

OR RNs Lead the Way in Managing Surgical Patients' Skin Integrity

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Skin breakdown affects the more than 4 million people who develop pressure sores each year. According to one expert, people who develop ulcers have an increased rate of mortality although how ulcers contribute to death is not clear.¹ The people most affected are the elderly and people suffering a major injury or disease. This results in an increase of \$9 billion in annual healthcare costs, according to the National Institute of Nursing Research.²

CLINICAL VIGNETTE

Mary Jasperson, 76, is admitted for surgery of a right total hip after falling in her home in the afternoon. She is diagnosed with mild dehydration and has an IV and Foley inserted before going to the OR. In the OR, she is positioned on a fracture table for the two-hour procedure with the physician and his assistant.

The OR nurse, Kim Yu, provides preoperative education and assesses Mrs. Jasperson. Kim discusses the intraoperative plan for positioning the patient with the surgeon and the team. As an advocate for the patient, Kim is concerned about managing the integrity of the patient's skin, knowing that elderly patients have special needs to prevent pressure ulcers.

1. On arriving in the OR, the Kim's initial assessment would include —
 - a. Condition of skin, color, turgor, warmth, abrasions, bruises, or any other abnormalities, such as anemia, potential blood loss and length and tolerance of procedure.
 - b. Blood pressure.
 - c. Knowledge of surgical procedure.
 - d. Knowledge of the risks, benefits and alternatives of surgery.
2. Kim's role as a patient advocate in the perioperative setting would include —
 - a. Noting the belongings of Mrs. Jasperson and her family.
 - b. Organizing and managing supplies needed for the case.
 - c. Maintaining an environment that prevents infections and pressure ulcers based on evidence-based practice.
 - d. Evaluating the need for X-ray.
3. After positioning, Kim reassesses Mrs. Jasperson, including the following systems —
 - a. Respiratory, circulatory, neurologic, musculoskeletal, and integumentary
 - b. Circulatory only
 - c. Neurologic and respiratory
 - d. Respiratory
4. Kim realizes that Mrs. Jasperson's susceptibility to pressure ulcers while on a fracture table can be caused by factors such as —
 - a. Humidity in the OR.
 - b. Being in a prone position for an extended period with less than an inch of support material between a body part and the hard surface.
 - c. The cold environment in the OR.
 - d. The extreme care taken when positioning.

For surgical patients, the rate of developing pressure sores can be as high as 66%, and they may not be noticed until one to four days postop, but may be seen as a burn area.³ In the OR, management of a patient's skin integrity is a challenge. Anesthetized patients cannot physically adjust their position in response to physiological discomfort; the state of anesthesia (general, local, block, or sedation) and anesthetic agents may compromise response. Nurses in the OR need to accept managing patients' skin integrity during the intraoperative phase of care as an accountability as identified by the American Nurses Association and Association of periOperative Registered Nurses.^{3,4}

Skin integrity is a nursing practice concept. "Skin is the first line of defense" is a mantra in nursing education programs, and nursing practice supports that principle. Traditionally, nursing literature did not strongly support the standard statement of "pressure points padded" (PPP) in nursing care plans and intraoperative nursing notes. The benefits of different support surfaces in the OR has been studied, but it remains difficult to verify the best and most effective means to prevent ulcers.²

Historical research on pressure ulcers in non-OR settings showed that using standard-issue hospital linen, cotton blankets, and Turkish towels as PPP to position patients compromised skin integrity rather than promoted it.³ OR RNs were hesitant to change practice, but as the research focused on nontraditional "padding" and stabilizers, such as foam heel and elbow protectors and headrests, ORs began to use them in good faith, assuming they were a best practice. But, in fact, these devices actually increased pressure, especially with obese patients, and did more harm than good for skin integrity.^{4,5}

Nursing research is now more sophisticated and supported by performance improvement projects in clinical practice. As a result of research, accrediting agencies, public and private payers, and evidence-based practice, a mandate has evolved for all nurses to manage skin integrity. In the OR, RNs were hard-pressed to ignore this mandate.

The new concepts of skin injury prevention and skin integrity management include new pressure-reducing surfaces and pressure-relieving devices. It is now crucial to change from the traditional OR skill set of PPP to a focus on managing skin integrity by integrating OR-specific risk factors with knowledge about pressure-reducing and pressure-relieving devices.

