Perioperative Pressure Management: It's a "Sore" Subject

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Perioperative Pressure Management: It's a "Sore" Subject - Study Guide #15

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Description of study guide topic

As the incidence of surgery-related pressure ulcers increases, it is becoming more and more crucial to focus on prevention. The cost of treating these conditions along with extended hospitalizations, further complications, and treatment options have become more evident to the surgical team. This study guide will provide surgical team members with facts and information about the etiology and incidence of pressure ulcers along with prevention practices that the provider can incorporate into their perioperative patient care plan.

Overall purpose of the study guide

To provide detailed information about pressure ulcers caused during surgery and practices and devices used to prevent their formation.

Objectives

Upon completion of this study guide program, the participant should be able to:

1. Review the incidence and etiology of pressure ulcers.
2. Describe a variety of perioperative practices needed for effective pressure management.

Intended audience

This study guide is a self-study program intended for use by perioperative nurses, surgical technologists, wound care nurses, enterostomal therapists, perianesthesia nurses and staff members, endoscopy suite nurse and staff members, physician office and clinic personnel, surgeons, and other healthcare professionals interested in this topic.

Clinical incidence and costs of OR-acquired pressure ulcers

When patients are scheduled for surgery, they depend on the surgical team to protect them from complications. They rarely think about problems that might occur from inadequate positioning or what happens to body parts that are not protected from undue pressure. Once anesthesia has been administered, the patient's pain receptors no longer detect pain or pressure. At this time, the role of the perioperative nurse in protecting the patient from harm becomes more critical than ever.

It has been suggested that nearly one-quarter of all pressure ulcers that originate during a hospital stay are initiated in the operating room (Lewicki, Mion, Splane, Samstag, and Secic, 1997). Some studies have shown that the longer a surgical procedure takes, the greater the incidence of pressure ulcer formation. Surgeries over 3 hours may increase the incidence of pressure ulcer formation by 6% while surgeries over 7 hours may raise the incidence to 13% (Aronovitch, 1999). Other studies have shown that the duration of the surgery is not statistically significant as a factor in the development of pressure ulcers. The common conclusion from the review of literature on the subject is that many surgical patients are at risk of developing pressure ulcers, regardless of their time on the OR table, but that patients having longer surgeries require extra care.

Studies show that the type of surgical procedure plays a major role in the incidence of pressure ulcers. The average surgical patient has a 15% chance of developing pressure ulcers - the incidence of pressure ulcer formation varies with the type of surgical procedure. Cardiac, orthopedic, and vascular patients have been identified as being at significantly higher risk than the overall surgical patient population (Rodeheaver, 1999). The incidences associated with different procedures are listed below (Lewicki et al., 1997 and Roberts, 1979):

Cardiac surgery	47%
Orthopedic surgery	33%
Vascular surgery	26%

Pressure ulcers are most frequently located on mid-line bony prominences with the sacrum being the most common site of involvement (67%). Lower extremity ulcers also occur regularly and are mostly found on or around the area of the heel (25%) (Rodeheaver, 1999).

The incidence of the various stages of ulcer classifications can be segmented into two main groups. Nearly three-quarters (74%) of hospital-acquired pressure ulcers fall into the Stage I & II categories. The remainder are Stage III and IV as well as non-stageable ulcers (Aronovitch, 1999). The delineation characteristics of each stage will be discussed later in this text.

While surgery causes almost one quarter of all hospital-acquired pressure ulcers, these lesions account for approximately 42% of the treatment costs (Rodeheaver, 1999). Hospitals spend between $750 million to $1.5 billion in direct costs each year to treat OR-acquired pressure ulcers (Aronovitch, 1999), which does not include patients' lost wages or expenses associated with additional care paid directly by patients and families. Thus, an average acute care hospital will spend between $400,000 to $700,000 per year (Robinson et al., 2003) to treat these wounds or about $5,000 to $50,000 per ulcer (Curtin, 1984). Research also shows that the actual costs on a timeline from creation of the ulcer to complete healing can reach as high as $90,000 (Aronovitch, 1999).

As of October 2008, Centers for Medicare and Medicaid Services is no longer reimbursing hospitals for healthcare-acquired infections (HAI) like pressure ulcers, so hospitals will need to be focused more on the prevention of pressure ulcers instead of the treatment.

The cost differences for healing pressure ulcers within the various stages of development are quite significant. For example, the cost to heal the less traumatic pressure ulcer is low with Stage 1 costing about $125 and Stage 2 costing $250. The cost to heal Stage 3 and Stage 4 ulcerations dramatically rise to $14,000 and $23,000 respectively (Aronovitch, 1999). The increased expense is attributed to the increased length of stay and the flap and graft surgeries that are needed to help heal these deeper and more extensive wounds.

Pressure ulcers can cost a hospital a substantial amount of money. Since pressure ulcers are largely considered preventable conditions, juries are awarding larger and larger settlements in malpractice cases. The highest award to date of $80 million was given to a patient's family after the patient died from complications associated with a hospital induced pressure ulcer (1997, Holder vs. Beverly). Even though most awards are much smaller, a typical award from a malpractice suit can average from $75,000 to 2 million. This amount does not include the other costs associated with litigation, such as management time and legal representation.

Case study

Since most pressure ulcer cost data found in the literature are based on statistical estimates rather than on actual costs, the following information will provide one real-life cost example.

A prevalence study was performed at a large, prestigious U.S. hospital with over 1000 beds and 35 operating rooms. This three-month study was done in the fall of 2000 and compared patients who developed ulcers to non-ulcer patients. The findings noted that ulcer patients cost nearly $12,000 more than non-ulcer patients. More startling information revealed that average insurance and Medicaid/Medicare reimbursement rate per patient was not even $1,600, leaving the hospital with a loss per ulcer patient of greater than $10,000. Since the time the study was done (in 2000), the reimbursement rate for complications due to pressure ulcers has dropped to $0. Also, the average ulcer patient's hospital stay was extended by 6.5 days. The cost of pressure ulcers continues to

present a challenge but these costs should be measured in more than just dollars and cents.

