CDC A4N151

Surgical Service Journeyman

Volume 4. Surgical Positioning, Draping, and Surgical Routines

Air Force Career Development Academy

The Air University

Air Education and Training Command

A4N151 04 1507, edit code 03

AFSC 4N151

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THE PREVIOUS volume of this course focused primarily on what happens to the patient before, during, and after surgery. This volume begins to cover the "heart" of surgical technology—what *you* must do before, during, and after surgery.

Unit 1 tells you how to prepare yourself mentally and physically to perform as a circulating or scrub technician. You also learn how to select and set up supplies, instruments, and equipment for a surgical procedure, and how to perform what is probably one of your most important tasks, that of counting sponges, sharps, and instruments.

Unit 2 begins with the factors that influence surgical position selection, and then explains how to prepare the operative bed to receive the patient. The unit describes the procedure for transferring the patient to a bed and positioning the patient for administration of anesthesia. You also learn the many basic surgical positions and some highlights of individual positions for surgery.

Unit 3 covers the who, what, why, when, and where of sterile patient draping.

Unit 4 discusses at length the common intraoperative and postoperative duties of sterile and nonsterile personnel. This discussion includes the application of the wound dressing and sterile setup breakdown.

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NOTE:

In this volume, the subject matter is divided into self-contained units. A unit menu begins each unit, identifying the lesson headings and numbers. After reading the unit menu page and unit introduction, study the section, answer the self-test questions, and compare your answers with those given at the end of the unit. Then do the unit review exercises.

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Please read the menu for Unit 1 and begin ➔

Unit 1. Initial Case Preparations

IN THIS UNIT, we'll discuss the specific events and practices that commonly occur before the patient enters the room. The focus of this unit is on the activities of the scrub technician and circulator at different phases of preparation. We explain the personal and physical preparations the surgical team must routinely accomplish before the surgical procedure actually begins. This includes such activities as selecting supplies and equipment for an operation and setting up the sterile field.

1–1. Preparations for Surgery Duty

Getting the patient ready for surgery is only one of the preparations surgical personnel must perform before the actual procedure begins. They must also prepare themselves, as well as collect the supplies and equipment needed for surgery. In this section, we will focus on the personal preparations, both mental and physical, you should perform to help get ready for a typical surgical work day. We then discuss how you select and set up supplies and equipment.

601. Preparing yourself for duty in the operating room

As a surgical technician, you have certain distinct responsibilities to yourself and your patients. Ensuring you are prepared to perform your daily duties mentally and physically is one of your most important responsibilities.

Mental preparation

Mental preparation begins as soon as you know you are assigned to a specific procedure. This is often when scrub and circulating personnel receive their daily duty assignments and check the surgery schedule. Usually you have at least the night before the procedure to prepare—but sometimes you have only minutes. Normally, your NCOIC (or designee) makes duty assignments for all assigned enlisted personnel, and the operating room (OR) supervisor designates the nurses. Usually, personnel are assigned to a specific operating room each day rather than to a specific service or specialty. The NCOIC posts the daily assignments in a designated area. Before leaving the surgical suite at the end of your duty day, you should check your work assignment for the next day. Then, check the *surgery schedule* to see what type of procedures will be performed in your assigned operating room.

Normally, the OR supervisor develops the surgery schedule from individual patient information transmitted to the surgical suite by the various surgical clinics. This information may be electronically transmitted or may be taken from individual scheduling request slips. The surgeon requests the specific date of the proposed operation, then coordinates with the OR supervisor and the chief of anesthesia to establish the order in which the procedures will be done. They consider factors such as available resources (personnel, supplies, equipment, etc.), the patient's age, the urgency of the surgery, and the difficulty of the proposed procedure as they develop the surgical schedule.

Local policy determines the specific information listed on the surgery schedule. Most list as a minimum the following information.

Minimum Information on a Surgery Schedule	
Date and day of the operation	
Time of the operation	Usually, a specific time is allocated to only the first cases of the day in each operating room; all others are scheduled "to follow" or simply "TF."
Designated operating room number or letter for the procedure	For example, OR 4 or OR D.
Patient identification information	• Name • Age • Sex • Military status or rank (D/W, E–3, O–5, Capt, Amn) • Hospital register number or Social Security number
Patient location or nursing unit designation	For example, 3B, 2W, ASU, or ICU.
Operation to be performed	Entries may be abbreviated to save space.
Primary surgeon	Assistants and residents or interns are sometimes listed.
Type of anesthesia	That is, general, local, spinal, or the anesthesia provider's "choice."
Name of anesthesiologist or anesthetist who will administer the anesthesia.	
X-rays required (if applicable)	Special films required in the room, or intraoperative films, fluoroscopy, etc.
Units of blood required (if applicable).	Number, type and cross, type and screen, etc.

Copies of the surgical schedule are distributed or transmitted to several key personnel and functional areas within the medical treatment facility (MTF). Specific distribution is determined locally but usually includes all patient care units with surgical patients, and support areas such as pathology, blood bank, and radiology.

When you obtain your duty assignment and check the surgery schedule, begin mentally preparing by studying or reviewing the information you will need to perform the duties involved efficiently. When scheduled for "routine" procedures, or duties you are very familiar with, mental preparation may be simply reviewing them in your mind. On the other hand, if the procedure is new or unfamiliar, you may have to do some research. This includes studying the anatomy of the operative area, reading about the disease process or injury involved, and reviewing instructions for special equipment or instruments used on the case. Textbooks on surgical technology or surgical patient care are excellent sources of information. Most OR supervisors and NCOICs maintain a small library of reference material for procedures or subjects related to your duties in the surgical suite and central supply. If you cannot find information in your section, look in your facility's medical library. Many surgeons will lend you reference materials on procedures they perform. (If you borrow books from the library or a doctor, make sure you return them promptly—medical books are very expensive!)

One of the best ways to prepare for a new procedure, or for one not often performed in your facility, is to talk to the surgeon who will be performing the operation. Most surgeons will gladly answer any questions to help you prepare, providing you ask *before* the time you are supposed to know the information already. As soon as you know you will be assisting with the procedure, call (or e-mail) and try to arrange an appointment. Bring the case setup card (if available) and a notebook to jot down important information about the procedure. Ask the surgeon to look at the preference card to make sure it lists everything needed, and make a note of any special requirements the surgeon has. By taking the time to contact a surgeon personally before the operation, you not only learn a great deal more about the procedure, but also demonstrate your interest in learning about and excelling in your job. This extra effort on your part will make you more self-confident, increase the surgeon's trust in

your abilities, improve the rapport between you and the surgeon, and make the operative day go much smoother.

You can obtain additional information about the patient and scheduled procedure by studying the nursing assessment and nursing care plan annotated on the perioperative nursing record. Also, periodically review your local instructions and procedure books to stay abreast of any changes to case preparation activities.

Mental preparation is essentially your responsibility. However, if you ever find yourself suddenly scheduled for a procedure you are unfamiliar with, or one you are very uncomfortable with, notify your trainer, supervisor, NCOIC, or the OR nurse. This can happen during emergencies, when cases are moved from the scheduled room to your room, or simply by oversight of the person making the assignments. You may still have to perform the duty, but they will usually try to provide you with experienced assistance.

Personal preparation also includes making sure you are healthy and physically fit to perform your duties.

Physical preparations

The exacting and often strenuous activities associated with the operating room require physical stamina as well as mental alertness. You and other personnel in the operating room are expected to conform to the highest standards of personal hygiene (discussed in Volume 2) that help create a safe environment for the surgical patient. You must also adhere to the strictest infection control standards, such as properly wearing surgical attire. You are also expected to perform physical tasks, such as moving patients, lifting heavy instrument sets, supporting extremities during preps, and holding retractors stationary during long procedures. All surgical technicians should maintain high standards of physical fitness (exercise) in order to perform their duties effectively and efficiently.

While you are not required to observe any specific or special physical regimen, you should follow the general guidelines for nutrition, rest, and exercise to maintain general good health. Neglecting these basic health rules and guidelines will show. If you are scheduled to scrub a long procedure, you are expected to stand and give your undivided attention through the entire operation. If you do not get enough sleep, you will not be alert. If you do not eat properly, you will become hungry and be distracted—you may even run out of energy before you finish the work day. Common sense should tell you to avoid “partying” the night before a duty day. Remember Murphy’s Law: the one time you are scheduled for an “easy” day and stay up too late is the one day you will suddenly have to scrub an emergency “micro-endoscopic-foreverectomy.”

Another important aspect of physical preparation is to *tell your supervisor* if you feel ill, have a cold or infection, develop a skin rash, or have any cuts or abrasions. Do not hesitate to go to sick call when you need to or the emergency room when you are hurt. When you are sick, you not only spread germs, you also cannot concentrate fully on your job. You may become more of a liability in the operating room than an asset. Put yourself in the patient’s position—would you want someone operating on you who is not fully alert or physically capable of finishing the procedure?

602. Selecting supplies, instruments, and equipment

Besides preparing yourself for duty, you and the other surgical team members must prepare the operating room for the procedure. After cleaning the room as we discussed in Volume 2, you must select and set up the equipment, supplies, and instruments necessary to perform the scheduled operations.

Checking preference cards

Before you can begin to “pick” or “pull” the supplies and equipment needed for a procedure, you need a list of required items. Each surgical suite maintains files, usually known as preference cards, containing information on the supplies, instruments, and equipment used on frequently performed

operations. This information is usually annotated on large file cards and kept in the surgical processing room, OR nurses' station, or some other convenient location. In some hospitals, this information is stored in separate computer files and printed on demand.

Most facilities use either the *surgeon's preference card* or the *case card* file for this purpose. The surgeon's preference card method uses an individual card or file for each operation performed by the specific *surgeon*. The cards or files are stored under the surgeon's name, usually alphabetically by procedure. The case card system is similar, but it has two main differences. A case card or file is developed for each *procedure* performed in the facility. Individual surgeon's preferences are listed in separate sections on each card or file. Case cards or files are usually maintained alphabetically by service (surgical specialty). For simplicity, we use the term "preference card" in this career development course (CDC) to refer to either method.

The information typically found on a preference card includes the patient position, skin prep, sterile and nonsterile supplies, instrument sets and individual instruments, wound closure materials, and surgical dressings. The surgeon's glove size is usually listed, and a "remarks" or special instruction section normally contains the requirements a particular surgeon may have for a given procedure.

All scrub and circulating personnel should check the preference card before beginning case setup activities. This ensures all required items are available and opened for the particular procedure. Having all supplies immediately available saves valuable surgical time. It also reduces the need for the circulator to make numerous trips in and out of the operating room to obtain supplies. This, in turn, reduces the risk of contamination (less room traffic and air currents) and ensures that the circulator remains available to assist anesthesia personnel and the sterile team at all times. In addition, the preference card often contains valuable information to help the scrub technician plan the sterile field setup and better anticipate the surgeon's needs during an operation.

One important fact about preference cards is they are only as good as the people who develop and maintain them. It takes a total team effort to keep the information on the cards accurate and useful. When a surgeon changes a routine, or when a surgeon performs a new procedure, the team assisting with the procedure should note all pertinent information on the card as soon as possible. This helps prevent future problems that may result in frustration, delays, or errors, and avoids wasting expensive supplies.

Selecting sterile supplies and instruments

Since sterile supplies are often located in different areas of the surgical suite, use a rolling table (D&C cart), basket, or cart to assemble all the items required for the case. Using the preference card, select the number and type of each item listed. Follow the rules for handling sterile supplies we discussed in Volume 2. If local policy allows, gather small items together in plastic bags, and place larger items on the cart. After you pull all supplies, cover the setup with a sheet. If your OR uses a case-cart system, place the setup inside the cart.

Always use the older dated items first when pulling sterile supplies. These oldest items should be located on the top and most accessible area of the storage shelf or bin if the items were rotated and stored properly. As you pull each item, check its expiration date (if applicable), and ensure the external chemical sterilization indicator has changed to the appropriate color. Also, check the integrity of the packaging; do not use items with holes, broken tape or seals, or evidence of moisture contamination (damp areas or water spots). Any item with questionable sterility is unwrapped and discarded or reprocessed.

Always use a preference card when pulling case setups for scheduled operations. Even if you have memorized every item listed on the card, you should use it as a visual reminder or checklist to be 100 percent sure you pull all items listed. If an item listed on the card is not available, ensure you tell the circulating nurse *before* the patient arrives in the room. An item you may think is unimportant may be crucial to the surgeon.

Selecting and retrieving equipment

Each operating room contains basic pieces of equipment that remain in the room at all times. The operating bed, IV poles, anesthesia machine, suction apparatus, prep carts, kick buckets, electrosurgical (Bovie) unit, and various tables, carts, and stands are some examples. In addition to these common equipment items, surgeons use many different types of specialty equipment for particular procedures. Many surgeons list specialty equipment requirements when they transmit or fill out the schedule requests. If the special equipment is routinely used for a procedure, you will most likely find it listed on the preference card.

As a result, of continuous advances in medicine, operating rooms are acquiring more and more specialized equipment to support new procedures. Most surgical suites are short on storage space, so you will find equipment stored in just about any vacant area. Many operating rooms have developed locator lists and inventories to help the staff find equipment and supplies. These lists are especially useful when looking for something used only once or twice a year. If your facility uses locator lists, do your part by storing items where they belong, and by notifying the person who maintains the lists whenever you move an item or discover something not listed.

One of your duties as a surgical technician is to retrieve and set up specialized equipment. It makes sense you must know what you are looking for and where it is (supposed to be) stored. One of the best ways to learn this information, particularly when you are new to a facility, is to take time to explore the "nooks and crannies" of your surgical suite. Make a note of the equipment you find and where it is located. If you find a piece of equipment you cannot identify, ask your supervisor or trainer what it is and how it works. Taking the initiative and time to learn about your OR can pay rewarding dividends. When the surgeon requests the "7 mm, 30 degrees laparoscope, with the built-in split-beam camera, that I used just last year," somebody should know its whereabouts. Make that somebody be you!

The scrub and circulating personnel (both nurses and technicians) usually work together to gather the required equipment. Report any unavailable (in use, cannot find, out for repair) equipment listed on the preference card to the circulating nurse *before* the patient is brought into the room. Clean all equipment with a germicidal solution *before* you bring it into the room. If the equipment has a heavy layer of dust (this should not happen), thoroughly clean it in a utility room, away from the main surgical suite traffic patterns to prevent the dust spreading throughout the OR. When all equipment is gathered and cleaned, it is brought into the operating room and set up for use.

Self-Test Questions

After you complete these questions, you may check your answers at the end of the unit.

601. Preparing yourself for duty in the operating room

1. When do you begin preparing mentally for your duties as a scrub or circulator?

2. Where do you find a listing of the type of procedures scheduled to be performed in the operating room to which you are assigned?

3. List the *minimum* information that is commonly found on a typical surgery schedule.

4. What can you do to better prepare yourself for new or unfamiliar procedures?

5. What is one of the best ways you can prepare mentally for a new procedure, or for one not often performed in your facility?

6. What should you do if you ever find yourself suddenly scheduled for an unfamiliar procedure that makes you very uncomfortable? What is usually the result?

7. Cite some simple actions you can take to ensure you are physically prepared to perform your duties in the operating room.

8. What should you do if you are ill on a day you are scheduled for surgery duty?

602. Selecting supplies, instruments, and equipment

1. What information do you need before you can begin to “pick” or “pull” the supplies and equipment needed for a procedure? Where do you find this information?

2. Describe the difference between the two types of preference card files used to list supplies and equipment for a procedure.

3. Who should check the preference card, and when?

4. Who should update information on a preference card?

5. Where should the oldest supply items be located if they were rotated and stored properly?

6. What do you check as you pull sterile supplies?

7. What action should you take if an item listed on the preference card is not available?

8. Besides the preference card, where do many surgeons list specialty equipment requirements?

9. List two ways you can learn what equipment is in your facility and where it is stored. What is one of the best ways?

10. What should be done to equipment before bringing it into the operating room?

1–2. Operating Room Setup and Count Procedures

Preparing the operating room must be done quickly and efficiently to prevent delays in the operating schedule and to help maintain an aseptic and safe surgical environment. In this section, we explain how to set up the operating room, briefly review how we establish a sterile field, then concentrate on who, what, why, and when technicians and nurses perform counts of sponges, sharps, and instruments. We will not discuss housekeeping or cleaning activities because we have covered this in Volume 2.

603. Setting up equipment and opening sterile supplies

After selecting and pulling the supplies and equipment, you must prepare the equipment and supplies for use. This involves positioning and setting up the equipment, and arranging and opening the sterile supplies and instruments.

Setting up and inspecting equipment

After you clean and bring the equipment into the operating room, you next position, set up, and perform an "operator preventive maintenance" inspection of each item. This includes a visual inspection for any obvious signs of damage, and testing the item's operation for signs of internal malfunction. If you find a damaged or improperly operating piece of equipment, immediately remove it from the operating room and replace it. Notify the circulating nurse immediately if the item cannot be replaced. Also notify the NCOIC or designee (follow local policy) so the faulty equipment can be sent for repair.

It is beyond the scope of this CDC to list every piece of equipment you may be called upon to set up. As usual, consult local policy and manufacturers' instructions for specific information and procedures for your equipment. We next briefly highlight some of the more common types of specialty equipment you may use.

Surgical lights

General lighting of the operating room and adjacent areas is usually provided by fluorescent lights, though some use incandescent bulbs. When you initially enter an OR and begin start-of-day activities, you should make a quick check of the lights and report any burned-out or nonfunctioning bulbs.

A wide variety of surgical or operating lights are available. Most OR "spot" lights have the following characteristics:

- Freely adjustable to nearly any position or angle.
- Closely approximate daylight.
- Minimize or eliminate shadows.
- Provide an adjustable, high-intensity light of 1,000 to 9,000 foot candles while minimizing glare and reflection.
- Can be focused to allow the light pattern diameter adjust to meet the needs of the operation.
- Produce minimal heat at the surgical site and around the surgical team.
- Easily cleaned.

When you set up the operating room for surgery, position the lights over the OR bed, then test their operation. Ensure the intensity adjustment is at the lowest setting, and then turn the lights on. Gradually turn up the intensity to the highest setting, and then check the focus, or "spot," to ensure it can adjust to the approximate area of the surgical site. Slowly turn the intensity back to the lowest setting; then turn off the lights until needed. If a lamp fails to light, troubleshoot it per the manufacturer's instructions.

NOTE: When changing the lamp or bulb of most OR lights, do not touch the lamp with your fingers, use the paper or foam sleeve provided. The oils from your hands greatly shorten the life of some high-intensity lamps.

Fiberoptic light sources

Fiberoptic light sources provide intense cool light illumination for most endoscopes used in the OR. Light sources and the cables that connect the endoscopes to them must match identically. Some light sources are universal; they have adapters to accept nearly all fiberoptic cables. Most are not universal; you must match the light source to the specific type of cable connected to the endoscope. The following guidelines apply to most light sources:

1. Ensure the power switch is "off" and the light intensity is set to the lowest position before plugging the source into the electrical outlet.
2. Test the light source before the patient enters the room. Follow the manufacturer's specific instructions. Usually, you test the light source by turning the power switch "on" and watching for the light. Gradually turn the light intensity to the highest position, then back to the lowest setting. Leave the power switch on for a few minutes to allow any internal fan to cool the bulb.
3. If the light source has more than one light bulb, test all bulbs to ensure they work.
4. After the procedure, turn the light intensity to the lowest setting and allow the bulb to cool before turning off the power and unplugging the machine.

Electrosurgery devices

Position the electrosurgical unit (ESU) as indicated on the preference card. Before the patient enters the room, plug it into an electrical outlet and ensure there is power to the unit. Check the ESU supplies, ensuring that the proper patient grounding pad is selected. Always check the expiration date (if applicable) on the pad's package. We will cover use and setup of electrosurgery devices more extensively in Volume 5.

Cardiac monitors

Cardiac monitors are primarily the responsibility of the anesthesia staff. As a surgical technician, you should at least become familiar with attaching leads and electrodes to the monitor and to the patient. You should also know how to inspect the monitors for safety and how to change the recording paper rolls used to print a "hard copy" of the patient's vital statistics. You should also be familiar with the basic operation, testing, and battery charging procedures for any portable cardiac monitors used in your facility. These portable monitors are often used when transporting critical patients to and from the OR and the intensive care unit. Cardiac monitors are delicate and very expensive; do not touch them until you are specifically trained in their care and set up.

Defibrillators

Defibrillators are usually centrally located in the surgical suite on the cardiac arrest or "crash" cart. In facilities that perform major thoracic, heart, or vascular surgery, defibrillators are kept in the ORs used for these procedures. Regardless of where they are stored, defibrillators must be maintained in peak operating condition.

Follow these procedures to maintain the defibrillator:

1. Keep the power cord plugged into an electrical outlet to maintain a full charge in the unit's battery.
2. Inspect and clean all components at least daily. This inspection involves checking for any visible signs of damage or missing pieces, and ensuring all components (internal paddles, external paddles, cords, patient leads, extensions, etc.) are in their proper places.
3. Test the unit (per the manufacturer's instructions and local policy) at least daily, and usually at the beginning of each work shift.

If a defibrillator ever malfunctions or fails to pass an inspection, immediately notify your NCOIC (or designee); the unit must be exchanged and sent for repair as soon as possible.

Portable suction units

The suction units most frequently used in the operating room are mounted on wheeled frames or carts to allow them to be positioned in the most convenient location for the procedure. You should always turn the vacuum supply on to check the integrity of all connections and to ensure the unit is suctioning effectively. If collapsible liner suction devices are used, ensure the liner is fully opened and not twisted or pinched. The anesthesia provider's suction unit is essential—ensure it is fully functional before the patient enters the OR.

Another type of suction apparatus frequently seen in the OR is a battery-operated emergency unit. These units are completely self-contained and are designed to provide suction during emergencies; they may also be used when transporting critical patients. These units must be tested on a regular basis, usually daily. Follow local policy and the manufacturer's instructions for the model used in your facility.

Hyper/hypothermia units

We discussed the use of hyper/hypothermia units in Volume 3. To set up a hyper/hypothermia unit, visually inspect all parts for damage; then test the unit according to local instructions. If the unit is a water-blanket or mattress unit, check the solution level of the machine; then place the proper sized blanket on the OR bed and cover it with a sheet. Turn the unit "on" and check for leaks. Local policy dictates whether you leave the power on to pre-warm or pre-cool before the patient is positioned on the mattress.

Solution warming cabinets

Solution warming cabinets are usually located in the sub-sterile room, not in the actual OR. They should be used to hold only recommended items (never for warming lunch). These items include cloth blankets and sheets, bottles of saline and sterile water, and certain medications and intravenous fluids. Most warming cabinets are designed to warm their contents uniformly and gradually. When you remove an item from a warming cabinet, you should replace it with an identical item as soon as possible. Items stored in the cabinet should be rotated to ensure the warmest items are the most accessible. Although most warming cabinets have an adjustable temperature, turning the temperature up in an attempt to warm an item rapidly *does not work.* Like cooking in a too hot oven, you "burn" the outside surfaces while the inside is still cold. Leave the temperature setting at the recommended level. The best way to ensure items are warm when you need them warm is to plan; keep the warming cabinet fully stocked at all times.

Insufflators

Insufflators (sometimes called carbon dioxide pumps) are used to inflate the abdomen with carbon dioxide (CO_2) to establish *pneumoperitoneum* during laparoscopic procedures. This inflation of the abdomen helps protect the abdominal structures and organs from damage. Setting up the insufflator usually involves simply positioning it according to the preference card. When setting up the insufflator the most critical item to check is the content of the CO_2 tank. Change the tank when the

pressure gauge reaches the level specified by your facility, commonly 200 psi. You should always keep a full “back-up” tank in the room.

Other features common to most insufflators include an internal tank, a flowmeter, a gauge or other devices to measure how many liters of gas have been used, and a manual/automatic flow switch. When setting up the insufflator, fill the internal tank, set the flowmeter to the setting specified by the surgeon, or turn it off (depending on the insufflator). Set the “liters used” device to zero, and the flow switch to manual.

Endoscopic equipment

Endoscopic procedures may be performed as sterile procedures or as surgically clean procedures. We will cover setup of specific endoscopic procedures in CDC 4N151B. For now, we concentrate on general handling guidelines and on setting up most endoscopy equipment.

Endoscopic equipment is either rigid or flexible, and may be illuminated either by fiberoptic bundles or by miniature electric light bulbs. Endoscopy equipment is delicate and expensive. Do not drop, bend, or pile other instruments on top of endoscopic instruments; a single nick, tear, or bend can render them unserviceable. When using fiberoptic cables, avoid coiling them tightly or pinching them with towel clips or similar instruments. Be especially careful with the tips of scopes; accidentally striking the tip on a hard surface can cause irreparable damage.

The patient is sedated, but awake, for many endoscopic procedures. Ensure you set up all equipment and supplies before the patient enters the room. After the patient enters, you must often focus all your attention on the patient and cannot safely leave the room to retrieve missing supplies. Pay particular attention to the light source and scopes that will be used for the procedure. Many scopes, particularly flexible ones, must be used with specifically designed units that supply light, air, irrigation, and electrosurgical capability.

Video equipment

As minimally invasive surgery has become more prevalent, the use of video equipment in the OR has become the standard of care. Numerous designs and types are available; as usual, follow the manufacturer’s guidelines for your specific equipment. All video systems have at least three basic components—a camera, a camera controller, and a monitor. Most also include some type of recording device that can capture digital still images as well as moving video of the surgical procedure. Ideally, you should test the entire system before each operation to ensure all components are functioning properly. As a minimum, ensure all components are receiving power and are properly connected to each other. Let’s go over the setup and the components of a typical video system.

The *camera* is usually a small, three– or four–inch by one– or two–inch device that connects to the endoscope or other viewing devices (such as a microscope). The camera has an electric cord that attaches to the camera controller. Some endoscopes have “built-in” cameras. For most procedures, the camera is sterile; no preoperative setup is required, except that the scrub should untangle the cord and ensure it is ready for connection. When the camera is being used with a microscope, it is usually unsterile and attached to the microscope before the procedure begins.

The *camera controller* allows you to adjust the color and light intensity. The camera cable connects to the controller, and then the color is balanced. Some controllers automatically balance the color, but for many, one of the most important buttons is the “white balance” control. The white balance control determines how all other colors will appear on the monitor. To use it, focus the camera on a pure white object such as a piece of paper, then press the “white balance” button on the controller. By balancing the white intensity in the operational light, the controller then can display all the other colors as they appear to the eye.

Most camera controllers also serve as the light source for the procedure. The guidelines described previously for turning the power on and the light intensity up or down apply to camera controllers also. Maintaining spare lamps and knowing how to change the lamps are also important. If you

change a lamp, or turn off the light source for any reason during the procedure, you must white balance the camera again.

The *monitor* is a high-resolution television that becomes the surgical team's eyes during the procedure. Ideally, the monitor should have a slightly higher resolution than the camera used. Most surgeons prefer a twenty-inch monitor. Positioning of the monitor is the surgeon's preference, but it obviously must be placed where the surgeon can easily see it.

Surgical microscopes

Surgical or operating microscopes were once almost exclusively used by ENT (ear, nose, and throat) surgeons and ophthalmologists, but are now used in virtually all surgical specialties. Some operating microscopes are permanently mounted to a stand suspended from the OR ceiling. Most operating microscopes are portable; they are mounted on a rolling pedestal with a vertical column. Use extreme caution when moving portable microscopes because they may be top-heavy.

Set up of the microscope depends largely upon the procedure and individual surgeon. Set up involves configuring the placement of the ocular heads, selecting the oculars (eyepieces), selecting the objective lens (the lens closest to the field), and attaching accessories. Accessories include attachments for lasers, beam splitters to provide identical views to the surgeon and assistant, and attachments for video cameras.

Operating microscopes are extremely expensive; so handle them with exceptional care. When handling operating microscopes, use these general guidelines:

- Do *not* move a microscope unless all sections or components are secured.
- Dust all external surfaces, *except the eyepieces and lenses*, with a germicidal detergent.
- Clean the lens and eyepieces according to the manufacturer's instructions.
- When changing lenses, eyepieces, or other lensed components, avoid touching lens surfaces and be very careful not to drop the items. Some components are heavy. Use two hands!
- Know where spare parts are stored and how to change all bulbs and fuses.
- Know how specific electrical connections affect operation of the microscope.

Before the procedure, inspect the microscope for proper operation. Be certain the floor lock mechanism and all adjusting or locking knobs work properly. Test all lamps, including the light intensity adjusting knobs. Ensure the power focus and zoom functions are working. Also test all controls operated by the foot pedal, then cover the pedal with a plastic bag (or specialized drape) to ensure solutions do not contact the electrical components within.

Lasers

We will cover the use of surgical lasers extensively in Volume 5. To set up a room for laser use, follow these procedures:

1. Post approved "laser in use" warning signs at all entrances to the room.
2. Ensure the correct type of eye protection is available for, and used by, all personnel.
3. Set up smoke evacuation apparatus according to local instructions.
4. Ensure a staff member fully trained in and authorized to use the maser sets up the laser equipment and conducts an operational test before the patient enters the room. This is often done by a registered nurse trained as a "laser" nurse.

After cleaning, positioning, and setting up all equipment, you begin establishing the sterile fields by arranging and opening sterile supplies. If a rolling table was used to hold the supplies, remove the dust cover before bringing it into the room. This reduces air currents and avoids spreading dust around the room. Next***, THOROUGHLY WASH YOUR HANDS***. You never begin handling and

opening sterile supplies before reducing the bacterial count on your hands and arms by washing with a detergent antiseptic such as povidone-iodine or chlorhexidine gluconate scrub solution.

