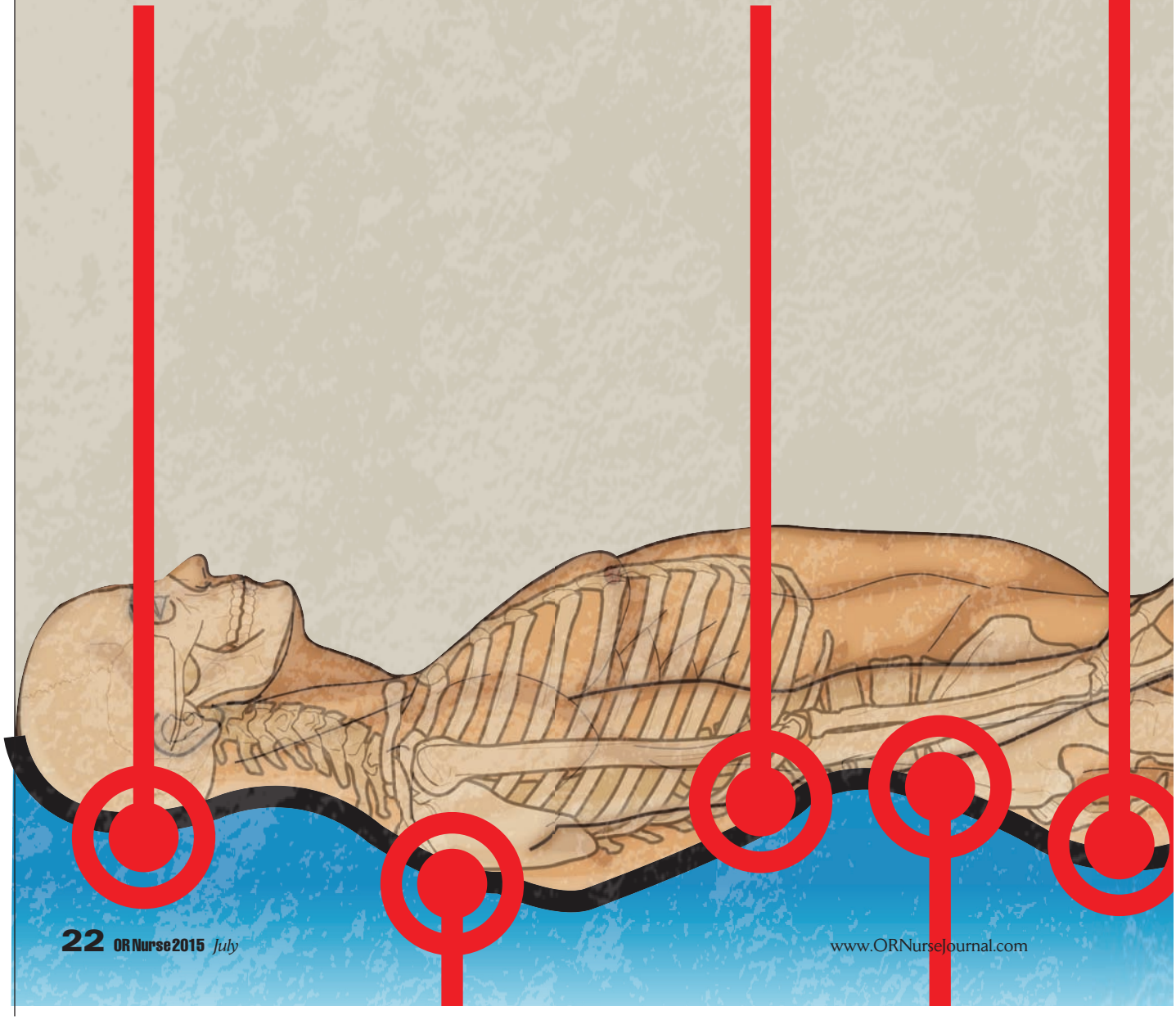
Perioperative pressure ulcers:



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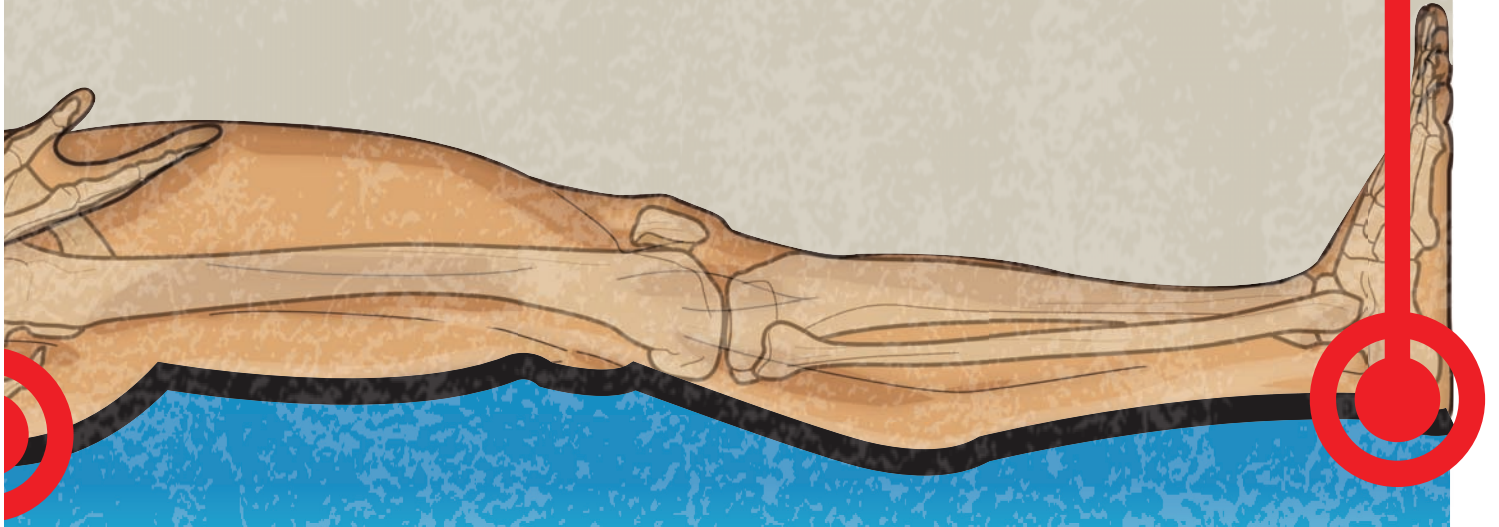
How can they be prevented?

By Denise Giachetta-Ryan, MSN, RN, CNOR

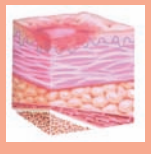
A pressure ulcer is defined as a localized injury to the skin or underlying tissue caused by unrelieved pressure or pressure in combination with friction or shear.[1,2] A pressure ulcer often develops when soft tissue is compressed between a bony prominence and an external surface for a prolonged period of time.[2] (See *Staging of pressure ulcers.*)

Each year in the United States, 60,000 patients die from hospital-acquired pressure ulcers.[1] Twenty-three percent of these pressure ulcers are acquired intraoperatively during surgeries that last more than 3 hours.[3] The Institute of Healthcare Improvement estimates that nearly 2.5 million people develop pressure ulcers each year.[4] The Centers for Medicare and Medicaid Services (CMS) estimates that each pressure ulcer adds more than $43,000 in costs to a hospital stay, totaling $11 billion annually.[5]

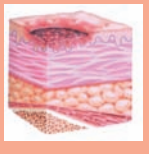
CMS considers Stage III and Stage IV pressure ulcers to be hospital-acquired conditions, and no additional reimbursement will be paid for patients who develop them in the hospital.[6] The incidence of pressure ulcers in



Staging of pressure ulcers[2]



Stage I–The intact skin appears as a defined area of nonblanchable redness in individuals with lightly pigmented skin; however, blanching may not be visible in individuals with darker skin tones. Skin tissue can be warm or cool, with firm or soft changes in tissue consistency and a painful sensation.



