



AST Standards of Practice for Surgical Positioning

Introduction

The following Standards of Practice were researched and authored by the AST Education and Professional Standards Committee and have been approved by the AST Board of Directors. They are effective April 1, 2011.

AST developed the Standards of Practice to support healthcare facilities in the reinforcement of best practices, related to positioning the surgical patient on the OR table. The purpose of the Standards is to provide information that healthcare workers (HCWs) in the perioperative setting can use to develop and implement policies and procedures for positioning the surgical patient on the OR table. The Standards are presented with the understanding that it is the responsibility of the healthcare facility to develop, approve, and establish policies and procedures for positioning the surgical patient on the OR table, according to established healthcare facility protocols.

Rationale

The following are Standards of Practice related to surgical positioning of the patient. The goal of the surgical position is to provide optimal visualization of, and access to, the surgical site that causes the least physiological compromise of the patient, while also protecting the skin and joints. When the patient has been administered anesthetic agents, the ability for the patient to communicate pain and pressure to the surgical team has been eliminated; therefore, the team now becomes responsible for the patient to ensure the positioning has been conducted in a safe manner, and the integumentary, musculoskeletal, respiratory and circulatory system functions have been preserved.

The three components of safe positioning of the surgical patient on an OR table include knowledge, planning and teamwork. The team should be knowledgeable in applying the principles of patient positioning in the OR, including attention to safety principles, because they pertain to the unique physiological qualities of each patient and the position itself that will be implemented. Planning and teamwork go hand-in-hand and their importance cannot be overemphasized. Planning involves communication and cooperation among the team in order to anticipate specific patient challenges, eg patient is obese, has COPD or rheumatoid arthritis, or has a total hip implant. If planning is done correctly, the team members will coordinate their efforts, when the patient is transported into the OR to avoid last minute troubleshooting. It also enables the team to anticipate transporting and positioning the equipment that will be required; confirming the equipment is in working order prior to the surgical procedure; and ensuring that all multiple parts of the positioning device fit together properly, if applicable. Teamwork is reinforced by ensuring an adequate number of trained personnel are assisting to

effectively and safely position the patient; and each team member knows his/her duties during the patient positioning.

By following these Recommended Standards of Practice, the surgical team can reduce the chances of patient complications, related to positioning as well as contribute to preventing team members suffering a musculoskeletal injury. Surgery department personnel should be involved in the process of developing and implementing healthcare facility policies and procedures for positioning the patient on the OR table.

Standard of Practice I

The surgical team should be familiar with the goals of achieving safe and effective positioning of the surgical patient.

1. The goals of positioning the surgical patient are ensuring patient comfort and dignity; maintaining homeostasis; protecting anatomical structures and avoiding complications and injuries; promoting access to the surgery site; promoting access for the administration of IV fluids and anesthetic agents; and promoting access of OR surgical equipment.
 - A. Patient comfort, when using general anesthesia or when the patient is conscious, is important toward decreasing any undue physical and/or psychological stress. When the patient is unconscious, a good practice is to treat the patient as if he/she was conscious.¹⁹

Additionally, it may be necessary to rehearse the surgical position with the patient prior to surgery to confirm, it is not placing any undue physical stress on the body.¹⁹
 - B. Patients, in particular pediatric patients, feel vulnerable and often helpless on the day of surgery and must place their trust in a surgical team who are strangers. The surgical team should make all efforts to minimize the exposure of the patient for purposes of respect, even if the patient will be under general anesthesia.
 - C. The position should minimally interfere with the homeostasis of the body, eg respirations and circulation. Also, minimizing exposure of the body contributes to maintaining the normal body temperature of the patient.
 - D. The surgical team must be acutely aware of protecting the anatomical structures of the patient's body to avoid complications and injuries, including protection of skin, muscles and nerves, extremities including digits, and spine. Additionally, the surgical team must protect the patient from pressure sores, diathermy burns and tourniquet injuries. (See below for specific Recommended Standards that address these items in detail).
 - E. The patient position should promote access to the surgery site without having to use a position that places undue stress on the body.
 - F. The patient position should promote access to IV sites for the administration of medications, fluids, blood and blood products and anesthetic agents.
 - G. The patient position should promote the ability to position surgical equipment (eg C-arm, operating microscope, laser, surgical robot) for ease of use by the surgical team.

Standard of Practice II

During preoperative planning for a surgical procedure, the surgical technologist and other surgical team members should be informed of specific patient physiological factors that can affect the positioning procedure.

1. The surgical technologist should have the information pertaining to the preoperative physical assessment of the patient in order to anticipate precautions that must be taken during patient positioning.
 - A. Patient preoperative assessment factors to be taken into consideration include:
 - Age
 - Height
 - Weight
 - Skin integrity
 - Ranges of motion
 - Preexisting conditions, eg allergies including latex; circulatory, respiratory, immune systems; neurological pathologies; nutritional condition
 - Mental competence, eg congenital disorders such as Down's syndrome; brain damage due to injury or disease
 - Prosthetics
 - Implanted devices, eg total joint implants; plates and screws; pacemaker
 - External devices, eg indwelling catheters; ostomy bags
 - B. Surgical procedure preoperative assessment factors to be taken into consideration include:
 - Surgical procedure to be performed
 - Estimation of the length of the procedure
 - Surgeon's and anesthesia provider's preferred surgical position

Standard of Practice III

Based upon the preoperative patient assessment and surgical procedure, the surgical technologist should anticipate the type of OR table and equipment that is needed.

1. The surgical technologist should collaborate with the surgical personnel and healthcare facility purchasing personnel in evaluating and purchasing OR tables and positioning equipment.
 - A. The surgery and purchasing personnel should analyze the types of surgical procedures performed at the facility, patient population, manufacturers' recommendations and published research to determine the OR tables and equipment that best meets the needs of the surgery department.
 - B. The following essential factors should be taken into consideration when purchasing OR tables:¹⁹
 - Stable base
 - Easy to maneuver and lock into place

- Easily adjusts into all positions, eg height, Trendelenburg, reverse Trendelenburg, lateral tilt, central break
 - Easy-to-add positioning equipment and adjust, eg armboards, stirrups, kidney rests, move head section to foot of OR table
 - Radiolucent to allow taking X-rays or using fluoroscope
 - Able to safely support patients. Based on analysis of types of surgical procedures performed and patient population, the surgery and purchasing personnel should request the manufacturer to provide information concerning the maximum patient weight the OR table can safely support. It may be necessary to purchase heavy-duty OR tables that can support up to 1,000 pounds.
 - Easy to clean
- C. One of the most important safety factors that should be taken into consideration when purchasing OR tables is the mattresses and ability to evenly distribute the body pressure to prevent circulatory disturbances and pressure ulcers at the bony prominences.
- (1) The routine mattress is foam covered with nylon or vinyl. An alternative is the gel mattress. Research results have not provided a definitive answer regarding which type is best for preventing intraoperative skin injuries and pressure ulcers. The surgery and purchasing personnel should request the manufacturer to provide information including research that has been performed on the mattresses being considered for purchase. Additionally, the personnel should be allowed by the manufacturer to use the mattresses on a test basis to determine which performs the best and meets the needs of the facility and patients. However, the surgery and purchasing personnel should base their decisions on the following factors:
- Based upon analysis of surgical procedures performed, mattresses are appropriate for the requirements of the various surgical positions, including availability of different sizes and foam thickness;
 - Made of resilient, long-lasting material, including no breakdown when cleaned with disinfectant agents;
 - Radiolucent (if surgery department performs procedures that require intraoperative imaging studies);
 - Moisture resistant;
 - Fire retardant;
 - Nonallergenic, in particular, no presence of latex in material;
- D. Even if the surgery department does not perform bariatric surgical procedures, it is still required that the department be prepared for performing other types of surgical procedures on obese patients.
- (1) The surgery and purchasing personnel should analyze the needs of the surgery department and purchase positioning

equipment that safely meets the needs for positioning the patient, including patient transfer lifts to move the obese patient from the stretcher to the OR table and heavy-duty OR table that safely supports the patient, but allows articulation to place the patient in the surgical position.