The change in practice is based on knowledge — not skill, evidence, routine — and two specific patient outcomes: freedom from injury and freedom from infection. The change is evidence-based practice, not just a rationale.⁶

Correct answers
1. A — Initially an assessment by the OR nurse includes condition of skin to include color, turgor, warmth, abrasions, and bruises. Additionally, anemia, potential blood loss, and length and tolerance of the procedure are assessed to form a baseline for comparison.
2. C — Nurses acting as advocates manage the environment to prevent infection and prevent pressure ulcers based on evidence-based practice.
3. A — The respiratory, circulatory, neurologic, musculoskeletal and integumentary systems are important to assess when a patient is positioned for a surgical procedure.
4. B — One inch of padding material is especially important to prevent pressure ulcers in the elderly.

Preventing injury and infection

The patient-nurse bond is founded on trust that the RN as a patient advocate will protect the patient and promote the patient's optimum operative outcomes.⁷ Patient outcomes are observable, measurable physiological and psychological responses to any nursing intervention.⁷ A patient outcomes model focuses practice on the high risks that patients in need of operative or other invasive procedures may encounter.

In the OR, the high risks are injury and infection, so the focus for care team practice is based on freedom from infection and freedom from injury. All care team members — regardless of license or title — contribute to these two patient outcomes. The environmental service staffs contribute when they use disinfectant to clean all the horizontal surfaces in the OR. The sterile processing staffs contribute when they decontaminate instruments as the first step in the sterilization process. Surgical technologists contribute when they manage sterile fields. All activities of RNs, as the licensed members of the OR care team, contribute to keeping a patient free from injury and infection. The RN in the role of circulator performs the preoperative assessment, noting patient needs and risk factors; organizes and manages the OR care environment to promote freedom from infection and injury; and evaluates care based on outcomes.

The standards of the Association of periOperative Registered Nurses emphasize the patient's skin integrity in discussion of both outcomes of freedom from infection and freedom from injury.⁷ The relationship between AORN standards and a patient's intraoperative position is a baseline skin assessment.^{1,3} Without a baseline skin assessment preoperatively, the RN will not be able to accurately evaluate skin integrity postoperatively. As a result, compromise to skin integrity from PPP or from pressure-reduction and pressure-relieving surfaces will be difficult to determine. A clear "before and after" comparison of the skin is the best way to determine whether any injury to skin integrity is related to pressure-reduction and pressure-relieving surfaces, which are part of positioning, according to AORN standards.

In addition, during a baseline assessment, the OR RN assesses a patient's risk factors and can be an advocate for the patient if he or she requires special intraoperative pressure-relieving devices. With such nursing interventions, intraoperative-related iatrogenic injuries, such as burns, nerve damage, pressure ulcers, and deep tissue or skin surface trauma, should decrease, as should nosocomial infections.

Damage is seen as purple color and may be documented as a burn.¹ The burn-like appearance of a bony prominence that does not regain blanch or dissipate over a few hours may indicate that deep tissue has been severely damaged. A nurse's focus should not be on the color, but on the potential internal tissue damage that likely has already occurred, especially if the color is over a bony prominence. In other words, the external purple color is, in all likelihood, not the injury. The injury is internal to deep tissue; the color is only a manifestation of the deep tissue injury. This is important to understand in order to grasp the concepts of pressure, duration, and the location of the pressure on various part of the body (i.e., "pressure points").

Intraoperative skin injury related to intraoperative positioning is a physiological function at the capillary interface level. The pressure gradient at that level is normally in the range of 23 mmHg to 32 mmHg, relative to the thousands of capillary interface levels in the body.³ Physical skin injury occurs when the skin is compromised by a physiological compromise at the capillary interface level. Compromise is caused by one or a combination of these factors:^{3,6,8}

- Unrelieved pressure (or intensity)
- Pressure over time (duration)
- The location of pressure that is unrelieved for any length of time on the patient's body
- If any pressure exceeds a capillary's normal pressure, regardless of the length of time, it is enough to restrict the normal blood-to-tissue interface at the capillary level. Deep tissue deprived of oxygen-enriched blood begins to break down at this microscopic capillary interface level. As pressure time (duration) increases, the rate of the tissue breakdown increases. As the density between deep tissue and skin surface decreases, the intensity of breakdown from microscopic to deep tissue to surface tissue to skin increases, and skin surface injury occurs. This can especially occur when tissue is stretched over a bony prominence and, as a result, capillary interface pressures are exceeded or diminished. Patients under going procedures lasting more than four hours or cardiac procedures are at greater risk for skin breakdown, nerve damage, and compartment syndrome.⁹⁻¹¹

In summary, key points about pressure and duration are that neither alone can cause deep tissue ischemia,¹² and that high pressure for a short duration and low pressure for long durations are equally compromising to tissue.¹³ A researcher has described this phenomenon as "tissue tolerance."¹⁴ Conceptually, tissue tolerance is an actual or potential closed pressure sore, which, if intensity and duration continue, will manifest as skin surface injury. If it is located in the coccyx area, heels, or elbows, it may become a true pressure ulcer because of the small surface area.¹³

What endangers skin integrity?