Doppler unit

A Doppler is an ultrasonic device used to identify and assess vascular status of peripheral arteries and veins. It works by magnifying the sound of the blood as it moves through the vessels, and it determines the rate of blood flow through an artery. It is most commonly used on procedures on the vascular system. It is often used to identify structures for cannulation and locating obstructions. It is a particularly important tool when the patient's circulatory system is depressed or compromised. When the surgeon places the sensing probe over an artery, high frequency sound waves are reflected back from the blood cells. From the sound of these varying pitches, the surgeon is able to interpret the results. During vascular surgery, the nonsterile probe is used in various locations away from the wound site to determine the patency of blood vessels. The Doppler is also equipped with sterile probes for use on the sterile field.

Sequential compression device

Another piece of equipment you may see in the operating room setting is the sequential compression device. The sequential pneumatic compression device uses an inflatable double-walled leg wrap that uses alternating compression and relaxation to reduce the risk of deep vein clotting in the legs. This device is most often used on high-risk patients who are undergoing general anesthesia. The leg wraps, usually made of vinyl or woven fabric, may be used over antiembolic stockings. The patient's thigh or calf must be measured for a correct fit. When applied, the foot is not wrapped but left visible. Proper selection and fitting are crucial for effective compression. The leg wraps are applied externally before the start of the surgical procedure. Sometimes it is applied before the patient arrives to the operating room and other times it is applied after the patient is transferred to the operating room table.

Once applied, the leg wrap tubing is attached to the compression device. A motorized pump sequentially inflates the leg wraps at the ankles, then at the calves, then at the thighs for full leg-compression. During this wave-like action, pressure is applied intermittently and empties the blood from deep leg veins. This action prevents venous stasis and accumulation of clotting factors in the deep veins. It is important to start the pump before the induction of anesthesia because general anesthesia reduces venous return and causes vasodilation. This also gives you the opportunity to ensure the machine and leg wrapping function properly. *Always check with the surgeon to verify the correct pressure setting.*

The circulator should periodically check the operation of the pump and inspect the leg wraps and tubing. Additionally, the type of device, pressure and cycle setting, start time, and time discontinued must be documented on the intraoperative record. Sometimes the surgeon will request that the device be left on the patient postoperatively; if this occurs, the device is usually transported to the post anesthesia care unit or intensive care unit with the patient. It is not uncommon for the surgeon to continue the use of sequential compression for 24 hours postoperatively. Following an abdominal, hip, or neurosurgical procedure, the surgeon may also use it until the patient is fully ambulatory.

Opening sterile supplies and instruments

After bringing the supplies into the OR, re-check the preference card to ensure you have everything you need. Remove any plastic outer protective "dust" covers. Place the major components, such as the drape pack, instrument set, and basin set on the appropriate tables and stands. Remember to check the table surfaces for moisture before positioning supplies. Place the items in a logical sequence to avoid unnecessary steps or trips around the room. Remove the tape from locally processed items in cloth wrappers; break the tape seal on locally processed items in disposable wrappers. Be careful not to dislodge and accidentally open the folded wrapper flaps when removing the tape or breaking the seals.

Open the supplies just before the patient is brought into the operating room. If supplies are opened and there is an unexpected delay in the start of the operation, they must *never* be left unattended.

They also should *not* be used if they are exposed for an extended period (usually, about an hour is maximum). Covering opened supplies with a sterile drape is not recommended; it is nearly impossible to remove the drape without dragging a contaminated edge over or onto the sterile field.

The scrub usually helps the circulator open the sterile supplies; start by opening the drape pack on the back table (instrument table). This provides a large sterile surface onto which you can project smaller individual sterile supplies. Usually, you open individual supplies at random. However, some surgical suites have definite policies and procedures (both written and unwritten) for opening all supplies. You've learned the basic aseptic principles and guidelines for opening sterile supplies in technical school. We reviewed some of them in Volume 2. We now highlight some of the specific areas and more important guidelines to remember.

- Open sterile packages in a sequence or manner that lets you move in a direction away from the sterile field.
- Avoid reaching over sterile surfaces when opening wrappers. When opening the wrappers of stationary supplies (packs, basin sets, scrub's gown, etc.), move from one side of the table or stand to the other side.
- Avoid walking between two sterile fields, and never turn your back to a sterile field (an unobserved sterile field is considered contaminated).
- Any wrapped supplies that are dropped on the floor must be discarded or unwrapped and reprocessed. They are never opened and used without reprocessing. (No three-second rule allowed!)
- Open individual items in similar groups on one area of the sterile field. For instance, open all sutures at the same time and project them into a sterile bowl or onto the Mayo tray. This saves the scrub valuable setup time and makes it easier for the circulators to check that all supplies are open.
- Open individual (hand-held) items so they do not lie precariously perched on the edge of the sterile field.
- Open knife blades and other sharps by handing them to the scrub technician after he or she is scrubbed in. If local policy allows you to open them on the field, ensure they are opened in a separate, very conspicuous location to prevent accidental injury to sterile personnel. Open them into a basin or bowl if possible; *never* cover open sharps with other supplies.

Once all packs and supplies (except sharps) are open, the scrub technician scrubs while the circulator finishes room and patient preparations. After the scrub is gowned, gloved, and completely "tied-up," numerous activities begin. Of the most important of these activities is counting sponges, sharps, and instruments.

604. Counting sponges, sharps, and instruments

One of the most important activities you perform as a surgical technician is keeping track of and accounting for all sponges, sharps, and instruments to prevent the team from leaving them in the patient's body. The circulating nurse and the scrub technician account for these items by counting them before, during, and after the procedure; then reporting and documenting the results. Counting all sponges, sharps, and instruments is known as a *complete count*; the accurate and positive result of this procedure is a *correct* complete count.

What items do you count?

As a rule, you count all sponges, instruments, needles, and blades. You also count other sharp items used on the sterile field, items like safety pins, hypodermic needles, Bovie tips, and scalpel blades. You also count *all parts* of multipart instruments, and all other small, easily lost items, such as vessel loops and umbilical tapes. Figure 1–1 shows some of the most frequently used counted items.

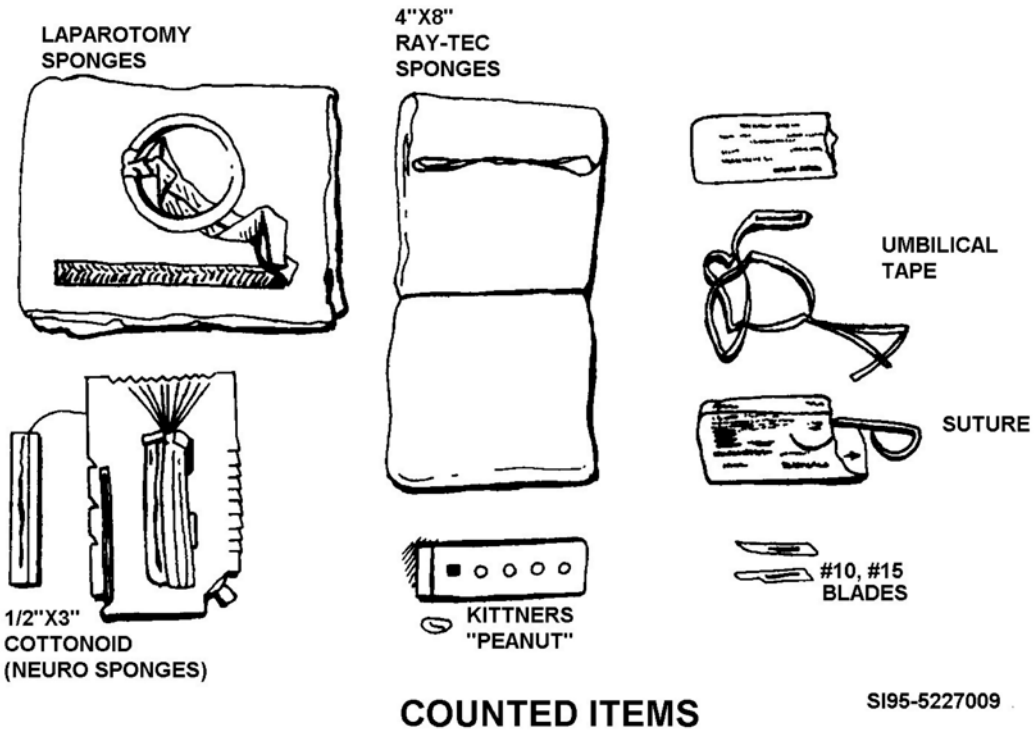

Figure 1–1. Some frequently counted items.

Instruments are usually counted when the sets are assembled, but this is usually considered a *preliminary* count, not as part of the OR's count procedure. Instrument sets should be standardized; each type of set should have a specified number of each type of instrument. Most hospitals use some type of instrument count record, such as the one shown in figure 1–2, to facilitate assembly and to assist with performing intraoperative counts. This sheet is typically placed in the set by processing personnel, sterilized with the instruments, and then passed off the sterile field to the circulator before the first count is taken. Most count sheets also have spaces that allow them to serve as checklists or worksheets to document all counts. They have spaces where additional instruments, sponges, and sharps can be listed and counted.

Most surgical sponges are purchased in pre-counted, sterile packages from medical supply manufacturers. The 4 x 4s and 4 x 8s, commonly called raytex, should have a visible string-type radiopaque marker in each sponge. Laparotomy sponges usually have a radiopaque loop and/or a sewn-in radiopaque marker. The number of sponges per package may vary with the type of sponge and the manufacturer, but most suppliers bundle sponges in groups of five or ten. You normally find 4 x 4 and 4 x 8–inch radiopaque (raytex) sponges packaged in groups of ten, and laparotomy ("lap") sponges in groups of five. Most prepackaged bundles of sponges have a tie or paper band around them to help keep the individual bundles separated when the wrapper is removed.

Manufacturers also group other commonly counted items, such as kittners and surgical cottonoids (patties), in multiples of five. Kittners are usually attached to a safety pin, contained in a small envelope, or secured in a special holder. Cottonoids are usually attached to a cardboard package insert that keeps their strings separated and neatly organized.

Counted "sharps" include suture needles, knife blades, detachable electrosurgery blades (Bovie tips), hypodermic needles, safety pins, and dermatome blades. These items are usually packaged individually. They are often placed in a "sharps box" to protect the sterile field from perforation and the sterile team from injury. These boxes have numbered slots to help with counting procedures.

INSTRUMENT COUNT RECORD

INSTRUMENT SET: MINOR SET | INSTRUMENTS SELECTED BY: SrA D. Smith | DATE: 25 Jul 95

FINAL COUNT: ☒ CORRECT ☐ INCORRECT 1 Aug 95 | SIGNATURE OF NURSE: Charles C. Millcamp, capt, USAFNC

INSTRUMENTS SELECTED	LEVEL PULLED	PRE-OP COUNT	POSTOP COUNT
ON STRINGER			
CVD. MOSQ	6	6	6
STR. MOSQ	2	2	2
CVD. CRILES	8	8	8
STR. CRILES	4	4	4
KELLYS	4	4	4
RT. ANGLES, 7" MIXTER	2	2	2
KOCHERS, 7"	2	2	2
ALLIS, 6"	4	4	4
BABCOCKS, 6"	2	2	2
BABCOCKS, 8"	2	2	2
N.H. MAYO-HEGAR, 7"	2	2	2
N.H. CRILE-WOOD, 6-1/4"	2	2	2
N.H. WEBSTER	1	1	1
NON-PERF T.C.	2	2	2
ROLLED TOWEL			
#3 K.H.	2	2	2
#7 K.H.	1	1	1
ADSON TISSUE FCPS.	2	2	2
DRESSING FCPS, SMOOTH 5-1/2"	2	2	2
TISSUE FCPS, 1x2 TEETH, 5-1/2"	2	2	2
DEBAKEY FCPS, 7-1/4"	2	2	2
METZ, 5-1/2"	1	1	1
METZ, 7"	1	1	1
CVD. MAYO, 6-3/4"	1	1	1
STR. MAYO, 6-3/4"	1	1	1
SHARP SENN RET.	2	2	2

INSTRUMENTS SELECTED	LEVEL PULLED	PRE-OP COUNT	POSTOP COUNT
BOTTOM OF PAN			
LG. RICHARDSON RET	2	2	2
SM. RICHARDSON RET	2	2	2
ARMY-NAVY RET	2	2	2
CUSHING VEIN RET	2	2	2
SHARP RAKES	2	2	2
DULL RAKES	2	2	2
GELPI RET	2	2	2
WEITLANER RET	2	2	2
PERF. T.C	4	4	4
PROBE	1	1	1
GROOVED DIRECTOR	1	1	1

PATIENT IDENTIFICATION
00563851
MILLER, PATRICIA E. D/W ADAF SSG
30-123-45-6789 F AGE 32
USAF PROT O POS
F4871 82 MDG, SHEPPARD AFB TX

Figure 1–2. Sample instrument count record.

Why do you perform counts?

The main and most important reason we count items is to prevent us from accidentally leaving an item inside the patient's body. There are two reasons we do not want to leave something in the patient. The first is to protect the patient from physical harm, and the second is to protect the hospital and surgical staff (including you) from litigation.

Any item unintentionally left in the patient's body may result in harm to the patient. The body reacts as it does to any foreign object; it tries to attack it and/or to isolate it from the rest of the body. A sponge left in the body often results in formation of an abscess or mass, and usually causes pain. A sponge left in the abdomen can cause adhesions and bowel obstruction. A suture needle left in the body may puncture arteries, veins, or organs.

In one reported case, a patient had an open cholecystectomy and was doing well post-operatively. Nearly a week later, the patient experienced extreme abdominal pain. An x-ray showed a clamp in the abdomen. An exploratory laparotomy revealed a Kelly clamp from the previous operation; the bowel had looped through one of the finger rings and obstructed. The clamp was removed, and the obstruction was corrected, but the patient died a few weeks later from resulting complications. Did the first surgical team fulfill its obligation to the patient?

When an item is left in a patient, the patient (or family) nearly always seeks legal compensation. Historically, there is no defense; an item left in a patient is automatically considered as evidence of negligence. The hospital, surgeon, and individual members of the team performing the procedure are all held legally responsible. A common misconception among surgical technicians is that only licensed members (nurses) are legally liable for counts; this is *not* true. The legal responsibility for correct counts is shared by the nurse *and the technician* (in fact, by the entire surgical team).

Another reason for performing counts is to ensure we do not leave any item in the operating room that may inadvertently be included in any following procedures. A sponge left in a kick bucket, or a needle on the floor may result in the numbers adding up and the count being reported as "correct" when, in fact, an item is missing. If an intraoperative count reveals more items than were initially documented, the count is incorrect. The same measures must be taken as for a count that is short an item.

The third reason for counting is that surgical instruments are expensive. Accounting for each instrument before and after the procedure increases the likelihood of all instruments being returned for processing and sterilization.

When do you perform counts?

Count sponges, sharps, and instruments for *all* procedures. As a minimum, perform an *initial* count to serve as a baseline, even for so-called "minor" procedures. Every surgical procedure involves risk and has the potential to escalate or to require emergency performance of an invasive procedure. The intestines may be accidentally perforated during a colonoscopy; airway obstruction may require a tracheostomy; or an artery may be punctured during endoscopy. Conducting an initial count provides security for the patient and eases the transition from a routine to an emergency. An additional benefit of the initial count is that it helps the scrub tech and circulator verify that some of the essential items and instruments are opened and available.

Count and add to the total all sponges, sharps, or instruments opened *after* the initial count. An emergency, such as the one mentioned previously, can occur at any time during a procedure. Add the number and type of counted items opened after initial counts to the baseline to ensure all sharps, instruments, and sponges can be accounted for if the unexpected happens.

After this initial count, counts are performed at various phases of the procedure, or they are performed due to certain incidents. Here is a synopsis of when counts are routinely performed:

When to Count Sponges and Sharps	When to Count Instruments
• Initially to serve as baseline. Add any opened after initial count. • Before closure of any large or deep incision, or body cavity. • After closure of any body cavity. • Immediately before completion of the surgical procedure. • When scrub or circulating personnel are relieved during a procedure. • Anytime there is a question of a lost counted item.	• Initially to serve as baseline. Add any opened after initial count. • Before closing any incision or cavity that might contain an instrument. • At the completion of the surgical procedure. • When scrub or circulating personnel are relieved during a procedure. • Anytime there is a question of a lost counted item.

As you can see from this synopsis, for many procedures you perform a complete count only two or three times. If the procedure involves only superficial areas, such as a muscle or tissue biopsy, you count before the procedure and as the procedure is completed. If the procedure involves entering the abdominal cavity, you usually perform three complete counts: before the start, while the surgeon is closing the cavity, and as the skin is being closed. However, some procedures and incidents that arise during procedures require you to perform "extra" counts.

A cesarean section is a good example of a procedure requiring "extra" counts. The circulator and scrub tech perform the *first* (initial) *complete* count before the procedure starts. Any items opened after the initial count are counted and added to the total. After the baby is delivered, just before the surgeon closes the uterus, a *second* count of *sponges and sharps* is performed (a complete count if the uterus can contain an instrument). The *third* count should again be a *complete* count, performed after the uterus is closed but before the surgeon closes the peritoneum (instruments are counted because the abdomen can contain an instrument). The *fourth* count consists of counting *sponges and sharps* immediately before the skin incision is closed. This is often considered the final count, but *instruments* should be counted at completion of the procedure (but before the dressing is applied) to ensure none have been lost.

Incidents also dictate "extra" counts. Count all sponges, sharps, and instruments when scrub or circulating personnel are *relieved during the procedure*. This reduces confusion and likelihood of misplaced items because the new team members know what items they have and where they are; the relieved members know all is accounted for before they leave the room. This is a very important guideline to follow. Many instances of items left in a patient have occurred in procedures where the scrub, circulator, or both team members were relieved by others. When you insist on counting before you relieve, or are relieved by another technician, you are *not* demonstrating mistrust of his or her ability. You are demonstrating personal responsibility to yourself and your patient.

If *written* local policy allows, counts other than the baseline count may be deleted if the risk of leaving counted items in the wound does not exist. To avoid incorrect counts on "to-follow" procedures, ensure all counted items are accounted for and removed from the room at the end of the procedure. For example, if written policy allows, only the initial count may be performed when a myringotomy with insertion of drainage tubes is performed. If a vasectomy is performed, sponges and sharps may be counted initially and before the incision is closed; instruments may be counted only initially. In either case, the team must ensure all instruments, sharps, and sponges are accounted for and removed from the room after the procedure.

The scrub should also keep track of, and maintain an informal "running count" or tally of all counted items on the sterile field. In other words, a good scrub technician knows exactly how many, what type, and where all counted items are at all times. Take a count *anytime there is a question of a lost sponge, sharp, or instrument*.

How do you perform counts and handle counted items?

Local policies and procedures establish the exact rules you follow to perform counts in your surgical suite. Most policies include the following minimum guidelines:

- Count aloud.
- Document all counts.
- Specialized counting procedures.

Count aloud

Sponges, sharps, and instruments are counted *ALOUD,* simultaneously by the scrub and circulator. A registered nurse usually performs this task with the scrub. In an emergency, another licensed practitioner, such as the surgeon or anesthesia provider, may perform the count with the scrub to satisfy medical or legal requirements.

Both the scrub and the circulator should be able to see each item counted, particularly during initial and final counts. Each sponge, sharp item, and instrument is counted individually. All needles in multiple suture packs are counted separately, and individual “free” suture needles are counted separately from swaged-on needles.

NEVER take counted items from the operating room during the procedure. The only exception is for those instruments that are dropped or contaminated and must be “flash” sterilized; they are returned to the room after sterilization.

NOTE: If counted sponges are intentionally used as packing in a patient leaving the OR, the number and type of sponges should be documented by the circulator.

If a counted item is cut or broken, or if multipart instruments are assembled or disassembled on the field, account for all pieces.

If any count is initially incorrect, immediately perform a re-count. If the re-count is correct, count again. It takes two consecutive correct counts before an “incorrect” count can be considered corrected.

Document all counts

In most Air Force hospitals, the circulating nurse documents all counts on the SF 516, Medical Record—Operation Report (if used); AF Form 1864, Perioperative Nursing Record; and locally approved instrument count records. An AF Form 765, Medical Treatment Facility Incident Statement, is used if any count is incorrect. The nurse also documents the circumstances and corrective measures on this form.

Specialized counting procedures

In addition to the general guidelines, surgical technicians and nurses usually follow specific procedures, developed and tested over time, to ensure their counts are as accurate as possible. You may want to, or be required to, make these procedures part of your daily process.

Keep types and sizes of sponges used on a surgical procedure to a minimum. The fewer types of sponges you use, the easier it is to count them. Used 4 x 4 raytex can be difficult to distinguish from used 4 x 8 raytex. Also, ensure all sponges used during the surgical procedure are x-ray detectable. However, *never* use x-ray detectable sponges for the skin prep or for dressing sponges.

Start by counting the sponges, beginning with small sponges such as 4 x 4s or 4 x 8s, and working up to the larger ones (lap sponges). Do *not* remove the tie or band securing each sponge bundle until you are ready to count it. Then, *completely separate* each sponge from the bundle (usually by grasping the folded edge) as you count aloud with the circulator. Count other sponge-like items, such as kittners and cottonoids, next. You also need to separate these small “sponges” when counting, but do not remove them from the pin, holder, or package insert because you can easily misplace them.

During the initial count, ensure each raytex sponge has an x-ray detectable marker, and each lap sponge has a loop. If one sponge (or more) in a package or bundle is missing the marker or loop, pass the entire bundle off the sterile field. The circulator should immediately remove them from the OR.

The number of sponges in the bundle must match the standard bundle number (10 raytex or 5 laps). If the initial count is more or less than the standard number, re-count the bundle. If the re-count also results in a nonstandard number, the entire bundle is passed off the field and removed from the room. If the re-count results in a correct number, two consecutive counts must be correct before it is safe to use the bundle.

After all the sponges are counted, count the sharps. Like sponges, these items are counted individually by type or group (needles, blades, etc.). Start with swaged-on suture needles, sometimes called atraumatic needles, and then count the “free” needles. Free needles are always counted separately from swaged-on needles. To count needles in multiple suture packages, tear open the pack

and count the individual needles; do not rely on the manufacturer's label. (The suture manufacturer is not going to be listed on the records as performing the count—your name is!) Count the knife blades next, then the electrosurgery tips. Count the specialty sharps, such as dermatome blades, last.

Instruments are normally counted using the count sheet (fig. 1–2) discussed previously as a checklist. When counting instruments, proceed in the order in which they are listed on the sheet. Ensure both the scrub and circulator can see each instrument, and count each instrument aloud, citing the type and number. If an instrument has several individual parts, such as found in self-retaining retractors, each part is identified and counted (one retractor frame, one moveable arm, one handle, four wire blades, two bladder blades, one wingnut). All discrepancies are noted on the count sheet.

Additional procedures for intraoperative counts

As you already know, you perform counts during a surgical procedure to ensure nothing is left inside the patient's body except what the surgeon intends to leave behind. All the previous guidelines and procedures apply, but additional procedures help ensure intraoperative counts are done systematically. They also facilitate close coordination between the scrub and circulator. You were taught some procedures for accomplishing intraoperative counts in technical school. Since this is such a critical part of your job, we reinforce them here to be sure you fully understand and know how and why to do them.

Counts are done during various phases of surgical wound closure (refer back to the "when" section for specifics). A count is routinely started when the surgeon asks for the first "closing" stitch (for each cavity being closed). After you pass this stitch to the surgeon, discard all dirty sponges into the kick buckets near the sterile field.

The circulator then retrieves these sponges using forceps, gloves, or both (never bare hands), and separates the individual sponges. Raytex sponges are often separated, opened, and draped over the sides of the kick bucket. If large numbers of laparotomy sponges are used, they are separated, and *counted by the scrub and circulator*. Then, in multiples of five, they are placed in impervious bags or other sealable containers. The containers are then labeled with the type and total number of sponges they contain.

Sponges that are bagged and labeled in this manner are not individually counted again unless a discrepancy arises in later counts. (The total number of sponges in all bags is added to the total number of individually counted sponges, on and off the sterile field, during subsequent counts.)

Once all items off the field are collected and ready for counting, do not throw anything off the sterile field. The scrub and circulator begin counting the items on the field. Count each item by type, starting with small sponges. Begin at the top of the sterile field (end nearest the patient's head) and include all sponges packed in the wound or being used by the surgeon. Ensure you count any sponges lying on the drapes near the wound. Next, count the sponges on the Mayo tray; then those in basins on the ring stand (do not forget sponge sticks). Count the sponges on the back table last of all on the sterile field. Next, the circulator and scrub count the soiled sponges off the field. This should result in a correct sponge count. Repeat this count sequence for every counted item until all items are accounted for and the results are documented. The circulator notifies the surgeon that the count is correct.

Unfortunately, counted items do occasionally get misplaced. If any count is inaccurate, notify the surgeon immediately. The surgeon may choose to halt wound closure until the item is found, or may continue if he or she is sure that the missing object is not in the wound. Re-count all items. If the second count is accurate, count one more time; remember it takes two consecutive correct counts to negate an incorrect count. If the second count is inaccurate, begin a thorough search of the entire operating room.

When an item is missing, the scrub thoroughly searches the sterile field while the circulator checks the remainder of the operating room. The scrub checks even the most unlikely sterile areas—inside all basins, pans, and suture pack containers, between the layers of the drapes, under and on the Mayo

trays, and attached to instruments. Sponges have been found in some strange places! The circulator checks all unsterile areas—inside kick buckets, under the OR bed, on the floor, and even on the bottom of sterile team members' shoes. If not found, the circulator dons protective attire and opens and searches all trash bags; re-counts bagged sponges (or checks for an attached needle), and checks the linen bag and all linen inside. If all these efforts fail to turn up the lost item, the surgeon usually orders an x-ray of the operative site. The x-ray is usually taken in the room during wound closure. If the item is in the wound, it can then be retrieved before the patient leaves the room. If the surgeon desires and local policy permits, the x-ray may be taken in the recovery room; most surgeons will not do this unless they are certain the item is not in the patient.

Regardless of the outcome, the circulator documents all counts on the operation report and the perioperative nursing record and documents incorrect counts on a hospital incident statement.

You should have a better understanding of surgical counts by now. In the next unit, we review the flurry of activity from the moment the patient is draped until the surgeon makes the incision. Check your knowledge first by completing the self-test questions.

Self-Test Questions

After you complete these questions, you may check your answers at the end of the unit.

603. Setting up equipment and opening sterile supplies

1. What are the two parts of your "operator preventive maintenance" inspection of equipment?

2. How do you test the operation of the OR "spot" lights?

3. Briefly describe what you check when you initially prepare an electrosurgical unit.

4. Who is primarily responsible for cardiac monitors?

5. List the three basic steps to maintain a defibrillator.

6. What type of items is warmed in a solution warming cabinet?

7. What is the best way to warm an item rapidly in a solution warming cabinet?

8. What is the most critical item to check when setting up an insufflator?

9. What are the three basic components of a surgical video system?

10. List three general guidelines for handling surgical microscopes.

11. Who sets up and conducts an operational test of the laser? When should this be done?

12. What is a Doppler?

13. What is the purpose of the sequential pneumatic compression device?

14. The sequential pneumatic compression device is often used on what type of patients?

15. What information needs to be documented on the intraoperative record when the sequential pneumatic compression device is used?

16. When do you open sterile supplies for an operation?

17. What sterile pack is usually opened first? Where is this pack opened?

18. When opening individual items by projecting them onto the sterile field, what rule saves the scrub setup time and makes it easier for the circulator to check that all items have been opened?

19. Where are knife blades opened? Why?

604. Counting sponges, sharps, and instruments

1. List the items that are routinely counted.

2. When are instruments first counted?

3. Describe the radiopaque markers used in surgical sponges.

4. What is the main reason for performing counts?

5. Who is legally responsible for correct counts?

6. True or false? An initial sponge and instrument count should be performed on all procedures; an instrument count is only required when the procedure involves a body cavity big enough to contain an instrument. Explain.

7. Cite the instances or times all sponges and sharps must be counted during a procedure.

8. Why is a complete count taken whenever there is a change of surgical team members during an operation?

9. True or false? When counting instruments, the scrub should count each instrument aloud, and use a skin marker to check off each instrument on the count sheet, as the circulator assists the anesthesia provider with induction. Explain.

10. On what three forms are correct counts documented in most Air Force hospitals?

11. What is the proper procedure for counting swaged-on needles in multiple suture packs?

12. How does the circulator retrieve bloody sponges from a kick bucket?

13. On what area of the sterile field do intraoperative counts begin, and with what items?

14. Describe the actions taken to find an item missing during an intraoperative count.

15. What is done if a counted item is lost and cannot be found during an operation?

Answers to Self-Test Questions

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1. Immediately after you receive your daily duty assignment—usually, before you leave the surgical suite at the end of the previous duty day.
2. On the surgery schedule.
3. Date and day of the operation, time of the operation (usually, just the first case of the day in each operating room), designated operating room number or letter for the procedure, patient identification information (name, hospital register number or Social Security number, age, sex, and military status or rank), patient location or nursing unit designation, operation to be performed (may be abbreviated), primary surgeon and possibly assistants, type of anesthesia, name of anesthesiologist or anesthetist, and units of blood required.
4. Research. This includes studying the anatomy of the operative area, reading about the disease process or injury involved, and reviewing instructions for special equipment or instruments used on the case.
5. Talk to the surgeon who will perform the operation, *before* the time you are supposed to know the information already.
6. Notify your trainer, supervisor, NCOIC, or the OR nurse. You may still have to perform the duty, but they will usually try to provide you with experienced assistance.
7. (1) Get enough sleep.
   (2) Eat properly.
   (3) Avoid "partying" the night before a duty day.
   (4) Maintain personal hygiene.
   (5) Maintain high standards of physical fitness.
8. Tell your supervisor; go to sick-call if necessary.