2. Surgical personnel should use the positioning equipment according to their designated use and manufacturer's instructions to avoid injury to the patient.
 - A. The surgical technologist should verify that the positioning equipment is designed to be used for the specific patient position per surgeon's orders.
 - (1) Verification should include the positioning equipment can sustain the weight of the patient. If the manufacturer's recommendation for weight limitation is exceeded, the positioning equipment should not be used.
 - (2) The positioning equipment should not be modified to fit the needs of the surgery department, unless the manufacturer has been consulted and approves the modification. The modified positioning equipment should be tested prior to use.
3. Positioning equipment, including the OR table and mattresses, should be inspected at least annually by the biomedical engineering technicians to ensure proper functioning in order to contribute to patient safety goals in reducing the risk of intraoperative injuries.
 - A. The surgery team should test the positioning equipment and OR table prior to use to contribute to the surgery department environment of making patient safety a priority on a daily basis.
4. The surgical technologist, in collaboration with the surgical team, should anticipate the type of OR table and positioning equipment necessary.
 - A. The day before the surgery, the surgical technologist should review the surgery procedures for the OR to anticipate positioning equipment needs and availability.
 - (1) Reviewing the OR surgery schedule the day before allows the surgical technologist in collaboration with the surgery team to troubleshoot positioning equipment needs, eg equipment is not available due to repairs or shortage of equipment.
 - B. The choice of OR table and positioning equipment should be based upon the patient's physiological conditions identified during preoperative assessment, surgeon's orders, and surgical procedure.
 - (1) Prior knowledge of a patient's preexisting condition(s) promotes communication by the surgical team to confirm positioning modifications that satisfies the needs of the team in being able to perform the procedure as well as adjusting to the physiological needs of the patient.
 - (2) The patient position should provide optimal exposure for placement of IV lines and anesthesia monitoring devices.

- (3) Surgical procedure factors, such as surgery site(s), length of procedure, and use of surgical equipment (eg imaging equipment, surgical robot, laser) aids in the preoperative determination of where the equipment should be placed based on the patient position.
5. On the day of the surgical procedure, the surgical technologist in collaboration with the surgical team should confirm all positioning equipment is available and in the OR, OR table is in working order and positioned according to surgeon's orders, and surgical equipment and furniture are in the proper position.
6. As part of the "time out," prior to the skin incision, the surgical team should verify the patient position, and all positioning equipment is placed correctly.¹⁰

Standard of Practice IV

The surgical technologist, in collaboration with the other surgical team members, should address the needs of special patient populations and implement the necessary precautions to avoid the patient from acquiring a pressure ulcer due to the surgical position.

1. Surgical patients are more susceptible to developing pressure ulcers as compared to the general acute care patient population. As defined by the National Pressure Ulcer Advisory Panel, "a pressure ulcer is localized injury to the skin and/or underlying tissue usually over a bony prominence, as a result of pressure, or pressure in combination with sheer and/or friction."¹² The NPUAP also revised their definitions of the stages of pressure ulcers, see Appendix A. The most prevalent risk factors for the development of pressure ulcers among surgical patients are: age; diabetes; peripheral vascular disease; length of surgery; chronic low blood pressure; increased body temperature; poor nutrition; thinness (stature); and use of a warming blanket.^{8,20}
 - A. The surgical technologist should be knowledgeable of The Joint Commission's 2006 National Patient Safety Goals. Goal 14 states that healthcare facilities should prevent the development of pressure ulcers, assess and periodically reassess patients for pressure-ulcer risk, and properly address the identified risks.¹⁰
 - B. The surgical technologist should take additional precautions to prevent pressure ulcers when the following risk factors are present:
 - (1) The length of the surgical procedure will be three hours or longer.¹⁹ The following studies that included duration of surgery support it as being a risk factor for pressure ulcer development.^{3,15,20}
 - (2) The surgical specialties most commonly associated with the development of pressure ulcers are cardiothoracic, vascular, and orthopedic, in particular orthopedic elderly patients.^{8,20}
 - (3) Patient has a low Braden scale assessment. The Braden scale is one of the most widely used ratings by healthcare providers to predict a patient's level of risk for developing pressure ulcers. It consists of six subscales, and the patient is rated on a scale of one (poor) to four (excellent): sensory

perception; skin moisture; physical activity; mobility; nutrition; friction and shear.²

2. The surgical team should take additional safety measures for special patient populations including infants; elderly; malnourished; morbidly obese; patients with chronic disease conditions in particular diabetics and peripheral vascular disease (PVD); and patients who are naturally thin.⁸
 - A. Information gained from the preoperative patient assessment that identifies patients as requiring additional positioning precautions should be communicated to the surgical technologist.
 - B. Elderly patients are at an increased risk for pressure ulcers due to the presence of multiple physiological challenges including poor circulation, thin body structure, impaired mobility, and malnourishment.⁸
 - (1) Over 95% of all pressure ulcers develop over bony prominences in the lower extremities.²⁰ The surgical technologist should ensure the bony prominences of patients who are elderly, thin and/or malnourished have additional padding to prevent pressure ulcers.
 - (2) However, even though studies have suggested that the risk for pressure ulcers is greater in the elderly patient, other studies such as that by Aronovitch reported a 9.3% incidence of pressure ulcers in patients between the ages of 20 to 40.¹ This suggests that no matter the age, pressure ulcer development during the perioperative period is a serious situation, and all patients should be considered at risk.¹⁸
 - C. Morbidly obese patients can present with multiple physiological challenges including assessing the skin when positioned on the OR table.
 - (1) The surgical technologist should assist the surgical team in achieving an optimal position that provides as much comfort for the patient as possible while still allowing for access to the surgical site and positioning of surgical equipment.
 - (2) The use of additional foam or gel positioning devices may actually contribute to the development of pressure ulcers due to the weight of the patient compressing the devices.
 - (3) The surgical technologist should assist the surgical team in smoothing out the wrinkling of the skin as much as possible that can occur with obese patients on the OR table. Skin wrinkling can lead to pressure ulcers and compromise the circulation to the area.
 - D. Diabetic and PVD patients are at an increased risk for pressure ulcers.
 - (1) Diabetic and PVD patients may have preexisting ulcers. The surgical technologist should be aware of them.
 - (2) PVD patients may have preexisting tissue ischemia.²³ Additionally, these patients may be hypertensive, requiring the surgical team to slowly move the patient into the

surgical position in order to allow the internal physiological mechanisms of the body to adjust and prevent an abnormal drop in the blood pressure.^{21,23}

- E. Patients who smoke tobacco are prone to developing vasoconstriction of the cutaneous blood vessels; nicotine is the cause of the vasoconstriction resulting in decreased tissue oxygenation²² A primary cause of PVD is tobacco use. Although no official guidelines have been established by the medical community, many surgeons will advise patients to quit smoking for a minimum of one week before and after a surgical procedure in order to attempt to resolve the tissue hypoxia.

(1) The surgical technologist should be informed of the preoperative assessment of the patient's smoking history and be cognizant of the vasoconstrictive properties of tobacco and the physiological effects on the skin of the patient.

Standard of Practice V

During preoperative planning for a surgical procedure, the surgical technologist and other surgical team members should be informed if the patient is at particular risk for falling.

1. The following should be communicated to the surgical team prior to the transfer of the patient from the unit to the surgery department in order to prevent patient injuries:¹⁰
 - History of falls
 - History of syncope
 - Medications the patient is currently taking that can contribute to falls
 - Patient has a disorder such as Alzheimer's disease or dementia that produces confusion and change in mental status
 - Chronic dizziness and/or tinnitus
 - Poor vision or blindness
 - Impaired mobility
2. The surgical team should take special precautions when positioning the patient who is at risk for falling.
 - A. The surgical team should communicate to the patient that the surgical team will transfer him/her from the stretcher to the OR table. The team should not allow the patient to transfer himself/herself.
 - B. A member of the surgical team should stand to one side of the patient next to the OR table until he/she is either under general anesthesia, received a regional block (spinal or epidural), and/or the patient is positioned and the sterile team members are ready to place the sterile drapes.

