1998 was determined to be between \$2.2 and \$3.6 billion, reflecting nearly 30% to 40% of an acute care hospital's total expenditures. The annual cost to treat surgical patients' pressure ulcers — nearly 42% of all hospital-acquired pressure ulcers occur in surgical patients — is between \$750 million and \$1.5 billion.<sup>18</sup> The treatment of a single ulcer has been estimated to cost \$14,000 to \$40,000.<sup>20,21</sup>

**Length of stay.** Pressure ulcers also increase length of stay by an (average) additional 3.5 to 5 days.<sup>22</sup> One hospital-based descriptive study found that pressure ulcers doubled the length of stay for patients undergoing hip surgery — an average increase of 10 days.<sup>23</sup> Schultz et al<sup>5</sup> reported that surgical patients with a pressure ulcer had a median hospital length of stay of 16.5 days, compared to 7 days for a surgical patient without a pressure ulcer.

**Differential diagnosis.** Intraoperatively acquired pressure ulcers are not always recognized in the immediate postoperative period. Failure to make a connection between the surgical procedure or operating room time and pressure ulcer development may be due to the possibility that not all nurses are familiar with the differences between “traditional” and intraoperatively acquired pressure ulcers. A “traditional” pressure ulcer is one that results from the common causes of shear, friction, and pressure. This is the type of pressure ulcer clinicians treat on a daily basis and what many professionals refer to as *decubiti*. An intraoperatively acquired pressure ulcer is the result of multiple factors that can be identified as causative agents and the appearance can range from mottled epidermis to hard, necrotic tissue.<sup>24</sup>

Intraoperatively acquired pressure ulcers typically start as burn-like lesions.<sup>6,12</sup> Changes in skin integrity may appear within hours — typically, within 72 hours following surgery. The affected area becomes ecchymotic (bruised) and may blister. Necrosis occurs within 2 to 6 days; patients with vascular compromise and subsequent altered skin integrity may present with an area of skin that has a mottled irregular pattern that may resolve or result in a full-thickness wound.<sup>24</sup> In many instances, the vascularly compromised patient might have only a diagnosis of diabetes mellitus, coronary artery disease, or peripheral arterial disease. Practitioners should be aware that vascular disease of the pelvic vascular system is not easily diagnosed unless that patient has a recognized abdominal aortic aneurysm or arterial studies for vascular disease in the lower extremities have been conducted.

**Determining patient risk.** Predicting the occurrence of a pressure ulcer that occurs during a surgical procedure is often difficult because many surgical patients are not generally considered at risk.<sup>2,4,11,18</sup> The author has observed that changes in the patient's skin often are thought to be related to events not associated with surgery, particularly if the patient is acutely ill. As such, nurses treating a patient with an intraoperatively acquired pressure ulcer may fail to consider the

intraoperative event the patient has experienced, which may result in inappropriate management of the pressure ulcer.

The author's personal observation/monitoring of the outcome of patients who developed mottled tissues during a surgical procedure has noted that placing an occlusive dressing (such as petrolatum-based gauze) on the discolored tissue, particularly in the coccyxgeal and upper buttocks, facilitated autolysis in the area. When the same patient population was placed on an appropriate specialty bed surface (eg, air-fluidized therapy) in addition to using an occlusive dressing, either the mottled tissue resolved without tissue loss or less tissue was damaged.

**Positioning.** Surgical positioning affects the risk and location of skin breakdown — eg, the lithotomy position affects the heels, sacrum, and elbows.<sup>22,23</sup> Additional operative risk factors include the type of anesthesia, length of surgery, use of a heating/cooling device, extracorporeal circulation, pressure (ie, retractor internally, operating room staff externally), and negativity.<sup>6,26,27</sup> Adding surface layers (eg, cloth, warming blanket) on top of a pressure-reducing surface negates the effect of the pressure-reduction surface and produces a higher pressure reading than would be expected — hence, negativity. Long periods of immobility pre- and postoperatively in elderly patients have been linked to pressure ulcer development in the immediate postoperative period.<sup>28</sup> Several descriptive and experimental studies have identified length of surgical time as a significant contributing factor to pressure ulcer development<sup>6,9,12,29</sup>; however, the reported time frame of intraoperative pressure ulcer development ranges from as little as two to as many as 14 hours.

Many surgical procedures require patient positioning that involves solid objects or devices such as a “bean bag.” After decompression, these devices can increase pressure over a bony prominence, especially if the patient is even minimally repositioned. In the lateral supine position, the circulatory system may be compromised not only by a tight restraint, but also by the overall effect of the horizontal body posture and the changed effects of gravity.<sup>29</sup>