602

1. You need a list of required items. Each surgical suite maintains files, usually known as preference cards, containing this information.
2. The *surgeon's preference card method* uses an individual card or file for each operation performed by the specific surgeon. The cards or files are stored under the surgeon's name, usually alphabetically by procedure. The *case card system* is similar, but has two main differences. A case card or file is developed for each procedure performed in the facility. Individual surgeon's preferences are listed in separate sections on each card or file. Case cards or files are usually maintained alphabetically by service (surgical specialty).
3. All scrub and circulating personnel should check the preference card before beginning case setup activities.
4. It takes a total team effort to keep the information on the cards accurate and useful. When a surgeon changes a routine, or when a surgeon performs a new procedure, the team assisting with the procedure should note all pertinent information on the card as soon as possible.
5. On the top and most accessible area of the storage shelf or bin.
6. Its expiration date (if applicable), the external chemical sterilization indicator, and the integrity of the packaging.
7. You should tell the circulating nurse it is unavailable *before* the patient arrives in the room.
8. On the transmitted or completed schedule request.
9. Consult locator lists and inventories if available in your facility. One of the best ways is to take time to explore the "nooks and crannies" of your surgical suite. Make a note of the equipment you find, and where it is located.
10. Clean it with a germicidal solution.

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1. Visually inspecting for any obvious signs of damage, and testing the item's operation for signs of internal malfunction.
2. Ensure the intensity adjustment is at the lowest setting, and then turn the lights on. Gradually turn up the intensity to the highest setting, and then check the focus or "spot" to ensure it can adjust to the approximate

area of the surgical site. Slowly turn the intensity back to the lowest setting; then turn off the lights until needed.

3. Plug it onto an electrical outlet and ensure there is power to the unit. Check the ESU supplies, ensuring that the proper patient grounding pad is selected. Always check the expiration date (or applicable) on the pad's package.
4. The anesthesia staff.
5. (1) Keep the power cord plugged into an electrical outlet to maintain a full charge in the battery.
   (2) Inspect and clean all components at least daily. Check for visible signs of damage or missing pieces, and ensure all components are in their proper places.
   (3) Test the unit (per manufacturer instructions and local policy), usually at the beginning of each work shift.
6. Recommended items such as cloth blankets and sheets, bottles of saline and sterile water, and certain medications and intravenous fluids. Never use this cabinet for warming unauthorized items.
7. The best way to ensure items are warm when you need them warm is to plan ahead; keep the warming cabinet fully stocked at all times.
8. The contents of the CO_2 tank.
9. A camera, a camera controller, and a monitor.
10. Any three of the following:
    (1) Do *not* move a microscope unless all sections or components are secured.
    (2) Dust all external surfaces, *except the eyepieces and lenses*, with a germicidal detergent.
    (3) Clean the lens and eyepieces according to manufacturer's instructions.
    (4) When changing lenses, eyepieces, or other lensed components, avoid touching lens surfaces and be very careful not to drop the items. Some components are heavy. Use two hands!
    (5) Know how specific electrical connections affect operations of the microscope.
    (6) Know how specific electrical connections affect operation of the microscope.
11. A staff member fully trained in and authorized to use the laser, often a registered nurse trained as a "laser" nurse. This is done before the patient enters the room.
12. An ultrasonic device used to identify and assess vascular status of peripheral arteries and veins.
13. To reduce the risk of deep vein clotting in the legs.
14. High-risk patients who are undergoing general anesthesia.
15. The type of device, pressure and cycle setting, start time, and time discontinued.
16. Just before the patient is brought into the operating room.
17. The drape pack. On the back table.
18. Open individual items in similar groups on one area of the sterile field. For instance, open all sutures at the same time and project them into a sterile bowl or onto the Mayo tray.
19. Open knife blades and other sharps by handing them to the scrub technician after he or she is scrubbed in. If local policy allows you to open them on the field, ensure they are opened in a separate, very conspicuous location to prevent accidental injury to sterile personnel. Open them into a basin or bowl if possible; *never* cover open sharps with other supplies.

604

1. Sponges, instruments, individual parts of multi-part instruments, sharp items (needles, blades, Bovie tips), and any item that could be easily lost, such as a vessel loop or umbilical tape.
2. When sets are assembled.
3. The 4 x 4s and 4 x 8s, commonly called raytex, should have a visible string-type radiopaque marker in each sponge. Laparotomy sponges usually have a radiopaque loop and/or a sewn-in radiopaque marker.
4. The main and most important reason is to prevent us from accidentally leaving an item inside the patient's body.
5. Legal responsibility is shared by the nurse and the technician.

6. False. Sponges, sharps, and instruments should be counted on all procedures. As a *minimum,* an initial count should be performed to serve as a baseline, even for so-called "minor" procedures. Every surgical procedure involves risk and has the potential to escalate, or to require emergency performance of an invasive procedure.
7. (1) I*nitially* to serve as baseline. Add any opened *after* initial count.
   (2) *Before* closure of any large or deep incision, or body cavity.
   (3) *After* closure of any body cavity.
   (4) Immediately *before* completion of the surgical procedure.
   (5) When scrub or circulating personnel are relieved during the procedure.
   (6) Anytime there is a question of a lost counted item.
8. This reduces confusion and likelihood of misplaced items because the new team members know what items they have and where they are; the relieved members know all is accounted for before they leave the room.
9. False. Sponges, sharps, and instruments are counted *ALOUD*, simultaneously by the scrub and circulator. Both the scrub and the circulator should be able to see each item counted, particularly during initial and final counts. (Also, you should be quiet during induction of anesthesia.).
10. SF 516 (if used), AF Form 1864, and the locally approved instrument count record.
11. Tear open the pack and count the individual needles.
12. Using forceps, gloves, or both (never bare hands).
13. Count each item by type, starting with small sponges. Begin at the top of the sterile field (end nearest the patient's head).
14. The surgeon may choose to halt wound closure until the item is found, or may continue if he or she is sure that the missing object is not in the wound. Re-count all items. If the second count is accurate, count one more time; remember, it takes two consecutive correct counts to negate an incorrect count. If the item is not found, the scrub thoroughly searches the sterile field while the circulator checks the rest of the operating room. The scrub checks even the most unlikely sterile areas, inside all basins and suture pack containers, between the layers of the drapes, under the Mayo trays, instruments, pans, and basins. The circulator checks all unsterile areas, all kick buckets, under the OR bed, the floor, and even the bottom of sterile team member's shoes. If not found, the circulator (dons protective attire and) opens and searches all trash bags, re-counts bagged sponges (or checks for an attached needle), and checks the linen bag and all linen inside.
15. The surgeon usually orders an x-ray of the operative site. The x-ray is usually taken in the room during wound closure. If the item is in the wound, it can then be retrieved before the patient leaves the room. If the surgeon desires and local policy permits, the x-ray may be taken in the recovery room; but most surgeons will not do this unless they are certain the item is not in the patient.

Do the unit review exercises before going to the next unit.

Unit Review Exercises

Note to Student: Consider all choices carefully, select the *best* answer to each question, and *circle* the corresponding letter. When you have completed all unit review exercises, transfer your answers to Field Scoring Answer Sheet.

Do not return your answer sheet to the Air Force Career Development Academy (AFCDA).

1. (601) You should begin to prepare mentally for a specific surgical procedure
   a. the day before the procedure.
   b. just before the patient is sent for.
   c. as soon as you know you are assigned to the procedure.
   d. after the NCOIC (or designee) makes out the daily assignments.

2. (601) Which of the following *is not* an entry that you normally find on the surgery schedule?
   a. Operation start time.
   b. Name of the circulating nurse.
   c. Inpatient nursing unit number.
   d. Name of the operating surgeon.

3. (601) Personal physical preparation for scrubbing and circulating in the operating room usually includes all of the following *except*
   a. getting a good night's sleep.
   b. wearing surgical attire properly.
   c. maintaining high standards of personal hygiene.
   d. avoiding food consumption before starting work.

4. (602) Which of the following *most* accurately describes preference cards?
   a. The surgeon's preference card method uses an individual card or file for each operation performed by the specific surgeon. The case card system uses an individual card or file for each procedure performed in the facility.
   b. The surgeon's preference card method uses an individual card or file for each procedure performed in the facility. The case card system uses an individual card or file for each operation performed by the specific surgeon.
   c. Both the surgeon's preference card method and the case card system use an individual card or file for each procedure performed in the facility.
   d. Both the surgeon's preference card method and the case card system use an individual card or file for each operation performed by the specific surgeon.

5. (602) Which information is *not* typically found on the preference card?
   a. Skin prep.
   b. Patient name.
   c. Surgical dressings.
   d. Sterile and nonsterile supplies.

6. (602) When a piece of equipment used on a particular surgical procedure is stored outside of the operating room, you will wipe it down with a germicidal detergent
   a. only if it is covered with a visible layer of dust.
   b. after it is brought into the room and prepared for use.
   c. before it is brought into the room for use on a procedure.
   d. in the afternoon on the day before the scheduled surgical procedure.

7. (603) When should a defibrillator be inspected, cleaned, and tested?
   a. Immediately before use in a cardiac arrest.
   b. Before bringing it into an operating room.
   c. At least daily, usually at the start of each shift.
   d. Weekly, usually on the first duty day.

8. (603) When you test the operation of the operating room lights, set the intensity adjustment to the
   a. lowest setting, then turn the lights on. Check the "spot," to ensure it adjusts, then rapidly turn the intensity to the highest setting. Turn off the lights, then slowly turn the intensity back to the lowest setting.
   b. lowest setting, then turn the lights on. Gradually turn the intensity to the highest setting, then check the "spot," to ensure it adjusts. Slowly turn the intensity back to the lowest setting, then turn off the lights.
   c. highest setting, then turn the lights on. Check the "spot," to ensure it adjusts, then rapidly turn the intensity to the lowest setting. Turn off the lights, then slowly turn the intensity back to the highest setting.
   d. highest setting, then turn the lights on. Gradually turn the intensity to the lowest setting, then check the "spot," to ensure it adjusts. Slowly turn the intensity back to the highest setting, then turn off the lights.

9. (603) Which piece of video apparatus usually connects directly to the endoscope?
   a. Camera.
   b. Monitor.
   c. Light source.
   d. White balance control.

10. (604) Which of the following *best* describes the count procedure for a Cesarean section?
   a. The first count is done before the procedure starts. Just before the surgeon closes the peritoneum, a second count should be performed. The third should be immediately before the skin incision is closed.
   b. The first count is done before the procedure starts. Just after the surgeon closes the uterus, a second count should be performed. The third should be after the peritoneum is closed. The fourth count is immediately after the skin incision is closed.
   c. The first count is done before the procedure starts. Just before the surgeon closes the uterus, a second count should be performed. The third should be after the uterus is closed but before the peritoneum is closed. The fourth count is immediately before the skin incision is closed.
   d. The first count is done before the procedure starts. Just after the surgeon closes the uterus, a second count should be performed. The third should be after the peritoneum is closed. The fourth count is immediately before the skin incision is closed. The fifth count is after the skin is closed and the dressing is applied.

11. (604) In which situation is a count *not* required?
   a. Immediately after the initial skin incision is made.
   b. Before the stomach is closed during a gastric resection operation.
   c. When the scrub and circulator are relieved for lunch during a procedure.
   d. Anytime an additional counted item is opened on the sterile field during surgery.

12. (604) What does the circulator do if a sponge pack is found to have an incorrect number of sponges during a count?
    a. Asks the scrub to place them on the prep set so that they can be used for cleansing the skin.
    b. Tells the scrub to set the pack of sponges to one side of the back table away from the other counted sponges.
    c. Documents the actual number of sponges counted on the operation report and the perioperative nursing record.
    d. Recounts with the scrub. If still incorrect, removes the entire pack of sponges from the operating room after they are passed off the sterile field.

Please read the unit menu for unit 2 and continue ➔

Unit 2. Surgical Positioning

ONE OF THE MOST IMPORTANT ASPECTS of perioperative patient care is proper positioning of surgical patients. Safe and effective positioning of surgical patients is essential; it must provide the surgeon adequate exposure of the operative site and allow anesthesia personnel to properly monitor and maintain patients' vital functions. Also, by positioning patients properly and ensuring they are well protected and as comfortable as possible, you can contribute immeasurably to their postoperative comfort and recovery.

As a circulating technician, you assist other members of the surgical team with positioning surgical patients. Consequently, you share the responsibility for protecting the patients from any adverse effects caused by positioning. To position and protect your patients effectively, you must be thoroughly familiar with positioning principles, techniques, and related safety guidelines. You also need to know how to set up and operate the surgical bed (operating bed), and all the different bed attachments and devices commonly used to position surgical patients.

In this unit, we discuss what you have to know to help the surgeon, anesthetist, and circulating nurse safely position patients for an operation. We start by looking at the factors that determine the best position for a particular procedure and the basic principles of positioning. Next, we review some features, functions, and uses of the operating room (OR) bed, including attachments and some of the more commonly used positioning devices. In the third section of this unit, we cover some considerations and specific safety guidelines that apply to positioning surgical patients, both before and after anesthesia induction. The last section reviews some basic patient positions and adds more complex ones to increase your understanding of the purposes, characteristics, and safety considerations that apply to specific surgical positions.

2–1. Positioning Considerations

Safe positioning of a patient requires a total team effort. It is essential for all members of the surgical team, including surgical technicians, to understand fully the critical factors involved. These factors apply to all positioning techniques and are applied to determine the specific position used on an individual patient for a particular procedure.

605. Factors involved in surgical positioning

The ultimate choice of position is made by the operating surgeon, usually after consulting with the patient, anesthesia personnel, and the circulating nurse. The surgeon considers many factors when choosing the best position for a particular procedure, including the type of surgery, type of anesthetic, the patient's overall condition, and the surgeon's own preferences.

Type of surgery

The site of the operation is the surgeon's primary concern when selecting a surgical position. Obviously, the patient's position should allow the surgeon easy access to and good exposure of the operative site. For example, if the surgeon plans to perform an exploratory laparotomy, the surgeon will probably want the patient positioned on his or her back (supine). On the other hand, for surgery of the lower back, the surgeon needs the patient positioned face down (prone). If the patient is undergoing orthopedic surgery for an injured extremity, he or she is positioned so that limbs may be manipulated or mechanical traction applied. Some types of surgery require tilting the bed laterally, head-down or head-up. Other types dictate flexing the patient's body to provide the surgeon adequate exposure of the operative site.

An accessible operative site enables the surgeon to work with greater speed, accuracy, efficiency, and safety. The surgeon must be able to see what he or she is doing at all times, so the position must allow the surgical lights to be focused on the operative field. The patient's position should also enable the surgeon and other members of the sterile team to work in the operative area with minimal bending or strain, since unnatural positions can rapidly cause fatigue. For most procedures, the surgeon wants the patient firmly secured or restrained to prevent movement during the operation. This is particularly critical during microsurgery, where one small slip could result in permanent damage or even death.

Since the type of surgery generally dictates the position, you can probably figure out the basic position to place the patient in by simply looking at the surgery schedule. However, you must remember that all patients are individuals and have different physiological abilities. Also, surgeons differ in the approaches and methods they use to perform the same basic procedures. Before positioning any patient, consult the surgeon's preference card, then talk to the surgeon and the other members of the surgical team to be sure you know all the special positioning requirements for the individual patient and procedure.

Type of anesthetic

The *first position* patients assume when they move from a transport gurney to the OR bed often depends on the type of anesthesia they will be administered. In many cases, patients are anesthetized before they are placed in the operative position. This is particularly true if the operation requires a complicated, potentially uncomfortable position or if moving the patient will cause a great deal of pain. Sometimes, the position used for anesthesia administration is radically different from the position used for the surgery; in other cases, only minor body realignment may be necessary after the patient is anesthetized. For instance, a patient scheduled for lower back surgery under general anesthesia is usually induced and intubated in the supine position on the transport gurney. After induction, the patient is rolled over to the OR bed and positioned in the prone or other operative position. By administering the anesthetic in the supine position, anesthesia personnel can better monitor and control the patient's vital functions, particularly respiration, during the critical induction period. The supine position also allows the anesthetist to verify endotracheal tube placement and secure the tube before rolling the patient into a position with minimal airway access.

On the other hand, if the patient is scheduled for surgery of an arm under intravenous regional (Bier) block, the patient will be in the supine position with the operative arm outstretched during administration of the anesthetic. After administration, the only change in position required for the operation is final placement of the affected arm.

The type of anesthetic also influences the operative position. Obviously, the anesthetist must be able to maintain the patient's airway and respiratory system. A patient in the prone position must have supporting pads placed under the chest and abdomen to allow the chest to expand. An extreme lithotomy position may provide excellent exposure for a hemorrhoidectomy, but if the thighs put too much pressure on the abdomen, the diaphragm muscle cannot move to allow the lungs to expand. If the lungs do not expand, the patient cannot breathe.

Regional or local anesthetics also influence the operative position. Because the patient is awake, more attention must be paid to immediate comfort. The surgeon's preference card may call for a standard supine position for a bunionectomy. If the patient is awake for the procedure, the anesthetist may contour the bed by bending the knees and flexing the seat (lawn-chair position) to provide added patient comfort. Then, the entire bed is tilted slightly head-down to return the operative site to a level position.

Surgical positioning must not interfere with administration of anesthesia and, more importantly, must not impair the patient's vital functions (such as breathing). For this reason, never move or position the patient without first obtaining the anesthesia provider's permission. In most situations, anesthesia personnel supervise positioning activities. They control and supervise the patient's movements to the OR bed before induction, contacts during induction, manipulation during surgery, and transfer from the OR bed to the recovery bed after the procedure.

It is ultimately the anesthesia provider's responsibility to ensure that the final position of the patient allows for unrestricted breathing, adequate circulation, and administration of intravenous fluids. The position also should not stress or strain muscles or joints, and should be as close to a "natural" position as possible to reduce patient discomfort, both intraoperatively and postoperatively.

Patient's condition

Each patient is an individual with different physical and physiological characteristics and limitations. These differences must be assessed and documented so all team members are aware of any special patient needs that must be met during the perioperative period. Individual variations between patients can dramatically alter "standard" positioning routines. Factors such as the patient's height, weight, age, cardiorespiratory status, and pre-existing diseases, are evaluated during preoperative interviews. This information is used to help determine special positioning requirements in advance of the patient's surgery. It also enables the team to assemble all the necessary special supplies and positioning devices preoperatively and have them available in the operating room. For example, if the preoperative assessment indicates the patient is extremely obese, additional people may be required to move and position the patient safely. If the patient is an infant, special positioning devices, OR bed attachments, and restraining devices replace those normally used on adult patients. Extremely tall patients require the use of extensions and extra padding on the OR bed.

In any event, the most important thing to remember is that every patient is different and deserves the best individualized care you can give. Since improper positioning can result in permanent injury, it is vital that all surgical team members be aware of any special patient needs so they can alter standard routines accordingly. You can find special patient needs documented on the perioperative nursing record or in the patient's chart; but, usually, all you have to do is ask the nurse, anesthesia provider, or surgeon.

Surgeon's preference

The last, but definitely not the least, factor determining the surgical position is the surgeon's preference. If the surgeon is performing a laminectomy, the anesthetist can administer the anesthetic on the transport gurney. Meanwhile, the circulator can gather all the supplies, equipment, padding, and people needed, and can ensure everyone knows the patient has had a left total hip replacement and must be careful when rolling the patient into the *prone* position. If the surgeon performs all laminectomies with the patient in a *lateral* position, the team has wasted its time. Since the surgeon chooses the approach used to perform the operation, circulators and anesthesia personnel should

always check with the surgeon to ascertain all preferences before any positioning preparations are started.

After determining the surgeon's preference and making modifications in positioning routines based on the type of surgery to be performed; the anesthetic to be given; and the patient's special needs; other minor adjustments are sometimes required to suit the surgeon. The surgeon may also help with positioning activities (before scrubbing) to make minor last-minute adjustments to maximize exposure of the site or to ensure the patient does not move during critical stages of the operation.

Failure to check the surgeon's positioning requirements before proceeding with other preoperative preparations, such as the skin prep, can result in having to reposition and re-prep the patient to meet the surgeon's needs. This prolongs the anesthetic and the procedure time, and it delays the entire surgery schedule. Effective communication among all members of the surgical team is essential to ensure the patient is placed in the proper surgical position.

606. Principles of positioning

Positioning involves moving and securing a patient's body to allow easy access to the operative site while minimizing interference with normal physiological functions. This includes maintaining vital systems and preventing undue stress to joints and other body parts. To accomplish these goals, we apply several positioning principles.

Maintain respiratory function

A primary rule of positioning is that it must not hamper breathing. Free movement of the patient's diaphragm is essential to facilitate anesthesia administration, to allow for adequate ventilation of the lungs, and to prevent hypoxia. The position must not hyperextend, hyperflex, or otherwise constrict the neck and cause airway obstruction. The nose and mouth should not be blocked. Making sure there is no impairment of respiratory function is particularly important when the patient is positioned in a dorsal or prone position. It is more difficult for the chest to expand and the diaphragm to move when the patient is lying on his or her chest. This causes a reduction in the amount of air moving in and out of the lungs, which reduces the amount of oxygen and waste carbon dioxide exchanged in the circulation.

What can you do to ensure the patient's breathing is not compromised? FIRST, NEVER ATTEMPT TO MOVE OR POSITION A PATIENT WITHOUT FIRST ASKING THE PERMISSION OF THE ANESTHESIA PROVIDER. After the patient is induced, anesthesia personnel control the patient's head and any breathing apparatus that is in use. They determine when other members of the surgical team can safely move the patient. When performing as a circulator, avoid crossing the patient's arms across his or her chest. Instead, position the arms on an arm board, or secure them near the patient's side. Ensure you know how to use common positioning devices, especially the chest rolls, bolsters, or special positioning frames used to relieve pressure on the chest when placing a patient in the prone position (more on this later). If you ever suspect something is compromising (or will compromise) the patient's breathing ability, immediately notify the anesthesia provider or surgeon.

Maintain circulatory function

The biggest risk to the circulatory system during positioning comes from blocking off blood flow to peripheral vessels in the extremities. The most frequent cause of obstructed blood flow in these areas is external pressure. Poor circulation caused by external pressure can result in the formation of a blood clot or thrombus in the circulating blood. These clots can become very dangerous if they obstruct a blood vessel, and they may prove fatal if they block coronary, pulmonary, or cerebral arteries. The following guidelines will prevent accidental restriction or obstruction of blood flow during positioning:

- Avoid applying restraints too tightly. For example, you should be able to slide your hand between the "safety belt" and the patient's body.
- Make sure the patient's legs are not crossed to prevent the upper leg pressure from influencing circulation of the lower leg.
- Ensure body surfaces do *not* rub against each other or press against a bony prominence. Rubbing can cause the skin to pinch or may bruise the patient; bony prominences cause pressure and restrict blood flow.
- Never lean on the patient's trunk or extremities, and do not allow equipment or heavy instruments to rest or lie on the patient. Heavy items cause pressure and reduce circulation.
- Thoroughly pad all areas of the patient's body contacting hard surfaces on the OR bed or its attachments. Again, pressure reduces circulation.
- Avoid extending, flexing, adducting, abducting, and twisting joints and extremities beyond their normal range of motion. You can block or constrict blood vessels by pinching them between bones or other hard tissue in the joints.

During positioning, the patient's circulation can also be affected by sudden movement or changes in position. Because of the effects of gravity and anesthetic agents, blood tends to pool in the peripheral veins of the arms, legs, and buttocks. Movement of blood into and out of these areas is greatly increased when the patient's position is changed too quickly. For instance, if the patient is in the lithotomy position (legs elevated in stirrups) and you lower the legs quickly, blood rushes from the trunk of the body to the legs and causes a sudden drop of blood pressure. This potentially dangerous shift in blood pressure can also occur if a patient is placed in a sitting position too rapidly. If you have ever risen quickly after lying down for an extended time, you probably experienced some of the effects of this blood pressure shift; you felt very light-headed or dizzy, and may have even fainted. These effects are intensified in the anesthetized patient.

Because sudden movement of the patient's body can cause negative effects in blood circulation, two rules must be followed during surgical positioning. The first is a repeat: ***NEVER*** attempt to move a patient without the anesthetist's or anesthesiologist's permission. This rule is repeated throughout this section because it is critical. In this case, the anesthesia provider must have time to prepare for any sudden changes in the patient's cardiovascular status caused by positioning activities. The other rule of positioning to reduce circulatory effects is to move patients in a slow and deliberate manner *always*. This allows their bodies time to adapt to the new position and prevent extreme fluctuations in vital functions.

Avoid strain or pressure on muscles and nerves

In addition to interfering with blood circulation, external pressure or stretching can damage muscles and nerves. This can result in a temporary loss of sensory and motor function or, in extreme cases, permanent paralysis.

Nerve damage caused by positioning most often occurs in long, superficial nerves in the extremities and face. The brachial plexus, which transmits nerve impulses to the arm and hand, is often injured by poor positioning. The ulnar, median, and radial nerves in the arms; the femoral, sciatic, peroneal, and tibial nerves in the legs; and the facial nerves in the head are easily traumatized by mechanical pressure or excessive stretching. Damage to nerves is most likely to occur after the patient is anesthetized and muscle tone is reduced. Since anesthetized patients cannot feel pain and discomfort caused by awkward or improper positioning, the extent of the damage is usually not evident until the operation is over and the patient is completely recovered from the effects of the anesthesia. In fact, the extent of nerve damage may be masked for several days postoperatively.

Muscles can also easily be damaged by improper movement and positioning. In a wide-awake, fully alert patient, movement of muscles and joints is usually governed and controlled within the limits of the patient's normal range of motion; pain or pressure prevents abnormal movement. Opposing

muscle groups also limit movement and help prevent strains and sprains. When anesthetized, the patient loses these natural defense mechanisms and is very susceptible to injury. Anesthesia removes sensation of pain and pressure, and it relaxes the muscles.

To reduce chances of muscle or nerve injury when positioning your patients, follow these guidelines:

- Maintain proper alignment and support of the patient's head, neck, and spine. Keep the spine in a straight line with the head and neck. Support the head with a small pillow, folded sheets, or foam positioning device. Allow for a slight curve in the lower back (lumbar region). Lower back pain, pressure, and stretching may be relieved by placing soft padding under the lumbar spine and knees.
- Ensure the patient's arms and legs are adequately supported and placed in a physiological (natural) position. This includes the following actions:
    - When using arm boards, never extend the arms more than 90 degree from the patient's sides. An increase beyond this angle puts unnecessary strain on the shoulder muscles, joints, and adjacent nerves and vessels.
    - Ensure the palms of the hand are up when the arms are outstretched on arm boards, and the palms face toward the body when the arms are tucked at the patient's sides.
    - Slightly flex the lower arms (forearms) at the elbows. Avoid hyperextending them.
    - Ensure the upper arm is not hanging over the side of or pressing against the edge of the OR bed.
    - Position the hands and fingers in a naturally flexed (cupped) or neutral position.
    - Take special care to prevent pressure or crushing injuries caused by pinning the hands and fingers under the patient's body or between hard surfaces such as the edges of the table break.
    - Keep the thighs and lower legs in a straight line, preferably slightly flexed at the knees.
- Ensure all bony prominences are adequately padded. Pay particular attention to padding around the wrists, elbows, armpits, shoulders, shoulder blades, iliac crests, hips, knees, ankles, heels, and back of the head. Use folded linen or foam padding material to support and cushion these areas.
- When moving the extremities of anesthetized patients, stay within the limits of the patient's normal range of motion. Be particularly careful when moving the limbs of elderly patients and patients with arthritis or other musculoskeletal disorders or deformities—their range may be severely limited.
- Protect the patient's head and face from pressure caused by straps, hairpins, or other objects.
- Avoid excessive tightening of safety straps and other restraining devices. Place padding material between restraining devices and the patient's body to prevent pressure damage to underlying tissues. Avoid using wrist restraints that wrap around the wrists whenever possible, and always pad the ankles and feet before applying stirrup straps.

By applying the guidelines just outlined and carefully checking the patient for any signs of excessive pressure or malpositioning, you and other team members should be able to prevent an unnecessary and tragic loss of body function caused by nerve, muscle, or joint damage.

Minimize pressure and friction on the skin

Although most surgical team members are aware of the damage that can be done to muscles, joints, and nerves because of improper positioning, many fail to consider the damage that can occur to the skin. *Decubitus ulcers*, commonly called bed sores, are caused by excessive pressure and compromised circulation to superficial tissues. Elderly patients, diabetics, and other individuals with

chronic diseases affecting the circulatory system are particularly prone to developing these “pressure sores.”

When patients are positioned for surgery, their weight is often unequally distributed. Bony prominences and their surrounding tissues support most of this weight, resulting in great surface pressure over a relatively small area. This pressure compresses blood vessels and reduces blood flow to and from the tissues. This reduced blood flow causes the tissues to become oxygen starved, and the capillaries try to compensate by becoming more permeable so they absorb more fluids. When the pressure is relieved, blood rushes into the tissues, rapidly dilating the vessels. Because the capillaries are so permeable, blood elements seep out of the capillaries into the spaces in the surrounding tissues; this causes swelling and reddening of the area.

