



Best Practice Guidelines

Guideline Name: Patient Positioning for Surgical Procedures		Page 1 of 13
Approval Signature:		
Date: December 2011	Supercedes:	

1. PURPOSE:

- 1.1. Provide optimal exposure and access to the surgical site taking into consideration requirements for skin prep, draping, surgical approach, and type of anesthetic administration.
- 1.2. Support respiratory and circulatory functioning of the patient.
- 1.3. Protect neuromuscular and skin integrity of the patient.
- 1.4. Allow access to IV sites and anesthesia support devices.
- 1.5. Maintain patient comfort and safety.
- 1.6. Maintain Healthcare Worker (HCW) safety during patient handling tasks (repositioning, transferring, lifting/holding limbs, etc) to minimize the risk of musculoskeletal injury.

2. GENERAL GUIDELINES:

- 2.1. Safe positioning/transfer of the patient requires involvement and coordination of all surgical team members. The circulating nurse should ensure that there are adequate personnel available to position/transfer the patient safely and that all personnel understand the Safe Work Procedures that will be used. The attending anesthesiologist or their designate leads the team in transferring the patient.

Rationale:

- Ensures the airway and other support devices remain intact throughout positioning; and
 - Prevents injury to the patient and HCW.
- 2.2. Patients who are at an increased risk of injury related to surgical positioning and who may require additional precautions during positioning include, but is not limited to:
 - Patients greater than 70 years of age;
 - Pediatric patients;
 - Malnourished (obese, thin, low serum protein);
 - Patients with respiratory and circulatory disorders;
 - Patients with chronic disease such as diabetes mellitus, and anemia;
 - Patients with mobility limitations;
 - Patients with neurological conditions;
 - Sensory deficit;
 - Steroid use;
 - Impaired temperature regulation;
 - Patients with edema, infection, existing pressure ulcers or cancer;
 - Patients with significant postural asymmetries;
 - Patients with demineralizing bone conditions (i.e. osteoporosis); and
 - Patients whose surgical procedure

- is ≥ 2 hours;
- requires lengthy time in lithotomy or prone position;
- is a vascular procedure;
- results in excessive pressure related to retraction;
- increases the risk of hypotensive episodes; or
- results in cool environments or are puts them at risk of hypothermia.

2.3. Preoperatively

- assess the patient for:
 - Age;
 - Height and weight;
 - Cardiopulmonary/respiratory status;
 - Pre-existing conditions/pain;
 - Mobility/joint limitations;
 - Preoperative skin integrity;
 - Presence of prostheses;
 - Presence of ostomies;
 - Altered sensation; and
 - Any other factors that may impact surgical positioning.
- Verify the correct patient position;
- Assess the safe repositioning and transfer method, including the number of HCWs required and the equipment required. (See Safe Patient Handling under 2.2)
- Prior to the surgical procedure, determine the positioning device(s) that will be required and ensure the device(s) is available in the appropriate size and/or weight capacity (see appendix).
- Remove body jewellery and piercings.

Rationale:

Jewellery and piercings may interfere with airway management, cause pressure injuries, electrosurgical burns, or cause injury during transfer by catching on linen or operating room devices.

2.4. During Positioning

- A team member shall stand on either side of the patient until the safety strap is secured.
- Maintain patient privacy and limit exposure.
- Maintain normal anatomical alignment.
- Prevent shearing and friction forces, or accumulation of moisture under the patient.
- Mattresses
 - Consider using a pressure redistribution mattress for all patients at risk of developing pressure ulcers or for procedures lasting greater than 2 hours.
- Sheets
 - Avoid folds or creases in sheets
 - Avoid excessive layers
 - **Rationale:** each additional layer will decrease the pressure redistribution capabilities of the mattress or positioning device.
- Padding
 - Pad all lines (catheters, EKG leads, IV's etc.) as applicable to the surgical procedure.
 - Pad all bony prominences and vulnerable structures.
 - **Rationale:** Compression against the patient during the procedure, could lead to skin breakdown.
- Positioning devices

- Ideally rolls, sandbags, pads and gels should be constructed of viscous polymer gel.
Rationale: Viscous polymer gel will not “bottom out”, therefore provides better pressure redistribution.
- Foam pads and IV bags should not be used for positioning and padding of pressure points.
- The patient’s body should be protected from coming in contact with metal portions of procedure bed or metal positioning devices.
Rationale: Edges of positioning devices may cause pressure that could lead to skin break down.
- Use recommended safe patient handling procedures to place positioning devices under the patient (e.g. rolling the patient).
- Eyes
 - Protect eyes with non allergenic tape, pads, goggles, or corneal shields as appropriate;
 - Lubricate with ophthalmic gel as applicable.
- Arms
 - Extended
 - Ensure arm board padding is at the same level as the table mattress.
 - Position arm on the armboard ensuring arm is extended less than 90 degrees.
 - Place arm in supinated or neutral position.
 - Secure arm loosely to arm board using an appropriately sized, soft, non-occlusive wrist/arm strap.
 - Arms at side
 - Support, protect and secure the full length of the arm using an arm protector (as applicable)
 - Extend draw sheet past the patient’s elbow and tuck the draw sheet between the patient and the OR bed mattress.
 - Patient’s elbows should be slightly flexed; wrists in neutral position; palms facing inward.
 - Patient’s fingers should be in a position that is clear of the breaks in the OR bed or other hazards.
- Safety Strap
 - Secure a safety strap 2” above the knee ensuring the ability to pass a flat hand or two (2) fingers between the safety strap and the patient. Place a blanket/padding between safety strap and patient’s skin. Reassess after each positional change or addition of extra padding.
Rationale: Prevents nerve compression injury and compromised blood flow.
- Safe Patient Handling
 - Refer to the WRHA Safe Patient Handling and Movement Program and Operational Procedures found at http://www.wrha.mb.ca/professionals/safety/files/OP_SafePatientHandling.pdf for a standardized, evidence-based best practice approach to safe patient handling and movement. If the HCW is required to lift greater than 35 lbs of a patient’s weight during any patient transfer task, assistive devices should be used. If a HCW is required to lift and hold a limb that weighs > 11.1 lbs (one-handed lift) or > 22.2 lbs (two-handed lift), an assistive device should be used. Where assistive devices are not available, the appropriate number of HCW’s to perform the patient handling task safely should be available. The following general guidelines can be applied for calculating safe lifting and holding limits:

- The average weight of a patient's head and neck is approximately 8.4% of their total body weight
- The average weight of a patient's legs (thigh, calf, & foot) is approximately 15.7% of their total body weight. This means that HCW's should not be lifting legs of a patient weighing > 220 lbs or holding the legs of patients weighing > 138 lbs.
- The average weight of a patient's arm (upper arm, forearm, & hand) is approximately 5.1% of their total body weight. This means that HCW's should not be lifting arms of patients weighing > 700 lbs or holding the arms of patients weighing > 440 lbs.
- Stretcher/bed ⇔ OR table
 - Use friction reducing devices (FRD's) for lateral transfers on/off the OR table. FRD's that extend the full length of the bed should be used where possible, especially for bariatric patients.
 - Height of receiving surface should be adjusted slightly lower than initial surface, at waist height of the shortest worker.
 - For patients weighing < 100 lbs, use at least 2 HCW's.
 - For patients who weigh between 100-200 lbs, use at least 2-3 HCW's.
 - For patients who weigh between 200-350 lbs, use at least 3-4 HCW's.
 - For bariatric patients (> 350 lbs) use at least 4 HCW's. If available, use a mechanical lateral transfer device, bariatric ceiling lift with supine sling or air-assisted friction-reducing device.
 - A minimum of 4 HCW's should be used for roller board transfers.
- Repositioning on OR table (up/down, side-side)
 - Use FRD's for repositioning the patient on the OR table.
 - Position OR table at waist height of shortest worker.
 - For patients who weigh < 200 lbs, use 2-3 HCW's.
 - For patients who weigh 200-350 lbs, use at least 3 HCW's.
 - For bariatric patients (> 350 lb) use at least 4 HCW's. If available, use bariatric ceiling lift with supine sling or air-assisted friction reducing device.
- Rolling Patients (for lateral or prone positions)
 - A minimum of 4 HCW's is required for this task (one pusher, two pullers, and anesthesia care provider at head).
 - Position OR table at waist height of shortest worker.
 - Use a FRD under the patient if patient is too difficult to position in lateral position, is totally dependant or is bariatric (> 350 lbs).
 - For bariatric patients, use a repositioning sling with lift if available.

2.5. After Positioning

- Confirm with anesthesia that the airway remains patent throughout positioning;
- Confirm that the patient's eyes are not compressed;
- Confirm that the surgeon will have an optimal view / access to the surgical site;
- Confirm that there is sufficient access to all lines and catheters intra-operatively;
- Confirm that there is no kinking or excessive tension on lines and catheters;
- Allow for a 2-3" clearance from equipment placed above patient eg Mayo stand; and
- Check that sequential compression device is functioning and the tubing is unobstructed after positioning.

2.6. Documentation required includes, but is not limited to:

- Preoperative assessment of relevant abnormalities of skin condition on arrival to the perioperative suite;
- Patient position and any new position(s) if repositioned;
- Type and location of positioning equipment including table attachments and padding;
- Position of arms (at sides or on armboard);
- Eye padding/protection;
- Confirmation of checking of vulnerable structures;
- Team approval and consensus of final patient position;
- Name and title of persons participating in positioning;
- Post-operative assessment of the patient for injury related to positioning including all areas that were padded; and
- Documentation of an event related to positioning including, but not limited to:
 - Description of what happened;
 - Date and time of the incident;
 - Location of the incident;
 - Witnesses;
 - Corrective action to be implemented; and
 - Communications regarding the outcome.

2.7. Special Considerations

2.7.1. Obese Patient (refers to patients with a BMI of > 40, or a BMI of > 35 in the presence of obesity related comorbidities)

- Ensure that the OR bed and mattress has the appropriate weight capacity to accommodate bariatric patient. The mattress may need to be 3" thick dependent on manufacturer.
- Ensure OR bed has the appropriate weight capacity to accommodate the weight of the patient in the required bed configuration and any articulating positions (ie. Trendelenburg or tilt).
- Consider an additional safety strap over the patient's lower legs to secure position.
- Place a roll under the right side.
Rationale: Displaces pressure off of the vena cava.
- Consider a wedge pillow under upper thorax.
Rationale: Increases chest wall compliance with ventilation.
- Consult physician for Sequential Compression Device (SCD) use especially when the procedure is of longer duration. If SCD is required, ensure proper fit for the patient.
- Positioning for intubation is of primary importance for the bariatric patient. The Head Elevated Laryngoscopy Position (HELP) may be required. The patient's head and upper body are positioned using folded blankets/flannels or a customized elevation pillow and standard intubation pillow in such a way that an imaginary line can be drawn from the patient's sternum to their ear.
- Side bed attachments may be used for patients with extra- wide girth.
- Additional resources (HCW's, equipment) will be required for safe patient handling of bariatric patients (> 350 lbs). Refer to the WRHA Regional Bariatric Care Plan for guidelines to provide safe, efficient and effective care to bariatric clients found at

<http://www.wrha.mb.ca/professionals/safety/files/Manual.pdf>

2.7.2. Trendelenburg/Deep Trendelenburg

- Place patient **directly** on an upper body gel pad. **Do not use a draw sheet in-between the patient and the gel pad.**

2.7.3. Pregnant patient

- Place a roll under the patient's right side.
Rationale: Displaces pressure off of the vena cava.