Standard of Practice VI

Surgical team members should follow ergonomic principles for positioning patients.

1. The surgical technologist should be aware of the following poor body mechanics that can lead to neck, shoulder, back and knee injuries:⁹

- Lifting with the back bowed out
 - Bending and reaching with the back bowed out
 - Jerking or twisting at the hips
 - Obesity
 - Loss of strength and flexibility
 - Poor nutrition
2. One of the more difficult tasks for the surgical team is moving and positioning an incapacitated/immobile or anesthetized patient.⁹ The surgical technologist should practice proper body mechanics in preventing injury and discomfort when assisting with positioning the patient.
 - A. Proper body mechanics to implement when positioning the patient include the following (Orthopedics International – Spine):
 - (1) Stand with legs approximately shoulder width apart to give the body a solid stance and allow the ligaments of the hips and knees to support the body.
 - (2) Avoid weight bearing on one leg and foot.
 - (3) Stand in front of and as close to the patient and/or body part to be positioned when moving or in other words, keep the weight as close to the body as possible.
 - (4) Tighten the stomach muscles to help support the back.
 - (5) Do not twist at the hips while lifting; if a turn must be made, turn the whole body if possible, but not at the waist.
 - (6) Lift using leg muscles.
 - (7) Lift or move the patient with a smooth, even motion in sequence with surgical team members; avoid jerking movements.
 - (8) Bow the back in, keeping the heels flat.
 - (9) Keep the lower back bowed in when lowering the patient or body part.
 - (10) Push, do not pull heavy equipment such as the OR table.
 3. A sufficient number of surgical personnel should assist in moving and positioning a patient.
 - A. Additional personnel should assist in moving and positioning the obese patient.
 4. OR tables are heavy and difficult to maneuver, placing the surgical team at risk for injury.
 - A. The surgical technologist should not attempt to move an OR table alone, but have assistance from at least one other surgical team member.
 - (1) The surgical technologist must confirm the OR table wheels are in the unlocked position prior to moving. If the wheels are in the locked position and a surgical team member attempts to move the bed assuming the wheels are unlocked, it can cause a body injury due to the harsh jerking movement that can occur upon pushing on the table.
 5. It is recommended the surgical team use a roller or other type of mechanical lifting device when placing the patient on the OR table from the stretcher.⁴

- A. A mechanical lifting device should be used for morbidly obese patients to avoid injuries to the patient and surgical team.

Standard of Practice VII

A patient who has been placed on the OR table must never be abandoned.

1. The surgical team must always ensure the patient that has been transferred from the stretcher to the OR table is never abandoned.
 - A. If the patient is left alone in the OR, the surgical team can be held liable for abandonment.⁴
 - (1) Patients are under the effects of preoperative medications, or may have a history of falls and therefore, the risk for injury is great.
 - (2) At a minimum, the circulating person and anesthesia care provider should be in the OR with the patient prior to the sterile surgical team beginning the procedure.

Standard of Practice VIII

The surgical technologist in the assistant circulating role or prior to performing the surgical scrub should assist in safely positioning the patient under the direct supervision of the surgeon and anesthesia care provider.

1. The surgical technologist should assist the surgical team in maintaining the privacy and dignity of the patient in the OR.
 - A. The OR should be restricted to those surgical personnel who are involved in the performance of the surgical procedure.
 - (1) The doors to the OR should be kept shut for patient privacy and infection control purposes.
 - (2) The traffic in and out of the OR by the surgical team should be kept to a minimum.
 - (3) The surgical team should communicate to the patient all the actions that are taking place when transferring from the stretcher to the OR table and positioning prior to anesthesia administration.
 - (4) Only those sections or parts of the patient's body should be exposed (eg, gown turned/rolled back) for anesthesia and surgical site access to preserve the patient's dignity. Additionally, exposing the minimum amount of body surface aids in preventing patient hypothermia.
2. The surgical technologist should assist the surgical team in achieving general safety measures that apply to every surgical position under the direct supervision of the surgeon and anesthesia care provider.
 - A. Jewelry and body piercings should be removed prior to transporting the patient from the unit to the OR. These items can catch on bedding and the OR table, causing shearing injury during positioning. Additionally, jewelry can cause pressure injuries, while the patient is in the surgical position.
 - B. The surgical team should confirm the types of patient care devices (eg portable oxygen tank tubing, IV tubing, Foley catheter, wound drainage

collection devices) that are in place and are positioned in such a manner to protect them from being pulled and/or dislodged during transfer and positioning on the OR table⁴

- C. The surgical team should lift and not slide the patient into position to avoid friction and shearing injuries.⁴
 - (1) Friction occurs when a patient's skin rubs against a resistant and/or rough surface such as stretcher and OR table sheets. Shearing is a combination of static friction and pressure that causes the skin to slide or be pulled from its normal anatomical position.⁸
 - (2) When transferring an immobile patient from the stretcher to the OR table, the surgical team should use a transfer device, such as rollers or lifting device for the morbidly obese. The patient should not be slid.
- D. The surgical team should coordinate their actions when moving and positioning the patient.
 - (1) To avoid injuries, there should be an adequate number of surgical personnel to assist in moving and positioning the patient.
 - (2) The surgical team must follow the directions of the anesthesia care provider, who directs the movements of the patient. The anesthetized patient should not be moved without permission from the anesthesia care provider.⁴
 - (3) The surgical technologist must not be responsible for maintaining the patency of the patient's airway, and head and neck position, while the patient is being moved and positioned; that is the sole responsibility of the anesthesia care provider.
 - (4) The surgical team should move and position the patient in a slow, but deliberate manner to maintain control of the body and allow for circulatory and respiratory changes.⁴
- E. The pressure points and bony prominences should be identified and properly padded.
- F. No body part should extend beyond the edge or end of the OR table or positioning devices, such as armboards to avoid nerve injury.
- G. The OR table safety strap must not be secured too tightly across the patient in order to avoid pressure that can compromise circulation and friction. The surgical technologist should be able to comfortably insert two fingers under the mid-section of the safety strap to assure it is safely applied.
- H. The patient's arms should be positioned to avoid nerve injury. (See recommendations for positioning the arms for each specific position).
- I. The surgical technologist should confirm the position of the patient's fingers to ensure they are not within the bed breaks to avoid shearing and/or crushing injuries.

- J. The patient's legs must not be crossed to avoid pressure and nerve injuries.⁴
 - K. The surgical technologist should assist the surgical team in confirming the proper alignment of the patient's body in particular head, neck, spine and legs are in straight alignment and in line with the hips. Excessive torsion, flexion, and/or extension of any body part must be avoided.⁴
 - L. Direct pressure on the eyes should be avoided to prevent corneal abrasions.
 - (1) The use of a head ring (donut) or horseshoe-shaped headrest should be avoided in order to avoid the risk of pressure on the eyes.¹¹ The head may move in these devices during a surgical procedure resulting in direct pressure on the eye causing retinal ischemia.¹¹
 - M. A pillow should be placed under the posterior of the patient's knees to relieve pressure on the lumbar region of the back.
 - N. Intraoperatively, the surgical technologist must not allow the Mayo stand or heavy equipment (eg, power equipment) to rest on the patient in order to prevent a pressure injury.
3. The surgical technologist should assist the surgical team in implementing safety measures to protect the nerves and reduce the risk for temporary or permanent injury when positioning the patient.
- A. The surgical technologist should be aware that nerves are vulnerable to injury by traction and pressure leading to potentially medicolegal action when they do occur. The nerves most commonly injured are the ulnar, common peroneal and brachial plexus.^{13,16,19} The mechanisms of injury are thought to be due to traction and/or compression of the nerve during surgery; however the precise events that lead to a neuropathy have not been established¹⁹
 - (1) The surgical technologist should be informed of the preoperative assessment of a patient's risk factors for nerve injury, including preexisting conditions such as alcoholism, PVD, diabetes, and hypertension.¹⁹
 - B. The surgical technologist should assist the surgical team in achieving general safety measures for reducing the risk factors for nerve injury that apply to every surgical position under the direct supervision of the surgeon and anesthesia care provider.
 - (1) The patient's head and neck should be in a neutral position. However, the only surgical personnel that should maintain control of the head and neck is the anesthesia care provider.
 - (2) For patients placed in the supine position, the arms should be abducted less than 90° and preferably should only be abducted up to 60°.¹⁶
 - (3) Only well-padded armboards should be used in the OR. The palms of the hand should be in the anatomical position (palms-up), and the fingers extended and not curled toward the palm. If the fingers are curled towards the palm due to a