After short surgical procedures, these symptoms usually disappear after the patient is moved or the area is massaged. However, after as little as two hours, this interruption of blood flow can result in serious damage to tissue. If the pressure continues, as can easily happen during long surgical procedures, bruising (indicated by bluish-black skin color), tissue necrosis (tissue death), and breaks in the skin may occur. If these pressure-damaged areas go undetected or are not properly diagnosed or treated, they can ulcerate (forming decubitus ulcers) and become infected. Severe decubitus ulcers can involve necrosis of not only skin but also the underlying fat, muscle, and bone.

In addition to pressure injury, skin and superficial tissue damage can also be caused by excessive friction or lateral forces applied parallel to the tissue. This type of tissue damage is called *shearing*. It can be caused by such things as sliding the patient across a mattress pad, sliding gloved hands under a patient’s back, or twisting of a tourniquet or blood pressure cuff on an extremity. The back of the head (occipital area) and buttocks are the two areas most likely to be subjected to shear injuries. These areas are also subjected to pressure in several surgical positions so the potential for tissue damage is increased.

Prevention is the best cure for pressure and shear injuries. After positioning a patient, check all body areas, particularly bony prominences, to ensure padding is adequate. Also, avoid applying tourniquet cuffs and restraining devices over bony prominences. *Never* reposition a fastened tourniquet or blood pressure cuff by sliding it on the skin. If you need to reposition a cuff, *always* unfasten it, and then move it to the proper position. *Never* slide a patient across a sheet or mattress pad; ensure enough people are available to lift the patient properly. Avoid sliding gloved hands under the patient to minimize shear injury. Immediately after the operation is completed, check for signs of pressure injury or “friction burns.” Look for red, swollen areas, bluish-colored bruised areas, and breaks in the skin. As we stated earlier, tissues over bony prominences are the most likely areas where you will find signs of pressure damage. If you find any suspicious looking areas, notify the circulating nurse, anesthetist, or surgeon at once.

Respect the patient’s privacy

Treat each patient, whether wide awake under a local anesthetic or completely unconscious under general anesthesia, with dignity. Limit body exposure to only what is necessary to prepare the operative site and perform the surgery. Restrict traffic in and out of the room to individuals directly involved in the procedure. When the patient is awake, limit conversation to discussion of professional subjects between team members, or direct it to the patient to inform him or her about procedures and alleviate anxieties. Do not stare at the patient’s body during positioning, and do not act overly embarrassed. Doing so makes your patient more self-conscious and raises his or her anxiety level. Be professional!

Make patients as comfortable as possible

Allow conscious patients to position themselves as comfortably as possible while still meeting all safety and operative requirements. Ask them if they feel comfortable, provide warm blankets and sheets to prevent chills, reduce back pain by padding their lower back or by slightly elevating their knees, place a small pillow under their heads, and, above all, communicate with them. By ensuring

your patients are comfortable when they first move to the OR bed, you not only help alleviate some of their apprehensions but also help prevent malpositioning of extremities and excessive pressure on the body. They can tell you what hurts or what is uncomfortable.

Prepare positioning supplies and equipment in advance

It is very important to assemble all required positioning devices and supplies in the operating room before the patient is brought into the room. By doing this, you'll save valuable anesthesia and surgical time, avoid unnecessary traffic in and out of the OR, and reduce noise during anesthesia administration. It is annoying to the anesthetist and dangerous to the patient if the circulator is busy scrambling for positioning supplies and unavailable to assist during anesthesia administration. It is also extremely frustrating for the surgeon to discover that his or her "helpers" have failed to prepare the OR adequately for the scheduled case—definitely not a good way to start a surgical procedure!

To ensure you have everything you need to position the patient, check the surgeon's preference card, case scheduling slip, and OR nurse's comments on the perioperative nursing record. When possible, ask the surgeon and anesthetist if there are any special positioning requirements or conditions that may require additional positioning devices or supplies in the room.

Use good body mechanics

Body mechanics are defined as careful, coordinated, and efficient use of the body to do work. You use your body every day when you sit, walk, lift, and perform numerous other tasks. As a surgical technician, you use your body as a "machine" to lift, pull, push, and otherwise manipulate patients and heavy objects. Unfortunately, many of you will injure yourself because you did not use your body properly. Poor posture and improper use of your body's muscles can result in chronic lower-back pain, severe muscle strain, joint injuries, and even permanent nerve damage. Good body mechanics and effective use of your muscles require you to accept your personal physical limitations, to think before you attempt to move or lift a patient, and to plan your moves in advance. Ask yourself: (1) "Is this the safest, most effective way I can move this patient;" and (2) "Can I lift or move the patient from this position without risk of hurting the patient or myself?" If you answer "no" to either question, find another way. Since surgical technicians are constantly lifting, pulling, pushing, or just standing next to the patients, the subject of good body mechanics deserves special attention, so refer back to Volume 1 for a quick review. Speaking of review, since safely positioning the patient is so critical, answer the following questions to see what you have learned. Review the areas you do not fully understand.

Self-Test Questions

After you complete these questions, you may check your answers at the end of the unit.

605. Factors involved in surgical positioning

1. What is the surgeon's *primary* concern when selecting the best position to use for a certain procedure? Why?

2. What factor often determines the *first* position a patient assumes on the operating bed?

3. What is the first thing you should do when positioning a patient? Why?

4. Why must all surgical team members be aware of any special physiological needs before positioning the patient?

5. What may happen if you fail to ask the surgeon if he or she has any special requirements for positioning a patient before you begin positioning activities?

606. Principles of positioning

1. List actions you and other surgical team members can take to ensure that a patient's breathing or circulation is not impaired.

2. What is the biggest risk to the circulatory system during positioning, and what is the main cause of this risk?

3. Cite four precautions that can be taken to reduce the risk of impairing a patient's circulation during positioning.

4. Why are patients moved into and out of positions very slowly?

5. Name the nerves or nerve groups that are very susceptible to injury during positioning.

6. How can you help prevent muscles in a patient's lower back from becoming painfully strained after positioning?

7. What guidelines do you follow when positioning a patient's hands and arms to avoid nerve, muscle, and joint injuries?

8. What specific precaution do you take when moving the extremities of an anesthetized patient?

9. What causes decubitus ulcers?

10. What is the term used to describe superficial tissue damage caused by excessive friction or lateral forces applied parallel to the skin?

11. What positioning guideline are you following when you restrict traffic in and out of the operating room, and when you avoid unnecessary patient exposure?

12. Why is it important to prepare all positioning supplies and equipment *before* the patient is brought into the operating room?

2–2. Positioning Equipment and Devices

The equipment used in positioning is designed to stabilize the patient in the required position, maximize operative exposure, and ensure the patient's safety throughout an operation. In order for you to effectively assist the other members of the surgical team during positioning activities, you must be familiar with the basic design and function of the operating bed (table) and a wide variety of commonly used positioning devices and accessories.

607. Basic design and function of the operating bed

The design of the general operating bed varies with the manufacturer and continues to change as technology advances. You will probably find that the OR beds in your surgical suite vary from room to room, and they differ from hospital to hospital as well. Most modern, general-operating beds are extremely versatile and can be used on nearly every type of surgical procedure. The best and most versatile OR beds have all but eliminated the need for specialty operating tables. However, you still see specialized OR beds, such as orthopedic fracture tables and cystoscopy tables used in many operating rooms, particularly in larger hospitals or medical centers where an operating room may be specifically designed for the specialized service.

Most modern, general-operating beds have a rectangular top that bends and flexes in many different positions. The top is mounted on a pedestal that raises and lowers, and the pedestal is attached to a heavy, very stable base that locks to the floor. The bed allows the surgical team to place patients in many different surgical positions while safeguarding their body structures and vital functions. In this lesson, we present a brief discussion of the common features found on the majority of general-operating beds. Figures 2–1 and 2–2 show examples of two commonly used OR beds; refer to them as we discuss their features.

Base and floor lock

The base has wheels that allow the bed to be moved with relative ease despite its weight and size. The base also contains a floor lock mechanism that acts as a brake to keep the bed from rolling out of position. The floor lock may be engaged by a foot-operated pedal located at the head of the bed, or it may be controlled by a hand-operated touchpad. The brake usually consists of four short, sturdy, rubber-capped legs. When the lock is engaged, the legs drop into position and act like miniature car jacks, raising the wheels off the floor. When the lock is disengaged, the legs retract allowing the wheels to contact the floor. *Always keep the bed locked to the floor except when intentionally moving it.* The bed is very heavy but builds up momentum when in motion. Getting "mashed" between a wall and a rolling OR bed can hurt someone very badly.

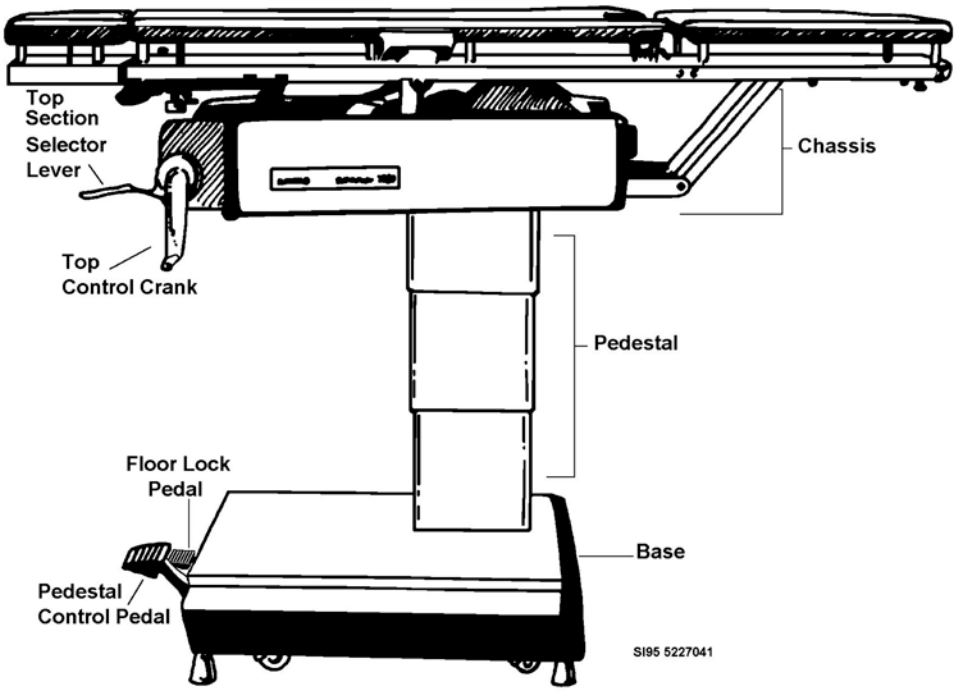

Figure 2–1. Manually controlled operating bed with x-ray penetrable "tunnel."

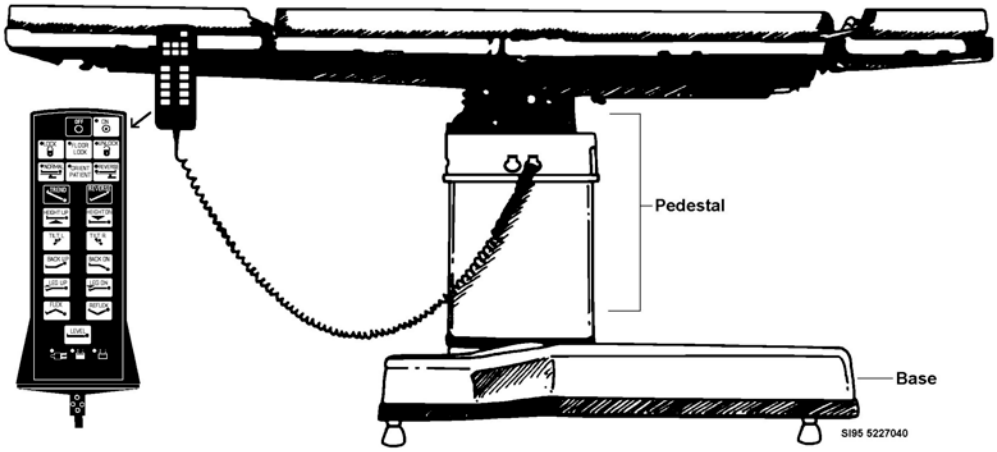

Figure 2–2. Electrically controlled operating bed with hand-held touchpad.

Pedestal

The pedestal of the bed connects the base to the chassis or frame that supports the top of the bed. The pedestal is designed to hydraulically "telescope" up or down, via a foot pedal or electric controls. This allows the operator to regulate bed height from below waist level (below three feet) to above chest level (over five feet). The hydraulic pedestal is extremely strong, so you must use great caution to ensure the patient is not crushed by overhanging objects (such as the Mayo stand). When elevating the bed, avoid raising it to the highest position. The higher center of gravity sometimes can throw off the bed's weight distribution, causing the bed to jam in the fully raised position. This is even more likely if a heavy patient is on the bed and the bed is tilted either foot-up or foot-down.

Chassis and controls

The chassis of the bed, just below the top, usually contains most of the manual or electric controls. Manual controls usually consist of a lever and two cranks. The bed is tilted head-up or head-down

with one of the cranks; the other crank works with a selector lever to control the remainder of the bed. Common selector lever choices are *back*, *side*, *foot*, and *flex.* Some beds have an additional crank or lever that controls the kidney elevator (more on this later).

Electric controls vary. Some use a lever to select the desired function and a "power" foot pedal or switch to operate it. Some beds have a hand-held control panel with individual buttons or switches to control functions. Beds using a hand-held control usually have built-in backup controls somewhere on the bed in case the hand-held fails. Electrically operated beds usually have backup batteries, or are designed to operate on rechargeable batteries (no power cord to trip over). Most beds have emergency manual controls as well.

Bed top and related features

The top of the bed is divided into three or more sections that can be individually manipulated by means of the controls we just discussed. Normally, the section divisions of the bed top correspond to major segments of the human body, with a section for the feet and lower legs, seat or buttocks and thighs, and back (torso). The gaps between the individual sections are where the top bends and are called *breaks.* These breaks allow individual sections to be flexed, straight, up, or down depending on the desired position. Manipulation of the top is commonly called *breaking the table.*

The head section is usually detachable and contains a ratchet or other mechanism to adjust and hold it between 90 to 270 degrees. The head section is not electrically controlled. The head section can usually be removed and replaced by special headrests, or it can be moved to the foot of the bed to act as an extension for some surgical positions.

The seat or upper leg sections on most general OR beds have a perineal cutout and provisions for attaching drainage trays. This feature allows the bed to be used on a variety of urological, gynecological, and rectal surgery procedures. Other design features commonly associated with the top of the bed include x-ray tunnel attachments, a body or kidney elevator, conductive bed pads, and side rails.

Many sections of modern OR bed tops are x-ray penetrable. This feature allows the bed to be used for procedures using fluoroscopy or other radiographic procedures. This feature has greatly reduced the need for specialty beds.

X-ray tunnel attachments

Special x-ray penetrable attachments (fig. 2–3) are available for most OR beds, particularly those without x-ray penetrable sections. These attachments snap onto each section of the bed top, creating a "tunnel" about two inches high that extends the length of the bed. The x-ray tunnel allows an x-ray cassette to be placed under any area of the patient's body.

Body or kidney elevator

The majority of general OR beds have a metal crossbar located in the break between the back and seat or upper leg section that can be raised to help support or elevate a part of the patient's body. This crossbar or body elevator is normally referred to as the *kidney elevator* because it is was originally designed to increase operative exposure when the patient is placed in the lateral kidney position. The body elevator is also sometimes used during gallbladder surgery. The kidney elevator is normally raised by turning a crank (fig. 2–3) or moving a ratcheted control lever—it is *never controlled electrically*. If you are ever asked to raise a kidney rest, the control mechanism should operate smoothly and with minimal resistance. If it is hard to raise, do not force it; the patient may be pinched between the elevator and the bed top. Avoid raising the kidney elevator to the fully elevated position; raising it too high can severely injure a patient. Also, on some older beds, the elevator has a tendency to "jam" when fully raised.

Bed pads

Conductive rubber covered pads, usually between two and three inches thick, are provided to serve as a mattress covering the different sections of the bed top or tunnel attachments. They are not shown in figure 2–3, but are in figures 2–1 and 2–2. Hook and loop (Velcro) fasteners are commonly used to secure the pads firmly to the bed, and snaps are sometimes used to connect the different pad sections together. The pads are usually made of dense foam; some are "gel-pads" that are designed to provide more even support and reduce chances of pressure sores (decubitus ulcers).

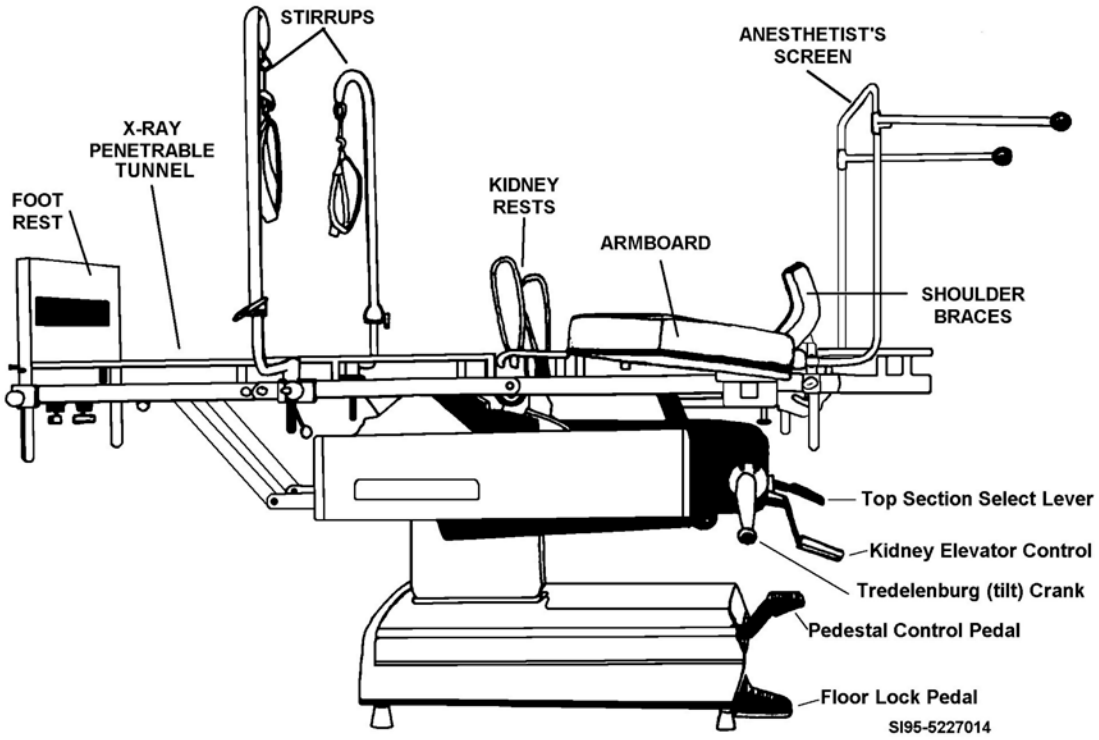

Figure 2–3. Manually controlled OR bed with common attachments and controls.

[NOTE: Attachments are shown for illustration; all are not used at the same time.]

Side rails

Heavy-duty metal rails are bolted to each side of the OR bed top. These rails provide an attaching track for the special clamps used to hold accessory devices in place. The rails also allow for secure attachment of safety restraint straps and a place to hang drainage devices. Small locking levers are normally incorporated at each end of the side rails to prevent the movable clamps from sliding off the rails when the bed is tilted or a section is adjusted. The rails can also have indentations located at regular intervals to facilitate attachment and removal of the clamps.

Because there are so many different OR beds used in the field, it is impractical for this text to discuss all the variations in design and function. You may find that the OR beds in your surgical suite differ from the general description provided here. It is extremely important for you to be thoroughly familiar with the OR beds used in your surgical suite. Read the manufacturers' instruction manuals, and ask for hands-on training. As we repeatedly stress throughout this course, you should never attempt to operate a piece of equipment, no matter how simple it may appear, without proper training. As we also repeat throughout this course, if a patient is on the bed and an emergency occurs, you do not have the time to fumble with unfamiliar controls. Prepare NOW.

608. Operating bed attachments and positioning devices

Most manufacturers of general operating beds offer a variety of common and special attachments for positioning patients. In addition to these attachments, there are numerous devices, pads, and other positioning aids available to help achieve optimum positioning and to ensure patient safety. Most of the attachments we discuss are illustrated in figure 2–3, while others are presented separately.

As a surgical technician, you must be thoroughly familiar with all the bed attachments and positioning devices used in your hospital. It is your job to retrieve, assemble, attach, detach, disassemble, clean, and store these devices. If you do not handle them properly and according to recommended guidelines, you risk damaging the devices—and subsequently your patient!

Common attachments

All attachments used to secure a patient in the desired position must be adequately padded to prevent pressure injuries and/or circulatory or respiratory system compromise. Commonly used padding includes commercially manufactured devices designed for specific applications or readily available materials such as webril, sheets, hand towels, or bath towels. If reusable pads are used, clean and decontaminate them according to the manufacturer's recommendations (usually with a detergent germicide) between uses. Linen used for padding must be laundered, and disposable materials discarded after single patient use.

You will not use every attachment for every procedure. Some attachments are used for nearly all procedures, while some are almost never used. It is important for you to be familiar with the seldom used attachments because they are usually specialized and critical to successful positioning. We start our discussion at the head of the OR bed.

Anesthesia screen

The anesthesia screen serves three purposes: (1) it keeps the drapes off the patient's face, (2) it acts as a barrier (screen) to prevent the awake-patient from viewing the operation, and (3) it separates the sterile field from an unsterile area. The screen is attached to the back or upper body section of the OR bed by special clamps that slide on the side rails. The angle of the anesthesia screen is adjusted by locking wing nuts on the attaching clamps. Some models, like the one pictured in figure 2–3, have bars attached to the main screen frame. The bars allow the surgeon to create a tent-like area around the patient's head with the drapes, or the drapes can be extended laterally (side-to-side) to create a wider and better separation between the sterile and unsterile areas.

Anesthesia screens are used primarily at the preference of the anesthetist or surgeon. They are seldom used during surgery on adults because the drapes are easily clipped to two of the IV poles on either side of the head of the OR bed. However, the anesthesia screen can provide a nearly vertical, 90° screen instead of the sloping screen provided by the IV poles. Many pediatric surgeons like this attachment because it provides a larger sterile field for the surgical team without sacrificing the anesthetist's access to the patient's head.

Shoulder braces

Shoulder braces consist of two curved, parentheses-shaped ")" metal attachments, usually joined by a metal bar, and padded with foam rubber or similar material. The braces are usually attached to the bed, just below the head section, using general-purpose rail clamps. Shoulder braces prevent the patient from sliding towards the head of the bed when the head of the bed is lowered. When you use the braces, leave a slight gap between the patient's shoulders and the surface of the pads to prevent excessive pressure when the bed is not tilted head-down. Also, cover the pads with linen to keep the patient's skin from sticking to the rubber. Shoulder braces are rarely used. You *never* use shoulder braces when either arm is extended on an arm board because this compresses and may injure the nerves in the axilla and shoulder.

Arm boards

Arm boards attach to the operating bed to support the arms away from the patient's body. They are used for the majority of surgical procedures to:

- Provide anesthesia personnel access to the intravenous (IV) site during the surgical procedure. The arms are outstretched and are draped off from the surgical field.
- Prevent the arm from interfering with access to the operative site. For example, if the arms were tucked at the patient's side, they would block in the surgeon's access during a mastectomy procedure.
- Provide a "mini-operating table" for some hand or forearm procedures.
- Facilitate access to nearby drainage devices, indwelling catheters, electrosurgical ground pads, or x-ray cassettes placed in the bed top "tunnel."
- Support the lower or "down" arm when the patient is in a lateral position.
- Add temporary additional width to the OR bed. On rare occasions, arm boards may be attached to the bed parallel to the mattress top to widen the bed to support grossly obese patients. Ensure the arm board manufacturer states the boards will support the extra weight before using them in this manner.

Most arm boards attach to the side rails of the OR bed by "hooking" the top of a slot over the side rail, then pushing the distal end of the boards down until they are level with the bed. Locking levers on the underside of the bed end of the attachments hold the boards in place. A toothed gear and locking bar mechanism allows them to be adjusted in several different positions along a 180° horizontal arc. Pads covered with washable, conductive fabric are attached to the arm boards by hook and pile (Velcro) strips. The arm boards are always covered with a pillowcase or towel to ensure patient comfort and prevent their skin from sticking to the surface of the pad. The arms are secured to the boards with a safety restraining strap.

Kidney and body rests

Like shoulder braces, these rests are also curved metal braces. But, unlike shoulder braces, they are usually made of heavy rod-like material and are separated from each other. Kidney rests have a grooved notch on each side of the base that slides over the OR bed's kidney elevator, then slides medially to firmly support the patient. Body rests are similar to kidney rests except they attach to the bed rails and can be positioned anywhere along the table. Both of these rests are used to stabilize a patient placed in the lateral position, and they come in different lengths so body support can be achieved without compromising operative exposure. Special rubber covered pads should be placed over the curved portion of the rests before they are placed against the patient's body. The pads should be covered with a towel to prevent the patient's skin from sticking to the rubber. Even with padding, you must take care *not* to position the rests too tightly against the body. You probably will not see body rests used very often because modern positioning devices, such as "bean-bags," serve the same purpose with less risk of injury.

Safety belt (restraining belt; body, hip, or leg straps)

Safety belts are wide, sturdy straps, usually made of reinforced conductive rubber, woven nylon, or a combination of the two. The straps attach to the side rails of the OR bed and are usually adjusted by buckles or Velcro fasteners. The belts are always used to restrain or secure a patient's upper legs during anesthesia induction. After induction, they can be moved and used to secure the legs, midsection, or torso when the patient is placed in various surgical positions. (Some positions, such as the lithotomy position, do not require the use of a leg strap after induction.) Location of the restraint during surgery varies depending on the final position of the patient. For example, if the patient is placed in a dorsal position, the strap is usually applied about midway between the thighs and the knees. For a patient in a prone position, the strap may be placed below the knees or across the back of the upper leg.

When applying a safety belt you should follow these directions:

1. Apply the belt firmly, but not so tightly as to interfere with circulation or respiration. When applied properly, you should be able to slide your hand under the strap without difficulty. When using leg straps over the patient's midsection, apply them loosely.
2. Make sure the belt is not placed over bony prominences. Position the strap at least 2 to 3 inches above or below any joint; avoid running it directly over the knees or over the hips. Try to place the strap over an area where there is a large mass of muscle, such as the mid-thighs or calves.
3. Double- and triple-check to ensure the patient's legs *are not crossed* before applying the safety belt.
4. Place linen such as a blanket, sheet, or towel between the patient's skin and the belt to reduce pressure and prevent skin sticking or rubbing against the strap.

Stirrups

Stirrups are used to suspend the legs in a modified frog-leg position during lithotomy positioning. They come in various configurations, but two types are most often used in the operating room. One type is shown attached to the OR bed in figure 2–3. These stirrups consist of upright, hook-end bars with rings or clips to attach straps (slings) designed to support the feet. The other commonly used type, sometimes called genito-urinary (GU) or cysto stirrups, have built-in boot-like supports for the lower legs (calves) and feet. Regardless of the type used, stirrups are attached to each side of the OR bed side rails via special clamps. They are usually positioned evenly with the bed's perineal cutout.

Before placing a patient's feet in sling-type stirrups, pad the feet by wrapping them with a towel or placing them in special foam booties. This helps alleviate pressure on the Achilles' tendons and bottom of the feet—the two areas where the stirrup straps are positioned. When GU or cysto stirrups are used, pad the leg and foot supports to prevent pressure injuries to the popliteal nerve and blood vessels in the back of the knee, and to other areas such as the heels of the feet.

Footrests (footboards or bed extensions)

Footrests are usually rectangular-shaped metal surfaces with extension bars that can be attached to the bed rails. They may be attached to the bottom section of the OR bed as a horizontal extension for tall patients, or attached perpendicular (at a 90 degree angle) to the bed top to support the feet. This helps prevent the patient from slipping towards the foot of the bed when the patient is placed in the reverse Trendelenburg (foot down) position. Footrests are also used to prevent *foot-drop* (excessive plantar flexion) when the patient is placed in a variety of dorsal positions. Some hospitals order extra OR bed head sections to serve as footrests and bed extensions. When used to support the patient, all footboards or extensions must be padded.

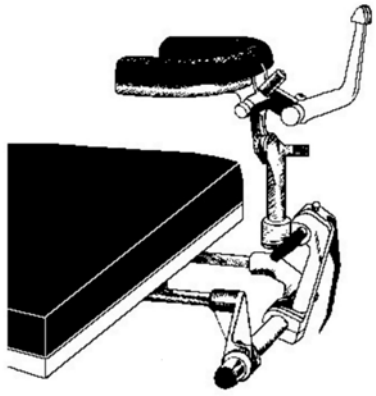

Figure 2–4. Cerebellar headrest.