Stage II–Partial-thickness tissue loss that involves the dermis and presents as a superficial open ulcer or as an intact or ruptured serum-filled blister.

Stage III–Full-thickness tissue loss involving damage to subcutaneous tissue. Exposed subcutaneous fat or necrotic tissue may be present. However, muscle, tendon, and bone are not visible. The ulcer may present as a deep crater.

Stage IV–Full-thickness tissue loss occurs with extensive destruction, tissue necrosis, or damage to muscle, bone, or supporting structures. Muscle, tendon, or bone may be visible and undermining often occurs.

Unstageable–Full-thickness skin loss is present with a wound bed covered with slough or eschar. The depth cannot be determined.

Suspected deep tissue injury–A purple or maroon discoloration of a localized area of intact skin or a blood-filled blister due to soft tissue injury from shear or pressure. Skin temperature may be warm or cold with firm or boggy changes in tissue consistency and a painful sensation.

Art courtesy of the Anatomical Chart Company.

surgical patients can be as high as 45%, and the percentage of patients who acquire pressure ulcers increases as the length of surgery increases.[1] Pressure ulcer prevalence occurs at a rate of 8.5% or higher among all patients who undergo surgical procedures that last longer than 3 hours.[4]

There are multiple risk factors that predispose a patient to the development of a pressure ulcer. Pressure is defined by its intensity and duration. Muscle is more sensitive to pressure than skin. The underlying tissue may become necrotic by the time a lesion presents on the skin surface.[1] Tissue damage may become apparent within several hours after surgery but may not present for up to 72 hours.[3] Low-intensity pressure over a long period can cause as much damage as high-intensity pressure for a short period of time.[1] Pressure risks include immobility related to the patient's inability to reposition during surgery, sensory deficit related to limited ability to sense the need to reposition under anesthesia, and bottoming out, which occurs when the pressure-relieving device no longer prevents direct pressure on the surface from which the patient needs to be protected.[1] (See *Pressure points*.)

Extrinsic factors

Extrinsic factors contributing to intraoperative pressure ulcer development include friction, shear, and moisture. Friction occurs when the surface of the skin is pulled and rubs against a rough surface.[7] Sliding or pulling can result in shearing, which occurs when the patient's skin remains stationary and underlying tissues shift. This occurs when a patient is dragged without lifting using a draw sheet or transfer device. Excessive moisture of the skin causes weakness of the collagen or elasticity of the skin that leads to maceration of the skin and tissue damage.[1] A patient's skin may be more susceptible to damage from pressure and friction as a result of the skin prep, as these solutions change the pH of the skin and remove protective oils.[1]

In addition, these prep solutions pooled beneath the patient increase the risk of maceration and pressure ulcer development if these skin changes occur. A significant factor is the degree and duration of pressure to pressure points of the body during the intraoperative period.[8] Other factors in the physical environment include the OR temperature, surgical position, positioning devices, and support surfaces.