The impact of pressure ulcers

Patients with pressure ulcers can experience pain and immobility. They suffer disfigurement, humiliation, and depression. Their hospital stay is typically extended by almost a week on average, leading to lost work. They face associated health complications such as septicemia and a host of other complications. These patients are also more likely to develop new ulcers in the future. Pressure ulcers can even contribute to death.

There are approximately 60,000 patient deaths per year due to complications associated with pressure ulcers (Aronovitch, 1998). This number is the equivalent of one fully-loaded Boeing 747 aircraft crashing every other day for an entire year.

HealthGrades Patient Safety in American Hospital Study published in April, 2007 reported decubitus ulcers as one of the most commonly occuring patient safety issues in the Medicare patient population. Decubitus ulcers had a rate of 32% per 1,000 hospitalizations: which was an increase of 9.03% for the years 2003-2005. The attributable cost was $2.81 billion.

Physiology

The physiological considerations of OR-acquired pressure ulcers, including how they develop and the different classifications, must be understood so that preventive measures can successfully be employed.

A **pressure ulcer** is any lesion caused by unrelieved pressure resulting in damage to the underlying tissue. Ulcers usually occur over bony prominences and are staged to classify the degree of tissue damage that is observed.

When tissues are compressed, capillaries are narrowed or closed, thus preventing oxygen-enriched blood from feeding the tissues. Since most capillaries are only wide enough for one red blood cell to move through at a time, they do not have to be completely closed to slow or prevent oxygen transfer. When pressure is relieved, blood flow resumes, and tissue experiences reactive hyperemia. This condition is characterized by increased blood flow that provides oxygen to the tissue that was previously starved of oxygenated blood. Reactive hyperemia generally fades on its own with little or no permanent tissue damage.

Reactive hyperemia is the first observable indicator of pressure. It can easily be assessed because the affected area will be blanchable, meaning that it will momentarily lose its redness when pressed.

If the blood flow is not resumed, then the tissue may become damaged or die, thus creating a pressure ulcer. These lesions usually take 24 to 72 hours to reveal themselves as the tissue necroses from the inside out. It may take up to 5 days to fully present itself.

Pressure is greatest at the bony prominence, decreasing gradually towards the periphery. Soft tissues, muscle, and skin have a differential resistance to the effects of pressure. Generally, muscle is the least resistant to the damage caused by pressure, and will necrose prior to skin breakdown. Because muscle breaks down first, we see the "inside-out" formation typical of OR-acquired pressure ulcers. Even though pressure may have been localized, deep and wide wounds can result. (See Figure 1.)

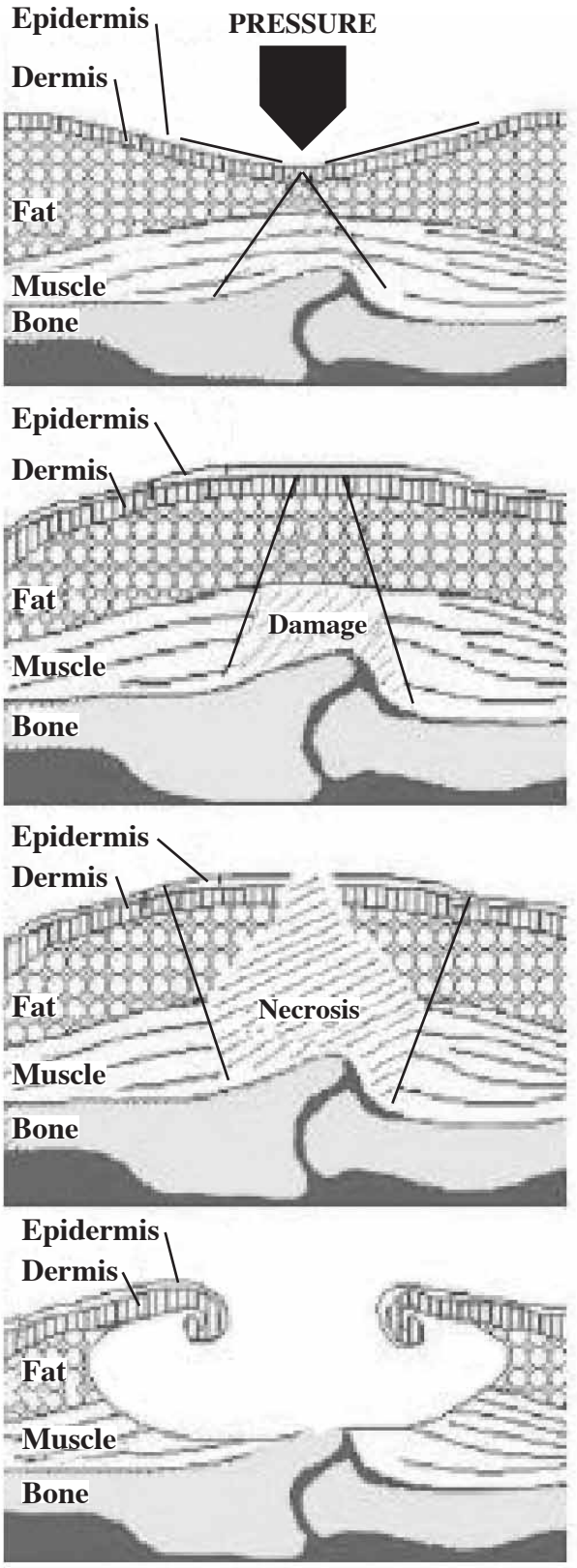
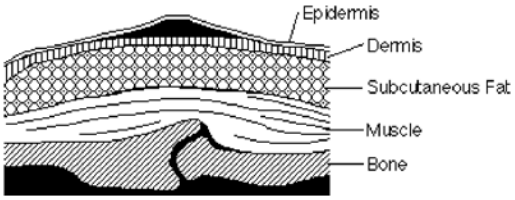


