Positioning Considerations in Robotic Surgery

CHRISTINA HORTMAN, BSN, RN; SIMON CHUNG, MD, MPH, MBA, FACS

Continuing Education Contact Hours

This program meets criteria for CNOR and CRNFA recertification, as well as other CE requirements.

AORN is provider-approved by the California Board of Registered Nursing, Provider Number CEP 13019. Check with your state board of nursing for acceptance of this activity for relicensure.

Conflict-of-Interest Disclosures

Christina Hortman, BSN, RN, and Simon Chung, MD, MPH, MBA, FACS, have no declared affiliations that could be perceived as posing potential conflicts of interest in the publication of this article.

The behavioral objectives for this program were created by Helen Starbuck Pashley, MA, BSN, CNOR, clinical editor, with consultation from Susan Bakewell, MS, RN-BC, director, Perioperative Education. Ms Starbuck Pashley and Ms Bakewell have no declared affiliations that could be perceived as posing potential conflicts of interest in the publication of this article.

Sponsorship or Commercial Support

No sponsorship or commercial support was received for this article.

Disclaimer

AORN recognizes these activities as CE for RNs. This recognition does not imply that AORN or the American Nurses Credentialing Center approves or endorses products mentioned in the activity.
Positioning Considerations in Robotic Surgery

CHRISTINA HORTMAN, BSN, RN; SIMON CHUNG, MD, MPH, MBA, FACS

Robotic surgery procedures are gaining wider acceptance and being performed in ever-increasing numbers for almost all surgical specialties. Use of the surgical robot platform creates unique and innovative challenges for surgical team members who must understand the unique positioning requirements to provide optimal patient safety and perioperative team access to the surgical field. Careful planning and patient positioning for robotic surgery allow the surgical team to work collaboratively to enhance surgical success, patient safety, and procedural reproducibility (ie, being able to reproduce the same results or outcome every time).

Robotic surgery offers enhanced visibility with three-dimensional imaging and improved exposure and dissection of surgical sites in confined spaces and uses instrument technology that allows the surgeon far more wrist flexibility and rotation than the human wrist can provide. Specialties that use robotic platforms include urological, colorectal, otolaryngological, thoracic, cardiac, gynecological, and general surgery. Each of these specialties has different surgical patient positioning needs that the surgical team must understand within the context of the robotic platform. Each robotic procedure requires different positioning and positional aids, and it is important for the perioperative nurse to understand the safety considerations of patient positioning during robotic procedures.

ROBOTIC PROCEDURE POSITIONING BASICS

The goals of positioning are to maintain circulation; protect muscles, nerves, and bony prominences from pressure injury; protect the patient from injury; provide adequate exposure of the operative site; maintain a functional airway; and provide the anesthesia professional adequate access to IV lines and monitoring equipment. In robotic surgery, extreme positioning is often used to gain maximum exposure to the
surgical site. This type of positioning requires a collaborative effort from the entire surgical team to provide for patient safety.

The type of robotic procedure determines how the patient will be positioned, and surgical team member communication in planning and implementing patient positioning is crucial. There are some articles in the literature that specifically discuss patient positioning for robotic surgery,4,5 but this literature is sparse. However, basic positioning principles apply to these procedures as they do for any other surgical procedure. The length of robotic procedures can vary from 60 minutes to up to six hours, particularly if there are multiple surgeons involved in the procedure, and careful attention to patient positioning is required. The RN circulator should perform periodic checks throughout the procedure to assess for positional shifts. In addition to making sure the patient is positioned properly and protected from injury, the nurse should monitor other systems that can affect the patient’s risk for positional injury, such as circulatory, respiratory, integumentary, musculoskeletal, and neurological systems.6

In addition to positioning concerns, there is risk for robotic arm contact with the patient during robotic procedures, which could result in injury. After the team docks the robot and periodically throughout the procedure, the surgical team should perform safety checks to ensure proper positioning of the robotic arms and that they are not in contact with the patient. If repositioning of the patient is necessary, the RN circulator should verify that the robot is undocked from the patient before assisting the team with repositioning.3 The following are descriptions of the most common positions used in robotic surgery and safety considerations for each.

**Steep Trendelenburg With and Without Lithotomy**

Steep Trendelenburg when the patient is in the lithotomy position (Figure 1) is used in robotic pelvic procedures such as prostatectomy, hysterectomy, and distal colorectal surgery. This position helps displace the patient’s abdominal visera cephalad, which improves the surgeon’s ability to see the anatomy in the lower abdomen and pelvis.7 In this position, the patient may slide toward the head of the OR bed because of the extreme tilt. This sliding can cause dermal and nerve injury related to shifting from the original position. For this type of positioning, one of the newer bean bag positioning aids that are not rigid like older types and that hook up to suction and conform to the patient or a memory foam positioner that works with skin-to-foam contact, is helpful. These positional aids are made specifically for steep Trendelenburg positioning and are meant to help maintain the patient’s position. Additionally, the team should place both of the patient’s arms in correct anatomical alignment with palms facing the thighs and foam or gel padding used under the arms and elbows to protect against ulnar nerve injury.8