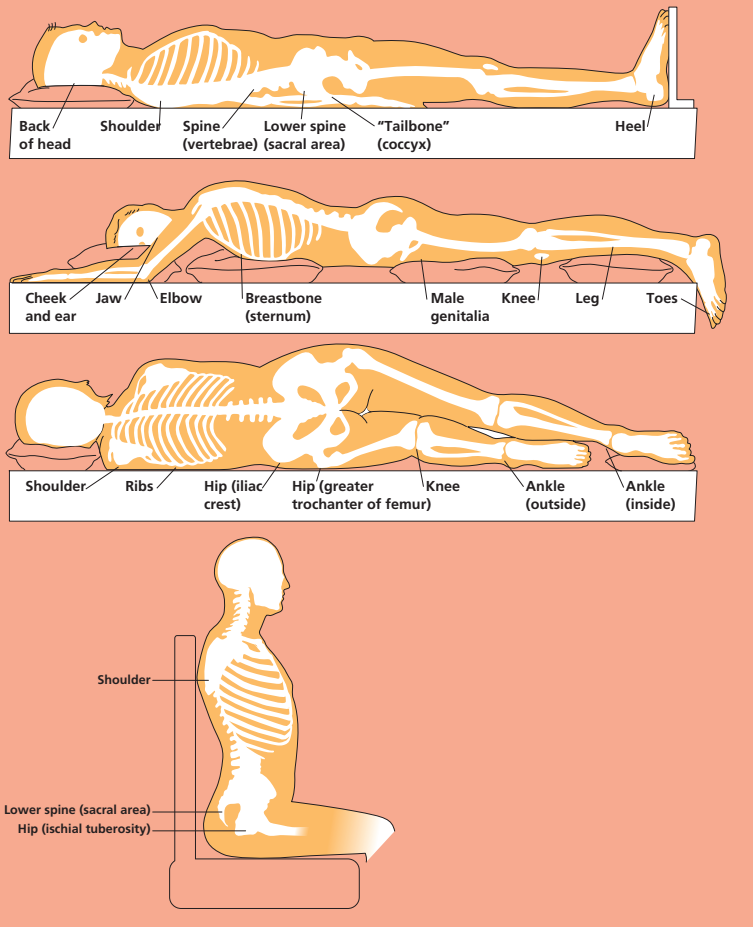
Intrinsic factors. There are also intrinsic factors, which may contribute to skin damage. These multiple factors, which may impact the development of perioperative pressure ulcers, include: age,

comorbidities (such as diabetes, cancer, peripheral vascular disease, respiratory or neurologic disorders), nutritional deficiencies, medications (such as corticosteroids or vasopressors), impaired regulation of body temperature, low hemoglobin and hematocrit, obesity, low serum protein, smoking, low systemic BP, fractures, and extracorporeal circulation.[1]

Pre-op assessment. All surgical patients are considered at risk for pressure ulcer development. When the preoperative assessment is performed, the nurse should consider skin status along with risk factors to identify high-risk candidates. A preoperative skin baseline assessment should include the presence of rash, maceration, infection, breakdown, dermatitis, and incontinence. Patients with a history of peripheral vascular disease as evidenced by claudication, cramps, and pain should be identified as being at higher risk in addition to patients identified as malnourished and dehydrated. Patients age 65 or older experience the highest incidence of pressure ulcer development.[1] This age group tends to have thinner dermis, less collagen, less muscle and adipose tissue, as well as decreased elasticity.[1]

Pressure points

The illustrations below show the pressure point areas where pressure ulcers are likely to develop when the patient is positioned supine, prone, lateral, and in a sitting position.



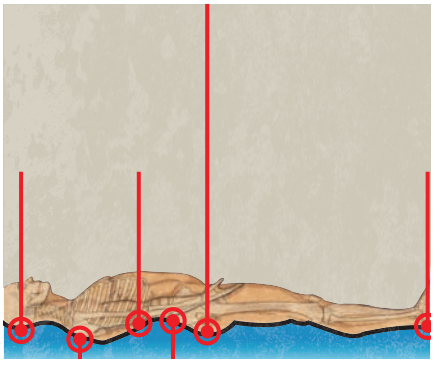
Source: Carter PJ. *Lippincott's Essentials for Nursing Assistants. A Humanistic Approach to Caregiving*. 3rd ed. Philadelphia, PA: Lippincott Williams & Wilkins. 2013, 445.