Figure 1. Creation of a Pressure Ulcer

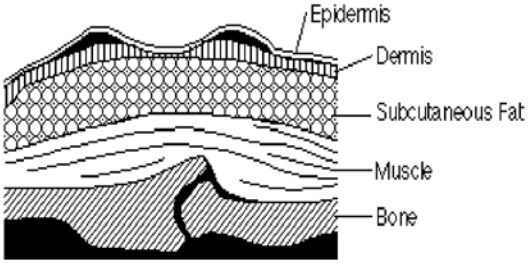
Stages of pressure ulcers
There are four stages or distinct categories of pressure ulcers that are defined by their severity (NWRSCIS, 2005).

Stage I



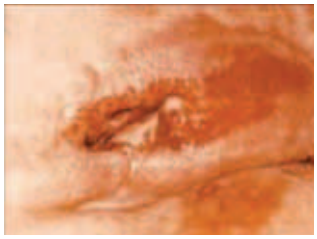
Stage I pressure ulcer: An observable, pressure-related alteration of intact skin. It looks like reactive hyperemia but is non-blanchable.

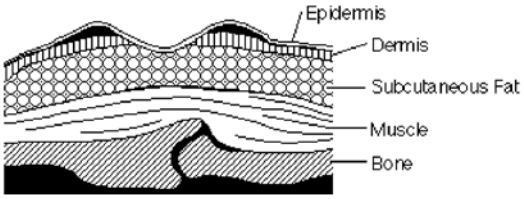
Stage II



Stage II pressure ulcer: A partial thickness skin-loss involving the epidermis and may include the dermis. This ulcer is superficial and appears as an abrasion, blister, or shallow crater.

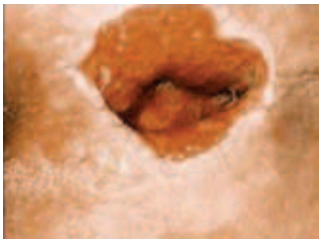
Stage III

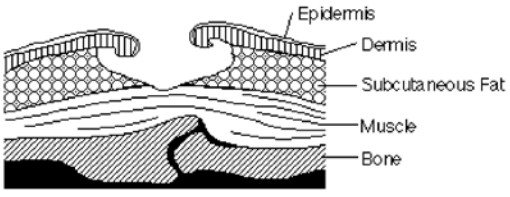


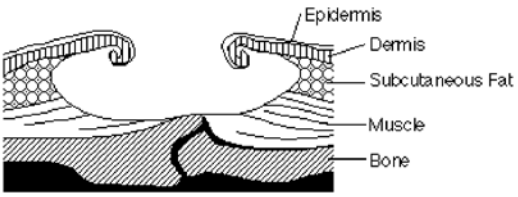


Stage III pressure ulcer: A full thickness lesion, involving damage or necrosis of subcutaneous tissue which may extend down to, but not through, the underlying fascia. It presents as a deep crater, with or without undermining of adjacent tissue.

Stage IV







Stage IV pressure ulcer: A full thickness skin loss with extensive destruction, tissue necrosis or damage to the muscle, bone, or supporting structures, such as tendons or joint capsules. Sinus tracts and undermining of adjacent tissue may be present.

Other ulcers outside of the stage classification system:

> Purple ulcers: Ulcers that do not meet the criteria for any specific stage. This is the catch-all category.

> Closed pressure ulcer: This is a rather difficult lesion to distinguish. It has an observably small wound, but inside it contains a Stage IV type lesion. These lesions are frequently overlooked, and many of the patients who develop these ulcers suffer from complications including infections which may be fatal. Most often, these ulcers aren't detected until post-mortem examination. (See Figure 2.)

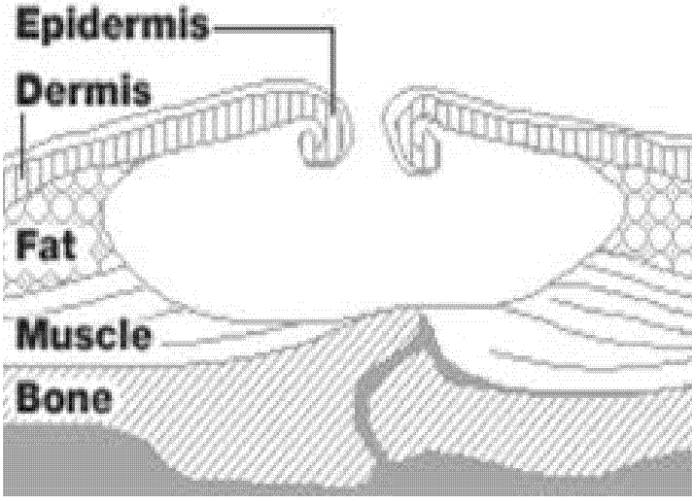


Figure 2. Closed Pressure Ulcer

Risk factors

The risk factors for developing pressure ulcers in the surgical patient should be assessed during the preoperative, intraoperative and postoperative periods. Risk analysis includes **intrinsic** and **extrinsic** factors.

Intrinsic risk factors are those already present in the patient that could impact the formation of pressure ulcers. Many of these factors are related to how well the circulatory system and skin can cope with the demands of the surgical environment. Most intrinsic factors affect metabolism, blood pressure and perfusion, or skin and tissue health.