pathology, a cushion of some type (eg, rolled towel, non-counted sponge, small gel pad) should be inserted between the fingers and palm.

- (4) Placing the patient's arms at the side of the body should be avoided in the supine position unless the surgical procedure necessitates this be done. If the patient's arms must be placed at the side of the body, care must be taken to avoid ulnar nerve damage, pressure injury and compromising circulation.¹⁶ The draw sheet should be used to keep the arms in position. The arms should be slightly flexed at the elbows, palms facing towards the body, fingers extended; sheet extends above the elbows and tucked between the patient and OR mattress.

C. The surgical technologist should assist the surgical team in taking additional precautions in implementing safety measures for reducing the risk factors for injury to those nerves most often injured, including the nerves of the cervical spine, brachial plexus, lumbosacral, common peroneal and ulnar.

- (1) The cervical spine requires additional protective measures in patients with specific pathologies, such as cervical spondylosis, who are prone to developing entrapment neuropathies due to neck positions, and patients with rheumatoid arthritis, who are at risk for spinal cord injuries.¹⁹ The preoperative assessment is highly important in identifying these types of pathologies through the patient history and physical and X-rays, and communicating this information to the surgical team preoperatively in order to anticipate the needed positioning equipment and adjustments to the surgical position.
- (2) As previously stated, to avoid brachial plexus injury, the arms should not be abducted more than 90° on the armboards.
- (3) Prolonged hyperflexion of the hip joints can lead to traction injuries. The lithotomy position is primarily associated with this injury.¹⁹ An angle of more than 90° at the hips must be avoided.
- (4) Compression of the common peroneal nerve is usually associated with the lithotomy position. Injury to the nerve can cause foot inversion and drop. Injury can be avoided by adequate padding of the stirrups and avoiding the lower legs resting against the stirrups.
- (5) The ulnar nerve is injured due to poorly placed arm straps/restraints and table attachments, and poor positioning of the arm when placed alongside the patient.¹⁶ The injury is avoided by padding the elbow or proper placement of the arm in pronation (see previous information).

- D. The surgical technologist should assist the surgical team in taking additional precautions in implementing safety measures for reducing the risk factors for injury to the pudendal nerve when positioning the patient on an orthopedic traction table.
 - (1) The perineal post must be well-padded and should rest against the pubic rami on the operative side.¹⁹ It should not be pressing against the pudendal nerve and external genitalia.
- 4. The surgical technologist should assist the surgical team in achieving the following general safety measures for the supine position and its variations.
 - A. Patients with cardiorespiratory disease may experience dyspnea when lying flat and need to be temporarily raised up on pillows until the induction agent is given.
 - B. Confirm the spine is in alignment with no flexion or torsion present and the legs are parallel.
 - C. Arms should be placed on well-padded armboards with additional padding for the elbows. Armboards are not extended more than 90°.
 - D. Pillow should be placed posterior to the knees joints to decrease pressure on the lumbar region of the back.
 - E. The ankles/legs must not be crossed to prevent pressure injury.
 - F. The safety strap should be placed 2” above the knees. It should not be restrictive to avoid compression and friction injuries.
 - G. The heels must be protected from pressure by placing a pillow, ankle roll or donut.¹⁹
 - H. The surgical technologist should confirm that no body part is extending beyond the OR table edges, in particular the feet, in order to avoid a foot-drop injury.
 - I. When placed in the supine position, the uterus of the pregnant female patient compresses the vena cava and aorta obstructing the blood flow referred to as “aorto-caval compression.”^{5,7} The reduced blood flow to the placenta, heart, kidneys and lower extremities can produce undesired physiological consequences for the female and fetus.⁵ Aorto-caval compression can also occur in the morbidly obese patient.
 - (1) To avoid aorto-caval compression during Caesarean section or when the obese patient is in the supine position, the patient should be tilted approximately 15° degrees to the left to reduce the uterine pressure on the vena cava.⁷ This is accomplished by tilting the OR table slightly to the left and/or placing a wedge under the patients right hip.
 - J. General safety measures for lithotomy position:
 - (1) The stirrups should be well-padded and positioned equal in height.
 - (2) Two surgical personnel must lift the legs simultaneously and position in the stirrups. One leg at a time **MUST** never be placed in the stirrups in order to avoid lumbosacral injury and hyperflexion of the hip.

- (3) To avoid a shearing injury, a minimum of four surgical personnel should move the patient, if necessary, to the break in the OR table. The patient should be slightly lifted and moved with the use of the lift sheet. The anesthesia care provider is responsible for the head and neck; two personnel should be positioned on each side of the patient and, most often, the surgeon will position herself/himself between the legs to assist by gently pulling the patient down. The surgeon, with the assistance of the surgical team, should confirm that the buttocks are not overhanging at the end of the OR table and are even with the lower break of the OR table.¹⁹
- (4) At the end of the procedure, two surgical personnel must simultaneously remove the legs from the stirrups and lower to the OR table. The pedal pulses should be checked.¹⁹
- (5) The arms should be placed on the padded armboards that do not extend more than 90° with palms upward. The armboard straps should be placed to secure the arms without causing undue compression.
- (6) If the arms must be tucked alongside the patient, the surgical technologist should confirm the fingers are clear of the lower break in the table to avoid a crushing injury when the lower section of the bed is elevated at the end of the procedure.¹¹
- (7) Extra precautions must be taken to avoid the patient falling from the OR table since the safety strap should not be applied across the abdomen or chest. The patient should be closely observed throughout the perioperative phase.
- (8) Calf compression is unavoidable and can predispose the patient to the development of venous thromboembolism and compartment syndrome.¹¹ The most consistent factor in the development of compartment syndrome is the length of the procedure.¹¹ To avoid complications, it is recommended that the surgical team remove the patient's legs from the stirrups every two hours, if the procedure has the potential of lasting four or more hours.¹⁷ It is also recommended that the surgical team consider monitoring the patient by obtaining continuous invasive compartment measurements for lengthy procedures.¹¹
- (9) The patient should be returned to the supine position as soon as possible.⁴

K. General safety measures for Trendelenburg position:

- (1) Brachial plexus injuries are associated with the use of shoulder braces.¹⁹ If possible, avoid the use of shoulder braces; however, if they must be used, the braces should be

well-padded. The braces must be placed on the outer parts of the shoulder away from the neck.¹⁹

- (2) The safety strap should be placed 2" above the knees. It should not be restrictive to avoid compression and friction injuries.
- (3) The OR table should be adjusted into the head downward position slowly to allow the physiological processes of the patient's body to adjust, as well as leveled slowly at the end of the surgical procedure. Trendelenburg's position increases the intracerebral and intraocular pressures.^{11,19} If it can be avoided, patients who have a history of head trauma or intracranial pathology should not be placed in Trendelenburg's position.