3. **POSITIONS:**

3.1. **Supine**

- Risks
 - Pressure causing injury to the head, eyes, scapulae, elbows, back/spinous processes, sacrum, coccyx, and heels.
 - Injury to peripheral vessels and nerves including, but not limited to:
 - brachial plexus;
 - ulnar nerve;
 - tibial; and
 - peroneal.
- Positioning devices/resources may include:
 - Pillows (available);
 - Foot board/extension (available for tall patients);
 - Self locking arm board;
 - Arm Protector (if arms placed at patient side);
 - Safety strap;
 - Securing devices for arm boards; and
 - Padding (Gels or Jutes)
- Positioning the patient
 - Place head on small pillow or gel donut headrest.
 - Place small pillow, gel or foam positioning pad(s) under the popliteal area.
Rationale: Relieves pressure on the spine and lower back.
 - Heels and feet
 - Place pillow under the full length of the calf and keep the knee in slight flexion to offload or free float the heels, if required.
Note: Donuts should not be used in supine position as they increase pressure adjacent to the area one is trying to offload.
 - Uncross ankles and legs.
 - Consider a foot extension for tall patients
 - Consider supporting the soles with a pillow or padded footboard.
Rationale: prevents prolonged plantar flexion and nerve stretch injury.
- Variations of the supine position
 - Shoulder or anterolateral procedures
 - Place a gel roll under the affected side.
 - Stabilize the length of the body to prevent the spine from rolling or twisting.
 - Keep hips and shoulders in a straight plane.
 - Shoulder/bridge (Thyroid elevator)
 - use a gel roll placed transversely under shoulders to provide hyperextension
 - A perpendicular roll can be placed between shoulders causing shoulders to fall back bilaterally, elevating sternum
 - Frog Leg
 - Place blanket over lower legs.
 - Place safety strap anterior to the shins.
 - Pillows may be placed under knees for support and to off load pressure from the lateral maleoli.

3.2 Lateral

Right lateral = right side is down (dependent), left side is up

Left lateral = left side is down (dependent), right side is up

- Risks
 - Tilting and falling during the procedure.
 - Pressure to structures on patient's dependent side (ie. Deltoid muscle, greater trochanter, maleoli).
 - Venous pooling shifts toward patient's dependent side.
 - Decreased lung capacity of dependent lung.
 - Injury to peripheral vessels and nerves including, but not limited to:
 - Brachial plexus;
 - Ulnar nerve;
 - Axillary artery and nerve; and
 - Common peroneal nerve.
 - Deep Vein Thrombosis (DVT) to lower extremities.
- Positioning devices/resources may include:
 - Small pillow or Gel donut head rest;
 - Self locking arm board x one (1);
 - Axillary roll;
 - Securing devices for arm board;
 - Armboard attachment (elbow post, Krause armrest, western elbow positioner, or over armboard as per surgeon preference);
 - Lateral positioners such as lateral body rests vacuum positioning device ("beanbag") or gel bolsters (as applicable) for patients over 115 lbs (52.2 Kg);
 - Safety strap;
 - Wide adhesive tape;
 - Pillows x 3; and
 - Padding as appropriate to the length of the procedure.
- Positioning the patient
 - If using vacuum positioning device
 - Place under patient prior to patient transfer to OR bed.
 - Place patient directly on device or as per manufacturer's directions.
 - Remove air **after** raising kidney rest and flexion of the OR table.
 - Anesthetize and intubate patient in the supine position.
 - Turn the patient from supine to lateral position following Safe Patient Handling Guidelines under 2.4.
 - Maintain patient in lateral position with padded lateral body rests/gel bolsters/vacuum positioning device as applicable. Follow manufacturer's direction and/or surgeon preference when using these devices.
 - Kidney Rest:
 - Position Patient with lower iliac crest slightly below the lumbar break in the OR bed;
 - Raise the kidney rest;
 - Flex the bed to elevate the area between the 12th rib and iliac crest (head and legs are lowered) for optimal kidney access.
 - Axilla/Arms
 - Place axilla roll inferior and posterior to the axilla, under the rib cage.
Rationale: Protects axillary artery, axillary nerve, brachial plexus, and takes the weight off of the deltoid muscle of the dependent shoulder/arm.
 - Dependent arm
 - Place with palm up;

- Extended arm less than 90 degrees; and
 - Secure arm to padded armboard.
 - Upper arm
 - Place on appropriate armboard attachment or rest on pillows placed between the arms;
 - Flex arm slightly with palm facing down;
 - Do not abduct arm higher than the shoulder; and
 - Secure to applicable armboard attachment or pillows.
 - Shoulders
 - May be secured with wide tape if surgeon requires.
Rationale: Thoracics – draws the scapula away from the operative site, widening the intercostal spaces.
- Legs
 - Flex dependent hip and knee for stability;
 - Pad dependent leg at lateral knee, lateral malleolus, and foot;
 - Place pillows x two (2) lengthwise between legs; and
Rationale: pads and protects the dependent common peroneal nerve, takes pressure off of the upper hip/dependent leg thereby benefiting circulation and assists with pressure management by avoiding bone on bone contact at knees and ankles.
 - Straighten or slightly flex the non-dependent leg to assist with counterbalance.
- Other Considerations
 - Ensure dependent ear is not folded over;
 - Confirm with anesthesia that airway is patent;
 - Ensure genitalia are not confined; and
 - Obese patient
 - Ensure abdomen does not exceed the table width. Extend the table width with a bariatric bed attachment as required.
RATIONALE: an abdomen that extends beyond the table width may potentially unbalance the patient and ultimately pull the patient off of the table.