They include:

> Advanced age
> Smoking
> Nutritional status
  - Low serum albumin
  - Low serum protein
  - Decreased lymphocyte count
  - Impaired lymphatic drainage
  - Decreased muscle mass
  - Weight (Obesity)
  - Low body mass index
  - Dehydration
> Co-morbidities
  - Diabetes mellitus
  - Hypertension
  - Pulmonary disease
  - Vascular disease
  - Anemia
  - Neurological disease
  - Heart disease
> Low hematocrit and hemoglobin
> Immobility or impaired mobility
> Hypotensive episodes

Extrinsic risk factors are potential causes of pressure ulcers that are outside of the body and are easily identified and controllable.

They include:

> Type of surgical procedure
> Anesthesia and anesthetic agents
> Length of surgical procedure
> Hemodynamics
  - Hypotensive episodes
  - Lower arterial pressure
  - Altered perfusion
  - Extracorporeal circulation
  - Blood loss
  - Low systemic blood pressure
  - Decreased peripheral blood flow
> Hypothermia - Use of heat or heat warming blankets
> Body positioning during the procedure
> Moisture, incontinence or pooled skin prep solution
> Intensity and duration of applied pressure
> Skin friction or shear

Heat becomes an extrinsic factor in intraoperative ulcer formation because heating blankets are used during surgery to reduce the incidence of hypothermia in surgical patients. When tissues are heated, the cellular metabolic rates increase and thus require more oxygen and nutrition. At the same time, pressure causes capillaries to become narrowed or closed. The body responds by trying to increase blood pressure. However, in a patient who is anesthetized, hypotensive, immobile, or vascularly compromised, the body may not be able to increase blood pressure to adequate levels. Without sufficient blood flow, tissues can become damaged, thus increasing the risk of pressure ulcer formation.

Moisture is introduced in the OR by the pooling of fluids on the OR table under or around the patient. When the tissue is soaked, it can be softened until the connective tissue fibers are so dissolved that the tissue components easily tear apart. This effect is known as maceration. The upper skin layers can be destroyed by moisture, making the tissue more vulnerable to external mechanical loads, such as friction or pressure.

Shearing forces result in the mechanical stressing of deep tissues. The deep tissues attached to the bone are pulled or stretched because while the body weight is being moved in one direction, the tissues on the surface (skin) are holding to the table or stretcher surface or sheet. The body skeleton actually slides downward inside the skin. This results in either obstructed or torn or stretched and angulated blood vessels. The presence of shearing forces is important because it decreases the time the tissue can be subjected to pressure before ischemia or destruction occurs.

Friction is the surface resistance to the motion of the patient rubbing, sliding, or rolling during patient transfer or repositioning. Friction removes the top layer of the epidermis and can also create microscopic tears in the skin, thus making it more vulnerable to pressure and moisture. Friction is quite different from shearing because shearing happens in deep tissue while friction affects the skin surface.

Pressure is a very important extrinsic factor, so it will be discussed in more detail than the other factors. For the surgical patient, pressure is normally located over bony prominences. It is the combination of the force and duration of the pressure that directly determines the extent of the pressure ulcer. Although the skin is very durable, it cannot tolerate localized pressure for very long and underlying tissue can withstand even less pressure force.

Pressure is measured in millimeters of mercury (mmHg), which represents the amount of pressure that it takes to displace a given quantity of cubic millimeters of mercury. Pressure measurements

help to define capillary closure rate, which is directly related to the development of pressure ulcers. When a capillary is closed, there is no blood flow to the surrounding tissue, which leads to tissue damage. So what is the level of pressure is needed to cause capillaries to close?

The capillary closure rate "standard" is 32. This number was determined in a study done in the 1930's on healthy, young people's fingertips (Landis, 1930). While a benchmark, 32 mmHg does not tell much about specific individuals. For example, the pressure required to close the capillaries in an athlete's sacrum could be in the 70s while the pressure required to occlude the capillaries in an elderly woman's heel could be below 20. Every individual is different. How the pressure is managed is what makes the difference, rather than the actual measurement in millimeters of mercury. Pressure readings are frequently used to indicate the performance of an OR table surface. These readings can easily be manipulated to appear better than they actually are. One must be careful when interpreting and comparing pressure maps. The pressure scales used must be the same or misinterpretation can easily occur.

Pressure ulcer management in the OR

Pressure ulcer management presents a significant patient care challenge for perioperative nurses as pressure ulcer prevention must continually be addressed. Building a plan for pressure ulcer prevention must include practical methods to reduce pressure and shear in the OR. The first step of a pressure management plan is to recognize that ALL surgical patients are at risk for the development of pressure ulcers. Millions of anesthetized patients who have been subjected to sustained pressure have not developed pressure ulcers, but all have been at high risk. Minimizing these risks must be addressed by developing and implementing a patient care plan that includes pressure management.

Developing a patient care plan to manage pressure includes the nursing process of assessment, planning, implementation, and evaluation.

Assessment

Pre-operative assessment identifies the risk that the individual patient faces which, in turn helps to determine the proper preventive care for individual surgical patients. Assessment can be done upon admission or directly before surgery. A risk assessment tool can be developed depending on the type of surgical patients involved. Those factors that directly affect a patient's risk level include:

- Co-morbid conditions
- Intrinsic factors
- Overall patient health
- Length of surgery
- Positioning and equipment used during surgery
- Exposure to pressure before, during, and after the procedure

Planning

Once the patient's health and propensity for developing pressure ulcers have been determined, a plan of action needs to be designed. There is a lot of pressure management technology that exists today to prevent OR-acquired pressure ulcers. But preventing pressure ulcers is not just a matter for the OR. Proper surfaces must be used throughout the patient's hospital stay to ensure continuity of care.