Special attachments

In addition to the commonly used OR bed attachments we just discussed, there are numerous attachments designed for specific applications. Operating room bed manufacturers are continually developing different attachments to support new surgical procedures, so covering all possible attachments is beyond the scope of this course. However, we do cover many of the more commonly used specialty attachments.

Headrests

Headrests are used primarily when positioning patients for neurosurgical procedures such as craniotomies. The main supporting frame of most headrests is adjustable to many

positions and height, and it attaches to the OR bed by replacing the head section of the bed. Some attach to the bed's side rails using special clamps and support bars. There are many different types and brands, but most fall into three types.

Cerebellar headrests

Cerebellar headrests support the patient's head from the front (i.e., by the face and forehead) when surgery is performed in the prone position. The most common type of cerebellar headrest is illustrated in figure 2–4. It is a well padded, horseshoe-shaped device contoured to frame the face. This design allows the anesthesia provider access to the nose and mouth during posterior cranial, spinal, and thoracic surgery.

Occipital headrests

Occipital headrests (fig. 2–5) support the patient's head from the back when a dorsal or supine position is used for anterior or lateral cranial surgery. They usually consist of two round- or oval-shaped pads attached to a curved bar. The pads and the curved bar pivot or swivel to adapt to the contours of the patient's skull. The pad and bar assemblies are connected to a frame attached to the OR bed as described previously.

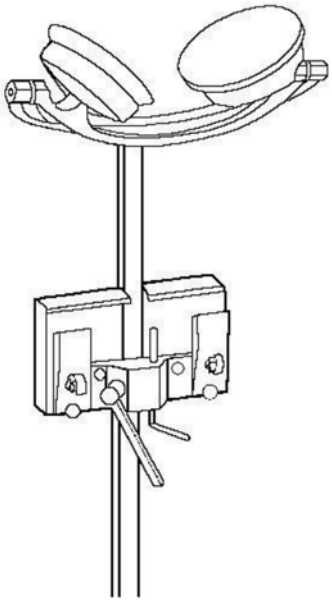

Figure 2–5. Occipital headrest.

Skull clamps, tongs, or rings

There are numerous neurosurgical headrests that use a system of pins (usually three pins) attached to an adjustable clamp, tongs, or a ring to stabilize the head. Three types of these headrests are shown in figure 2–6. These headrests require the insertion of sterile pins (using aseptic technique) into specific points of the skull, then attaching the clamp, tongs, or the ring to the pins. The clamping device is then connected to the main frame attached to the bed. These headrests are often used when the patient is placed in a sitting position, but they are multi-purpose and may be used in any position.

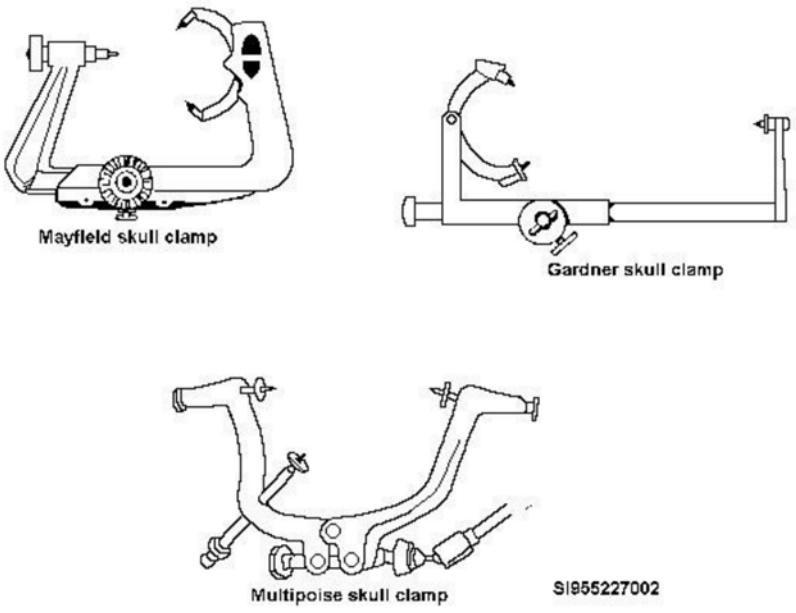

Figure 2–6. Skull clamp headrests.

Thyroid elevator or shoulder bridge

The thyroid elevator is a metal bar designed to be placed between the OR bed top and the OR bed mattress just below the head section of the bed. It is rarely used as most surgeons use rolled sheets, towels, or commercially manufactured padded positioning aids. When it is used, the elevator is raised and locked into place to elevate the shoulders and provide exposure of the anterior neck for thyroid and parathyroid procedures.

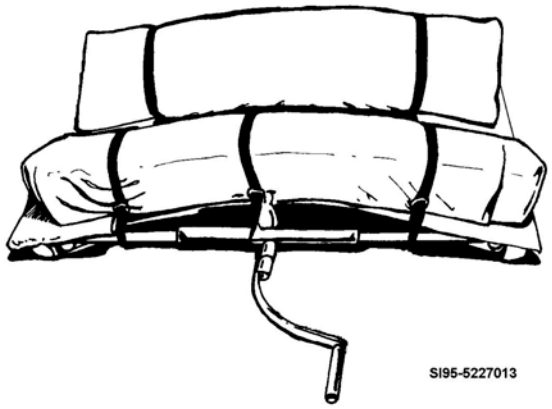

Figure 2–7. Wilson laminectomy frame.

Wilson laminectomy frame

The Wilson laminectomy frame (fig. 2–7) is designed to support the patient's torso and provide adjustable flexion (posterior arching) of the spine when the patient is placed in the prone position for spinal surgery. The frame consists of two pads, approximately six inches wide by three feet long, connected parallel to each other. The frame is placed centered on the torso/back section of the OR bed with the pads parallel to the sides of the bed. The pads support the anterolateral areas (front sides) of the chest, and have a wide gap between them to allow for chest expansion during respiration. A built-in, crank-operated adjusting mechanism raises or lowers the curvature of the frame, increasing or decreasing the arch of the patient's spine. This, in turn, regulates the separation of the vertebrae in the spinal column. The greater the curve of the frame, the more the vertebrae separate. Before the patient is positioned, the Wilson frame must be covered with sheets or towels to prevent the patient's skin from sticking and stretching. One important note—the crank handle of the frame is often detachable and easily lost; ensure you keep it with the frame, especially when storing it after, or retrieving it before, a procedure.

Andrews spinal surgery frame

The Andrews frame attaches to the OR bed on the lower leg section after it is lowered 90 degrees. The patient is positioned in a prone, kneeling position, with the head and upper chest supported by pads on the OR bed. The patient's knees, lower legs, buttocks, and hips are supported by the frame. The Andrews frame is rarely used because of the versatility of modern OR beds and the difficulty of safely positioning the patient while providing the anesthetist access to the airway. When used, it is almost exclusively for spinal fusion operations that require exposure of large numbers of vertebrae.

Elevated arm boards (airplanes)

When a patient is positioned in a lateral position, the upper arm must be supported. Some type of elevated arm board must be attached to the side rails of the OR bed and positioned directly above the standard arm board used to support the lower arm. One commonly used elevated arm board is illustrated in figure 2–8. It clamps to the bed using a clamp similar to the ones used to hold stirrups. The clamp holds an extension bar, adjustable in length and with a ball-and-socket that allows it to rotate. The end of the extension bar also has a ball-and-socket clamp that swivels and locks to hold the arm holder. The actual arm holder is made of rod-like metal, slightly curved, with two joined parallel bars about six inches apart. To support the arm, tubular stockinet is slipped over the frame to serve as a sling for the arm. (If stockinet is not available, an elastic ace bandage may be wrapped around the frame and securely taped in place.) The over-arm holder is clamped to the bed, and then secured in the desired position. The sling gently supports the patient's upper arm and minimizes the risk of pressure injuries.

Another over-arm board is the *double arm board.* This attachment is nothing more than two pieces of material (usually plastic) similar in size and shape to a standard arm board. The boards are attached together "biplane-like" by four to six struts. The struts are either adjustable or hold the boards apart approximately 20 inches. The double arm board does not usually attach to the side rails. Instead, it is positioned and fixed in the desired location by sliding the lower board (which is slightly longer than the upper board) under the bed mattress. Before this special arm board is used, both the upper and lower boards must be adequately padded. This type board provides limited access to the patient's lower arm, and it is more bulky and limited than the metal adjustable over-arm board we previously discussed.

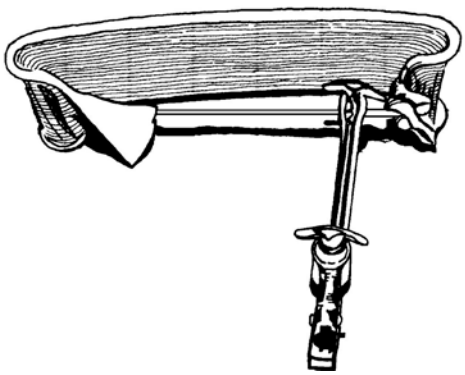

Figure 2–8. Elevated arm board with stockinet "sling

Hand or upper extremity table

When surgery involves the hand or arm, a detachable upper extremity table is often used. This hand table provides a wider and longer surface than a standard armboard. Like the other table accessories, there are many models and types of hand tables. Some are freestanding, some are completely supported by the OR bed, and others are supported on one end by the OR bed and on the other end by a supporting leg. Most hand table tops are made of stainless steel with a removable cutout that can be replaced by an x-ray penetrable insert, or can be used to hold an irrigation pan.

One type of commonly used hand table has an ironing board-shaped stainless steel top. The tapered end of the hand table slides under the mattress of the OR bed, and the other end has an adjustable height, fold-down leg to support it. Another commonly used table has a rectangular-shaped top supported by a frame mounted on wheels. It is freestanding and has a floor locking device similar to the device on the OR bed.

Arthroscopic leg holder

There are many different models of leg holders designed to secure a leg during arthroscopic surgery of the knee. One design is shown in figure 2–9. These leg holders are designed to firmly grip and hold the patient's leg above the knee. They allow the surgeon to manipulate the lower leg (abduct or adduct) to provide exposure to (open) various areas of the knee joint during arthroscopic surgery. Most of these leg holders are extremely sturdy and have very thick pads that completely surround the patient's thigh. The holder is clamped to the OR bed side rails, usually six to eight inches above the patient's knee. The patient's upper leg is then padded and placed in the leg holder, and the lower leg section of the OR bed is lowered. At the surgeon's discretion, the leg holder is tightened to hold the leg securely during the procedure.

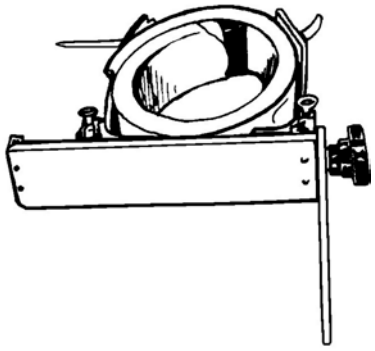

Figure 2–9. Arthroscopic leg holder.

Extremity elevators

Extremity elevators also are used primarily for orthopedic procedures. The elevators fall into two basic categories: those used for short-term support, such as for the skin prep, and those used for relatively long-term support during the procedure.

Short-term elevators may be used to hold the operative leg during the skin prep, if the foot is not being prepped, and during other preparatory procedures such as tourniquet application. These

elevators usually consist of a rigid bar with a pad, stirrup, or splint-type device to support the leg. The elevator attaches to the bed with a clamp that allows it to be adjusted in many positions.

Long-term elevators are usually crane-like devices that support the arm from above using a sling or inflatable gripping device. They usually consist of a vertical post clamped to the bed some distance from the operative site, and a horizontal bar that holds the extremity securing device. These elevators may be used to position and hold the arm during procedures, such as shoulder arthroscopy, and can usually be adjusted in all directions to provide optimal surgical exposure.

Positioning accessories

In addition to the various attachments we have discussed, there are several other aids and supplies commonly used to help stabilize and support the patient during surgery. It is impossible to discuss all of these accessories, so we limit our discussion to those you are most likely to see used in a typical Air Force operating room.

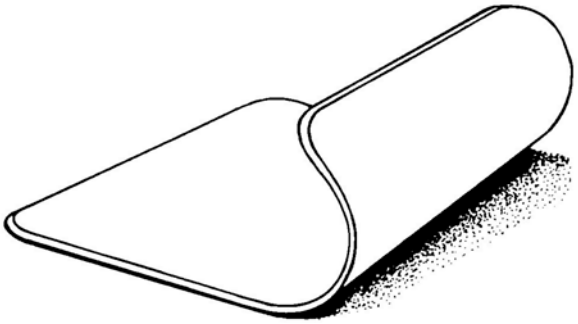

Figure 2–10. "Toboggan" arm guard.

Arm guards

Arm guards may be used when the patient's arm is positioned along the side of the body. They protect the patient's arms from pressure injury. They also prevent accidental occlusion or disruption of IV catheters in the arms caused by sterile team members doing something they are not supposed to do—leaning against the patient during long procedures.

The most commonly used arm guards are wide, curved pieces of aluminum or heavy plastic, with a flat extension that slides under the OR bed mattress (fig. 2–10). They are often called "sleds" or "toboggans" because they resemble the front of a snow toboggan. When arm guards are used, the patient's arms must be adequately padded and separated from the metal by linen such as sheets or towels.

Vacuum positioning devices

These positioning aids come in a variety of shapes and sizes (fig. 2–11). Because they are so versatile and easy to use, vacuum positioning devices have all but eliminated the need to use "old fashioned" sandbags, bolsters, and rolled sheets to stabilize patients during positioning. Vacuum positioning devices are soft rubber- or vinyl-covered "bags" filled with tiny plastic or foam beads, similar to a "bean-bag" chair. The positioning devices are placed under and around the areas of the patient's body requiring support during surgery.

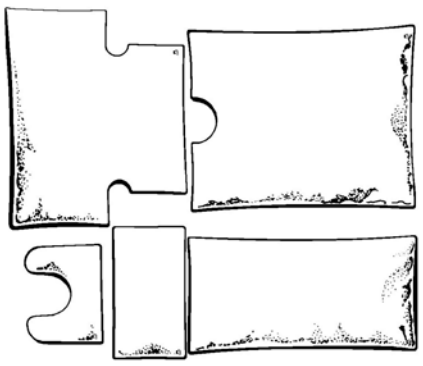

Figure 2–11. Five configurations of vacuum "bead-bag" positioning aids.

To provide support, air must be removed from the positioning aid by connecting suction to a port that resembles the valve on a typical air mattress. As the air inside the bag is withdrawn, air space surrounding the internal beads disappears. The vacuum created compresses the beads, preventing them from moving, and the "bag" becomes firm. During this process, circulating personnel hold the device in position so it actually molds to the patient's body contours. This creates a solid mass that retains its molded shape as long as the device remains air-tight. Once all the air is evacuated, the suction is disconnected and

the port cap is closed. If the patient needs to be repositioned, the valve can be briefly opened until the bag begins to soften. It can then be remolded, as needed, while suction is applied. At the end of the procedure, the valve is left open until the bag fills up with air and returns to its original configuration. Vacuum positioning devices offer extremely stable support while effectively providing even pressure distributed throughout the mass of the patient's body.

Because these devices must remain air-tight to be effective, you must use great care when handling them. Even a pin-hole makes them useless. When cleaning, storing, or removing them from storage, ensure you do not pinch the bag in cabinet doors or scrape them on sharp surfaces. Small holes can usually be patched; large tears or rips cannot. Do not discard a torn device; manufacturers often offer repair or "trade-in" service.

Head positioning aids

The most commonly used head positioning aids are large foam "doughnut" rings, or foam blocks with a concave cutout in the center (fig. 2–12). These are primarily used by the anesthesia provider to maintain head position during the procedure but also are used for some procedures involving the head or neck. Commercially manufactured doughnut-shaped foam headrests come in different diameters and sizes to fit the back (occipital area) of different size heads. Although doughnuts are primarily used to support the back of the head, they also can be used to pad the patient's knees in a prone position, and to pad the heels in a supine position.

If you do not have a commercially manufactured doughnut, you can make one using rolled towels, tape, and webril. Roll the towel(s) lengthwise, using as many as it takes to get the bulk you want. Place the ends together, overlapping to make the desired size, and tape them together to form a ring. Wrap the ring with two– or three–inch webril for additional padding.

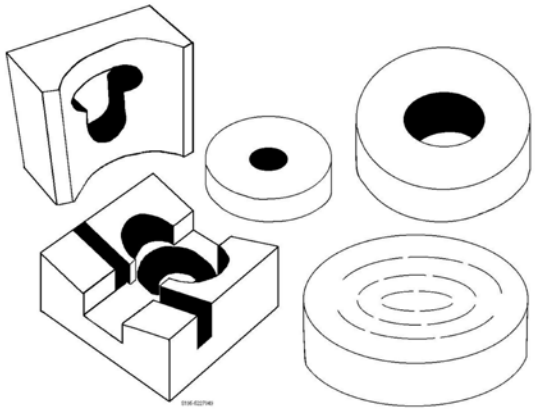

Figure 2–12. Foam head positioning devices.

Most operating rooms use commercially manufactured foam block headrests instead of doughnuts. This headrest is simply a block of three– to six–inch thick foam, about ten–inches square, with a concave "valley" cut out of the top. Some of these headrests have partial cutouts in the base of the valley that can be removed so the block headrest can be used like a doughnut ring. These foam headrests can be used on nearly all sizes of patients, reducing the need to have several different size doughnut headrests on hand. Most foam headrests are disposable. Clean reusable foam headrests between each patient use. To make this chore easier, many operating rooms cover them in plastic to make them waterproof.

Pressure reducing pads

Numerous commercially manufactured devices are available to reduce pressure during positioning.

Foam pads

Open-cell "egg-crate" foam pads (fig. 2–13) are available in widths and lengths varying from full bed pads to small armboard pads. Many ORs stock only the largest size and cut smaller ones as needed. "Egg-crate" foam is widely used because it is relatively inexpensive, disposable, and easily cut or contoured to fit almost any area needing padding. This foam also is used to manufacture specialized pads such as heel protectors, elbow protectors, and knee protectors that fasten with hook-and-pile straps.

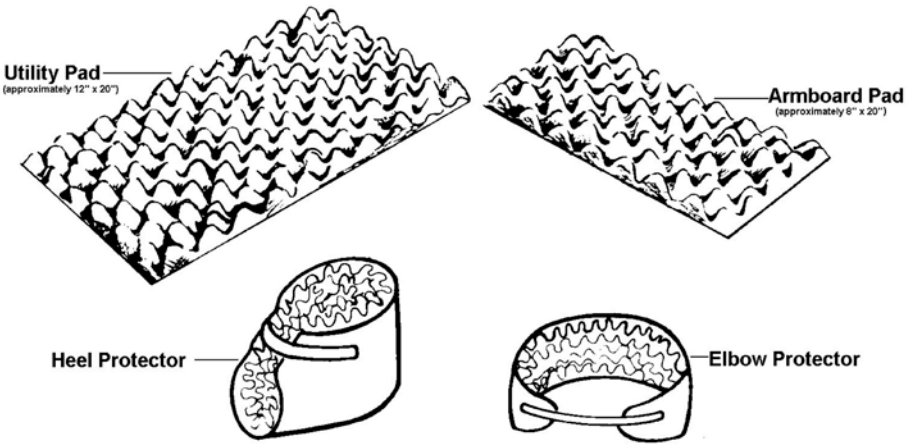

Figure 2–13. "Egg-crate" foam pressure reducing pads.

Gel pads

Gel pads are strong plastic bags filled with a thick, heavy gel. The surface of the pad gives, but the gel maintains equal and even pressure to distribute the weight evenly. Small gel pads are used to pad positioning devices such as leg supports on genito-urinary (GU) stirrups. Some manufacturers make large OR bed gel-filled mattresses. Like the vacuum positioning devices discussed previously, gel pads are expensive but reusable. You must exercise great caution when handling, cleaning, and storing them.

Additional positioning aids

Virtually any soft, pliable item commonly found in an OR can be, and has been, used as a positioning aid. Tape is also commonly used as a positioning aid.

Sandbags

Sandbags of various sizes are covered with conductive rubber and used to immobilize or support body parts. They are most often used to stabilize a patient's head during delicate eye or ear surgery, and to support an arm or leg during orthopedic surgery. The use of sandbags has greatly declined since the development of other positioning devices. When used, cover sandbags with a towel.

Pillows

Different sizes of pillows are used to relieve pressure or to support various areas of the body. You can use a very small pillow to elevate a patient's head slightly. Regular size pillows, like those on nursing unit beds, are commonly used to separate and pad the legs during lateral positioning. Pillows are also used under the lower legs and abdomen when the patient is positioned in various prone positions.

When used in the operating room, cover all pillows with a water-repellent cover so they can be cleaned between each patient use. Apply clean pillowcases after they are disinfected and before they are used again or stored. Special vinyl-covered, low-profile pillows of various shapes and sizes are manufactured by several medical supply companies. These pillows are designed specifically for positioning and can be filled with special foam or plastic beads that mold to fit the patient's body contours.

Surgical linen

Surgical muslin sheets are some of the most versatile positioning aids available in the surgical suite. Sheets can be folded or rolled to support and pad nearly any body part. They are used to cover supporting devices, such as laminectomy frames; they are rolled to make axillary or chest rolls; or they are folded as a small pillow under a patient's head or lower back. As you know, a sheet can be

folded into quarters and used as a draw or lifting sheet to safely transfer patients between the OR bed and gurney. Draw sheets are also commonly used to restrain a patient's arms when they are positioned at the side.

Pillowcases, hand towels, and bath towels are also versatile positioning aids. They are used for numerous positioning purposes. They cover or pad OR bed attachments and different positioning aids. They can be used to make small rolls and supports for extremities, axillae, shoulders, or the neck. Towels or pillowcases are also used to wrap and pad feet and ankles before putting them in stirrups, and can serve as homemade positioning aids, such as "doughnuts." They also can be used in place of sheets for padding and supporting pediatric patients.

Foam supports

Denser foam than the open-cell foam used for padding is used to manufacture foam positioning support products, and they have virtually replaced linens and homemade positioning aids. These supports are cut in a variety of shapes to suit specific purposes; some of the more common configurations are illustrated in figure 2–14. There are foam chest rolls, support wedges, bolsters, and headrests, to name just a few of the available supports. Some of these foam positioning aids are single-use; others are covered with impervious fabric and must be cleaned before storage and use.

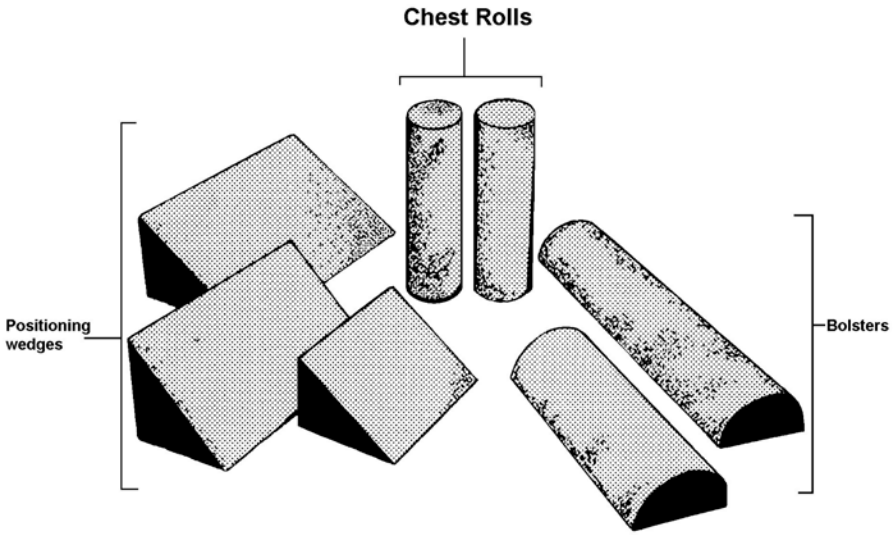

Figure 2–14. Foam positioning aids.

Adhesive tape

Tape, especially cloth adhesive tape, is another commonly used, versatile aid when it comes to surgical positioning. Tape of various lengths and widths is used to secure padding materials, to hold linen rolls and doughnuts together, and to help stabilize or restrain the patient in certain positions. Wide adhesive tape is commonly used to stabilize the patient's hips, legs, and arms in the lateral positions. It is also often used to separate the buttocks during rectal surgery with the patient in the jackknife position.

The positioning devices and aids mentioned previously are the ones you most likely will see and use no matter where you go in the Air Force. Since there is so much variety in the types of devices and aids used for positioning patients and technology and standards are always changing, it is important to remain flexible. Items or devices used in your hospital may be very different from those used to position a patient for the same procedure in another hospital. Your job is to learn what positioning materials you have available in your surgical suite and how you can best use them to meet your surgeons' positioning requirements.

609. Function and features of the orthopedic fracture table

Orthopedic fracture tables are primarily designed for procedures involving the hips and lower extremities. They are designed to provide optimal exposure for surgery while maintaining the patient's anatomical alignment. They provide intraoperative traction to the operative leg, and are "x-ray friendly" because the leg is suspended by the heel (or by a traction bow and Steinmann pin) rather than supported by a table. Fracture tables are used extensively for fluoroscopic procedures such as closed reduction and intramedullary nailing of the femur.

Orthopedic fracture tables are manufactured by many different companies, and each company's table is different. Most fracture tables fall into one of two basic types. The oldest design and most common type is a single-pedestal mounted table, as illustrated in figure 2–15. It has two *leg spars* mounted on the chassis below the table top. The other type of fracture table consists of a large, heavy frame supported by two pedestals. This design also features two leg spars, but they are suspended from the frame's heavy crossbar, above the patient and table-top. (The overhead suspension table is pictured in figures 2–26 and 2–27 later in this unit.) Regardless of the design, most orthopedic fracture tables have the following features.

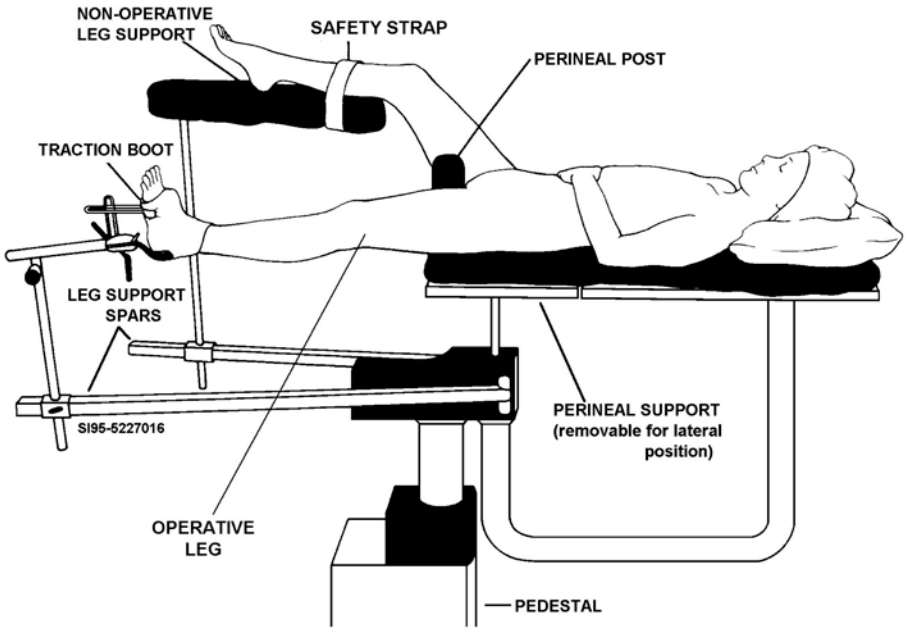

Figure 2–15. Patient positioned on single-pedestal type fracture table.

Hydraulic wheeled base

Whether the base is a two-pedestal or single-pedestal type, it must contain wheels or casters to provide mobility, and a mechanism to lock the bed to the floor. It must also provide a sturdy, balanced support for the table-top and accessories. The base usually contains the pedal or other control to raise and lower the table.

X-ray penetrable top

The components that make up the top of the fracture table are usually made of as much x-ray penetrable material as possible. The upper (body) section of the table is usually a one-piece design. During use, it supports only the head and upper torso of the patient. The seat section of the table may be a one-piece design that raises, lowers, or is removed, or the seat may be a multi-piece design. Multi-piece designs have two or three pieces that can be independently raised, lowered, or removed. The lower section or leg section of the orthopedic table usually is used only to support the patient

during anesthesia administration. It is removed after induction, and the patient's legs are supported by one of the various leg spar attachments.

Leg spars

Leg spars are usually stainless steel. The spars support various types of attachments that are designed to support the patient's legs and provide traction. The spars swivel and can be adjusted up to 180 degrees to abduct or adduct the legs. They also lock securely in place once adjusted. Most leg spars are telescopic; they can be shortened to provide support at the knees, or can be lengthened to apply traction to a seven-foot basketball star.

Traction applying attachments

All fracture tables have attachments designed to apply traction to the legs after they are secured on the leg spars. The two most commonly used types of traction attachments are traction "bows" and traction "boots." Traction bows are used when a Kirschner wire or Steinmann pin is inserted in the operative leg. The bow has two legs that attach to each end of the pin. Traction boots are of various designs, but all hold the patient's foot and ankle securely; they must be very well padded to reduce injury. The traction bow or boot is attached to a device that increases or decreases the traction intraoperatively. When traction devices are used, a *perineal post* attaches to the table. It is extremely well padded, then placed between the patient's legs to provide a firm surface to pull against, or provide *counter-traction.* When a perineal post is used, the external genitalia must be checked and positioned to avoid crushing injury.