Cardiovascular changes are seen with Trendelenburg's position. If it can be avoided, patients who have a history of cardiovascular pathologies including heart failure and myocardial infarction as well as peripheral vascular disease that interferes with venous return, should not be placed in Trendelenburg's position.

Diaphragmatic movement is impaired by the weight of the abdominal viscera. The combined pressure of the viscera and increased airway pressure to ventilate the lungs, which causes the diaphragm to push back against the viscera, increases the risk for atelectasis.^{11,19}

- (4) When tilting the bed head downward, the surgical team should closely observe the patient to prevent sliding and causing a shear injury and/or falling off the OR table.

L. General safety measures for reverse Trendelenburg position:

- (1) The primary complications of this position are hypotension and increased risk of venous air embolism.¹¹ Patients with cardiovascular disorders such as valvular disease can become hypotensive if the movement from level supine to reverse Trendelenburg is too rapid. Cerebral perfusion decreases in the presence of hypotension.¹⁹ Air embolism is at an increased risk when the head is above the level of the heart such as in the case of reverse Trendelenburg. To avoid these complications, the OR table should be slowly moved into the reverse Trendelenburg position to allow the physiological processes of the body to adjust as well as slowly leveled at the end of the surgical procedure.
- (2) A well-padded foot board must be used to support the body and prevent the patient from slipping off the OR table. The bottoms of the feet should be flat against the foot board with no inward curling of the toes.

- (3) The safety strap should be placed 2" above the knees. It should not be restrictive to avoid compression and friction injuries.
- (4) When reverse Trendelenburg position is used, the arms are usually placed along side the patient.

M. General safety measures for Fowler's position:

- (1) The primary risk factors are venous air embolism, venous pooling, and if hypotension is present as a co-morbidity it can have a dangerous effect on cerebral perfusion which is already decreased due to the position.^{11,19} The adjustments to the OR table should be made slowly to decrease the chance of these risk factors from occurring.
 - (2) The table breaks should be underneath the lumbosacral area and knee joints.
 - (3) Unless necessary, the head of the bed should not be elevated past 45° to contribute towards reducing the risk of venous pressure.
 - (4) Pressure points should be well-padded including the occiput, lumbosacral area, and heels.¹⁹
 - (5) Arms may be placed on armboards with the palms downward. If not placed on armboards, a pillow should be placed across the abdomen, not the chest, and the arms bent at the elbows resting on the pillow; the arms should not be positioned where one arm is resting on top of another arm or crossed.⁴
 - (6) A padded footrest should be used to support the feet and ankles; the bottoms of the feet should be flat against the foot board with no inward curling of the toes.
 - (7) The upper body may need to be restrained in order to prevent movement during the surgical procedure. The restraint should not be restrictive to avoid compression and interference with respirations and friction.
 - (8) The safety strap should **not** be placed until after the patient has been positioned. If the safety strap is placed prior to the positioning, such as during movement of the OR table, the safety strap could cause shearing and friction injuries. The safety strap should be placed 2" above the knees.
5. The surgical technologist should assist the surgical team in achieving the following general safety measures for the prone position and its variations:
- A. A minimum of four surgical personnel should assist in transferring the patient from the supine to the prone position to provide full support to the patient and avoid injuries to the personnel. Often, the patient is anesthetized on the stretcher in the supine position and then rolled over to the prone position on the OR table. The anesthesia care provider is responsible for supporting the head and neck of the patient and ensuring the

endotracheal tube is not dislodged. Two personnel should position themselves alongside the stretcher, and the other two personnel should take a position opposite on the far side of the OR table.

- B. The eyes are at particular risk for compression injuries. Direct pressure on the eyes should be avoided by not using a horseshoe-shaped headrest. The eyes should not be padded but gently taped shut.¹⁹ A softly padded headrest should be used that does not apply pressure to the eyes and nose and provides for airway access.
- C. Body alignment is very important and should be confirmed by the surgical team. The cervical spine should be in alignment with the rest of the spine, with no torsion or twisting, and the legs parallel to each other.
- D. Chest rolls (also called axillary rolls) should be placed laterally and long enough to extend from the clavicles to the iliac crests to allow for respirations and decrease the abdominal pressure.⁴
- E. The breasts of females should be positioned laterally to avoid compression or torsion injury.
- F. The male genitalia should be confirmed to be in a downward natural position to avoid compression or torsion injury.
- G. The arms can be placed in one of two positions: alongside the patient or on armboards. If placed alongside the patient, the steps previously described should be followed – palms facing inward; elbows slightly flexed; fingers extended, not curled; draw sheet extends above the elbows and is tucked between the patient and the OR table mattress in a fashion that keeps the arms in place but is not too restrictive.

If armboards are used, they are positioned to allow the arms to assume a natural position extending above the patient's head. The arms are moved into position by using the natural rotation of slowly lowering the arm and then moving upward onto the armboard. The elbows should be slightly flexed, and the palms facing downward. Positioning the arms in this manner places the brachial plexus at a higher risk for a stretch injury as compared to placing the arms alongside the patient.

- H. Padding should be placed under each patella of the knee joints.
- I. A pillow should be placed under the ankle joints to elevate the foot to relieve tension on the sciatic nerve and prevent the toes from resting on the OR table mattress.¹⁹
- J. The safety strap should **not** be placed until after the patient has been positioned. If the safety strap is placed prior to the positioning, such as during movement of the patient on the OR table, the safety strap could cause shearing and friction injuries. The safety strap should be placed 2" above the knees.
- K. General safety measures for Kraske (jackknife) position:

- (1) All general safety measures for the prone position apply to the Kraske position.
 - (2) The hip joints should be over the middle break of the OR table.
 - (3) The head should be turned towards the non-affected or non-operative side.
 - (4) The OR table should be moved into the Kraske position slowly. The patient should be closely observed to ensure the body maintains position, and the hip joints remain over the middle break.
 - (5) The safety strap should **not** be placed until after the position has been achieved. If the safety strap is placed prior to positioning, such as during movement of the OR table, the safety strap could cause shearing and friction injuries. The safety strap should be placed 2” above the knees.
 - (6) The patient should be returned to the horizontal prone position as soon as possible.⁴
6. The surgical technologist should assist the surgical team in achieving the following general safety measures for the lateral position and its variations:
- A. The surgical technologist should be familiar with the terminology as related to the lateral position.
 - (1) The patient in right lateral position is placed on the OR table lying on her/his right side, and the patient in left lateral position is lying on the left side.
 - B. A minimum of five surgical personnel should assist in transferring the patient from the supine to the lateral position to provide full support to the patient and avoid injuries to the personnel. The anesthesia care provider is responsible for supporting the head and neck of the patient and ensuring the endotracheal tube is not dislodged. Two personnel should be positioned on each side of the OR table (total of four personnel); two should be positioned alongside the thoracic region, and the other two will be responsible for the lower extremities. When rolling the patient into position, the personnel should try to gently lift the patient as much as possible, since shearing and friction injuries are a risk factor for the lateral position. The team should ensure that spinal alignment is maintained while turning the patient.
 - C. The alignment of the body should be confirmed by the surgical team. The head and cervical spine should be in alignment with the rest of the spine, hip joint and legs. An imaginary straight line should be able to be drawn connecting the shoulder joint to hip joint to knee joint and ankle joint as an aid in confirming body alignment.
 - D. A headring or pillow should be placed under the patient’s head as an aid in maintaining cervical and thoracic spine alignment. The patient’s ear should be assessed to make sure it is not folded under and positioned correctly in the headring or on the pillow.