For example, a patient may start a hospital experience in an ambulance, in the supine position on a hard backboard with thin padding. From the ambulance, the patient is taken into the ER where he or she is still in the supine position on a hard stretcher surface. Several hours later, in surgery and still in the supine position, the patient is on a 2 inch, hard standard surface. After at least an hour in the PACU, remaining in supine position, the patient is ready for transfer. Now, after experiencing numerous hours of high pressure, the patient is finally placed on a pressure-reducing surface in the hospital room. Two days later, a pressure ulcer appears. The wound specialist cannot determine why a relatively healthy person who had a three-hour surgery has a Stage III sacral pressure ulcer. Surgery is not the only time that skin may be under pressure; therefore, continuity of care becomes extremely important and must be adequately planned when possible. Three hours of surgery does not equate to three hours of pressure; therefore, continuity of care is paramount.

The Agency for Healthcare Research and Quality guidelines mandate "any individual who is assessed to be at-risk for developing pressure ulcers should be repositioned at least every two hours. The patients who cannot move or be repositioned every two hours must be placed on effective pressure-relieving surfaces…" Many surgical patients cannot be moved or repositioned every two hours, so they must be placed on effective pressure-relieving surfaces during surgery.

To ensure that patients are on effective pressure-relieving surfaces, perioperative team members must understand what existing and new technologies are available on the market. Proper planning to prevent pressure ulcers must include this advanced technology.

Standard foam replacement pads are still being purchased for OR tables today. They are usually 2 inches thick and are covered with a fabric called 'lectrolite' or 'lectrolite' comfort. This cover material was the standard not so many years ago when the measure of "Good" was the economic value as a function of time. Many times surgical team members have placed duct tape over cuts and worn areas to add life to a pad. This repaired cover is conductive but not very elastic. The end result is a pad that supports the body but does not address the bony prominences.

Bony prominences support the body on a hard flat surface in a fashion similar to landing gear on an aircraft. Pressure maps indicate the highest pressures of the bony prominences which are primarily on the occiput, scapula, sacrum, and heels. (See Figure 3.)

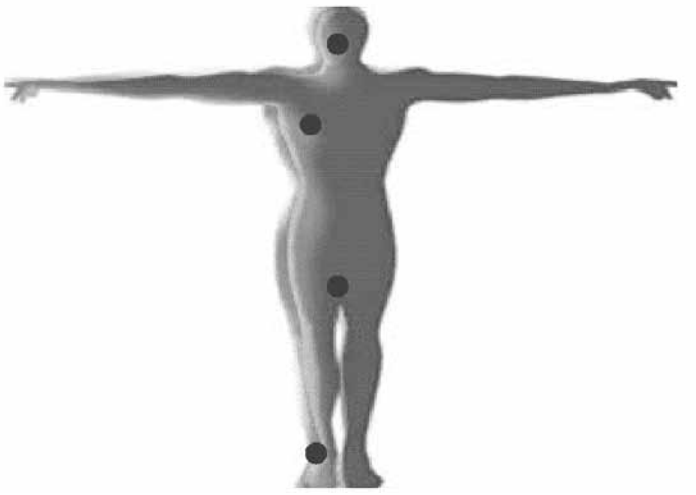


Figure 3. The occiput, scapula, sacrum, and heels are bony prominences at the highest risk for ulcer formation.

The older types of harder surfaces do not reduce pressure very effectively. Cover materials (omni-stretch materials) are now available that can stretch in four directions to conform to a bony prominence (without causing "hammocking") while also preventing shearing injuries.

Some pads, disposable bags, and rolled towels create high pressure areas and can potentially contribute to permanent nerve damage. A better option for these areas are gel positioners (See Figure 4), which are becoming very popular aids in posturing patients. Gel pads help with patient positioning by protecting bony prominences and vulnerable nerves. Gel pads are easy to use, come in a large variety of shapes, and are radiolucent.

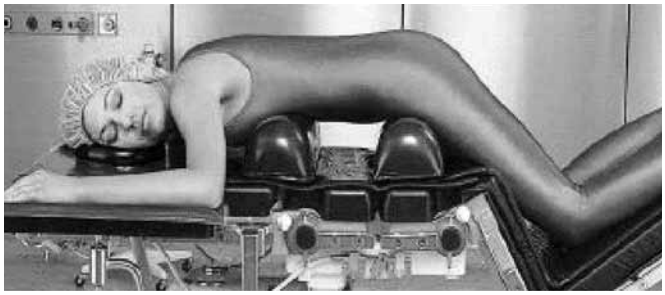


Figure 4. Gel positioners and overlays

Research and comparative pressure maps have shown that gel actually does NOT relieve pressure as once commonly thought. In fact, pressure maps indicate that the addition of a gel overlay actually increases pressure on bony prominences. When gel pads were first introduced, demonstrations were performed involving customers kneeling on the pad over a hard tile floor. The customers were convinced that the pressure on their knees was dispersed through the ½ inch thick pad. Years later, using pressure mapping technology, it was discovered that pressures greater than 275 mmHg were being exerted on the knees.

Questions were then asked as to how bony prominences were being protected by these gel pads against pressure. Studies began to show that patients on gel pad overlays on top of standard replacement pads got half the pressure ulcers than those patients solely on standard OR table pads (Hoschowsky and Schramm, 1994). If pressure readings of gel overlays are greater than those of the replacement pad itself why is there not a greater incidence of pressure sores on patients placed on gel overlays? The reason seems to lie in the fact that gel products act rather like a layer of skin and fat. They appear to complement the skin to significantly reduce the effects of shearing forces.

Many healthcare providers have been trained to pad areas of high pressure. Unfortunately, placing foam or other inferior padding directly beneath bony prominences actually increases pressure, especially on the head, scapula, trochanter, lateral chest wall, sacrum, and heels. Therefore, advanced positioning devices created specifically for pressure management must be used.

Pressure ulcers most commonly occur on the back of the head, also known as the occiput. Other facial ulcers are rare but can occur if improper positioning is employed. Gel head positioners are frequently used for preventing alopecia, which is permanent baldness due to a lack of blood flow. Permanent hair loss can be very traumatic for anyone, particularly when the loss is so easily prevented.