Arm and/or leg supports

Orthopedic fracture tables have specially designed arm boards, arm holders, and leg supports. The design of the arm boards varies from resembling a standard OR bed arm board to extend the arm at the side, to boards designed to hold the arm over the patient's chest. Arm holders can suspend the arm from an overhead pole or frame, or may be similar to the sling-type over-arm holder discussed previously. Leg holders are designed to support the non-operative leg. They range from simple padded boards to the sling-type leg "basket" design.

Cassette holders

Most fracture tables have attachments to hold x-ray cassettes in various positions and at various areas of the body. Some orthopedic tables support the x-ray tunnel attachments like those of the standard OR bed.

Many other attachments and features are available on orthopedic fracture tables. It is your responsibility to read the manufacturer's instructions and attend any inservice training offered *before* you attempt to configure a table for a procedure.

Self-Test Questions

After you complete these questions, you may check your answers at the end of the unit.

607. Basic design and function of the operating bed

1. Describe the design of the brake normally used to lock an OR bed to the floor.

2. What part of the OR bed usually contains the manual or electric adjustment controls?

3. What is the phrase used to describe manipulating the different sections of the OR bed?

4. Which section of the OR bed usually has a perineal cutout?

5. What part of the OR bed is designed to be raised manually in order to increase surgical exposure in lateral positions?

6. What is the purpose of the side rails that are attached to the tops of most operating beds?

608. Operating bed attachments and positioning devices

1. Where is the anesthesia screen attached to the OR bed, and what three purposes does it serve?

2. When do you *not* use shoulder braces? Why?

3. Cite four reasons for using arm boards.

4. Where are kidney rests attached to the operating bed, and what are they used for?

5. How do you check a leg-restraining strap to ensure it is not applied too tightly?

6. Generally, where are stirrups clamped to the OR bed side rails?

7. What do you do to the patient's feet before placing them in sling-type stirrups? Why?

8. Briefly describe a cerebellar headrest. What is it used for?

9. What is the purpose of the Wilson laminectomy frame?

10. What has to be done to a sling-type elevated arm board before it can be used to support a patient's upper arm during lateral positioning?

11. What are arthroscopic leg holders designed to do?

12. What positioning aid is used to prevent pressure injury and/or accidental occlusion or disruption of IV catheters in a patient's arms when positioned at the sides?

13. Briefly describe how a vacuum positioning device works.

14. What should you do before using a pillow as a positioning aid?

15. Besides helping to lift and position the patient, for what is a draw sheet used?

609. Function and features of the orthopedic fracture table

1. Orthopedic fracture tables are *primarily* designed for what types of procedures?

2. What is the primary difference between a single-pedestal and a double-pedestal orthopedic fracture table?

3. What features are unique about the seat section of the orthopedic fracture table?

4. What are the two most commonly used types of traction attachments?

2–3. The Positioning Process

Now that you have a basic understanding of positioning principles and are familiar with commonly used positioning devices and aids, we move to how you and other surgical team members can assist during positioning activities. For many operations, positioning of the patient is done before anesthesia administration, but most of the time, final positioning is delayed until after the patient is anesthetized.

In this section, we cover the process of positioning. We begin by reviewing how to safely transfer a patient from a gurney to an OR bed, then how to position a patient safely and comfortably before he or she is anesthetized (initial positioning). Then we discuss basic guidelines for positioning the patient after being anesthetized (final positioning). We also list key safety considerations and provide a checklist you can use to ensure your patients are positioned safely and properly.

610. Surgical positioning before anesthesia administration

Normally, the first step in positioning patients is to safely transfer them from the transport device to the OR bed. We discussed the proper methods for transferring patients from their nursing unit beds to the gurney in the unit on preoperative patient preparation in Volume 3. We apply most of the same rules and safety guidelines in the OR as well.

Patient transfer from gurney to operating bed

When all members of the surgical team are ready, the patient is transferred from the transport gurney (or similar device) to the operating bed. Just as when transferring patients from their unit beds to the transport gurney, *at least* two people must help conscious patients move to the OR bed. Ideally, patients are only lightly sedated and can move themselves to the OR bed. This is safer for the staff and allows patients to assume a position that is most comfortable for them. At least four people are required if the patient is large, unconscious, heavily sedated, or encumbered by medical hardware and devices. If the patient is conscious, the anesthetist and circulating nurse will greet the patient, verify the patient's identity (as discussed in Volume 3), and then bring the patient into the operating room.

Wheel the transport gurney alongside and against the OR bed, and then lock it in place. Transfer IV containers to the OR IV poles, and carefully detach all drainage devices from the gurney and place them where they will not be disrupted during the transfer. Lower the gurney's side rails, release patient safety straps, and then slowly unwrap the "mummy sheet" covering the patient. By unwrapping the sheet slowly, you reduce air currents that might transport microbes around the OR.

> "O.K. Mrs. Miller, we are almost ready for you to move to the OR bed. There is a small gap in between the beds, but don't worry, we'll hold the beds together as you move. The OR bed is narrow, so be careful, and the sheets will probably feel pretty cool. Are you ready to move?"

One staff member stands beside the gurney; another stands on the opposite side of the OR bed. Both secure and stabilize the beds to prevent patients from falling as they move to the OR bed.

> "Now, take your time and, taking the cover sheet with you, slowly move to the OR bed. Remember, the bed is narrow so feel both side rails to make sure you are in the middle. As I said, the sheets feel cool, so I'll get you a warm sheet or blanket as soon as we get you safely situated."

Instruct patients to grasp the top of the cover sheet and move slowly to the OR bed. Ensure you help patients remain covered by the cover sheet. Tell them what they will experience—that there is a slight gap between the gurney and the bed, that the bed is very narrow, and that the sheets are cool. Keeping them informed reduces the startle reflex from what could be an unpleasant surprise.

> "Are you in the middle of the bed? Good. I'm unlocking the gurney and moving it out of the way. I'm also putting a safety strap over your legs; it's not too tight is it? Now, don't move around too much. I'm going to cover you with this warm sheet and take this cool one away, and then I'll get this gurney out of the room."

After patients are on the OR bed, ensure they are centered by asking them to feel the sides of the bed. Unlock and move the gurney out of the way. Ensure IV lines and drainage bags are accessible to the anesthesia provider. Place a clean warm blanket or sheet (from the OR warming cabinet) over the patient, then remove the transport cover sheet. Secure the safety strap over the clean sheet or blanket. Replacing the transport sheet with a clean sheet helps minimize the risk of contamination by outside microbes. The warm sheet or blanket also reduces chill and may help the patient relax. Finally, remove the transport gurney from the room.

Initial positioning considerations

The initial position a patient assumes on the OR bed should be as comfortable as possible while meeting the requirements for anesthesia administration. This usually is a supine position, with the

head on a small pillow or support, and both arms outstretched and secured to arm boards. As we said, when the patient has maneuvered into position, place the safety strap securely but not tightly across the thighs. Normally, you apply the strap over the cover sheet or blanket to prevent it from cutting into or abrading the patient's bare skin. Avoid placing any securing or safety strap over bony prominences. A circulating nurse or technician should remain with the patient from the moment he or she is initially positioned until the sterile draping procedure begins. During this pre-anesthesia stage, it is very important to communicate with and comfort the patient, and to ensure proper body alignment is maintained.

Communication

This immediate pre-anesthesia period is often very stressful to patients, and they may be very apprehensive. It is very important to keep them informed, but avoid saying anything that may cause the patient further distress. For example, avoid using the terms "restraint" or "restrain" when talking about the leg or arm straps. Instead, emphasize they are "safety belts" to remind them the bed is narrow. Also, refer to the OR "bed" instead of the "table"—the patient is not a meal!

Circulators should always tell patients what will be done and why it must be done *before* doing any action. The anesthesia providers should also do their part to help alleviate some of the patient's "jitters" by explaining what they are doing. If an anesthetist forgets (or is too busy) to tell the patient what he or she is doing, the circulator should not hesitate to explain what is going on. Keeping the patient informed is an excellent way to allay fears and reduce anxiety. It also helps build the patient's trust in the competency of the surgical team.

Proper body alignment

Once the patient has been properly positioned and initially aligned on the OR bed, there are several precautions you should take to ensure the position is maintained and to reduce chances of injury. Usually, the leg strap restrains and maintains the position of the lower extremities, but you must check to ensure the patient's legs are not crossed before and after applying it. A small pillow, folded sheet, "doughnut," or foam head positioning aid usually is placed under the patient's head for comfort and to help maintain proper neck alignment. If the patient has a history of back problems or feels lower back strain, place a small pillow or folded sheet under the lower back for support. As we mentioned earlier, lower back strain also can be reduced by putting a pillow or roll under the knees so the legs remain flexed. A padded foot board may need to be placed on the OR bed to prevent *foot-drop*, particularly if the reverse Trendelenburg position is anticipated.

In the supine position, when a patient's arms are positioned on arm boards, never adduct them (extended away from the body) more than 90 degrees (the hands must not be above the head). Place the arms so the patient's hands are palms-up on the arm boards to prevent joint strain and allow easy access to veins and arteries on the inside of the forearm. Also, ensure the arm board pad is level with the OR bed pad. Apply safety straps loosely over the wrists to prevent the patient's arms from slipping off the arm boards during anesthesia administration and surgery. Allow the patient to position his or her arms on the arm boards before applying the safety straps. This ensures the position is not only comfortable, but is most likely to prevent strain on the shoulder joints.

Comforting the patient

When initial positioning has been completed, the circulator should stand by the patient as the anesthetist makes final preparations. You may find patients want to hold your hand during this time; let them. Hand-holding is very comforting and an acceptable way for one human being to gain support from another during a period of uncertainty or stress. If your patient is a child or infant, you may need to hold both hands and arms, especially during anesthesia induction. A leg strap may effectively restrain the legs, but children are often afraid of tight arm restraints. To avoid increasing children's fear, the best way to restrain them gently is to hold their hands as they are falling asleep. After they are asleep, their arms can be restrained by a draw sheet or, if the child is big enough, by placing the arms on padded arm boards. Very tiny babies may be placed on special padded restraining

boards (sometimes called “papoose” boards). If a restraining board is not available, the infant’s arms and legs may be secured using loops of roller gauze loosely applied around the wrists and ankles, then tied to the bed side rails.

Special considerations

When a patient is administered a regional anesthetic, such as a spinal or epidural block, the patient must be re-positioned after moving from the gurney to the bed. We discussed the positions for administering regional anesthesia in Volume 3. The anesthesia provider supervises the positioning, but you usually have to help. It is very important to ensure patients move deliberately and safely. Remember, preoperative medications sometimes make patients act irrationally.

Patients are usually administered the anesthetic after being transferred to the OR bed, as we just discussed. However, some procedures and final positions require the patient to be anesthetized on the transport gurney, then transferred and positioned on the OR bed. Most of the same rules apply, but it is critical you have enough help to safely move and position the patient while maintaining proper body alignment.

When positioning patients before anesthesia administration, you can best help your patients by trying to put yourself in their place. Imagine how you would feel lying on a cold, hard, narrow OR bed—virtually naked under a sheet, just about to relinquish all voluntary control of your body to a room full of strangers. How would you want to be treated?

611. Positioning patients after anesthesia administration

After anesthesia is induced, the patient is placed in the “final” or “operative” position which is the position required to allow the surgeon to perform the surgical procedure. Final positioning is not always required; many procedures are performed in the supine position.

General guidelines

If repositioning the patient is necessary after anesthesia induction or administration, there must always be enough surgical personnel available so that the patient can be adequately supported during the move. Remember, it takes *at least* four people to move an unconscious or fully immobilized patient. Six people are usually required to move and position an adult patient into a prone position on the OR bed (if anesthetized on a transport gurney). If the patient is very large or heavy, use of a draw sheet or patient roller can make moving and turning the patient much easier. As we stated earlier, the anesthesia provider supports and controls the patient’s head and airway apparatus. *Never* attempt to move or position a patient until the anesthesia provider gives you specific permission to do so.

When positioning patients’ arms at their sides, you usually secure them with the draw sheet by wrapping the sheet around each arm, then tucking the sheet under the OR bed mattress. Take extra care to ensure patients’ elbows are not pressing against the bed rails; their hands are maintained in a cupped, normal anatomic position; and their fingers are not wedged under the body or between parts of the bed. For lengthy procedures, arm guards may be used to protect IV catheters and tubing and prevent pressure injuries to the arms.

When final positioning is required, the surgeon often directs and helps with the positioning to ensure the exact surgical requirements are met. The circulators and other helpers support the patient’s extremities and assist with padding and restraints following the guidelines we discussed (refer back to the section on positioning principles). Later on, we describe specific positions and some guidelines pertaining to them.

Just to refresh your memory, here are the objectives for positioning a patient. Remember, all of these actions are carried out within the limits of any physical disabilities the patient may have.

- Protect the patient from injury and provide as comfortable a position as possible.
- Maintain the patient’s respiration and circulation without impairment.

- Avoid placing pressure on nerves and muscles.
- Achieve a position that facilitates anesthesia administration and allows for adequate exposure of the operative site.

Final positioning safety checklist

Before proceeding with further preoperative activities, circulating personnel conduct a thorough inspection of the patient's position on the OR bed. The following table serves as a checklist of important areas to look at during this inspection.

Final Positioning of the Patient's Position on the OR Bed	
Item to Check	**Highlights**
Safety/restraining straps	Straps must be snug but not too tight. They should be positioned over fleshy, muscular areas, not bony prominences. Leg restraint is placed over a sheet, towel, or blanket, not directly on the skin. Wrist and other restraints are secure but not restrictive to circulation.
Heels, ankles, toes	Should be well padded and free from excessive pressure. Maintain normal anatomical position, not hyper-flexed or extended. Ensure extremities are not (nor will be) subject to pinching or wedging between sections of the OR bed.
Legs	Make sure legs are well supported and properly aligned. Legs and ankles must *not* be crossed. Slightly flex and pad the knees if possible. Ensure joints (i.e., hips, knees) are not stressed and no pressure is on bony prominences. Separate and pad legs with a pillow if they may rest against each other.
Spine	The head, neck, and spine should be maintained in a straight line. For dorsal (supine) positions, support the lower spine with a small pillow or pad if possible. Supporting the knees in a slightly elevated, flexed position also eases back strain.
Genitals	Male or female genitals should be checked to ensure external areas are not pinched, pressed, or rubbed. Also, check after skin prep to ensure solutions have not pooled.
Chest and torso	Expansion and contraction of the chest must not be compromised. Any restraints or positioning aids should be well padded and must not interfere with respiration. Ensure female breasts are protected from excessive pressure, particularly in the prone positions.
Arms, hands, fingers	In the supine position, arms are *not* extended more than 90°, elbows are slightly flexed, and hands are palm up. Ensure elbows are adequately padded and not stressed. Securing straps should be padded and not overly tight. If secured by a draw sheet, ensure the palms are facing the body and the arms are *not* pressing against the bed side rails. Ensure fingers are *not* hyperextended or wedged under the patient's body or sections of the OR bed.

Final Positioning of the Patient's Position on the OR Bed	
Item to Check	**Highlights**
Face, eyes, ears	Ensure the face, eyes, and ears are protected from pressure or injury from nearby objects. Many times, anesthesia personnel place ointment in the patient's eyes and tape the eyelids shut to prevent possible traumatic eye injury and keep the corneas moist during general anesthesia. If the surgery involves the nose or mouth, the eyes can be protected by wrapping a towel around the head and over the eyes to create a kind of low-riding "turban." Use of a doughnut or foam headrest can prevent pressure injuries to the ears when the patient's head must be turned to the side. Make sure all hairpins have been removed from the patient's hair and anesthesia face mask straps are not too tight.

Proper positioning is not always easy, but with a little thought and effort you may save a patient many hours of discomfort following surgery and, in some instances, even prevent permanent physical damage.

Self-Test Questions

After you complete these questions, you may check your answers at the end of the unit.

610. Surgical positioning before anesthesia administration

1. How many surgical team members are required to move a conscious patient from the gurney to the OR bed? How many for an unconscious patient?

2. Why do you *slowly* remove the wrap or "mummy" sheet covering a patient on the transport gurney before you transfer the patient to the OR bed?

3. What safety precautions do you routinely take to prevent a conscious patient from falling during transfer from a gurney to an OR bed.

4. Why should the OR bed leg strap be applied over the patient's cover sheet or blanket?

5. How can you help ensure a patient's head is positioned comfortably and proper neck alignment is maintained?

6. A padded foot board is used to prevent what condition?

7. Describe how very small infants can be restrained before and during anesthesia administration.

611. Positioning patients after anesthesia administration

1. How many people are usually required to move and position an adult patient who will be placed in a prone position after being anesthetized on a transport gurney?

2. What two positioning aids can you use to facilitate moving a heavy patient from a transport gurney to an OR bed?

3. What four objectives should surgical team members attempt to achieve when positioning a patient for surgery?

4. Describe what you should look for during your final positioning inspection to ensure that a patient's legs are properly aligned and supported.

5. How can you protect the patient's spine and ensure it is properly aligned?

6. When is it particularly important to check a female patient's breasts for indications of excessive pressure?

7. Specify two ways a patient's eyes are often protected from injury during positioning and surgery of the nose and mouth.

8. How can you reduce chances of ear damage when a patient's head is turned to the side during final positioning?

2–4. Basic Surgical Positions

There are a number of positions commonly used for surgical procedures. Some of these are only slight variations of the basic supine or prone positions. Others are radical departures from these "standard" positions. As a member of the surgical team, you must be familiar with the most commonly used surgical positions. This includes knowing what positions are used for various types of operations, the bed attachments and positioning aids commonly used, and the proper procedures to follow when placing patients in these different positions. In this section, we take a look at the most frequently used positions, and at some of the more commonly used special positions. To break them into smaller blocks, we group the basic surgical positions into dorsal, prone, and lateral positions. Then, we wrap things up with a discussion of sitting, orthopedic, and examination positions. The illustrations accompanying the text are to show the basic anatomical positions in relationship to the

various positions. The patients depicted are shown without cover sheets, and all positioning and safety devices may or may not be illustrated.

612. Dorsal positions

There are four basic dorsal or supine positions: basic dorsal recumbent (supine) position, Trendelenburg, reverse Trendelenburg, and lithotomy. We describe only the basic guidelines for each position; there are numerous modifications to suit various procedures and surgeons.

Dorsal recumbent (supine)

In the dorsal recumbent position, commonly known as the supine position, patients lie flat on their backs, and the top of the OR bed remains parallel to the floor (fig. 2–16). Their arms are either extended on padded arm boards or secured at the sides using a draw sheet. Safety straps or hand towels folded in thirds lengthwise are commonly used to secure the arms to arm boards. In some cases, padding such as rolled towels or sheets are placed under the ankles to protect and support the Achilles' tendon and heels. (Foam "booties" or heel protectors may also be used.) The leg strap is positioned snugly across the patient's thighs (over the cover sheet) approximately 2 to 3 inches above the knees (roughly three finger widths). The head and neck are usually supported using a foam head positioning aid, doughnut, or folded sheet. Rarely, but occasionally, the surgeon may request a footrest or other device to prevent foot-drop.

The supine position is the position of choice—it is used, if at all possible. It is considered the position least likely to cause patient complications, though they do arise. The supine position provides the anesthesia provider with optimal access to the airway without sacrificing patient comfort. It is routinely used during administration of general anesthetics and for performing surgery on the abdomen, face, neck, and anterior chest wall. It is also used, with slight modifications, for vascular procedures and many orthopedic procedures.

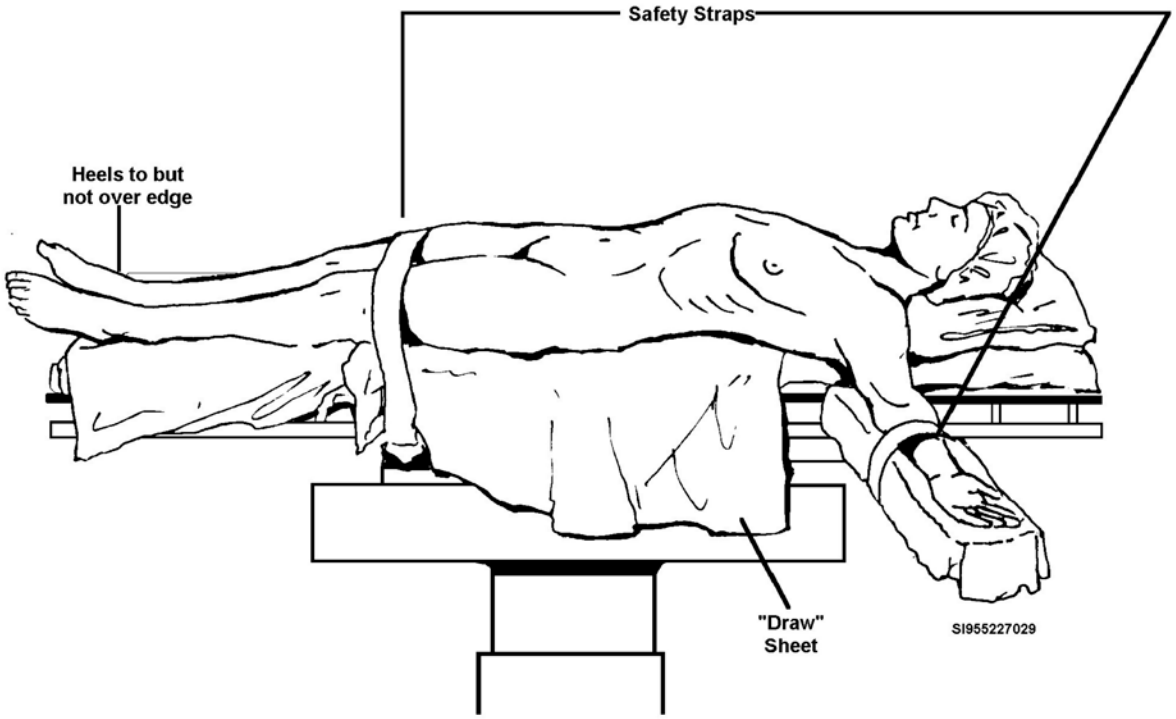

Figure 2–16. Dorsal recumbent or "supine" position.

Common modifications to the basic supine position include the *lawn chair* and *contoured spine* positions. These positions involve flexing the legs at the knees and hips to help relieve lower back strain and relax the abdominal muscles. The lawn chair involves contouring the patient's position

using the table breaks. The OR bed top is configured to look like the name implies—a lawn chair. The knees are flexed by lowering the leg section slightly, and the seat and back sections are flexed into a broad “V” to ease strain on the spine. The contoured spine position uses pads, pillows, and bolsters to achieve the same result on a flat OR bed surface.

Trendelenburg

In a classic Trendelenburg position (fig. 2–17), the patient lies on the OR bed in a supine position with knees over the lower “table break” (gap where the lower leg section flexes). This is necessary so the knees bend where the bed flexes to prevent excessive pressure on the peroneal nerves and popliteal blood vessels. A leg strap is placed 2 to 3 inches above the knees and the arms are positioned and secured in the same manner as previously described for the supine position. Pressure on the heels and Achilles’ tendon is relieved using the methods described for supine positioning. The foot section of the bed is lowered to an angle of approximately 30 to 40° with the bed top (or to the degree specified by the surgeon) to flex the knees. Then, *the entire bed is tilted head-down.* The angle of tilt is dictated by the surgeon and depends on the type of procedure being performed.

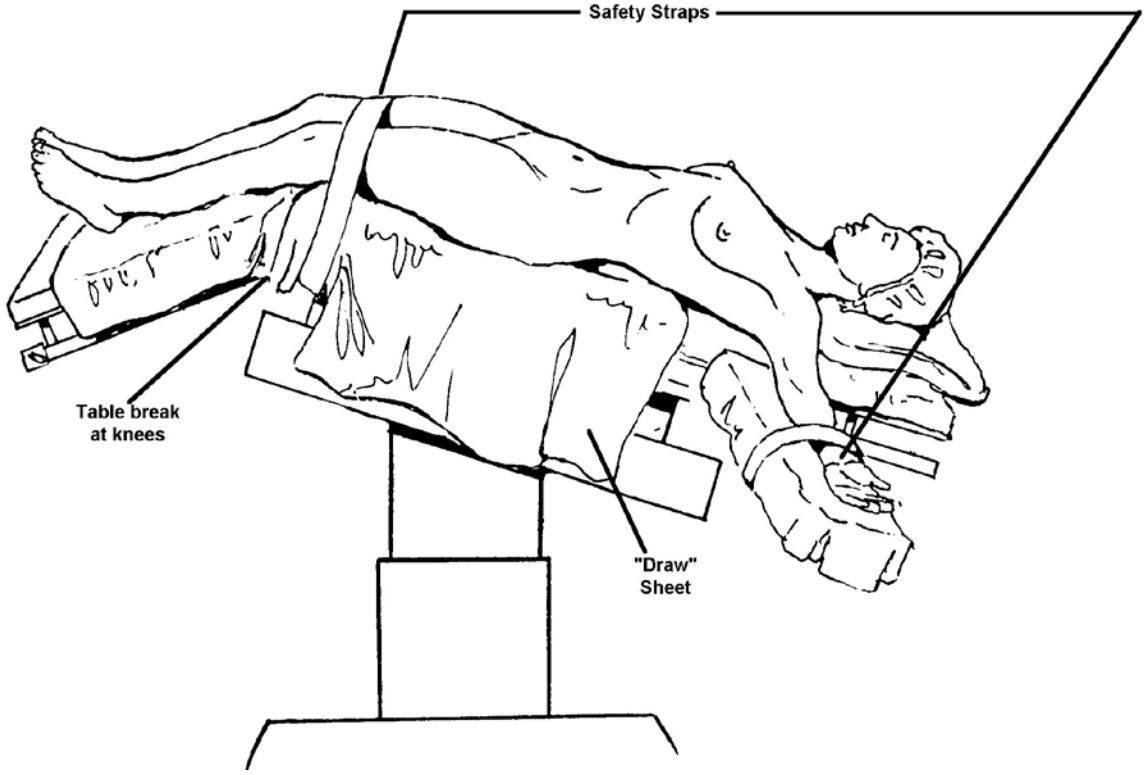

Figure 2–17. Trendelenburg position.

If the surgeon anticipates the need for extreme head-down Trendelenburg, shoulder braces may be attached to both sides of the OR bed. They must be level with the top of the patient’s shoulders and equidistant from the head of the bed. The braces are covered with a towel or suitable material and laterally adjusted so they rest against the outer bony areas of the shoulders, well away from the neck. Remember, *when shoulder braces are used, the patient’s arms should not be extended on arm boards,* as this can result in pressure damage to the shoulder joint and adjacent nerves.

The Trendelenburg position is most often used for operations involving structures of the lower abdomen and pelvis because it allows the abdominal viscera (intestines, omentum, etc.) to fall away from the pelvic region, thereby creating a better surgical exposure. The patient is maintained in this position for as short a time as possible because it increases the pressure on the diaphragm and

interferes with normal respiration. To return the patient to the supine position, the leg section is slowly raised, and the bed is adjusted to a horizontal position. Following this sequence is important to allow the patient's body to adjust to changes in circulation gradually.

Though not truly accurate, most surgical personnel equate "Trendelenburg" with any position requiring a head-down tilt. You may hear a surgeon request "more Trendelenburg" when the patient is in a lithotomy position. The "shock" position, though somewhat similar, is also sometimes referred to as Trendelenburg, particularly when it involves keeping the body in a straight line and tilting the *entire bed* into a head-down position. Remember, the Trendelenburg position is referring to the patient, not the bed.

Reverse Trendelenburg

In a reverse Trendelenburg position (fig. 2–18), the patient is placed on the OR bed flat on his or her back, and the entire bed is horizontally tilted in a foot-down position. A padded foot board may be attached at a 90 degree angle to the foot of the bed to prevent foot-drop and to keep the patient from sliding when the bed is tilted at a steep angle. (If the degree of tilt is slight, a foot board may not be used.) Foam heel protectors, doughnuts, or other suitable types of padding are used under the heels and Achilles' tendons to protect them from excessive pressure. The leg strap is placed over the thighs as previously described, and the arms are either extended on arm boards or secured at the patient's side.