- E. An axillary roll must be placed to support the thorax. Inadequate placement contributes to compression of the neurovascular bundle in the axilla.¹¹
- F. The arms should be placed on a double-padded armboard. The palm of the lower hand is positioned upward, and the palm of the upper hand is positioned downward.⁴
- G. The lower leg should be flexed, and the upper leg kept straight. Padding or a long pillow should be placed between the legs and ankles to prevent damage to the common peroneal and saphenous nerves.¹¹
- H. The safety strap should be placed over the hip joint, if possible. If the safety strap cannot be used, tape is a suitable substitute. Tape may need to also be placed as an upper body restraint.
- I. General safety measures for lateral kidney position:
 - (1) All general safety measures for the lateral position apply to the lateral kidney position.
 - (2) The kidney region must be positioned over the middle break or kidney elevator of the OR table.
 - (3) A short kidney rest is attached to the OR table and positioned against the back of the patient, and a large kidney rest is positioned against the abdomen. The kidney rests must be well padded.
 - (4) The least possible degree of table flexion and kidney elevator level should be used.⁴
 - (5) Reduce the table flexion and lower the kidney elevator as soon as possible.

Standard of Practice IX

Once the patient is positioned, the surgical team should assess the position.

1. Patient position assessment should be completed by all surgical team members to confirm that a safe position has been achieved.
 - A. The assessment should take place before the surgical skin prep is begun.
 - B. The assessment should include body alignment, placement of padding, placement of the arms on the armboards, placement of the safety straps and any other positioning devices.
 - C. A team member should communicate to the others if he/she notices any equipment or body part that may need adjusting.

Standard of Practice X

The assistant circulating surgical technologist should document in the patient OR/intraoperative record the positioning equipment and the patient position.

1. Documentation of the types, uses and placement of positioning equipment, and the patient position contributes to the ability to track information pertaining to patient outcomes, as well as “near-miss incidents” and adverse events that occurred during patient positioning. The information is necessary for review purposes to improve patient safety in the healthcare facility and medicolegal reasons.

2. The assistant circulating surgical technologist should document the following items:
 - Assessment of the patient's skin condition upon arrival and leaving the OR, including pre-existing conditions, such as pressure ulcers;
 - Type of positioning equipment used, including type of OR table (eg, routine, orthopedic fracture table; cysto);
 - Location of the positioning equipment;
 - Name of initial patient position, and if repositioned, the name of the position and location of positioning equipment, as well as the addition of positioning equipment; and
 - Immediate postoperative assessment of patient injuries related to the position and actions taken by the surgical team.

Standard of Practice XI

Surgical personnel should complete continuing education on patient positioning, new positioning equipment, and patient and personnel safety.

1. Surgical personnel should periodically complete continuing education (CE) on patient positioning in order to reinforce knowledge and skills.
 - A. CE should include review of the following:
 - (1) Healthcare facility policies and procedures for positioning.
 - (2) Physiological effects of positioning on the patient and patient risk factors (eg, diabetes, PVD, cardiovascular diseases, COPD, immobile).
 - (3) Completing the OR/intraoperative patient record.
 - (4) Completing an adverse event/incident report as related to a patient or surgical personnel injury related to positioning.
 - (5) Hands-on review training on the use of positioning equipment including OR tables (eg, routine, orthopedic fracture, cysto)
 - (6) Ergonomic safety of surgical personnel, as related to the use of positioning equipment including OR tables and moving and positioning the patient.
 - (7) The completion of the CE as well as the periodic competency assessment of surgical personnel in the use of positioning equipment should be documented.
 - B. CE should include didactic and hands-on training on new positioning equipment.
 - (1) The competency of each surgical personnel in the use of the new positioning equipment should be documented.

Standard of Practice XII

Healthcare facilities should develop and annually review the policies and procedures for patient positioning.

1. The policies and procedures should include a quality and risk control management plan in order to analyze outcomes as related to patient positioning and improve patient safety in the OR.
 - A. The policies and procedures should address the perioperative assessment of the patient and risk factors for positioning; documentation of patient positioning in the OR/intraoperative patient record; patient safety as related to positioning; positioning equipment to be kept in inventory; schedule for biomedical technicians to conduct maintenance checks of the positioning equipment including OR tables; ergonomic safety of surgical personnel in the use of positioning equipment including OR tables, and moving and positioning patients.
 - B. A healthcare facility should have a risk control plan for the prevention and management of pressure ulcers. The following are recommendations provided by the ECRI.⁸
 - (1) Preoperative identification and assessment of patients at risk for pressure ulcers.
 - (2) A system for documenting a preexisting pressure ulcer and actions taken by the surgical team to adjust the patient position to prevent further injury to the ulcer.
 - (3) Prevention protocols to assist in protecting and preserving the integrity of the patient's skin.
 - (4) Completion of CE on pressure-ulcer prevention by surgical personnel.
 - (5) Education programs on pressure-ulcer prevention for patients, family members and other health care workers.
 - C. Healthcare facility policies and procedures should address the documentation of an adverse event related to patient positioning.
 - (1) The documentation of an adverse event should include date and time of event; location of event; detailed description of what occurred; injury sustained by patient and/or surgical personnel; names of witnesses; immediate action(s) taken by the surgical personnel.
 - (2) Information and data on "near-miss" and adverse events involving patients should be collected and analyzed in order to improve patient outcomes and safety.
 - (3) Information and data on surgical personnel injuries sustained while positioning a patient should be collected and analyzed in order to improve patient care performance.
 - D. The surgical technologist should participate in the development and annual review of the policies and procedures for patient positioning.

Competency Statements

Competency Statements	Measurable Criteria
<p>1. Surgical technologists are knowledgeable of the various surgical patient positions and body regions that may be accessed for each specific position.</p> <p>2. Surgical technologists are knowledgeable of the patient risk factors for positioning and the preoperative safety precautions that must be implemented.</p> <p>3. Surgical technologists implement general patient safety measures when positioning a patient.</p> <p>4. Surgical technologists implement ergonomic safety measures to prevent personal injury when positioning a patient.</p> <p>5. Surgical technologists are knowledgeable of the function and safe use of positioning equipment including OR tables (routine, orthopedic fracture, cysto).</p> <p>6. Surgical technologists have the knowledge and skills to complete the OR/intraoperative patient record.</p> <p>7. Surgical technologists have the knowledge and skills to complete an adverse event/incident report as related to positioning.</p>	<p>1. Educational standards as established by the <i>Core Curriculum for Surgical Technology</i>.⁶</p> <p>2. The subject of surgical patient positioning is included in the didactic studies for surgical technology and surgical first assistant students.</p> <p>3. Students demonstrate knowledge of the principles of patient positioning and implementing the safety measures during clinical rotation.</p> <p>4. As practitioners, CSTs apply the principles of patient positioning and safety measures. Healthcare facilities whose protocols and policies allow, assistant circulator CSTs document the positioning procedure in the patient's OR/intraoperative record.</p> <p>5. CSTs complete continuing education to remain current in their knowledge of patient positioning, including annual review of the policies and procedures of the facility.</p>

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Appendix A

National Pressure Ulcer Advisory Panel: Definition and Stages of Pressure Ulcer ¹²

Definition

A pressure ulcer is localized injury to the skin and/or underlying tissue usually over a bony prominence as a result of pressure, or pressure in combination with shear and/or friction. A number of contributing or confounding factors are also associated with pressure ulcers; the significance of these is yet to be elucidated.

Pressure Ulcer Stages (refer to illustrations)

Suspected Deep Tissue Injury

Purple or maroon localized area of discolored intact skin or blood-filled blister due to damage of underlying soft tissue from pressure and/or shear. The area may be preceded by tissue that is painful, firm, mushy, boggy, warmer or cooler as compared to adjacent tissue.

Additional description

Deep tissue injury may be difficult to detect in individuals with dark skin tones. Evolution may include a thin blister over a dark wound bed. The wound may further evolve and become covered by thin eschar. Evolution may be rapid, exposing additional layers of tissue even with optimal treatment.

Stage I

Intact skin with non-blanchable redness of a localized area usually over a bony prominence. Darkly pigmented skin may not have visible blanching; its color may differ from the surrounding area.