Intraoperative care

Administering anesthetic agents is the first consideration for intraoperative risk. These agents block sensitivity to pressure and pain and depress the autonomic nervous system, resulting in vasodilation, decreased BP, and decreased tissue perfusion. Patient transfer safety is critical to decrease the risk of developing intraoperative pressure ulcers. An adequate number of staff members for transfer and proper devices (such as a lateral transfer board) should be employed to reduce friction and shear.[1] Surgical positioning is the balance between the position a patient can physically assume and those positions that are physiologically tolerated. As technologies continue to develop (such as robotics and other minimally invasive surgeries), additional challenges are placed on the perioperative nurse to safely position the patient.[9]

Proper padding and pressure-relieving devices should be utilized. A support surface is required to redistribute pressure. The use of foam pads has not been as effective as protective devices, as they

easily compress under heavy body areas and result in bottoming out. An overlay can be placed directly on the mattress or frame as a replacement for the OR mattress.[3] Gel overlays (viscoelastic polymer) are useful, as they prevent shearing, support weight, and prevent bottoming out.[1] The number of pads and blankets beneath the patient have been implicated as a risk factor for pressure ulcer development.[7] Rolled sheets placed beneath a mattress or overlay may negate the pressure-reducing effect of those devices.



The patient's head should be in a neutral position and placed in a headrest.

Head positioning. The patient's head should be in a neutral position and placed in a headrest.[7] The headrest may be constructed of foam or gel. It is recommended that the head be repositioned in prolonged surgical procedures to reduce occipital alopecia.[7] Patients in lithotomy position have an increased risk of pressure ulcer development as the time in heel-supported leg positioners increases.[7] Inadequate arterial blood flow combined with improper positioning can cause decreased tissue perfusion and venous return.[1] All support surfaces throughout the facility, including OR beds and stretchers, should be assessed along with the length of time a patient spends in the ED on a stretcher.[1]

Heel pressure. Heel pressure can be reduced by padding and elevating the patients' heels. However, there is a question as to whether this practice may contribute to sacral pressure ulcer development due to weight redistribution onto the sacral area. The National Pressure Ulcer Advisory Panel recommends to prevent heel pressure ulcers that the knees be positioned slightly flexed and the heels be completely elevated off the OR bed to redistribute weight along the calf without placing pressure on the Achilles tendon.[2] For prolonged procedures, the intraoperative repositioning of the heels by the circulating nurse may assist with decreasing sacral sequelae. There is a relationship between surgical duration and pressure ulcer development. Prolonged pressure results in tissue ischemia, tissue anoxia, and necrosis. Traditional care of immobilized patients to decrease pressure ulcer development has been to turn them every 2 hours. This is impractical in the intraoperative surgical patient with the exception of repositioning the head, heels, and arms. For every 30 minutes, the surgery extends beyond 4 hours, the risk of pressure ulcer increases by 33%.[10]

Hypothermia. All surgical patients are at risk for developing perioperative hypothermia (temperature lower than 96.8° F [36° C]) because of inhibition of normal thermoregulation from anesthetic agents and the OR environment.[11] There is an association between hypothermia, tissue viability, and surgical site infections. Studies have shown that 30% to 40% of all patients are hypothermic on admission to postanesthesia care units.[11] Hypothermia has been associated with increased incidence of pressure ulcers.[11]

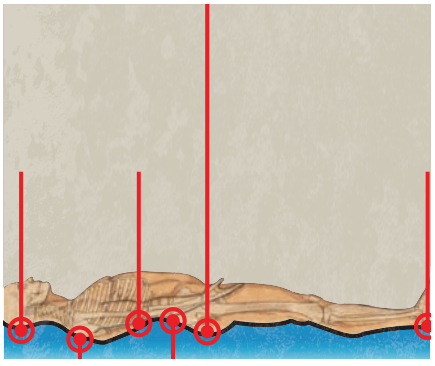
Postoperative care

Postoperatively, a pressure ulcer acquired intraoperatively may resemble and be documented as a burn.[1] This lesion usually develops outward on the muscle of a bony prominence and has a purplish discoloration. The localized area of discolored intact skin or blood-filled blister occurs as a result of damage to underlying soft tissue.[1]

Pressure ulcer risk assessment scales assist the perioperative nurse to identify surgical patients at risk for pressure ulcer development as well as to assist in planning and implementation of preventive care.[8] Current pressure ulcer risk assessment tools do not address the patient who comes in for surgery, is admitted to the hospital after surgery, and then develops a pressure ulcer. Since many surgical patients who arrive at the hospital on the same day of the surgery do not routinely have their risk assessment performed preoperatively, the OR staff may be less likely to identify pressure ulcer development as a perioperative problem.[4] One goal of perioperative practice should be the

development of a tool for pressure ulcer risk assessment, including identification of pressure ulcer risk factors for surgical patients.