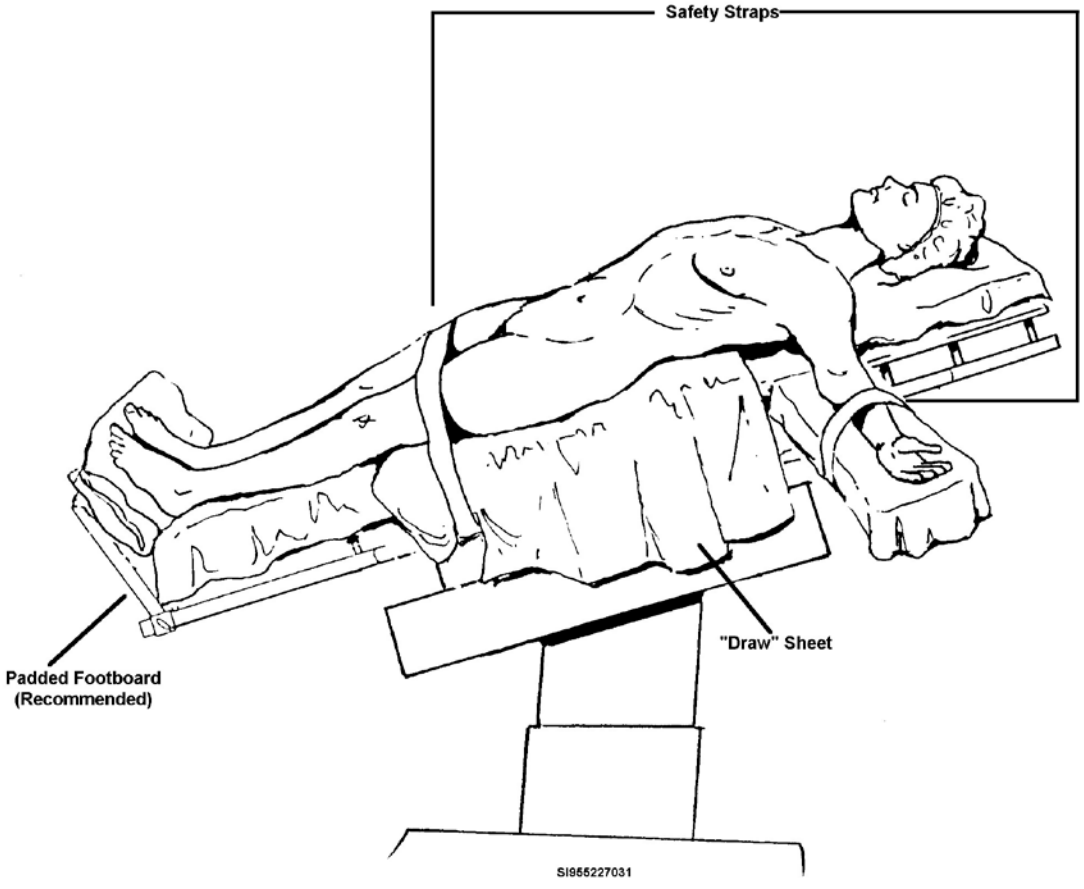

Figure 2–18. Reverse Trendelenburg position.

The reverse Trendelenburg position is often used for neck surgery, particularly for thyroidectomies, because it decreases bleeding at the highly vascular operative site by preventing pooling of blood in the head and neck region. It is also commonly used for upper abdominal operations, such as open

cholecystectomies and hiatal hernia repairs. This is because it causes the abdominal viscera to fall toward the pelvis, away from the operative site, thereby increasing operative exposure. Placing a patient in the reverse Trendelenburg position also facilitates breathing by reducing pressure on the diaphragm.

When neck surgery is to be performed, the patient is placed on the OR bed with shoulders even with the upper break (gap between the head and body sections of the bed top). The patient's head is then hyperextended by placing a small pillow, bolster, or other positioning aid under the shoulders and neck. The head of the OR bed may be dropped slightly to increase the degree of neck extension depending on the surgeon's needs.

If gallbladder surgery is to be performed, a folded sheet or small pillow may be placed under the patient's right side in the lower thoracic region to elevate the gallbladder area and increase surgical exposure. Sometimes (rarely), the patient is placed lower on the OR bed so the operative area is over the kidney elevator. The kidney elevator can then be raised during the procedure to the degree required to increase operative exposure. If this positioning modification is used, the head section is usually removed and attached to the lower leg section of the OR bed. This supports the patient's lower legs and feet, and allows the anesthesia provider to remain close to the patient's head.

Like the Trendelenburg, the "reverse Trendelenburg" is also mistaken for any procedure involving a foot-down tilt to the OR bed.

Lithotomy

Before a patient is placed in the lithotomy position (fig. 2–19), the OR bed is reconfigured by removing the headrest (with attached pad) and attaching it to the bottom (lower leg or foot) section of the bed. The sheet is adjusted to cover this (headrest) footrest.

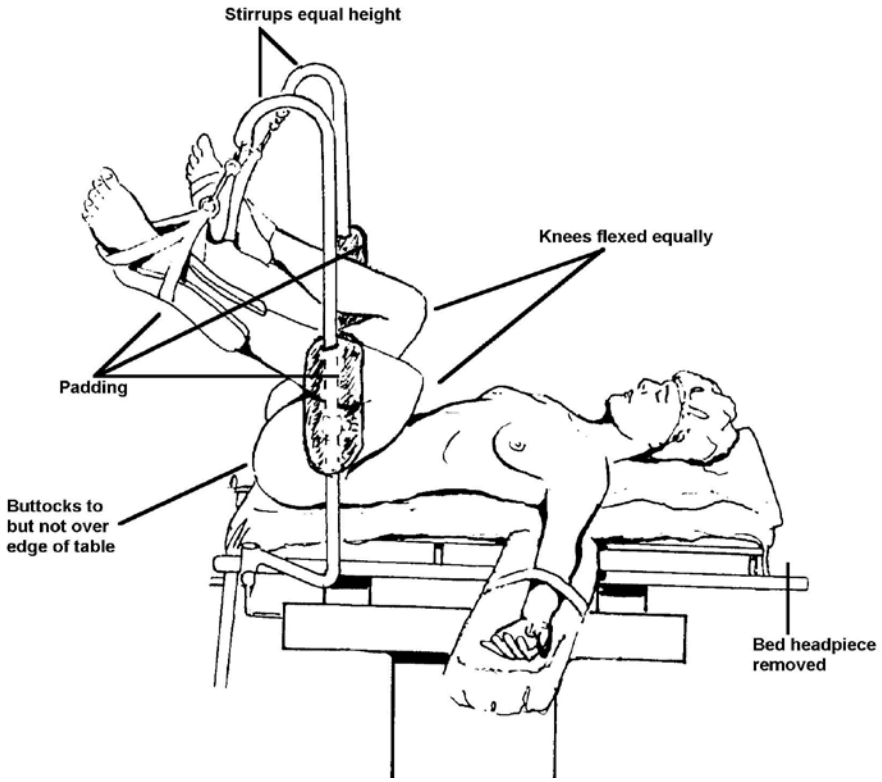

Figure 2–19. Lithotomy position using sling-type stirrups.

Local policy dictates whether you attach the stirrup opposite the side the gurney will butt against before or after patients are anesthetized. Some attach the stirrup before anesthesia to reduce preparation time and, subsequently, the time patients are anesthetized. Others attach both stirrups after anesthesia administration, particularly for general anesthesia patients. This is thought to reduce patient anxiety by reducing noise before induction and by preventing the patients from focusing on the "torture rack" they are about to be placed on.

Initially, the patient assumes a supine position with the buttocks at the edge of, but not over, the perineal cutout or the edge of the table break between the body and leg sections. The feet are supported by the head section you attached to the foot of the bed. Usually, the patient's arms are extended on arm boards. If the arms must be positioned by the sides, the forearms and hands should rest on the patient's abdomen to ensure fingers or hands are not crushed in the table break as the leg section is lowered and raised.

Stirrups are attached to the rails of the bed using adjustable clamps. The stirrup clamps must be equidistant from the end of the bed section, and in line with the patient's hips. The stirrups should also be of equal height. If hook-type stirrups are used, they should be adjusted so the strap sides of the hook-shaped ends are next to the patient. If knee-crutch or foot-and-calf supporting stirrups are used, the angle of the legs should be the same.

General anesthesia or major conduction anesthesia is usually administered before the patient's legs are placed in the stirrups. If a local or regional block, such as a pudendal block, is used, the patient's legs are raised before administration. In either case, keep the patient covered with a sheet and place a safety strap across the thighs until the anesthetist gives permission to raise the legs.

Raising and adjusting the position of the legs requires two people. Stand opposite the other team member who will raise the patient's legs. Place the palm of one hand on the sole of the foot, and the other hand under the knee.

After the anesthesia provider gives permission, keep the legs together and raise them slowly and simultaneously, bending the knees. It is important to raise the legs slowly to prevent strain on the patient's lower back muscles and hip joints, and to prevent a sudden shift in the patient's cardiorespiratory status.

Place the patient's feet in the stirrup straps, or position the legs in the padded leg cradles if GU/cysto stirrups are used. When using strap stirrups, pad the patient's feet and ankles by wrapping them with towels or covering them with foam "booties" before the legs are raised. It is also a good idea to pad any area where the patient's leg may contact the stirrup. Place each one of the patient's feet in the straps with one loop under the bottom (sole) of the foot and the other loop behind the ankle.

An alternate method of positioning feet in the stirrups is to place the straps on the patient's feet before the legs are raised. Then, grasp the patient's legs behind the knees and control the feet by holding onto the straps near their metal attaching rings. Raise the legs and secure the straps to the stirrup.

After the patient's feet are suspended in the straps, check and simultaneously adjust the stirrups to achieve the desired operative exposure and prevent undue strain or pressure on the legs and hips. You may have to angle the stirrups toward the foot of the bed, pivot the stirrup shafts toward the head or foot of the OR bed, or vary the height. Ensure the patient's lower legs do not rest against the stirrups and the legs remain flexed at the knees. Avoid flexing the knees so much that they place excessive strain or pressure on the patient's abdomen. This can compromise respiration by increasing intra-abdominal pressure against the diaphragm, and may interfere with blood flow to and from the legs. If the legs are positioned before the patient is anesthetized, the patient should be asked to identify areas of pressure or discomfort.

After the legs are positioned, remove the head section that supported the patient's feet, then lower the leg section of the OR bed as far as it will go. Do a final check and adjust the position of the patient's torso so the buttocks are even with the edge of the perineal cutout or table break. *Do not allow the*

patient's buttocks to extend beyond the edge of the break. This can result in excessive strain being placed on lower back muscles and ligaments.

When the procedure is finished, soiled drapes are removed, the lower leg section of the OR bed is raised, and the head section is reattached to the raised leg section. As in raising the legs, it takes two staff members to lower them. Simultaneously remove the feet from the stirrups, then bring the patient's knees together. Slowly lower the legs, extending them as you do so, to the bed mattress. Lowering the legs slowly is necessary to prevent a sudden drop in the patient's blood pressure. Bringing the knees together and extending the legs as you lower them prevents over-abduction of the thighs and possible damage to structures in and around the hip joint. After the legs are lowered, replace the safety strap over the thighs until the anesthetist indicates the patient can be moved.

The lithotomy position is used for surgery in the perineal region. Operative procedures include those involving the male and female genitalia and the rectum. This position is also used for many laparoscopic procedures; for diagnostic examinations performed in the general surgery, urology, and OB/GYN clinics; and for normal vaginal deliveries.

613. Prone positions

As in supine positions, there are numerous modifications of the prone position. We cover the basics of the four most commonly used. Prone positions are the opposite of supine ones; patients lie on their chest and abdomen, providing surgical access to posterior or ventral areas.

A general anesthesia patient is usually anesthetized in the supine position while lying on the transport gurney or bed. After induction—upon the signal of the anesthesia provider—the patient is slowly rolled into a face down position on the OR bed. Since the patient is unconscious, this transfer requires at least four people and, usually, at least six. During the move, the anesthesia provider controls the head and attached anesthesia apparatus, while other surgical personnel control the patient's torso, arms, and legs. The patient is turned as a unit, using a *logroll* method, with arms at the sides and legs held together. Once the patient is situated in a face down position on the OR bed, the transport gurney is removed from the room, and final positioning activities continue.

Basic prone position (not illustrated)

The anesthesia provider places the patient's head on a small pillow, foam head positioning aid, or other support. The head is normally turned to the side. Chest rolls, bolsters, or other torso-supporting positioning aids are placed under the patient's body. These devices are usually placed parallel to the sides of the body, and extend from the shoulders to the hips. They raise the chest and abdomen off the bed, allowing for chest expansion and keeping pressure off the iliac crests and rib cage.

The arms may be extended on arm boards, positioned by the patient's sides and secured by the draw sheet, or raised above the head, resting on the bed pad. If arm boards are used, they are attached to the bed at shoulder level and the arms are extended out and up toward the head with the elbows slightly flexed. Arm boards may also be used to extend (widen) laterally the bed's top section when the patient's arms are raised above the head. The arm boards are positioned to lie along the side of the mattress from the shoulders to the head of the bed. When you position a patient's arms, you must *rotate them through their normal range of* motion to prevent injuring the shoulders.

A pillow or pad is placed under the lower legs and feet to prevent pressure on the "shins" and to raise the feet off the bed. Doughnuts or other padding materials are placed under the knees to prevent pressure injuries. Additional padding may be required under the armpits (axillae) to prevent hyperextension of the shoulder joints and prevent pressure on the brachial nerves. When the arms are extended on arm boards or raised above the patient's head, padding may be needed under the upper arms and elbows for support and pressure relief. The external genitalia of the patient should be checked to ensure they are not pinched or otherwise compromised. The chest and torso must be adequately padded; particularly ensure female breasts are not under excessive pressure. For some procedures, a pillow may be positioned under the abdomen to pad the hips further and to reduce strain

on or arch the back. The leg strap is normally placed across the back of the thighs over a cover sheet. An additional safety strap may be placed over the calves to keep the lower legs secured.

The basic prone position is used for surgery on the posterior chest, torso, legs and, occasionally, the rectum. Variations of this position (two of which we discuss in the following text) are often used for operations involving the spine and posterior cranium. Since there are many variations in prone positioning routines, always consult with the surgeon before the patient is brought into the operating room to ensure you have all required supplies and equipment for the specific positioning requirements. In most cases, the operating surgeon directs and assists with positioning activities.

Laminectomy position

The laminectomy position is pictured in figure 2–20. This is one of the most common modifications of the prone position, and involves using the previously discussed Wilson laminectomy frame (spinal or arch frame) for positioning a patient for spinal surgery. This frame replaces the chest rolls or bolsters used to support the chest off the OR bed. It also allows the surgeon to arch the patient's back to separate the vertebrae and increase surgical exposure.

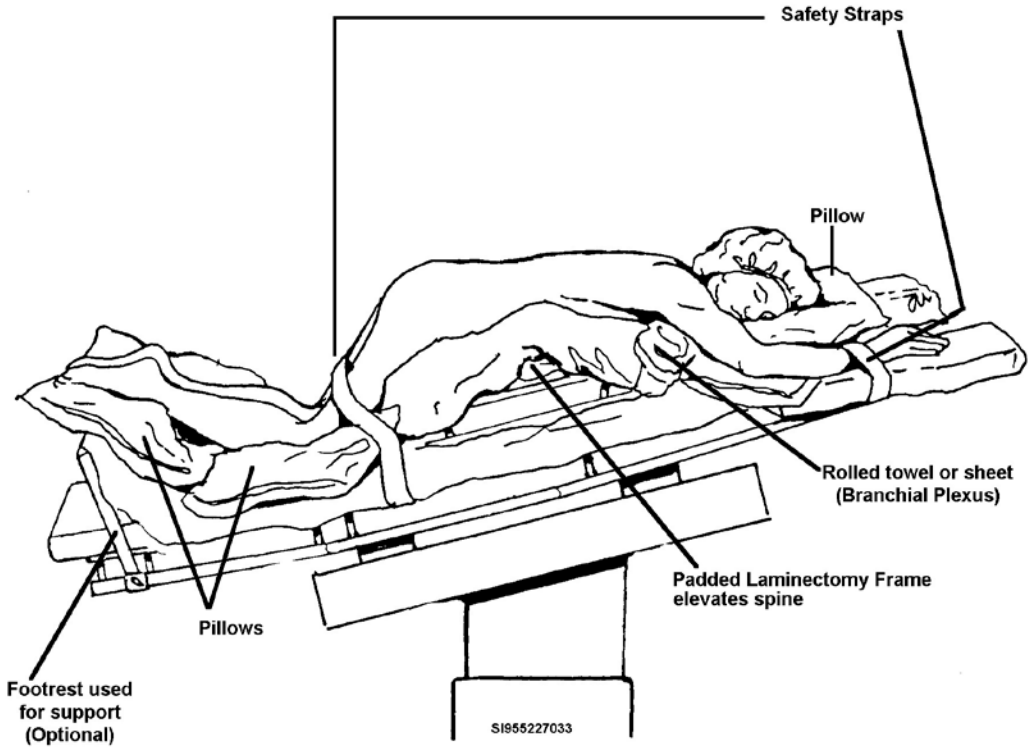

Figure 2–20. Laminectomy position.

Cover the frame with a sheet before positioning the patient to prevent the patient's skin from sticking to the frame; sometimes it is padded with an "egg-crate" mattress pad. Adjust the frame location and patient position so the area of the spine to be operated on lies directly over the high point of the frame's arch. The patient's arms are normally extended on arm boards, with the elbows flexed and padded. A pillow is placed under the lower legs and feet, doughnuts or other pads are placed under the kneecaps, small rolls are placed under the axillae, and the genitals are checked and padded if necessary. The patient's head is turned to the side and placed on a foam head positioning aid, small pillow, or doughnut. Additional padding or bolsters may be placed between the frame pads and the patient's body. A footrest may be attached at a 90 degree angle to the foot of the OR bed to act as an additional support for the feet and to keep the legs flexed at the knees. If the footrest is used, it must be very well padded to prevent pressure damage to the toes and top of the feet. A leg strap is placed

over the back of the thighs and an additional strap may be put over the calves. The entire OR bed is tilted into a foot-down position until the patient's back is horizontal to the floor. The surgeon then adjusts the degree of arch on the Wilson frame by turning the crank that projects from the side. (After the frame is adjusted, the crank is removed or folded out of the way to prevent injury to members of the surgical team).

Other types of spinal frames are used for laminectomy positions. The Andrew's-type spinal frame was primarily designed for spinal fusion, but may be used for other spinal procedures. It involves attaching a kneeling-pad device to the lowered foot section of the OR bed. The patient is in a prone kneeling position, with the upper torso supported by the top of the OR bed and a chest pad. A padded supporting frame supports the knees and lower legs, and the knees and padded lateral rolls support the hips and abdomen. Similar frames exist to place patients in kneeling prone positions. One attaches to the top of an OR bed tilted at 45 degree; it uses a seat-like device to support the buttocks, a bolster to support the chest, and leg and ankle rolls for padding. It allows the surgeon to control the spine's curvature while keeping the spine horizontal.

Prone position using a headrest (craniotomy position)

The cerebellar headrest is most often used when positioning patients for neurosurgery procedures involving the posterior skull and brain: skull clamp headrests may also be used. Figure 2–21 shows a patient in this craniotomy position.

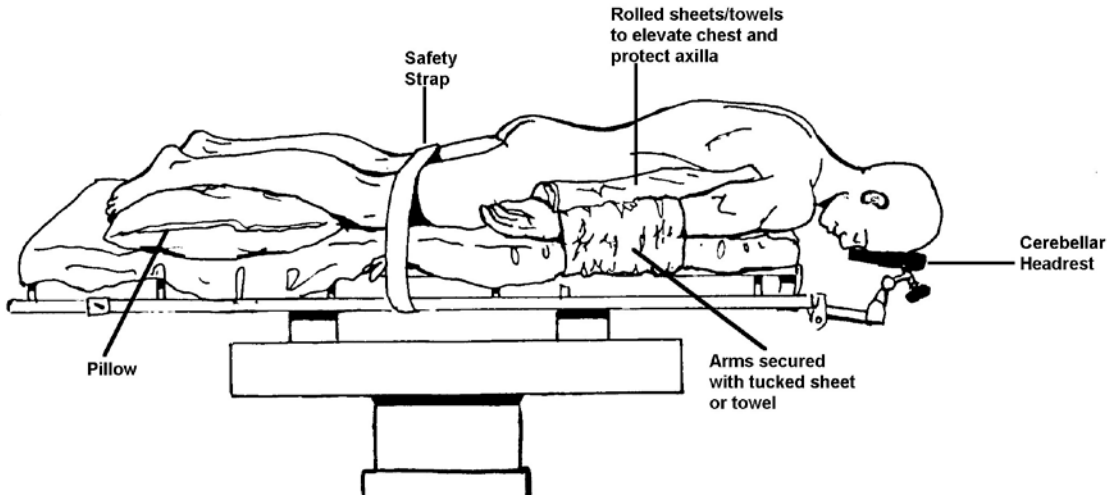

Figure 2–21. Craniotomy position using cerebellar headrest.

The standard OR bed headrest is removed and replaced with the desired cerebellar or other headrest. Like most prone positions, the patient is anesthetized on the gurney then rolled over onto the OR bed. If a skull-clamp headrest is used, it may be attached immediately after anesthesia induction, while the patient is still in the supine position. The patient is turned, and final positioning is accomplished, following the same guidelines and procedures used for the basic prone position, *except for the following differences*.

- When using a cerebellar headrest, the patient's forehead and cheekbones rest on the horseshoe-shaped pad. The anesthesia provider and surgeon usually position the head. Care must be taken to ensure there is no pressure on the eyes, nose, or mouth. Interference with anesthesia apparatus must also be avoided. During the procedure, the head may be raised periodically to temporarily relieve pressure on the face and forehead.
- When using a skull-clamp headrest, the surgeon and anesthetist again work together to position the head. A third staff member is usually needed to help adjust the position of, and tighten or loosen, the various clamps and screws on the table attachment.

- The arms are positioned by the sides and secured by the draw sheet. This allows the sterile team access to the patient's head without obstruction by the arm boards.
- Either the OR bed is turned, or the anesthesia apparatus is moved, so the anesthesia provider is stationed at the side of the patient (usually the side with IV access). This allows the surgical team more operating room while allowing the anesthesia provider rapid access in an emergency.

Kraske or jackknife position

In this position, the head section of the bed is removed and placed at the foot, as it is in the lithotomy position. As illustrated in figure 2–22, the patient lies face-down on the OR bed with the hips over the table break between the seat and leg sections. A pillow is placed under the hips to protect the genitals and pad the hips. A pillow is also placed under the lower legs and feet. The leg strap is placed over the calves or across the back of the thighs two to three inches above the knees. The arms are either extended above the head on arm boards, or supported in a flexed position on the head of the OR bed in the same as the basic prone position. The patient's head is turned to the side and supported by a foam headrest or pillow. Chest rolls or bolsters may be used to raise the patient's chest off the bed, particularly during long procedures under general anesthesia. The major difference between this position and the basic prone position is that the OR bed is flexed so the patient ends up in an inverted "V" or "jackknife" configuration. This is accomplished by lowering the leg section of the OR bed, then tilting the entire bed into a head down position until the hips and buttocks are at the top of the inverted "V." The degree of flex is determined by the surgeon.

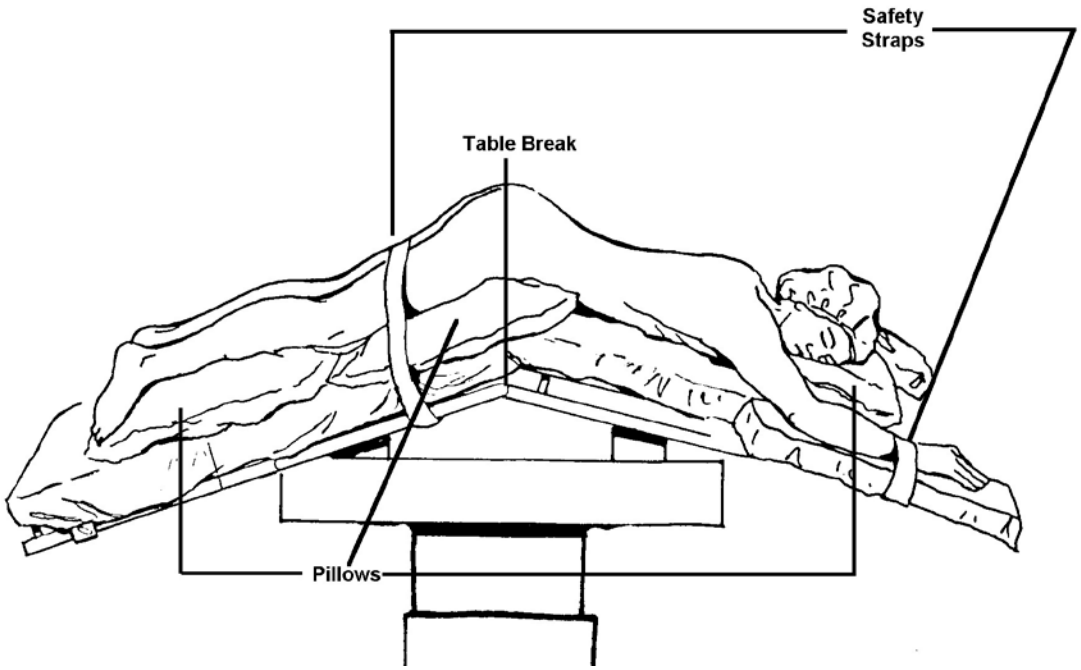

Figure 2–22. Kraske or "jackknife" position.

The jackknife position is used primarily for rectal (proctological) surgery. The surgeon may want the buttocks separated to increase exposure of the operative site. The most common method used to accomplish this is to use two long strips of wide adhesive tape (3–foot long strips usually suffice). One end of each tape strip is split four to six inches from the end to form a "Y." These "Y" ends are attached to the medial top and bottom areas of the buttocks after the skin has been sprayed or painted with benzoin or a similar substance. (The benzoin leaves a tacky residue that helps the tape adhere to the skin.) An additional piece of tape (five to six inches long) is placed over each "Y" for reinforcement. The buttocks are separated by two circulators applying tension to the tape strips

simultaneously. Tension is maintained by securing the free ends of the tape to the sides of the OR bed.

614. Lateral positions

There are three types of lateral positions (figure 2–23 shows a typical example) that you should be familiar with—the lateral chest position, the lateral kidney position, and the anterolateral position. As with other positions, each is subject to numerous modifications, but we cover the basic ones. For lateral positions, general anesthesia patients are usually anesthetized in the supine position on the OR bed. After induction, patients are *logrolled* onto their sides and positioned. This usually takes at least four staff members.

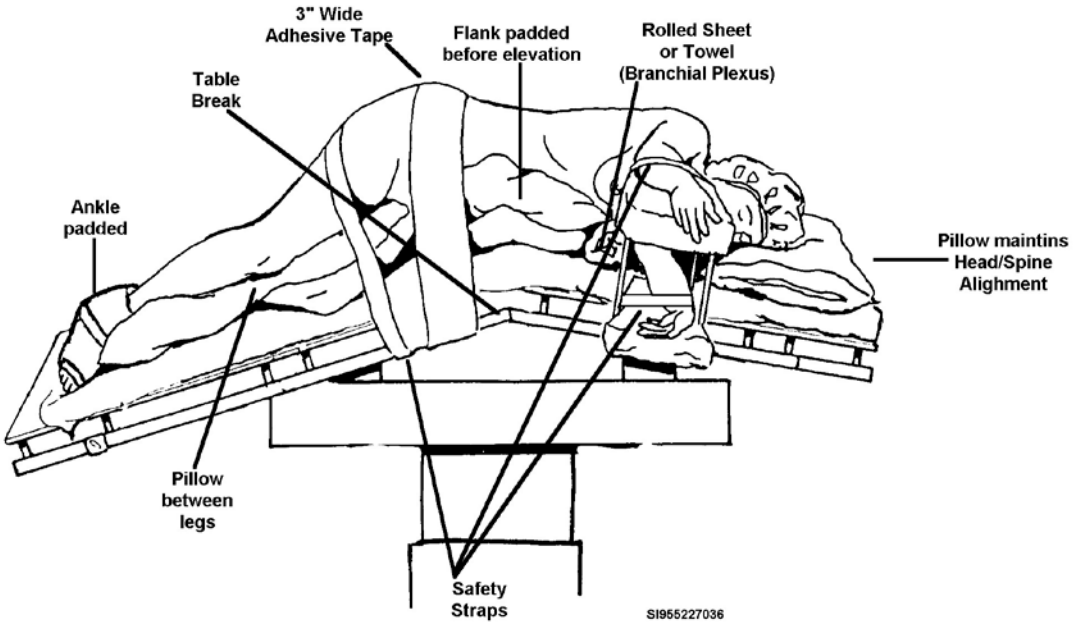

Figure 2–23. Typical lateral position.

Lateral chest

In this position, the patient lies with the operative side up. The patient's back lies next to, and parallel with, the side of the OR bed. The head is supported by a small pillow or foam headrest to protect the ear and the side of the face from pressure injuries. The headrest also helps ensure the head is aligned with the spine to prevent muscle strain and to reduce compression of the lower shoulder.

The arms are extended in front of the patient and can be supported in a variety of ways. One way is to place the lower arm on a standard padded arm board and the upper arm on an elevated arm board (like the one we discussed earlier in this unit). Another method of supporting the patient's arms utilizes a special double arm board that is slid under the OR bed pad at the level of the patient's shoulders. (The double arm board supports both the lower and upper arm.) Regardless of which method is used, it is important to secure both arms with loosely applied safety straps, tape, or folded towels. The upper arm should be raised above the head and slightly flexed at the elbow when chest surgery is performed. This positioning raises the scapula (shoulder blade) allowing access to the underlying ribs. It also helps widen the intercostal spaces between the ribs. A small roll or pad can be placed under the upper chest near the axilla to help eliminate pressure on the down shoulder joint, and to slightly raise the chest so the rib cage can expand more during respiration.

The patient's lower leg is flexed at the knee to provide stability. The upper leg is extended toward the foot of the bed with slightly less flex at the knee than the lower leg. A large pillow is placed between

the legs and pulled up into the groin region to prevent contact between bony surfaces. The area between the ankles and lower legs may need additional padding if the pillow is not long enough to keep them separated. The leg strap is positioned across the upper leg, over the cover sheet, two to three inches above the knee.