3.3 Lithotomy

Low – urology, thighs raised 30 – 45 degrees.

Standard – gynecology, thighs flexed 90 degrees, calves horizontal.

High – Perineal access, thighs flexed beyond 90 degrees, legs towards ceiling.

Exaggerated – Perineal and Retropubic access, pillow used to flex pelvis vertically at spine, thighs flexed toward the abdomen, calves vertical.

- Risks
 - Hip dislocations, fractures, and muscle injuries;
 - Injury to peripheral vessels and nerves including, but not limited to:
 - Brachial plexus;
 - Ulnar nerve;
 - Axillary artery and nerve;
 - Obturator nerve;
 - Lateral femoral cutaneous nerve;
 - Femoral nerve;
 - Common peroneal nerve; and
 - Sural and plantar nerves.
 - Pressure injuries to foot, ankles, knees and lower leg which could result in compartment syndrome;

- Back strain;
- Decreased lung capacity;
- Venous pooling shifts toward head;
- Deep Vein Thrombosis (DVT) to lower extremities; and
- Crushed fingers.
- Positioning devices/resources may include:
 - Small pillow or Gel donut head rest;
 - Self locking arm board(s) (as applicable);
 - Gel roll;
 - Securing devices for arm boards or for tucking arms at side (as applicable);
 - Stirrups (as applicable):
 - Candy Cane
 - Boot –Type: supports the foot and calf, distributes pressure evenly, and limits abduction.
 - Padding as appropriate to the length of the procedure.
- Positioning the patient
 - In some situations, it may be beneficial to position patient in the lithotomy position prior to anesthesia.

Rationale: Allows assessment of painful areas and limits to ROM. Allows the patient to create a position that is comfortable yet appropriate for surgery. Allow the patient to assist with positioning (e.g. assist in lifting limbs to position in stirrups). Reduce the risk of injury to HCW associated with lifting of limbs.
 - Maintain the patient in lithotomy for the shortest duration possible.
 - Physician may order TEDS or SCDs for procedures lasting > 2 hours.
 - Follow supine guidelines for upper body.
 - Lower bed to the lowest height possible for the procedure.
 - Following Safe Patient Handling Guidelines under 2.4, position the anesthetized patient on the bed with the buttocks even with the perineal cutout. Do not hang buttock over cutout.

Rationale: Supports the lumbar-sacral spine
 - Place gel roll under patient's sacrum for additional support or to slightly elevate buttock (as required) dependent on the surgical procedure.
 - If arms are tucked at sides, ensure fingers are free and clear from bed joints when lowering or raising bed platform.
 - Placing legs in stirrups
 - Securely fasten stirrups at same level on the bed and adjust both stirrups to equal height;
 - With two (2) HCWs, simultaneously place the patient's legs in the appropriate stirrups as follows:
 - Approach from the side of the patient;
 - Use proper body mechanics;
 - Slowly bend the patient's knee and hip supporting legs at the sole of the foot and at the calf near the knee;
 - Lift the foot and place in the stirrup.
 - Limit hip flexion (< 90 degrees). Pay particular attention to patients who have limited ROM (ie. hip prosthesis), amputations, casts, existing back pain, spasticity, or who are obese.
 - Minimize rotation of hip joint therefore causing excessive abduction.

Rationale: Prevents sciatic and obturator nerve injury and joint and muscle strain.
 - Candy Cane

- Follow manufacturer's recommendations for use.
 - Ensure legs are not resting against metal vertical posts.
Rationale: compression of the common peroneal nerve (lateral resting) or femoral nerve (medial resting) may result. Padding the post will not eliminate this pressure fully, therefore avoid the contact.
 - Use wide ankle and foot straps, with padding cradling the foot.
Rationale: Decreases pressure on the distal sural and plantar nerves and prevent pressure ulcers at the foot and ankle.
 - Boot Type (Universal, Yellow Fin)
 - Follow manufacturer's recommendations for use.
 - Attach stirrup support to bed at level of the patient's hip.
 - Position the boot to ensure that patient's foot aligns with the knee and the opposing shoulder. For example: right foot aligns with right knee and left shoulder.
 - Seat heels appropriately in the cushioned boots.
 - Check that the peroneal nerve and posterior knee are clear of pressure from the boot.
 - Remove foot and leg sections of mattress pad from OR bed and lower platform fully.
 - Remind scrub personnel to not lean on patient's thighs or legs.
Rationale: leaning increases pressure areas.
 - Evaluate distal extremity pulses pre, intra, and post-op (recommended).
 - Post procedure
 - Raise the lower platform being cautious to not catch patient's fingers in the bed joint.
 - Return and secure OR bed mattress pad portions;
 - Using two (2) HCW simultaneously remove patient's legs from the stirrups as follows:
 - Support the legs at the sole of the foot and at the calf near the knee;
 - Slowly lower the patient's foot and straighten the knee;
 - Supporting the knee joint and foot bring the knees together and slowly lower the legs.
- Rationale:** Allows for slow revascularization of the lower limbs; therefore decreasing possibility of hypotension. Also assists to avoid triggering spasticity in susceptible patients.