A standard replacement pad is made up of standard foam with a 'lectrolite' cover. A deluxe value replacement pad may use standard foam in combination with a stretchable cover fabric to reduce hammocking. One type of multiple-layer engineered foam OR table surface, it consists of an OMNI-stretch cover that provides little or no return pressure or hammocking. The slow recovery foam layer permits the bony prominences to sink into the pad. The lower density foam allows for effective pressure dispersement while the high density foam keeps the patient from bottoming out. All engineered foam surfaces incorporate multiple layer construction.

There are some products on the market that combine a surface cover material that is elastic in multiple directions along with advanced technologically-engineered foams. This combination allows the patient to effectively "float" in a pressure-dispersing environment.

When an OR pad made from engineered foams and innovative covering technology is compared with that of a standard OR replacement pad, a pressure map reveals some significant information. The engineered foam permits the body to sink into the pad allowing the pressure to become evenly divided as the pad comes into contact with the entire body. The pressure is evenly dispersed with little or no extra pressure evident on the sites of the bony prominences. The pressure map of a standard replacement mattress clearly shows that the bony prominences act as the primary support which indicates undue pressure is being exerted.

Implementation

Implementation of a pressure ulcer prevention program includes providing the care needed to prevent pressure ulcers based on the patient assessment and planning involved to provide appropriate surfaces and positioning devices. Pressure maps have repeatedly shown the importance of more technologically engineered foam pads in decreasing pressure pain and ischemia. There are a variety of configurations of replacement pads to meet the needs of patients and the facility. If surgeries tend to be shorter than 2 hours on low-risk patients, then basic technology surface for OR pads will suffice. For higher risk surgeries, such as cardiac or orthopedic cases, then the higher end, more engineered surfaces should be used. These advanced surfaces will protect those patients who are at a higher risk for developing pressure ulcers, who are under anesthesia for longer periods of time, and who may be facing higher-risk surgeries.

There are other sources of pressure in the OR by which the surgical patient may be injured. Pressure can be created by any hard object pressed against the patient. Prior to draping, a visual overview of the patient must be performed to check for any possible pressure points, such as the leg touching the hard surface of the stirrups.

The staff should also be trained to use equipment properly and to avoid leaning on the patient. If there are situations in which leaning is unavoidable, the patient must be protected with arm sleds or comparable devices.

Wrinkled sheets can even cause lines of high pressure. When using a pressure mapping system, wrinkles show obvious and distinctive lines of pressure. Underlying sheets should never be allowed to bunch up under the patient.

Strapping a patient tightly to the table will increase the table/tissue interface pressure, even doubling the pressure on bony prominences. Straps should be just tight enough to prevent moving or slipping. Folding or wrinkles under adhesive materials must also be avoided. Folded skin under tape can cause deep tissue lesions. Furthermore, care must be taken when transferring and positioning obese patients. Skin folds on obese patients, especially in the leg areas, can also cause serious pressure ulcers.

Shearing forces must also be reduced to eliminate pressure ulcer formation. The forces of shear typically occur when patients are transferred or repositioned on the OR table. When repositioning or transferring an anesthetized or unconscious patient, the "log roll" technique should be used if not contraindicated by the patient's condition. When log rolling, the patient is rocked from side to side to allow the skin that is resting on the OR table surface to return to an unstressed condition. This quick and easy action will reduce much of the shearing force that many patients experience.

Shearing will also occur when restraints are not used when the OR table is tilted laterally or in the Trendelenburg or reverse Trendelenburg positions. This happens quite often in the OR as the table pad is used as a restraint device. The surgical team relies on the friction between the patient and the OR table pad to keep the patient from sliding. Staff can help prevent this mechanical stressing by using proper restraint devices such as braces, supports, and straps. These devices help to reduce shearing by reducing patient shifting. Products that are made of materials that stretch with the patient are also effective in preventing shearing forces.

The use of proper restraints helps to reduce shearing.

Reducing shear is a very important part of preventing pressure ulcers but there are other practices to consider as well. To prevent maceration, all fluid that has pooled on the OR table around the patient before surgery begins must be dried. All preoperative prepping solution instructions provided by the manufacturer must be followed to ensure safe use. The literature strongly recommends never using the combination of heat and pressure on the tissue of an anesthetized or unconscious patient (Martin, 1997). There are alternatives, however, such as the use of thermal blankets, forced warm air devices, fluid warmers, and even increasing the room temperature.

During the preoperative and postoperative phases, the risk of developing pressure ulcers is reduced if different positions from the surgical position are used. For example, if the patient is to be placed in the supine position during a lengthy surgery, then in the pre-op and the PACU areas, the patient may be positioned laterally. This reduces the amount of time that tissue is stressed by undue pressure.

During the postoperative phase, treatment of a potential pressure ulcer requires complete and total relief of pressure for the injured area. Optimal recirculation of the site of pressure is the goal. Even a few minutes of pressure can add to the trauma. An area damaged by pressure should never be massaged. The added mechanical stress may cause additional damage to tissue that would have recovered if left undisturbed.

Evaluation

Postoperatively, the patient must be evaluated closely to determine the success of the pressure management practices. Communication and observation are essential and can have a direct affect on the patient outcome. Almost 60% of Stage I pressure ulcers will progress into Stage II or greater stages if left untreated (Roberts, 1979).

The pre- and post-operative assessments are critical and must be communicated throughout the perioperative process. The patient's surgical position, table accessories, and pads used for positioning should be documented along with anything else that could alert attending personnel to assess potential at-risk areas. Signals of a pressure ulcer include a change in color, feeling, or skin temperature as well as body temperature changes. Surprisingly, surgical patients whose body temperatures return to normal very quickly after surgery may be in the process of developing a pressure ulcer. The enterostomal (ET) therapist or wound specialist can be a valuable provider in the observation and treatment of pressure ulcers.