Patients who have an operative or other invasive procedure are at increased risk of impaired skin integrity because

of three variables: surface pressure, immobility, and the length of time that the pressure and immobility are exerted on the body. Postoperatively, it is not unusual to observe reddened areas (hyperemia) on patients' skin surfaces. Not all hyperemia is related to "poor" positioning. Skin injury also may be the result of tissue trauma during surgery; manipulation of internal organs and a homeostatic response to being injured; thermal or chemical surface skin reaction to an agent used to prepare the surgical site; placement of retractors during the procedure; iatrogenic factors, such as staff's leaning against the draped patient; and the patient's own hemodynamics during the procedure.⁷ Additional factors that may contribute to skin injury, but to a lesser extent, include medications and irrigating solutions, as well as fluid overload.

The patient also may be genetically or medically predisposed for impaired skin integrity. (See sidebar for intrinsic risk factors.) The skin integrity of such patients is then insulted a second time because of OR-specific risk factors.

Important extrinsic factors that are gaining attention are the interfaces between the patient's body and the bed surface and between the patient's body and the positioning supplies and equipment used for intraoperative positioning.¹⁴

Heel pressure, for example, is difficult to relieve or reduce because of the heel's small surface area. In fact, standard foam heel pads increase heel pressure, so hyperemia may even be expected if they are used.³ (Suspending heels over a gel "bump" is more effective.) A recent report on foam headrests suggests that they, too, are more likely to cause occipital pressure injuries and alopecia than to maintain skin integrity.¹⁵

Intraoperative extrinsic risk factors include pooled liquids from skin preps, shearing of skin and skin friction during positioning, intraoperative hypotension due to anesthetic agents and manipulation of the patient's body, alterations in hemodynamic and circulatory status related to the patient's intraoperative position, and negativity, the layering of material between the patient and the pressure-reducing or pressure-relieving surfaces.⁷

The key role of the OR RN

Expert OR RNs use evidence-based patient-outcomes-focused principles when a patient requires intraoperative positioning. The ability of OR RNs to manage skin integrity is part of the perioperative care model and involves directing the OR care team toward optimal patient outcomes. The outcomes are the result of all OR caregivers working to prevent skin surface injury and deep tissue injury. Positioning, therefore, is a responsibility that all OR caregivers share. OR RNs usually initiate evidence-based care because of their knowledge of the patient, the patient's risk factors, and the OR supplies and equipment available for intraoperative positions. The operative procedure, the surgeon's preference, and the patient's condition are variables to consider when choosing the type of equipment used for positioning. The type of position the patient is placed in affects every system. All members of the patient's OR team have their own interests in positioning and contributing to optimal outcomes by safe and appropriate positioning. The interests include:

- Optimal exposure of the surgical site — surgeon
- Airway management, ventilation, and monitoring access — anesthesia care provider
- Physiologic safety for the patient — team
- Maintenance of patient dignity — circulating RN

(See sidebar for injury risks and safety considerations when positioning patients.)

Providing positioning devices that relieve and reduce pressure is part of the advocacy role and duty of OR RNs. Pressure-reduction devices decrease pressure to lower than what a patient would experience on a standard-issue hospital mattress. An OR bed mattress overlay is popular in OR skin integrity management. It's efficient, effective, and supported by evidence.^{3,4,14}

Most overlays are gel-filled pads used to cover the entire OR bed mattress. Air- and fluid-filled overlays are also available, including as accessories (e.g., "bumps," "rolls," and supports). An accessory molds to the body and distributes and supports the weight-bearing surfaces of the body in contact with the pressure-reducing overlay. Pressure at patient capillary interface levels is reduced (intensity), and the duration and location of pressure on the patient's body surfaces are relieved.

Research has shown that a gel or an air overlay is an effective barrier between deep tissue and skin surface (pressure potential) and between the traditional OR bed mattress (intensity potential) and the patient.^{4,15} All of these surfaces and devices help in managing a patient's intraoperative skin integrity.