3.4 Prone

NOTE: in all prone procedures a stretcher or hospital bed must be immediately available for the duration of the procedure so that in the event of a cardiac arrest or loss of the airway the patient can be expeditiously turned supine and resuscitated.

- Risks
 - Pressure to cheeks, eyes, ears, breasts, genitalia, patellae, and toes that may result in pressure sores.
 - Falls and dislodgment of airway, monitoring cords and/or IV lines.
 - Decreased lung capacity/respiratory function.
 - Injury to breasts and genitalia.
 - Injury to shoulders, arms and upper extremity nerves including, but not limited to:
 - Brachial plexus; and
 - Ulnar nerve.

Colorectal Type Procedures

- Positioning devices/resources may include:
 - Pillows
 - Bolsters
 - Padding as appropriate to the length of the procedure.
- Positioning the patient
 - Follow Safe Patient Handling Guidelines under 2.4.
 - Anesthetized patient in the supine position and then log-roll into the prone position.
 - Pad all bony prominences and areas where the patient's skin comes in direct contact with lines during the procedure using gel pads or jute padding.
 - Arms
 - Place arms on an armboard extended no more than ninety degrees from the patient's body, with the arms slightly flexed and palms facing downward. Never position the arms above the patient's head.
Rationale: prevents brachial plexus injury.
 - Adequately pad armboard
 - Breasts, genitalia
 - Use bolsters from the clavicle to the iliac crest.
Rationale: Allows for adequate chest expansion and decreases pressure to the patient's abdomen.
 - Place bolster/pillows under hips to elevate buttock as per surgeon preference.
 - Position breasts and genitalia in such a way that they are free from pressure and torsion injury during the intraoperative phase.
 - Knees – use gels/pillows underneath as required.
 - Special Considerations:
 - Obese patient
 - Allow abdominal wall to hang freely.
Rationale: Decreases diaphragm impedance and allows chest wall movement.

Neuro/Spinal Procedures

- Positioning devices/resources required may include:
 - Small pillow/gel donut/head rests / head supports that attach to the table, ie. Sugita, Mayfield as applicable to the procedure.
 - Bolsters (as applicable).
 - Padding as appropriate to the length of the procedure.
 - Self locking armboard(s)/Arm Supports.
 - Securing devices for arm boards.
 - Thigh safety belt.
 - Vacuum positioning device (Bean Bag) for pediatrics and patients of small stature.
 - Kneeling attachments – table attachment dependent on the procedure being performed.
 - Mattress / gel pads.
 - Rolls – use action pad rolls or other padding devices dependent on assessed need.
 - Blankets – conventional blankets or warming devices for long procedures.
- Positioning the patient
 - Following Safe Patient Handling Guidelines under 2.4.
 - Anesthetized patient in the supine position and then log-roll into the prone position.

- Place 2 bolsters/pillows lengthwise under the patient's trunk (usually across the back of the patient's thighs, with padding underneath).
- Pad all bony prominences and areas where the patient's skin comes in direct contact with lines during the procedure using gel pads or jute padding.
- Protect the forehead, eyes and chin. If using headrests, ensure they are padded.
- Arms
 - Position arms at patient's sides with palms facing the body (thighs).
Rationale: Reduces the risk of radial/ulnar nerve compression and brachial plexus injury.
 - If placing the patient's arms at their sides is not possible, arm should be placed on an armboard extended no more than ninety degrees from the patient's body, with the arms slightly flexed and palms facing downward. Never position the arms above the patient's head.
Rationale: prevents brachial plexus injury.
 - Adequately pad armboard.
- Breasts, genitalia
 - Use bolsters from the clavicle to the iliac crest.
Rationale: Allows for adequate chest expansion and decreases pressure to the patient's abdomen.
 - Position breasts and genitalia in such a way that they are free from pressure and torsion injury during the intraoperative phase.
- Knees – use gels/pillows underneath as required.
- Special Considerations:
 - Obese patient
 - Allow abdominal wall to hang freely.
Rationale: Decreases diaphragm impedance and allows chest wall movement.

3.5 Sitting (Beach Chair)

- Risks
 - Pressure to scapulae, sacrum, coccyx, ischial tuberosities, back of knees (popliteal fossa), and heels.
 - Air embolism if venous sinus is opened
 - Shearing
 - DVT in lower extremities
 - Venous pooling shifts toward lower body
 - For additional risks see Cranial and Spinal Surgery.
- Positioning the patient:
 - Follow Safe Patient Handling Guidelines under 2.4.
 - Attach Beach Chair to OR table according to manufacture's instructions.
 - Buttocks when sitting should be against lower back of chair when in sitting position.
 - Two Head Sets available
 - Intubation pad - only be used for intubation then removed and replaced with headrest.
 - Headrest – may be used for both intubation and the surgical procedure. It provides stability of the head and keeps the airway in the neutral position. After induction a padded mask (tenet face mask) is placed over the patient's face and tightened to secure the head and reduce undue stress on the neck. Make certain no pressure is on the eyes and that the pressure is equal over all areas of the face. Make

- certain that there is no pressure on the neck to prevent jugular vein and carotid artery compression.
- Arms
 - during intubation - place inside the lateral rests with palms facing the body;
 - after intubation - non operative arm is placed on a padded raised arm board.
- Lateral supports - provide lateral stability, so when the surgeon pulls on the operative arm the head and body will remain in the initial position.
- The knee bolster (wedge) prevents the body from slipping down the OR table. A knee strap is used to secure the patient's legs.