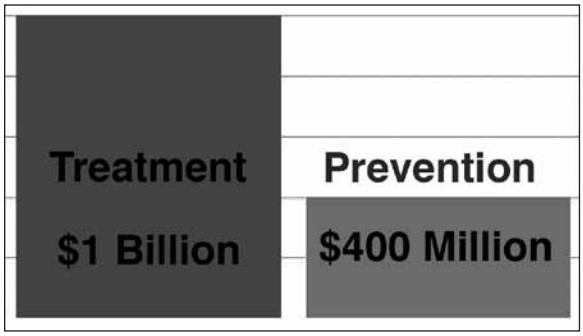
Follow up is the final step and is imperative for evaluating the preventive care implemented. Lines of communication must be kept open between the patient, surgeon, and nursing staff members to identify pressure ulcer formation and/or the effectiveness of the treatment. Communication is also critical among departments in reducing the chance of pressure ulcer formation. Continuity of care with all healthcare providers cognizant of how pressure ulcers can be formed and prevented is vitally important.

The incident rate of surgical pressure ulcers at a facility determines a benchmark that reveals the success of a program and also helps to identify the further steps needed to protect the surgical patients. This evaluation information also helps to justify preventive practices and devices and helps to determine actual costs of pressure ulcers that originate in the OR. Outcomes must be continually evaluated to note if the practices that are implemented are effective.

An enterostomal therapist or wound care specialist is a valuable team member who will help to determine the best practices needed to minimize and eliminate pressure ulcers. Team investigation of patients at high risk for pressure ulcer formation helps to develop a viable and successful pressure management program. The wound care nurse should check surgical patients for up to five days for those who remain in the hospital after surgery. Some patients develop ulcers after they have gone home from the hospital and go to their regular doctor for treatment. Asking the family physician or the office personnel to follow up with the hospital if any such wound occurs will help provide valuable information that will identify the scope of the OR's pressure ulcer incidence.

Another way to ensure a successful pressure management program is to always explore new pressure-reducing technologies. The pressure management industry is quickly moving forward, offering new and better technology to protect surgical patients. Another valuable way to ensure success is to share information about pressure management experiences with healthcare care colleagues - perioperative nurses, surgeons, enterostomal therapists, and wound specialists.

A thorough evaluation of your existing pressure management program will lead to successful preventive services. But the treatment of pressure ulcers that have occurred must not be overlooked. Treatment of pressure ulcers ($1 billion) costs significantly more than prevention ($400 million), according to a recent study (Lapsey and Vogels, 1996).



Prevention is Cost Effective

Pressure ulcers formed in the OR impact the hospital with a 50% increase in nursing care time for each wound as well as increased patient morbidity and mortality (Rodeheaver, 1999). Since much of the cost of these ulcers is not reimbursable, the hospital experiences increased expenses. The risk, costs, and number of litigations continue to grow while the patient faces emotional and physical burdens, high monetary costs, and sometimes even death.

The fact that there are approximately 60,000 patients who die each year as the result of the contribution of pressure sores is difficult to imagine. This is roughly the capacity of many United States baseball stadiums and is equivalent to one Boeing 747 airplane dropping out the sky every other day for an entire year. These are startling numbers!

Nursing activities play a major role in avoiding the development of OR-induced pressure ulcers. There are several steps that can be taken which cost little or nothing but will save a hospital, and especially the patients, from the physical, emotional, and financial hardships that pressure ulcers bring.

One simple step is to recognize that the surface used on an OR table plays an important role in the patient's outcome. Everyone realizes that the special pressure-reducing OR table pads that create the safest environment to prevent pressure ulcers cost more than the standard replacement pads. This cost difference is insignificant when compared to the expenses that a hospital incurs as the result of treating a single stage III pressure ulcer. The old analogy "spend a little now or a lot later" holds true in this situation.

Unfortunately, there are several reasons that many ORs will not invest in specialized pressure ulcer prevention pads. One of the reasons is the lack of awareness of the potential problem and outcomes. There is also a lack of feedback from the floors or physician's offices to the OR when pressure ulcers have developed. Without this feedback, many OR personnel never think about OR-acquired pressure ulcers.

Another reason is that many hospitals do not have a system for locating the source of pressure ulcers. Ulcers often are misdiagnosed as burns or some other injury. Frequently patients go home a day or two after surgery, develop the ulcer, and then go to a different doctor to be treated. Unfortunately, many times it takes a serious event to identify that an ulcer may have started in the OR and to communicate that back to the hospital.

Another barrier to purchasing appropriate pressure management pads includes the simple resistance to change. In some cases there is a perception that an OR table surface should not cost more than $195. Nurses have even been known to try to shift responsibility by saying that a pressure management pad should not be purchased by the OR if the cost savings is going to be realized by another department. Opportunities to improve patient outcomes must always be approached as a team effort.

Summary

The prevention of OR-acquired pressure ulcers requires a combination of astute perioperative nursing care, the effective use of available technology, and the dedication of the healthcare team. A successful pressure management program must include advanced technology for adequate prevention which will, in turn, save resources, hardship, and even lives. Pressure ulcers are a preventable tragedy.

This Study Guide has been planned, produced, and approved as a continuing education (CE) activity. This material will be reviewed within 2 years of its release date and re-released, or its designation for CE credit will become invalid.

Glossary

Alopecia
Permanent hair loss, usually caused from lack of blood flow (which could be from excessive or prolonged pressure).

Anoxia without oxygen
Often used to note a reduced supply of oxygen to tissues.

Blanch to become pale
Often referred to as the pale color that occurs when localized pressure is exerted over an area.

Bony prominence
Any elevation, projection, or protrusion of a bone.