Position	Risks	Safety Considerations
Supine	Pressure points, including occiput, scapulae, thoracic vertebrae, olecranon process, sacrum/coccyx, calcaneum, and knees Neural injuries of extremities, including brachial plexus and ulna, and pudendal nerves	<ul style="list-style-type: none"> • Padding to heels, elbows, knees, spinal column, and occiput alignment with hips, legs parallel and uncrossed ankles • Arm boards at less than 90 degrees and level with floor • Head in neutral position • Arm board pads level with table packs
Prone	Head Eyes Nose Chest compression, iliac crests Breasts, male genitalia Knees Feet	<ul style="list-style-type: none"> • Maintain cervical neck alignment • Protection for forehead, eyes, chin • Padded headrest to provide airway access • Chest rolls (i.e., clavicle to iliac crest) to allow chest movement and decrease abdominal pressure • Breasts and male genitalia free from torsion • Knees padded with pillow to feet • Padded footboard
Lateral	Bony prominence and pressure points on dependent side Spinal alignment	<ul style="list-style-type: none"> • Axillary roll for dependent axilla • Lower leg flexed at hip • Upper leg straight with pillow between legs • Padding between knees, ankles and feet • Maintain spinal alignment during turning • Padded support to prevent lateral neck flexion
Lithotomy	Hip and knee joint injury Lumbar and sacral pressure Vascular congestion Neuropathy of obturator nerves, saphenous nerves, femoral nerves, common peroneal nerves and ulnar nerves Restricted diaphragmatic movement Pulmonary region	<ul style="list-style-type: none"> • Place stirrups at even height • Elevate and lower legs slowly and simultaneously from stirrups • Maintain minimal external rotation of hips • Pad lateral or posterior knees and ankles to prevent pressure and contact with metal surface • Keep arms away from chest to facilitate respiration • Arms on arm boards at less than 90-degree angle or over abdomen

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Adjusting positioning to patient needs

Preoperative assessment includes the factors outlined in "Predisposing Patient Risk Factors." The assessment is within the OR RN's duty because care must be individualized. As an example, if a patient's musculoskeletal system is compromised, safe and appropriate positioning may not be possible because of anatomic and physical limitations. In this case, the OR RN will need to adjust the type of position and positioning devices. Other preoperative assessments include a baseline assessment of skin, specifically in areas where the safety straps and grounding pads are placed.

In the OR, positioning devices should be available in a variety of sizes and shapes. The devices should be durable, allergen-free, fire and moisture resistant, and easily cleaned/disinfected. They should retard microbial growth and be able to be stored, handled, and retrieved easily. A facility with more high-risk patients and a greater incidence and prevalence of tissue injury is justified in spending more on positioning devices.³ Positioning injuries are especially costly to hospitals because the federal government does not reimburse for the cost of hospital-acquired injuries.

Specific policies and procedures or nursing protocols for various intraoperative positions are not recommended by AORN, because it would be difficult to encompass all variables and scenarios.³ However, facilities should have practice guidelines based on evidence-based principles and patient-outcomes standards.

Intraoperative documentation should, at a minimum, include the OR RN's preoperative assessment, the type and location of positioning devices, the names and titles of people positioning the patient, and an evaluation of outcomes.³

Also, when the patient is repositioned on the OR bed or the positioning devices are moved, the OR RN should

reassess the patient. Postoperatively, while the patient is still in the OR, the OR RN should reassess the patient, noting for hyperemia and washing off residual skin prep solution before applying the dressing.

Having four care providers assist with transferring the patient from the OR bed to the gurney will help to avoid shearing injury, friction injury, physical patient injury, and injury to OR personnel themselves.³ AORN provides guidelines on preventing shearing and friction as well as moving patients in its Perioperative Standards and Recommended Practices.³

During hand-off communication, the PACU RN communicates with the OR nurse, performs a follow-up skin assessment, and notes when any reactive hyperemic areas begin to fade.⁶ The nurse reports to the surgeon any purple-colored areas that do not regain blanch or diminish in time.

RN research sets the stage

OR RNs can assess the risks of deep tissue and skin surface injury in their own care setting to compare incidence and prevalence.¹⁷ The data are available from an institution's quality and outcomes department. Identifying the risks of injury in an OR and calculating their incidence vs. prevalence can be used to support changes in positioning practices that are focused on prevention. Cost savings in the OR, based on evidence-based research, can contribute to success with reimbursement, best practices, and shorter hospital stays.¹⁸

This viewpoint is a change from the traditional view of intraoperative patient positioning as a skill to that of positioning as an outcomes-based practice based on nursing knowledge and nursing evidence. This may be a culture change in some ORs. It is an opportunity to help control the problem of perioperative compromise of skin integrity, which is debilitating to patients through injury and infection and, in turn, a financial challenge to the healthcare industry with the resulting longer hospital stays and lack of reimbursement for hospital-acquired injuries.

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