3.6 Fracture Table

- Pressure points include but not limited to
 - Head;
 - Scapulae;
 - Elbows;
 - Back/Spinous Processes;
 - Sacrum;
 - Coccyx;
 - Heels;
 - Foot and ankle (including maleoli) in traction; and
 - Genitalia;
 - Peripheral vessels and nerves including, but not limited to:
 - Brachial plexus;
 - Ulnar nerves;
 - Perineal nerve;
 - Pudendal nerve
- Positioning devices/resources may include:
 - Small pillow or gel donut head rest;
 - Self locking arm board (as applicable);
 - Securing devices for arm board and for securing arm on unaffected side;
 - Safety strap; and
 - Padding as appropriate to the length of the procedure.
- Positioning the patient
 - Following Safe Patient Handling Guidelines under 2.4, transfer the patient from the stretcher/patient bed to the fracture table. **Rationale:** Slow and careful transfer is required to avoid injury to the patient.
 - Perineal post
 - Position the patient in the supine position on the table with the pelvis stabilized against a well padded perineal post which has been placed between the genitalia and the uninjured leg. Ensure pressure is not placed on the genitalia, perineal and pudendal nerves.
Rationale: The intense pressure placed on the pelvis when traction is applied to the injured leg increases pressure on the genitalia, perineal and prudendal nerves which can cause fecal incontinence and loss of perineal sensation.
 - Legs
 - The unaffected leg is raised, abducted and supported on a padded leg rest (stirrup).
 - The injured leg is extended and is held by a well padded boot or combination of boot and straps.

Rationale: Excessive pressure placed on the foot and ankle causes pressure on the heel and uneven distribution of the weight.

- Check the distal lower extremity before during and after this position.
- Arms
 - Rest the arm on the operative side on the patient's chest and secure the arm appropriately. Avoid pressure on the ulnar nerve.
 - If a supporting arm holder is used, ensure the post and arm holder are distal to the elbow, freeing the cubital tunnel from pressure.
- Place a safety strap across the patient's upper body.

3.7 Cranial and Spinal Surgery

There are 5 classic surgical approaches for craniotomies: frontal, temporal, occipital, parietal, and posterior fossa.

- Risks
 - Quadriplegia, cerebral infarction, and possible mechanical stress of arteries and veins supplying the brain and cervical spine related to manipulation of the head and neck during positioning
 - Decrease blood flow in vertebral and carotid arteries, leading to brain stem ischemia, resulting in quadraparesis and quadriplegia as a result of hyperflexion of the head and neck.
 - Associated with sitting position:
 - High incidence of air embolism (25%-40%) related to air entrainment due to the negative pressure gradient between the surgical site and the heart.
 - Hypotension if the position is not attained gradually and not preceded by adequate hydration.
 - Cardiac output decrease related to a reduction in venous return.
 - Airway obstruction related to overzealous flexion resulting in supraglottic edema, obstruction of the endotracheal tube.
 - Brachial plexus stretch injuries related to inadequate arm support.
 - Associated with beach chair position (30 to 60 degrees with head up):
 - Hypotension and/or bradycardia
 - Decreased cerebral perfusion pressure
 - Associated with the prone position:
 - Central retinal artery occlusion from direct or indirect pressure on the globe
 - Periorbital and scleral edema with time in prone position related to progressive intraocular pressure increases.
- Positioning devices/resources required
 - Headrests and fixation devices that attach to the OR bed.
 - Specialized spinal OR table with attachments (including specialty headrests and fixation devices), which allows for customized positions and radio-translucent access for C-arm fluoroscopy.
 - The OSI lateral position table
 - The Jackson spinal table
 - Specialty headrests (may be secured to the patient's head with the use of pins which are inserted into the patient's skull and completely immobilize the patient's head)
 - Mayfield or Sugita skull clamps or Leksell skull frame.
 - Horse-shoe headrest frames attach directly to the OR bed may be used for some patients who are positioned in prone position.
- Positioning the patient - depends on the type of approach necessary.
 - Follow Safe Patient Handling Guidelines under 2.4.

- Supine position or some modification can be used for approaches to the frontal, parietal and temporal lobes, anterior cervical spine and anterior lumbar spine.
- Sitting position may be used for craniotomies involving a posterior or occipital approach.
- Prone position and modifications can be used for suboccipital and posterior fossa craniotomies and to access posterior spine.
- Lateral position may be used for anterior thoracic and lumbar spine and to access the posterior spine.
- Some spinal procedures require both anterior and posterior approaches and the patient is positioned in supine position for part of the surgery and is rotated to a prone position for the second phase of the surgery.
- During positioning, the head can typically be safely rotated between 0-45 degrees away from the body.
- Good venous drainage and maintaining a low ICP are important considerations.
- Positioning is surgeon led.
 - When assisting the surgeon during patient positioning, care is taken to prevent injury to the spine, shoulders or head. Ensure the head is securely supported and in anatomical position at all times to prevent hyperextension of the neck or sudden movement.
- Mayfield or Sugita skull clamps or Leksell skull frame are secured to the OR bed with the use of an articulating arm such as the Mayfield articulating arm or a coupling device such as the Jackson coupler to allow for fine adjustments.
 - Local infiltration of the skin should be used whenever possible in awake and anesthetized patients for application of skeletal fixation device.
 - **Rationale:** Application of the device and tightening of the pins on the scalp has a profound stimulating effect, leading to tachycardia and hypertension
- Horse-shoe headrest frames attached directly to the OR bed may be used for patients who are positioned in prone position.
- The surgeon places the skull clamps on the patient's head after anesthesia is administered.
 - The skull clamp is placed strategically in the skull to provide access to the surgical site and to avoid:
 - Frontal sinuses
 - Superficial temporal arteries
 - Eyes
 - If the prone position is used on a regular OR bed, the surgeon will place the skull clamp while the patient is supine
 - The surgeon supports the patient's head during the position change and adjusts the final head position after the patient is placed prone.
 - After positional adjustments are made to the patient's body, the skull clamp is locked into the articulating arm/coupler by someone other than the person holding the head.
 - The skull clamp and articulating arm is tightened from distal to proximal and is double-checked for security. No positional adjustments can be made to the patient's body without first releasing the head. Not doing so could cause injury to the

patient's cervical spine. To release the skull clamp, the arm is loosened from distal to proximal, while the head is supported by another individual.