While the patient is in steep Trendelenburg (Figure 2), regardless of whether accompanied by the lithotomy position, there is risk for brachial plexus injury if the patient is not positioned properly.3,8 The brachial plexus is a network of nerves that innervate the upper limbs and shoulders.9 If brachial plexus injury occurs, the patient can lose sensation or motor control of the arm or hand and may require physical therapy and, in some rare cases, surgery to regain function.8 Care must be taken therefore to ensure that the patient’s head is in the midline position and that there is no dorsal extension or lateral flexion of the head, which can cause stretching of the brachial plexus.7 Use of shoulder braces is not recommended for patients in this position because instances of brachial plexus injury have been reported related to using braces.3,8,9

In addition to these considerations, when a patient is in steep Trendelenburg, with its severe head-down position, intraocular pressure (IOP) increases.10 For this reason and others, the surgical team should keep the patient in steep Trendelenburg position for the briefest time possible and evaluate the need for...
repositioning at regular intervals throughout the procedure. At our facility, we limit time in steep Trendelenburg position to a maximum of five hours. The nurse and anesthesia professional should pay close attention to the duration of time the patient is in this position because long periods of IOP can lead to blindness.9 If team members determine that the patient is at risk for injury, a five-minute supine rest intervention is recommended to relieve IOP.10

Reverse Trendelenburg

The reverse Trendelenburg position (Figure 3) is used during upper abdominal surgery procedures such as robotic cholecystectomy, gastrectomy, and Nissen fundoplication. This position provides the surgical team with adequate visibility of the surgical site by shifting the abdominal contents toward the pelvis. Risks related to this position include skin shearing, tissue damage, and nerve damage as a result of sliding on the OR bed.2 It is important for the team to use positional aids to protect the patient from injury and to keep the patient in position. Reverse Trendelenburg also can cause venous pooling in the lower extremities.11 Preoperatively, the nurse should apply sequential compression devices to the patient’s lower extremities to help prevent deep vein thromboembolism.11

For a patient who is placed in reverse Trendelenburg, the nurse should use safety interventions that include

- using a padded footboard to prevent the patient from sliding toward the foot of the bed,
- placing a pillow under the patient’s knees to help minimize back strain,
- using two bed safety straps to secure the patient’s legs (ie, one strap across the thighs and one across the lower legs), and
- using a foam headrest to protect the patient’s face against contact from robotic arms that extend over the patient’s head.

Semilateral Position

Semilateral position (Figure 4) is most often used during robotic procedures on the kidney and adrenal glands. The bed is tilted to one side or the other to provide maximum exposure to the surgical site, but puts the patient at risk for sliding off the OR bed and for injury at pressure points. To place the patient in the semilateral position, the team places the patient in the supine position on the OR bed, which should be covered with nonslip padding, and then secures the patient to the bed at the hips, shoulders, thighs, and lower legs using safety straps and other positioning aids. The RN circulator should place padding at all pressure points to protect the patient when the bed is tilted. Safety considerations in using this position include

- turning the patient’s shoulders and hips simultaneously to prevent torsion of the spine3;
- placing a headrest or pillow under the patient’s head to ensure that it is in cervical alignment with the spine3;
- placing a pillow under the patient’s knees and between the legs, if necessary, to protect bony prominences and prevent back strain;
- padding bony prominences (eg, under feet, ankles, elbows, hips, and arms) to help prevent tissue and nerve damage; and
- securing the patient with safety straps at the shoulders, hips, and knees and using tape over the straps to secure the straps to the bed, if appropriate, which helps ensure that the straps remain in place and helps prevent the patient from shifting or sliding.

POSITIONING CONSIDERATIONS FOR OBESE PATIENTS

Morbidly obese patients are those with a body mass index (BMI) of 40 kg/m² or greater or a total body weight that is 100 lb above their ideal weight. The incidence of obesity is on the rise around the world, and in the United States, more than
33% of adults and approximately 17% of young people are obese. In addition to the positioning issues that excess weight creates, these patients frequently have underlying comorbid conditions—such as diabetes, sleep apnea, hypertension, atherosclerosis, arthritis of weight-bearing joints, alveolar hypoventilation, gastroesophageal reflux disease, and poor wound healing—that represent a risk for surgical complications.