Decubitis ulcer
An ulceration caused by excessive or prolonged pressure which leads to tissue ischemia from interference with the circulation. Usually occurs over a bony prominence such as over the sacrum, heel, hip, elbow, or shoulder.

Erythema
Redness of the skin associated with skin injury, infection, or inflammation.

Friction
Occurs when two surfaces rub against each other such as when a patient is dragged across the bed linen instead of being lifted. The skin can be denuded and abraded thus causing inflammation or infection as well as pain.

Ischemia
A decreased supply of oxygenated blood to a body part that may be due to constriction or actual obstruction of a blood vessel.

Maceration
Occurs when prolonged fluid on the skin saturates and weakens the epidermis to the point of being more vulnerable to the effects of pressure, shearing, or friction.

Necrosis
Localized tissue death or changes indicative of cell death usually due to lack of blood supply, disease, or injury.

Positioning device
A device used to place the patient in a position for the best possible anatomical exposure.

Pressure
The force that is placed on underlying tissue, such as bony prominences, by the body weight with the downward pull of gravity. If pressure is sustained, tissue ischemia and microscopic necrosis will occur due to decreased tissue perfusion.

Pressure management
Controlling the variables that can lead to excessive pressure that would cause untoward tissue effects.

Pressure reduction
Reducing the amount of pressure so tissue does not become ischemic from lack of perfusion.

Pressure ulcer
Any lesion caused by unrelieved pressure resulting in damage to the underlying tissue. Ulcers usually occur over bony prominences and are staged to classify the degree of tissue damage that is observed.

Shearing
Occurs when the underlying body tissue (i.e., skeletal structure) moves while the skin remains stationary which can cause vascular occlusion that can lead to tissue ischemia.

Staging of pressure ulcers
Distinct categories of pressure ulcers which are defined by their severity.

> Stage I: Nonblanchable erythema of intact skin.

> Stage II: Partial thickness skin loss involving the epidermis and may include the dermis: superficial and appears as an abrasion, blister, or shallow crater.

> Stage III: Full thickness lesion, involving damage or necrosis of subcutaneous tissue which may extend down to, but not through, the underlying fascia; presents as a deep crater, with or without undermining of adjacent tissue.

> Stage IV: Full thickness skin loss with extensive destruction, tissue necrosis or damage to the muscle, bone, or supporting structures, such as tendons or joint capsules.

> Other ulcers outside of the stage classification system:
- Purple ulcers: Ulcers that do not meet the criteria for any specific stage; catch-all category.
- Closed pressure ulcer: Difficult lesion to distinguish; has an observably small wound, but inside it contains a Stage IV type lesion.

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Review Questions

1. Nearly _____ of all pressure ulcers that originate during a hospital stay are initiated in the operating room.
   A. 3%
   B. 5%
   C. 15%
   D. 25%

2. Cardiac, orthopedic, and ophthalmic patients have been identified as being at significantly higher risk than the overall surgical patient population.
   A. True
   B. False

3. The most common site of involvement for pressure ulcers is:
   A. Heel
   B. Occiput
   C. Elbow
   D. Sacrum

4. While surgery causes almost one quarter of all hospital-acquired pressure ulcers, these lesions account for approximately _____ of the treatment costs.
   A. 10%
   B. 25%
   C. 42%
   D. 98%

5. Since pressure ulcers are largely considered preventable conditions, juries are awarding larger and larger settlements in malpractice cases.
   A. True
   B. False

6. There are approximately _____ patient deaths per year due to complications associated with pressure ulcers.
   A. 500
   B. 1000
   C. 10,000
   D. 60,000

7. _____ is the first observable indicator of pressure.
   A. Pain
   B. Reactive hyperemia
   C. Continual redness
   D. Broken skin

8. A Stage II pressure ulcer is defined by a partial thickness skin-loss involving the epidermis and may include the dermis. This ulcer is superficial and appears as an abrasion, blister, or shallow crater.
   A. True
   B. False

9. Extrinsic risk factors for pressure ulcer formation are easily identified and controllable. They include:
   A. Pressure, shearing, heat, moisture, and friction
   B. Time of immobility, weight, medications, nutrition
   C. General anesthesia, co-morbid conditions, mobility status
   D. Serum albumin levels, friction, heat, pressure

10. The treatment of pressure ulcers costs two-and-a-half times more than prevention, therefore justifying the purchase of advanced pressure-reducing pads for surgical tables.
    A. True
    B. False

Answers to Review Questions and Section Sources

1. D Clinical incidence and cost of OR-acquired pressure ulcers
2. B Clinical incidence and cost of OR-acquired pressure ulcers
3. D Clinical incidence and cost of OR-acquired pressure ulcers
4. C Clinical incidence and cost of OR-acquired pressure ulcers
5. A Clinical incidence and cost of OR-acquired pressure ulcers
6. D The impact of pressure ulcers
7. B Physiology
8. A Stages of pressure ulcers
9. A Risk factors
10. A Evaluation

Registration Evaluation Form

Study Guide #15: Perioperative Pressure Management: It's a "Sore" Subject

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Non-RN: License or Social Security Number

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To what extent did the study guide meet the 2 stated objectives below?

1. Review the incidence and etiology of pressure management. [1] [2] [3] [4] [5]
2. Describe a variety of perioperative practices needed for effective pressure management. [1] [2] [3] [4] [5]
3. To what extent is this learning method easy-to-use? [1] [2] [3] [4] [5]
4. How much time was required to read the content, take the test, compare your answers and complete the evaluation form? _____ hours _____ minutes
5. Has the provider disclosed the conflict of interest or lack therof declared by the planners and content specialist? Yes_____No_____ (Review inside cover page)
6. Was the content presented without bias of any commercial product or drug? Yes_____No_____

I have completed all the requirements for this entire activity (please sign and date).

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