- Two individuals (together) verify that all locking devices are secure and in their locked position. Verify each device in a systematic sweep from patient's feet to head. If the patient is to be rotated, do not rotate the patient until all locking knobs have been secured.
- Do not disengage the 25 degree rotational stop during the adjustment procedure.
- The person at the patient's head must hold the table with one hand whenever the friction control on the spinal table is unlocked to prevent accidental or excessive rotation. Never let go of the table top while the rotational friction control is released.
- For cervical spine surgery both arms are tucked at the patient's side.
- Sequential compression stockings are often applied to prevent deep vein thrombosis.
- Pads may be placed over the eyes to protect them from injury. This is at the discretion of the anesthesiologist. Anesthesiologist may prefer to not place pads so that they can see the face and eyes better and know that nothing is compressing the globe of the eye.

3.8 Trendelenburg

- Risks
 - As per supine, lithotomy, lateral or prone as applicable.
 - Increased risk of compartment syndrome, & tissue injury
 - Increase risk of inaccurate physiological monitoring (BP, IV, ART Line).
 - Increased risk of diminished lung capacity.
 - Increased risk of venous pooling shifts toward head.
 - Sliding and shearing.
 - **OR Table should not be tilted more than 40 degrees downward at head** results in:
 - Pulmonary and cardiovascular changes;
 - Diaphragmatic movement can be limited severely by the weight of the abdominal viscera;
 - Increased intracranial pressure;
 - Increased intraocular pressure; and
 - Passive regurgitation
- **Note:** for prolonged procedures the nurse should communicate with the anesthetic team and surgeon every two hours to assess the need to reposition the patient.
- Positioning the patient
 - Follow Safe Patient Handling Guidelines under 2.4.
 - **Supine position on an upper body gel pad.** Patient contact directly with gel mat. **Do not use** a draw sheet in-between patient and gel mat. (If draw sheet is required to move patient, place under the gel mat.)
 - Patient's body should not be in contact with any metal portions of the procedure bed.
 - Extended arms
 - If arms are extended, amount of incline in Trendelenberg position should be limited to less than 30 degrees.
 - **DO NOT** use shoulder braces or wrist straps.
 - Knees

- **Knees must be bent with the break of the operating room table.**
Rational: prevent pressure on the peroneal nerves and veins in lower extremities. Mechanism of injury to **lower extremity nerves: femoral, lateral femoral cutaneous, obturator, sciatic; common peroneal nerves**, is due to compression and stretching.

3.9 Reverse Trendelenburg

- Risks
 - As per supine.
 - Deep vein Thrombosis (DVT) in lower extremities.
 - Sliding and shearing.
 - Injury to peroneal nerve
- Positioning the patient
 - Follow Safe Patient Handling Guidelines under 2.4.
 - Attach footboard to bed to prevent sliding and shearing.
 - Opposite of Trendelenburg position.
- Other considerations
 - Obese patient
 - “head up” position is associated with weight moving downward, therefore a well padded footboard should be used to prevent the patient from sliding down the OR table.
 - The circulating nurse must be vigilant about the position of the feet and concerns of circulatory or nerve impairment.
 - Check position foot to ensure feet are not being allowed to drift to the side and that they are still being supported by the footboard.

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Appendix A
Positioning Devices
Pictures courtesy of Carol Knudson

Device	Picture	Weight	Articulation/Tilt	Notes
Accessories				
Arm Board		Maximum weight capacity is equivalent to that of the OR table		
Arm Board - Krause		300 lb		An arm length stockinet supports the arm without noticeable pressure. The support is appropriate for unilateral, prone, supine, and seated positioning of patient. The frame is adjustable for arm length.
Bariatric Bed Extensions (Amsco/Steris)		Maximum weight capacity is equivalent to that of the OR table		Increase width of bed by 8"
Bariatric Bed Extensions (Skytron)		Maximum weight capacity is equivalent to that of the OR table		
Beach Chair (Tenet Medical Engineering)		350 lb (Height minimum 5'2")		

<p>Gel Positioners</p>				<ul style="list-style-type: none"> • Viscous Polymer Construction • To optimize pressure reduction properties and to reduce shearing avoid covering gel positioners • Will always take on the temperature of the environment that they are in
<p>Foot Board (Amsco/Steris)</p>		<p>BF03-100 Maximum weight 300 lbs (136 kg)</p> <p>Bariatric BF542 Maximum weight 1000lbs (454 Kg)</p>		
<p>RIK Fluid Mattress</p>		<ul style="list-style-type: none"> • 1000 lb (454 Kg) max 		
<p>Split Leg Positioner</p>		<p>Check applicable manufacturer instructions for your site re: weight restrictions.</p>		
<p>Stirrup – Candy Cane (Amsco/Steris or Skytron)</p>		<ul style="list-style-type: none"> • 300 lbs (136 kg) 		<p>Height and angulation are adjustable for full positioning flexibility</p>