Additional description

The area may be painful, firm, soft, warmer or cooler as compared to adjacent tissue. Stage I may be difficult to detect in individuals with dark skin tones. May indicate "at risk" persons (a heralding sign of risk)

Stage II

Partial thickness loss of dermis presenting as a shallow, open ulcer with a red-pink wound bed, without slough. May also present as an intact or open/ruptured serum-filled blister.

Additional description

Presents as a shiny or dry shallow ulcer without slough or bruising.* This stage should not be used to describe skin tears, tape burns, perineal dermatitis, maceration or

excoriation.

*Bruising indicates suspected deep tissue injury

Stage III

Full thickness tissue loss. Subcutaneous fat may be visible but bone, tendon or muscle are not exposed. Slough may be present but does not obscure the depth of tissue loss. May include undermining and tunneling.

Additional description

The depth of a stage III pressure ulcer varies by anatomical location. The bridge of the nose, ear, occiput and malleolus do not have subcutaneous tissue and stage III ulcers can be shallow. In contrast, areas of significant adiposity can develop extremely deep stage III pressure ulcers. Bone/tendon is not visible or directly palpable.

Stage IV

Full thickness tissue loss with exposed bone, tendon or muscle. Slough or eschar may be present on some parts of the wound bed. Often include undermining and tunneling.

Additional description

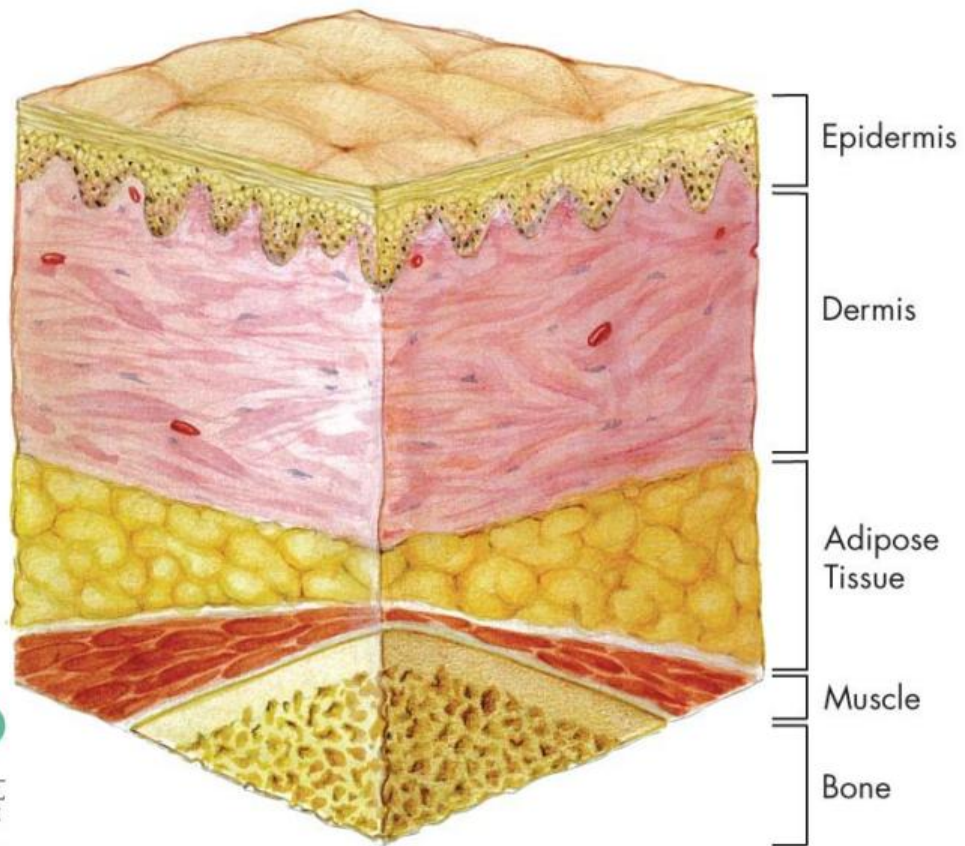
The depth of a stage IV pressure ulcer varies by anatomical location. The bridge of the nose, ear, occiput and malleolus do not have subcutaneous tissue and these ulcers can be shallow. Stage IV ulcers can extend into muscle and/or supporting structures (e.g., fascia tendon or joint capsule) making osteomyelitis possible. Exposed bone/tendon is visible or directly palpable.

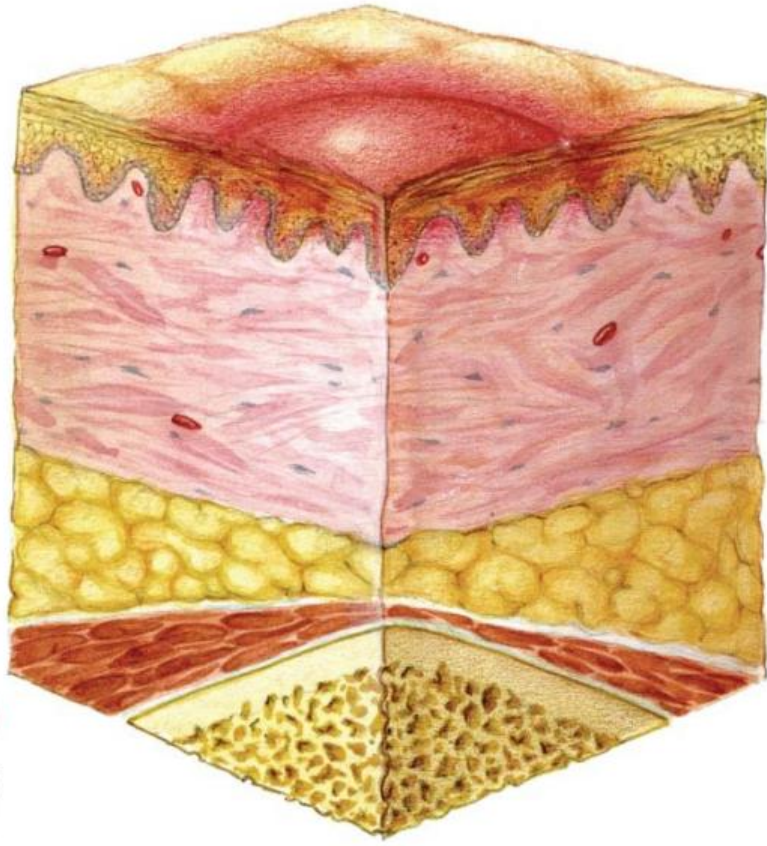
Unstageable

Full thickness tissue loss in which the base of the ulcer is covered by slough (yellow, tan, gray, green or brown) and/or eschar (tan, brown or black) in the wound bed.

Additional description

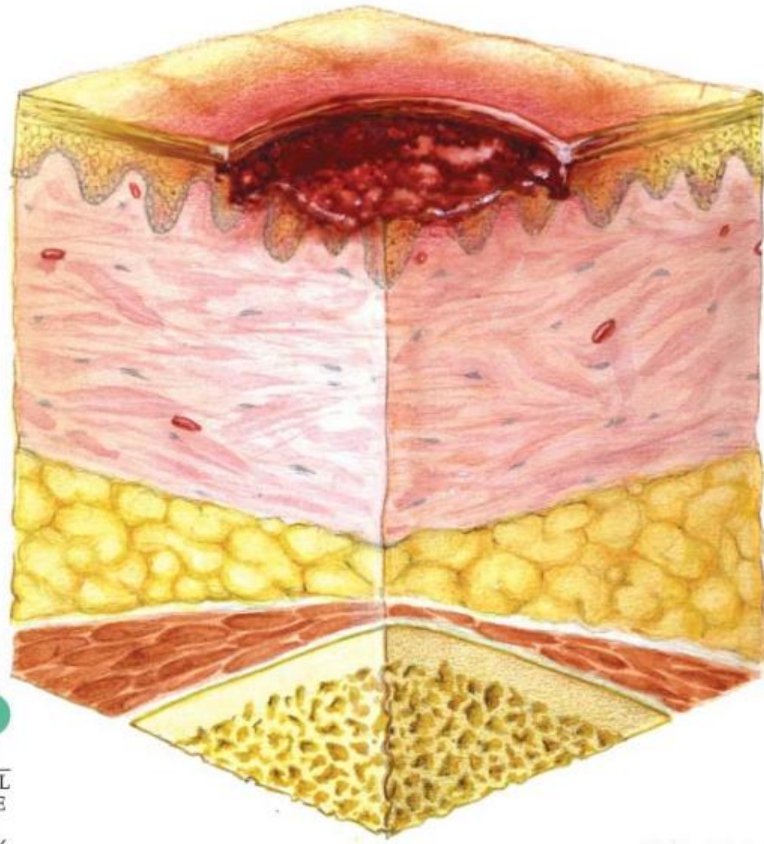
Until enough slough and/or eschar is removed to expose the base of the wound, the true depth, and therefore stage, cannot be determined. Stable (dry, adherent, intact without erythema or fluctuance) eschar on the heels serves as "the body's natural (biological) cover" and should not be removed