Robotic procedures are often used for weight-loss procedures. To care for these patients safely, it is important for the nurse to know the weight limit of the OR bed and which positioning equipment can be safely used. Extra subcutaneous fat, which one might assume would protect a person from injury, actually increases strain on the body and compresses tissue against the table and positional aids. To help prevent pressure injuries, perioperative team members should identify the rating of the mattress on the OR bed, which indicates whether it provides adequate support for obese patients without bottoming out (ie, overcompressing from the patient’s weight). The surgical team should consider having positional aids available in the OR suite, such as foam or gel padding, side bed attachments, sleds, bariatric stirrups, and longer, wider safety straps. Additional staff members should be available to help move and position the patient to protect staff members from injury, and an inflatable transfer pad can be used to aid in transferring the patient to and from the OR bed. Use of this device and other moving aids helps prevent staff member injuries.

The obese patient is at risk for circulatory and respiratory issues because of the various positions that are required during robotic surgery. These risks include

- airway compromise,
- difficult intubation,
- hypoxia,
- intra-abdominal pressure on the diaphragm,
- aspiration,
- increased cardiac output,
- increased pulmonary artery pressure, and
- inferior vena cava compression.

To address respiratory risks, the surgical team should have a difficult airway cart available and discuss a plan for dealing with potential complications, such as the inability to provide an adequate airway or to ventilate the patient. Positioning measures can help alleviate the risk for pressure on the diaphragm and the inferior vena cava, such as placing a wedge under the patient’s side to shift the abdominal contents away from the midline. To address increased cardiac output and increased pulmonary artery pressure, the team would take the patient out of the extreme positioning until stabilized, and the anesthesia professional would administer medications as needed.

**DOCUMENTING PATIENT POSITIONING**

Documentation for robotic procedures is the same as with any procedure performed in the OR. Thorough documentation of positioning on the operative record is important because it describes the nursing care that was provided to the patient; the patient’s condition before, during, and after the procedure; and patient care during the transfer of care. Documentation should include

- patient position;
- extremity positioning (eg, arms tucked or on arm boards, legs extended or in lithotomy);
- use of padding, pillows, and safety straps;
- the names of team members who were responsible for positioning;
- intraoperative position changes; and
- preoperative and postoperative skin assessment.

**CONCLUSION**

The perioperative nurse and other surgical team members are ultimately responsible for helping to ensure a safe outcome for patients. The extreme positioning required for robotic procedures can result in significant injury to the patient. The surgical team should carry out patient positioning according to positioning guidelines; assess the patient’s position at regular intervals throughout robotic procedures, especially if the procedure requires extreme positioning or lasts more than two hours; and assess the patient’s condition postoperatively. It is important for the team to remember that positioning problems often can be prevented by forethought, careful planning, and thorough assessment.

**References**


Christina Hortman, BSN, RN, is a nurse manager in the Surgical Center for Women OR at Inova Fairfax Medical Campus, Falls Church, VA. Ms Hortman has no declared affiliation that could be perceived as posing a potential conflict of interest in the publication of this article.

Simon Chung, MD, MPH, MBA, FACS, is the medical director of Robotic Surgery at Inova Fairfax Medical Campus, Falls Church, VA. Dr Chung has no declared affiliation that could be perceived as posing a potential conflict of interest in the publication of this article.
Continuing Education: Positioning Considerations in Robotic Surgery 0.9 CE

This evaluation is used to determine the extent to which this continuing education program met your learning needs. The evaluation is printed here for your convenience. To receive continuing education credit, you must complete the online Learner Evaluation at http://www.aorn.org/CE. Rate the items as described below.

PURPOSE/GOAL
To provide the learner with knowledge specific to positioning the patient during robotic surgery.

OBJECTIVES
To what extent were the following objectives of this continuing education program achieved?
1. Discuss practices that could jeopardize safety in the perioperative area.
   Low 1. 2. 3. 4. 5. High
2. Discuss common areas of concern that relate to perioperative best practices.
   Low 1. 2. 3. 4. 5. High
3. Describe implementation of evidence-based practice in relation to perioperative nursing care.
   Low 1. 2. 3. 4. 5. High

CONTENT
4. To what extent did this article increase your knowledge of the subject matter?
   Low 1. 2. 3. 4. 5. High
5. To what extent were your individual objectives met?
   Low 1. 2. 3. 4. 5. High

6. Will you be able to use the information from this article in your work setting?
   1. Yes 2. No

7. Will you change your practice as a result of reading this article? (If yes, answer question #7A. If no, answer question #7B.)

7A. How will you change your practice? (Select all that apply)
   1. I will provide education to my team regarding why change is needed.
   2. I will work with management to change/implement a policy and procedure.
   3. I will plan an informational meeting with physicians to seek their input and acceptance of the need for change.
   4. I will implement change and evaluate the effect of the change at regular intervals until the change is incorporated as best practice.
   5. Other: __________________________________

7B. If you will not change your practice as a result of reading this article, why? (Select all that apply)
   1. The content of the article is not relevant to my practice.
   2. I do not have enough time to teach others about the purpose of the needed change.
   3. I do not have management support to make a change.
   4. Other: __________________________________

8. Our accrediting body requires that we verify the time you needed to complete the 0.9 continuing education contact hour (54-minute) program: ________________