<p>Stirrup – Yellow Fin (Allen Medical)</p>		<ul style="list-style-type: none"> • Without lift assist – 350 lb • With lift assist – 500 lb • Ultra – 800 lb 		<ul style="list-style-type: none"> • Without lift assist: position between +90° and -35° • With lift assist Position available between +84° and -33°
<p>Stirrup – Little PAL (Allen Medical)</p>		<ul style="list-style-type: none"> • 3-6 years of age • 160 lb 		
<p>Stirrup – Junior PAL (Allen Medical)</p>		<ul style="list-style-type: none"> • 7-11 years of age • 250 lb 		
<p>Stirrup – Red Fin (Levigator Stirrup)</p>		<ul style="list-style-type: none"> • 600 lb 		
<p>Transfer Board (Amsco/Steris)</p>		<ul style="list-style-type: none"> • 2” pad - 300 lb (136 kg) • 4” pad – 400 lb (181 kg) 		
<p>Troop Elevation Pillow</p>				<ul style="list-style-type: none"> • Used to position patient in HELP position • Replaces rolled blankets when positioning for anesthesia
<p>Olympic Vac-Pac</p>				<ul style="list-style-type: none"> • Ensure any sheets or gels placed between patient and Vac Pac are smooth • Available in variety of sizes • Radiolucent • Ensure bottom is flat to avoid rolling of the patient

OR Tables				
Amsco 2080		300 lb (136 Kg)		
Amsco 3080 SP		500 lb (227 kg) <ul style="list-style-type: none"> • 400 lb with IA Extender with 2” pad 	Tilt: <ul style="list-style-type: none"> • Trendelenberg – 25° max • Reverse Trendelenberg – 25° max • Lateral - 18° max 	
Amsco 3085		1000 lb (454 kg) patient in NORMAL patient orientation <ul style="list-style-type: none"> • 500 lb (227kg) limit in SIDE TILT • 500 lb (227kg) limit in all patient REVERSE orientation • 500 lb (227kg) Amsco Shoulder table • 400 lb(181kg) when using head rest in REVERSE orientation • 400 lb (181 kg) orthopedic Extension accessory • 400 lb (181 kg) Fem/Pop board • 400 lb with IA Extender with 2” pad 	Tilt: <ul style="list-style-type: none"> • Trendelenberg – 25° max • Reverse Trendelenberg – 25° max • Lateral - 18° max 	Min. table height = 27” Max. able height = 44”

Amsco 4085		<ul style="list-style-type: none"> • 1100 lb (500Kg) centered on support 	<p>Articulate:</p> <ul style="list-style-type: none"> • 1000 lb (500Kg) full table articulation centered on support • 600 lb (272 Kg) full table articulation including slide <p>Tilt: Trendelenburg - 30° Reverse Trendelenburg - 30° Lateral - 20°</p>	Height 26" – 45" (660 mm – 1143 mm)
Amsco – Orthovision		<ul style="list-style-type: none"> • 400 lb (181 kg) • 300 lb (136 g) in REVERSE orientation 		
Canada Microsurgical OSI – Ortho Trauma Bed		<ul style="list-style-type: none"> • 500 lb (227 Kg) 		
Canada Microsurgical OSI – Modular Jackson Spine 5890C		<ul style="list-style-type: none"> • 500 lb (227 Kg) 		
Canada Microsurgical OSI – Modular Jackson Spine 5803		<ul style="list-style-type: none"> • 500 lb (227 Kg) 		
Marquet Alpha 1150.01		<ul style="list-style-type: none"> • 396 lb (180 Kg) standard • 495 lb (225 Kg) max depending on table top & configuration 	Tilt: lateral 40°	

Marquet Plus 1150.02		<ul style="list-style-type: none"> • 495 lb (225 Kg) standard • 792 lb (360 Kg) max depending on table top & configuration plus 44 lb (20 Kg) accessories 		
Shampaine 4900B		<ul style="list-style-type: none"> • 400 lb 	Articulate: 400 lb Tilt: <ul style="list-style-type: none"> • Trendelenberg – 25° max • Reverse Trendelenberg – 25° max • Lateral - 18° max 	
Skytron 3500 Elite		<ul style="list-style-type: none"> • 500 lb (318 Kg) lift and articulate 		
Skytron 3501B EZ Slide		<ul style="list-style-type: none"> • 700 lb (318 Kg) lift 	Articulate: 600 lb (272Kg)	
Skytron 3600B Ultra Slide		<ul style="list-style-type: none"> • 1000 lb lift 	Articulate: 800 lb	
Skytron 6001 Elite		<ul style="list-style-type: none"> • 500 lb (227 kg) 	Articulate: 500 lb (227 kg) capacity Tilt: <ul style="list-style-type: none"> • Trendelenberg – 30° max • Reverse Trendelenberg – 30° max • Lateral - 30° max 	

<p>Skytron 6701 Hercules</p> <p>Skytron 6700B Hercules</p>		<ul style="list-style-type: none"> • 1200 lb lift 	<p>Articulate: 1000 lb</p> <p>Tilt:</p> <ul style="list-style-type: none"> • Trendelenberg – 30° max • Reverse Trendelenberg – 30° max • Lateral - 30° max 	<p>Minimum Height = 23”</p> <p>Maximum Height = 41”</p>
<p>Ovation (OSI) R Orthopedic Trauma 6300</p>		<ul style="list-style-type: none"> • 400 lb 		
<p>Uroview 2800 GE Medical Systems</p>		<ul style="list-style-type: none"> • 450 lb 		