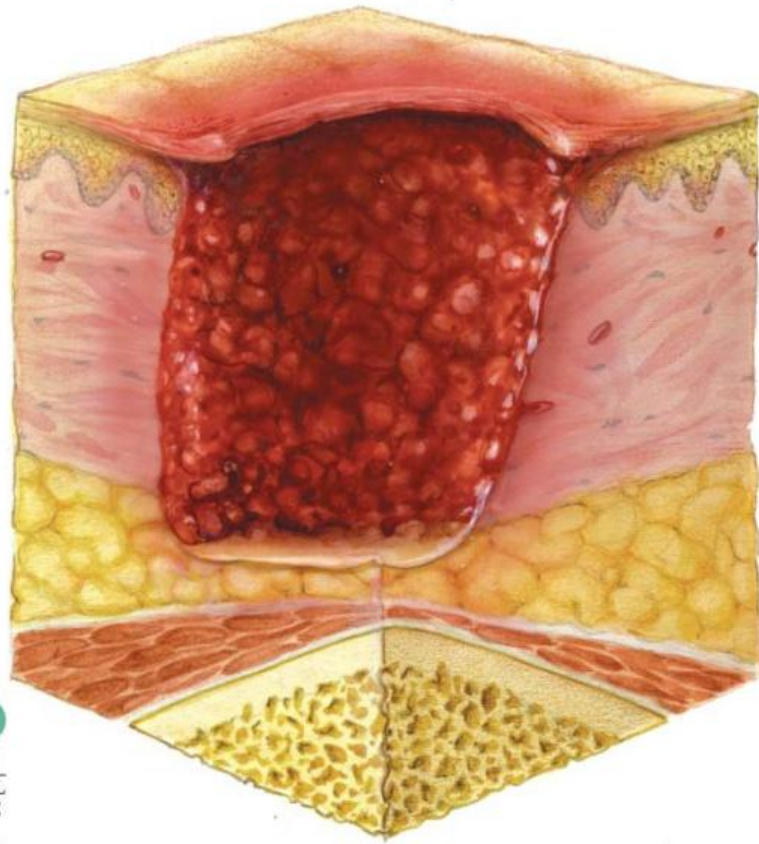


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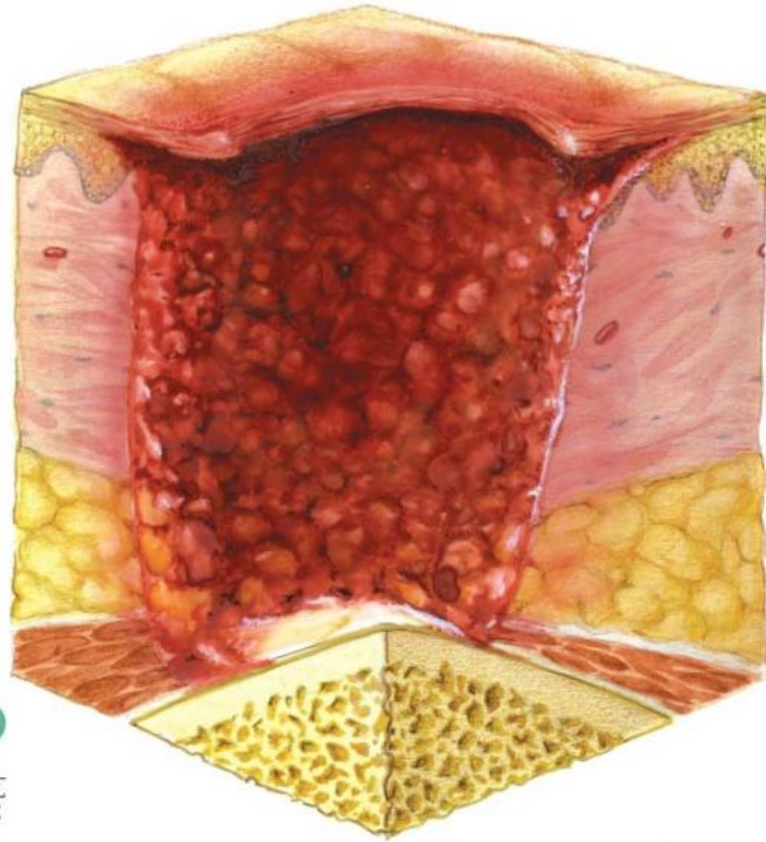
STAGE 1



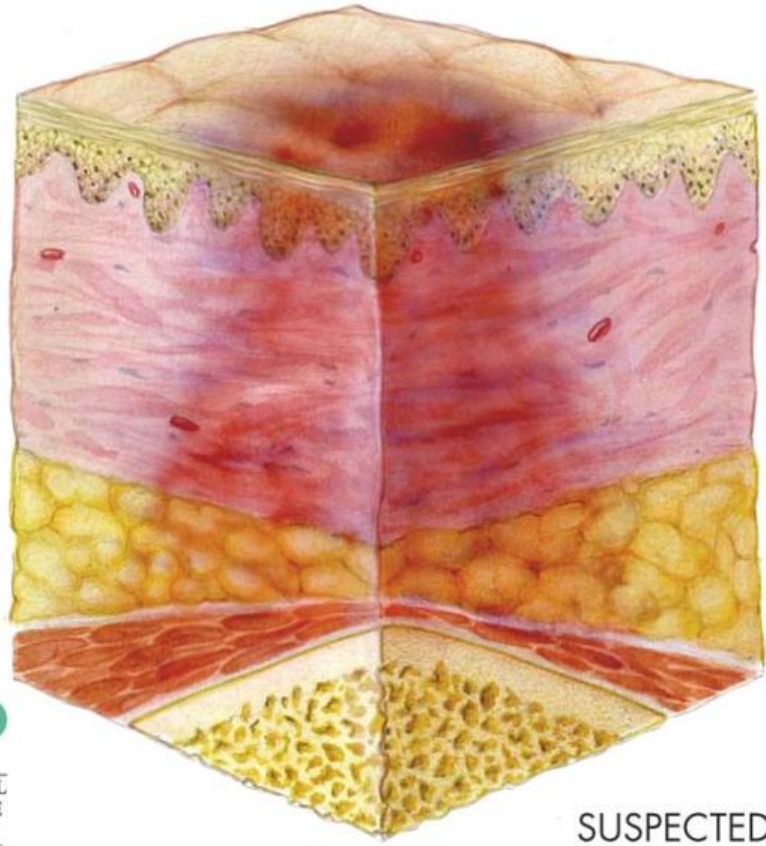
STAGE 2



STAGE 3



STAGE 4



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PRESSURE
ULCER
ADVISORY
PANEL

SUSPECTED
DEEP TISSUE INJURY



NATIONAL
PRESSURE
ULCER
ADVISORY
PANEL

UNSTAGEABLE