Braden Scale—for predicting pressure sore risk. The Braden Risk Assessment Scale is (currently) widely used for pressure ulcer risk assessment, but it does not include surgery-related risk factors. This scale is the most frequently used pressure ulcer risk assessment tool and provides useful information for planning patient care.[12] However, it is not specifically designed to assess the surgical patient population.[8] It has been suggested by Munro that using the Braden scale before surgery would be ineffective, since after induction of general anesthesia, all patients would receive the lowest possible Braden scores, thus, resulting in inefficient planning for patients who would be considered high risk.[8]



Perioperative nurses need to be increasingly familiar with the problem of hospital-acquired pressure ulcers

Munro Scale. There is currently no validated tool available to assess the surgical patient's risk of pressure ulcer development. Munro developed the Munro Scale in 2010 to specifically address the perioperative patient. This scale includes the extrinsic risk factors (friction and shearing forces, moisture, and maintained body temperature), intrinsic risk factors (age, body mass index [BMI], nutrition, body temperature, mobility, American Society of Anesthesiologists (ASA) Physical Status Classification System score, and comorbidities), and the surgery-specific risk factors (support surfaces, type of anesthesia, induced hypotension, position, length of procedure, blood loss during surgery).[8] Validity of this scale must be determined before it can be universally implemented into perioperative nursing practice.[8]

In April 2014, revisions to the Munro Scale were added to include the existence of additional comorbidities of pressure ulcers and clarification as to whether the patient is a current versus a former smoker.[6] The Munro Scale assesses the patient through the three phases of perioperative care, assigning a score for each and arriving at a cumulative score at the end; this scoring system (rather than just one score) better reflects what is happening to the patient during the perioperative phase.[6] Preoperatively, patient mobility, nutritional status, and weight/BMI are considered. Intraoperatively, the factors considered are the type of anesthesia, length of procedure, and positioning devices.[13]

Postoperatively, it is important to consider patient positioning and the frequency of turning. The Association of periOperative Registered Nurses (AORN) has created a task force for further development and validation of this scale so it can be recommended as part of perioperative practice.[6] Assessment and communication throughout the perioperative journey, including the postoperative nursing unit, is imperative. Effective communication regarding risk assessment can result in early implementation of prevention strategies and decreased pressure ulcer development.[4]

Proactive perioperative nurses

Perioperative nurses need to be increasingly familiar with the problem of hospital-acquired pressure ulcers in their daily practice. It is essential that perioperative nurses be continually educated on the need for risk assessment and positioning guidelines as recommended by the AORN. Utilizing staff members to participate in performance improvement activities related to pressure ulcers can heighten awareness of the critical nature of the problem.[4] Cooperation of the entire multidisciplinary team is required to implement reduction strategies. The anesthesia staff must be brought on board to assist with proper assessment and prevention. Sharing information through performance improvement activities and continuing education regarding use of the risk assessment scales and prevention interventions can help decrease the risk of pressure ulcers within the perioperative environment.[4]

In summary, the AORN developing and validating a surgery-specific tool to determine risk assessment of the perioperative patient is an important step in the prevention of hospital-acquired

pressure ulcers. The Munro scale tool identifies and scores co-morbidities, nutritional status, BMI, age, temperature, ASA status, and mobility. A research study to validate the tool was started in the Spring of 2015, and once completed, the implementation of that assessment tool for the perioperative patient is anticipated. The perioperative nurse must be proactive in participating in this risk assessment and the use of preventive strategies. **OR**

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Denise Giachetta-Ryan is a perioperative specialist at Richmond University Medical Center, Staten Island, N.Y.

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