The patient's torso can be stabilized by using chest rolls, a large vacuum positioning device, pillows, or sandbags. If chest rolls are used, they are positioned next to the patient's torso, one along the back and the other in front. The chest rolls are secured against the patient by loosely tying them together with roller gauze or similar wide dressing, passing the ties over the rolls but under the patient, then tying them to the side rails. When a vacuum "bean-bag" positioning device is used, place it on the OR bed and cover with a draw sheet before the patient's transfer. Because the "bean bag" creates an extra thickness of padding, it is necessary to pad the rest of the OR bed to the same height as the bag. This prevents excessive arching of the patient's upper body when supine on the bed during anesthesia induction. Pillows and sandbags used to stabilize the patient's torso are positioned against the front and back of the patient's body similarly to the chest rolls. (The lack of space behind the patient's back, after he or she is moved over to the edge of the bed, may make it impossible to place a pillow or large sandbag behind the back for support.) To provide additional stability, a long strip of wide adhesive tape is usually placed over the patient's hip and attached to the side rails of the bed. Occasionally, the surgeon may want an additional tape strip placed over the upper shoulder and along the arm to help stabilize the upper torso.

As the name implies, the lateral chest position is primarily used for surgery on the ribs and lungs. It is also used for certain types of hiatal hernia repairs and cardiovascular operations.

Lateral kidney

The lateral kidney position is used for surgery on the kidneys, upper ureters, and other structures that lie behind the peritoneum (in the retroperitoneal space). Positioning is accomplished in essentially the same manner as the lateral chest position with the following exceptions.

- The patient is laterally positioned so the lower iliac crest is situated over the kidney elevator.
- Either a vacuum bean-bag positioning aid is used, or kidney rests are slid onto both ends of the kidney rest to provide support for the abdomen and lower back. A short kidney rest is used up against the patient's back because this is the area where more exposure is required. A longer kidney rest is positioned against the lower abdomen. Both rests must be well padded, particularly when the patient is obese, to prevent tissue damage caused by folds of skin hanging over the ends of the braces. If other positioning devices are not available, sandbags can be used as supports.
- The OR bed is flexed at the middle break and the horizontal tilt is then adjusted so the patient's flank (operative area) is parallel to the floor.
- The kidney elevator may be used to increase surgical exposure. If used, it is raised only at the surgeon's specific direction and only to the surgeon's specified height. When used, the kidney elevator must push *up on the patient's iliac crest,* NOT *on the soft, fleshy area between the iliac crest and the bottom of the rib cage.* Allowing the kidney rest to push up on the gap between the hip and ribs can compress and damage soft tissues and blood vessels in this area. Check to ensure that the patient is positioned with the lower iliac crest over the kidney elevator *before the elevator is raised.*
- The patient's torso is usually stabilized by placing a pillow or large sandbag in front of the patient and a wide strip of adhesive tape across the upper hip. Some surgeons may request the use of a vacuum positioning device, while others prefer the kidney rests.
- The kidney rest is lowered and the bed is taken out of the flex position before closing a flank (kidney) incision. This lessens tension on the tissue so the wound can be more easily approximated.

Anterolateral

This position is a combination of the lateral and the supine positions. It is used for operations involving the anterior chest wall, lungs, heart, thoracic blood vessels, and upper abdomen. After the patient is anesthetized in the supine position, the operative side is elevated using pillows, bolsters, rolls, vacuum-beanbags, sandbags, or folded sheets placed under the shoulder and buttocks. The degree of elevation and the positioning aids used are determined by the surgeon and depend on the operative site. The knee of the upper leg (affected side) is slightly flexed and supported on a pillow to help relax the abdominal muscles. Additional padding may be required to keep the legs separated. The lower arm (on the unaffected side) may be extended on a standard arm board or secured by the patient's side using the draw sheet. The arm on the operative (upper) side may be positioned by the patient's side, extended on an arm board, or suspended from an anesthesia screen or extremity holder. If the arm is to be suspended, it should be well padded, then wrapped loosely and secured in place using tape or roller-type gauze. Avoid hyperextension of the arm to prevent injury to the shoulder joint and brachial plexus. A leg strap is placed across the mid-thighs above the knees.

615. Other surgical positions

Finally, we'll cover some unique surgical positions and the use of the orthopedic fracture table. As with the other surgical positions we have covered these are not all inclusive and may be modified based on the surgeon's preference. Let's start with a semisitting position known as the Fowler's.

Fowler's (semisitting)

This position is most often used for surgery on the face, nose, mouth, and throat. With slight modifications, it can also be used for neck operations such as thyroidectomies. When properly attained, the Fowler's position puts the patient in a position similar to the one you are placed in when you have dental work done.

The patient is transferred to the OR bed and initially placed in a supine position with knees over the leg break. A footrest is attached perpendicularly to the lower leg section of the bed and adequately padded to prevent foot-drop and to support the patient's weight when the bed is adjusted into a sitting configuration. A leg strap is placed across the patient's mid-thighs and the head is supported on a small pillow, doughnut, or foam head positioning aid. The arms are either secured by the patient's sides with the draw sheet or folded across the lap and secured by tape. If the arms are folded across the lap, then place padding under the forearms to relieve pressure on the lower abdomen. Foam elbow protectors, doughnuts, or other suitable padding are also used to prevent pressure on the ulnar nerve. To achieve a semisitting configuration, the following adjustments are made to the OR bed:

1. First, lower the leg section to flex the knees slightly.
2. Next, raise the back (body) section, usually to about 45 degrees. The exact angle of elevation must be specified by the surgeon.
3. Finally, tilt the entire bed slightly in a head downward direction. This is to stop the patient from slipping down on the OR bed and to relieve some of the pressure on the buttocks.

Ideally, the back is raised and the table is tilted simultaneously. For neck surgery, the head can be hyperextended to increase operative exposure by placing a roll or bolster under the upper shoulders and slightly dropping the head section. (This modification is the same one we described previously when we discussed the reverse Trendelenburg position).

Modified Fowler's (full sitting)

A full sitting position, as shown in figure 2–24, may be used to perform certain neurosurgical procedures involving the posterior part of the brain or cervical spine. This position is basically the same as the Fowler's semisitting position except the patient's torso is elevated to an almost full upright position. For some procedures, a skull clamp headrest is used to replace the standard OR bed headrest. This allows the surgeon access to the back (posterior) of the head and neck. Use of the skull

clamp headrest also facilitates maintenance of general anesthesia during the procedure because it allows anesthesia personnel access to the patient's nose and mouth.

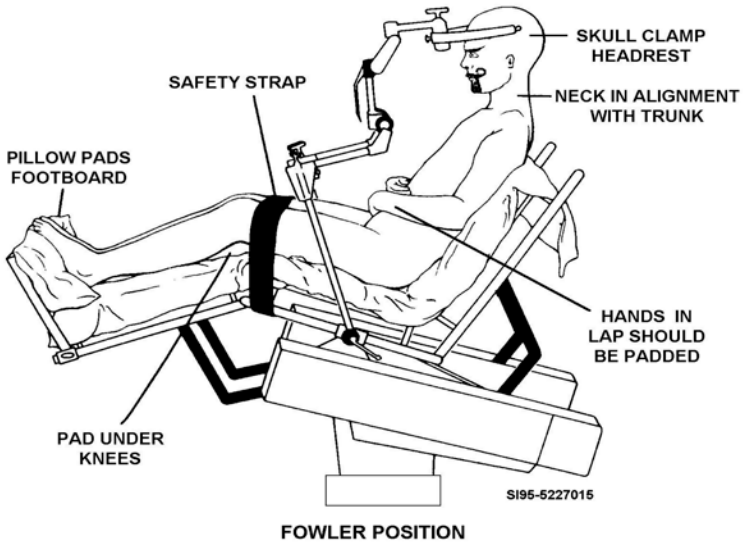

Figure 2–24. Modified Fowler's (full-sitting) position using skull clamp headrest.

On some OR beds, particularly older models, it is necessary to turn the bed around so the head of the patient is at the foot end of the bed. This is because the back section of these OR beds can only be raised to around a 20 degree angle; only the leg section can be raised 90 degrees. Before the patient is transferred to the OR bed, the standard headrest is removed and attached to the foot of the bed as for lithotomy positioning. This provides support for the patient's head during anesthesia induction.

For procedures involving the use of a skull clamp headrest, sterile pins are aseptically inserted into the patient's skull after hair removal and skin preparation of the insertion sites. These pins are attached to the skull clamp which, in turn, is attached to a frame mounted to the OR bed. The standard headrest is removed.

In the full sitting position, the arms are usually folded across a pillow resting on the patient's lap or rested on a padded table positioned in front of the patient. A footrest is used to prevent foot-drop and padding is normally placed under the heels. A bolster or roll can be placed under the knees to prevent pressure on the popliteal space, and the leg strap is positioned across the mid-thighs. The section of the OR bed supporting the patient's lower legs is flexed downward before the section supporting the torso is raised. The patient is slowly elevated into an upright position to avoid sudden changes in vital functions. At the same time, the entire OR bed is tilted in a steep Trendelenburg (head downward) position. This should leave the patient sitting almost fully upright, with knees flexed, and lower legs almost parallel to the floor.

Sim's position

The Sim's position (fig. 2–25) is one that is almost exclusively used for endoscopic or manual examination of the rectum, lower colon, and occasionally the vagina. Surgeons choose this position, rather than a jackknife or lithotomy, particularly when the patient is very old or obese because it requires less movement to achieve exposure.

In the Sim's position, the patient lies on his or her left side with the upper leg flexed at the hip and knee, and the lower leg almost fully extended. A pillow may be placed between the legs for comfort and another pillow used to support the patient's head. The downside arm rests along the patient's back with the weight of the chest supported by the bed mattress. The upper arm is flexed and rests in

front of the patient on the OR bed. Since the patient is usually conscious, and the examination procedures done in this position take very little time, physical restraints are not normally required. However, a staff member must stand next to the OR bed to comfort and hold the patient as necessary.

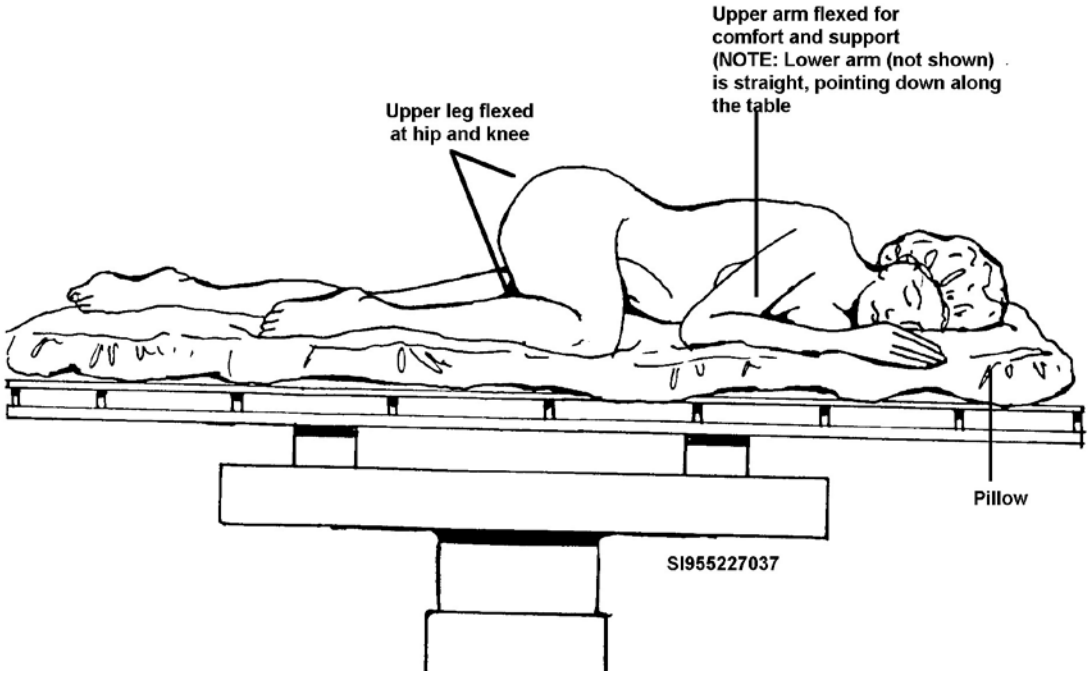

Figure 2–25. Sim's position.

Orthopedic fracture table positioning

There are many different makes and models of orthopedic fracture tables designed to support and put traction on a patient's extremities. These tables are frequently used for hip nailing, femur fracture reductions, and for other orthopedic procedures involving long bone fractures. Orthopedic fracture tables aid in fracture reduction by providing a means of intraoperative traction. These tables also enable the surgeon to take x-rays or use a portable fluoroscopic unit to view virtually any part of the body, in any plane, without the radiation impermeable obstructions associated with a conventional OR bed. Fracture tables also make it possible for the surgeon to apply casts (such as spica casts) to large areas of the body while maintaining proper anatomical alignment.

Figure 2–26 shows a dual pedestal, overhead suspension spar type table with the patient in a lateral position. This position is commonly used for intramedullary nailing or external fixation of the femur. In the illustration, the patient's right leg is the operative leg, so it is the upper leg, with the foot placed in a supporting "boot." A Steinmann pin is driven through the distal end of the femur and then attached to a 90 degree traction bow. When a traction bow is not used, the foot and ankle are secured in a boot specifically designed for traction. The unaffected leg is supported by a *leg basket*. The perineal post is attached to a lateral post holding bar, and the post is positioned snugly in the perineum. Both the post and the holding bar are well padded. The perineal post provides counter-traction as the traction increases from the distal femur.

Ensure the patient's external genitalia are not pinched or wedged between the perineal post and the perineum to prevent crushing injury. The hips and pelvis are supported by adjustable rests; they must be level with the table supporting the torso. The upper arm is resting on an over-arm board; the lower shoulder is rolled forward, and the lower arm is outstretched. All attachments are designed specifically for the table. The head is supported by a standard foam headrest.

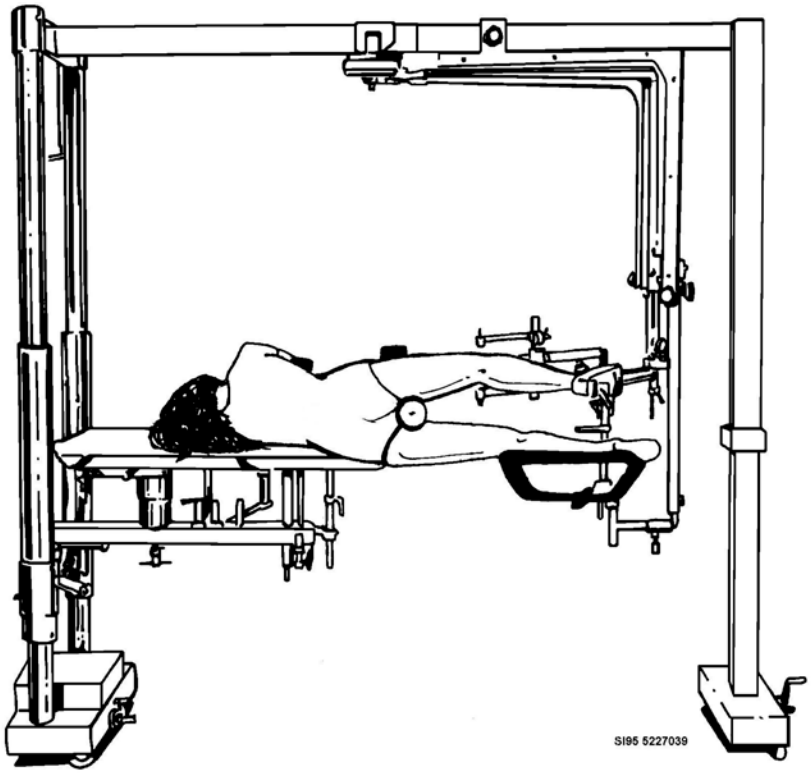

Figure 2–26. Patient in lateral position on dual-pedestal orthopedic fracture table.

Figure 2–27 shows the same table with the patient in a modified supine position for a hip nailing or plating procedure. Again, the right leg is the operative leg, but in this position the foot is well padded and placed in the traction boot. The unaffected leg is elevated on the leg basket with the knee flexed about 90 degree. The leg is usually abducted away from the operative leg to provide greater surgical access. The perineal post is attached perpendicular to the table top; again it is very well padded. The nonoperative hip is supported by an adjustable rest.

After anesthesia administration, the rest that supports the operative hip is lowered and rotated 180 degree under the table top to provide surgical exposure and access to the joint. The upper torso is supported by the table top. The operative-side arm is elevated across the chest and rests on a specially designed over-arm board. The non-operative side arm is usually outstretched on a standard-type armboard. Positioning the operative side arm across the chest allows the surgeon to apply a specially designed vertical sterile drape to create a sterile field “wall” on the operative side. In the illustration, the two bars with the “U” shaped ends above the patient are used to support the vertical drape.

There are many different types of fracture tables found throughout the Air Force. It is beyond the scope of this course to list or illustrate each type. Refer back to Figure 2–15 for an illustration of a patient positioned on a typical single-pedestal, under-the-table support spar type orthopedic table. It is important for you to become familiar with the table (if any) used in your operating room. Read the manufacturer’s operating instructions, and attend all in-service training sessions covering fracture table setup and operation.

Always consult with the operating surgeon, anesthesia personnel, and the circulating nurse before setting up a fracture table and positioning a patient on it. Positioning a patient on one of these special tables is a total team effort, requiring effective communication and a great deal of preoperative planning.

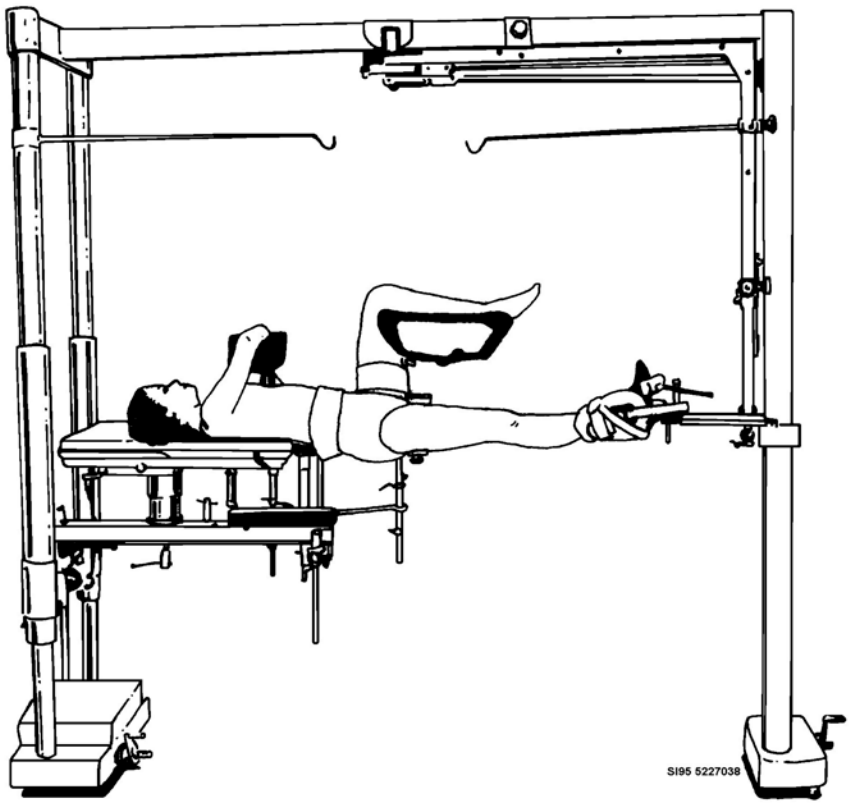

Figure 2–27. Patient in modified supine position on dual-pedestal orthopedic fracture table.

Positioning patients may look easy to the casual or untrained observer but, in reality, it requires a great deal of hard work and planning. Safe, effective surgical positioning is only accomplished when all members of the surgical team have a good understanding of basic anatomy, know how to apply physiological principles, are thoroughly familiar with positioning equipment and aids, and approach positioning with a safety conscious attitude. By studying the material presented in this unit and applying the various principles and guidelines we discussed, you should be able to help ensure your patients are placed in a safe, comfortable position that allows the surgeon good access to the operative site.

Self-Test Questions

After you complete these questions, you may check your answers at the end of the unit.

612. Dorsal positions

1. What position is used during general anesthesia administration, and for surgery on the abdomen, face, neck, and anterior chest wall?

2. Why is a lawn chair or contoured spine modification of the supine position used?

3. What dorsal position is used to increase operative exposure for lower abdominal or pelvic surgery? Why?

4. What surgical position places the patient flat on the OR bed with the entire bed tilted in a foot down configuration?

5. Why is the position described in question 4 often used for neck surgery, such as thyroidectomies?

6. Describe how an OR bed must be prepared prior to placing a patient in the lithotomy position.

7. Why should positioning a patient's arms by his or her sides be avoided during lithotomy positioning?

8. What is the reason for bringing the patient's knees together before and extending the patient's legs as you lower them?

9. What types of surgery are commonly performed with a patient in the lithotomy position?

613. Prone positions

1. What precautions do you take to prevent shoulder injuries when placing a patient's arms on arm boards during basic prone positioning?

2. When a patient is placed in a prone position, what measures are taken to prevent injuries to the anterior legs and feet?

3. What types of surgery may be performed with a patient in the basic prone position?

4. Briefly describe how a patient is positioned on a Wilson laminectomy frame.

5. Why is it necessary to tilt the OR bed into a slight reverse Trendelenburg position when a patient is placed on a Wilson laminectomy frame?

6. When a patient is placed in a prone position for neurosurgery on the skull or brain, where are the arms usually positioned? Why is this positioning necessary?

7. Where are the patient's hips positioned in relation to the OR bed during jackknife positioning?

8. Describe the proper sequence for flexing the OR bed to achieve the inverted "V" configuration that is characteristic of the Kraske position.

9. What types of surgery are performed using the Kraske position?

614. Lateral positions

1. Where is a patient's back situated on the OR bed during lateral chest positioning?

2. Specify how the patient's arms are supported in a lateral chest position.

3. Which leg is flexed at the knee when a patient is placed in a lateral position?

4. What devices or positioning aids may be used to stabilize a patient's torso during lateral chest positioning?

5. What types of operations are performed with the patient in a lateral kidney position?

6. Cite four ways the lateral kidney position differs from the lateral chest position.

7. What types of operations are performed with the patient in an anterolateral position?

8. Briefly describe how the anterolateral position differs from the supine position.

615. Other surgical positions

1. What position is most often used for surgery on the face, nose, mouth, and throat?

2. State the three steps required to adjust most OR beds into a semisitting configuration.

3. What is the *main* difference between the Fowler's and modified Fowler's positions?

4. What positioning modifications may be required to place a patient in a full sitting position on some OR beds?

5. Generally, where are a patient's arms situated when he or she is placed in a full sitting position?

6. The Sim's position is one that is almost exclusively used for what procedures?

7. Cite three advantages associated with the use of an orthopedic fracture table for patient positioning.

8. What is the purpose of the perineal post on an orthopedic fracture table?

Answers to Self-Test Questions

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1. The site of the operation, because the position should allow the surgeon easy access to, and good exposure of, the operative site.
2. The type of anesthesia to be administered.
3. Obtain the anesthesia provider's permission since surgical positioning must not interfere with administration of anesthesia.
4. To help determine special positioning requirements in advance; to enable the team to assemble all the necessary special supplies and positioning devices preoperatively; and to avoid patient injuries.
5. The patient may have to be repositioned and repreped, prolonging procedure and anesthesia time and causing a delay in the surgery schedule.

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1. (1) Avoid applying restraints too tightly.
   (2) Move extremities only within their normal range of motion.
   (3) Never attempt to move a patient without first asking anesthesia personnel for permission.
   (4) Avoid crossing the patient's arms across his or her chest; make sure patient's legs are not crossed.
   (5) Use chest rolls, bolsters, or special frames to relieve pressure on the patient's chest during prone positioning.
   (6) Never lean on patient's trunk or extremities during the operation.
   (7) Make sure heavy items are not lying on the patient's chest, abdomen, or neck.
   (8) Immediately notify the anesthesia provider or surgeon if you suspect respiratory compromise.
2. Blocking off blood flow to peripheral vessels. External pressure.
3. Any four of the following:

(1) Avoid tight restraint application.
(2) Make sure the patient's legs are not crossed.
(3) Make sure body surfaces do not rub or press against each other.
(4) Avoid leaning on the patient and do not allow heavy instruments or equipment to lie on or against the patient.
(5) Thoroughly pad all areas of the patient's body that may contact hard surfaces.
(6) Avoid extending, flexing, adducting, abducting, and twisting joints and extremities beyond their normal range of motion.

4. To allow their bodies time to adapt to the new position and prevent extreme fluctuations in vital functions.
5. Brachial plexus, ulnar, median, radial, femoral, sciatic, peroneal, tibial, and facial.
6. By placing soft padding under the lumbar area and knees.
7. (1) Avoid extending the arms more than 90° from the patient's sides.
   (2) Place the hands palm up on arm boards, and the palms toward the body when the arms are positioned at the patient's sides.
   (3) Slightly flex the arms at the elbows and avoid hyperextension.
   (4) Ensure the arms do not hang over or press against the sides of the OR bed.
   (5) Maintain the hands and fingers in the natural flexed position.
   (6) Ensure hands and fingers are not pinned beneath the patient's body or between hard surfaces.
   (7) Adequately pad bony prominences and areas such as the wrists, elbows, shoulders, and shoulder blades.
8. Stay within the normal range of motion.
9. Prolonged excessive pressure and compromised blood circulation to superficial tissues.
10. Shearing.
11. Respecting the patient's right to privacy.
12. To save operative and anesthesia time, avoid unnecessary traffic in the OR, and reduce noise levels during anesthesia administration.

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1. It may be engaged by a foot operated pedal located at the head of the bed, or may be controlled by a hand-operated touchpad. The brake usually consists of four short, sturdy, rubber-capped legs. When the lock is engaged, the legs drop into position and act like miniature car jacks, raising the wheels off the floor. When the lock is disengaged, the legs retract allowing the wheels to contact the floor.
2. The chassis.
3. Breaking the table.
4. The seat or upper leg section that normally supports the upper legs and buttocks.
5. The body or kidney elevator.
6. To provide an attaching point and track for a variety of clamps used to hold accessory positioning devices in place, and to provide attaching points for restraint straps and drainage devices.

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1. To the side rails on the back or upper body section. It keeps the drapes off the patient's face, acts as a barrier to prevent the patient from viewing the operation, and separates the sterile field from an unsterile area.
2. When either arm of a patient is extended on an arm board, because use of the braces can cause compression of nerves in the axilla and shoulder.
3. Any four of the following:
   (1) To provide anesthesia personnel access to the IV site during the surgical procedure.
   (2) To prevent the arm from interfering with access to the operative site.
   (3) To provide a mini operating room table for some hand or forearm operations.

(4) To facilitate access to nearby drainage devices, indwelling catheters, electrosurgical ground pads, or x-ray cassettes placed in the bed top "tunnel."
(5) For support of a lower arm when a patient is placed in a lateral position.
(6) To add temporary additional width to the OR bed. On rare occasions, arm boards may be attached to the bed parallel to the mattress top to widen the bed to support grossly obese patients.

4. They are slid onto the ends of the kidney elevator and are designed to stabilize a patient's body in the lateral kidney position.
5. By sliding your hand under the strap. If the strap is applied correctly it should be snug, but still allow sliding of the hand without difficulty.
6. On both sides of the bed, evenly with the perineal cutout.
7. Wrap them with a towel or place them in foam booties to prevent pressure injuries to the Achilles' tendons and bottoms of the feet caused by the straps.
8. It is a well padded, horseshoe-shaped device contoured to frame the face. It replaces the head section of the OR bed. It is used to allow the anesthesia provider access to the nose and mouth during posterior cranial, spinal, and thoracic surgery.
9. It supports the patient's torso in the prone position so that the chest can expand during respiration, and it provides adjustable flexion of the patient's spine to separate the vertebrae.
10. The arm-holder frame must be covered with stockinet or an "ace" wrap to form the sling.
11. Firmly grip the patient's leg above the knee to secure the leg during arthroscopic knee surgery.
12. Arm guards or "toboggans."
13. The device is positioned under and around the portion of the body to be stabilized; air is removed by suction while the device is molded to the patient's body; after all air is removed and the device is hard, the valve port is closed. At the end of the procedure or before repositioning, the valve port is opened to allow air back into the device, causing it to soften and resume its original shape.
14. Ensure the pillow is covered with a water repellent cover and a clean pillowcase.
15. To secure patients' arms by their sides.

609

1. Procedures involving the hips and lower extremities, particularly for those requiring intraoperative traction and/or x-ray.
2. A single-pedestal table has leg spars mounted below the table top. A double-pedestal table has leg spars suspended from above the table top.
3. It may be a one-piece design that raises, lowers, or is removed; or the seat may be a multi-piece design. Multi-piece designs have two or three pieces that can be independently raised, lowered, or removed.
4. Traction "bows" and traction "boots," with a perineal post.

610

1. At least two people must help conscious patients move to the OR bed. At least four people are required if the patient is unconscious.
2. Unwrapping the sheet slowly reduces air currents that might transport microbes around the OR.
3. (1) Move the gurney against the OR bed and lock in place.
   (2) One staff member stands beside the gurney; another stands on the opposite side of the OR bed. Both secure and stabilize the beds.
   (3) Instruct the patient to move slowly to the OR bed.
   (4) Tell the patient to feel for the sides of and center his or her body on the OR bed.
   (5) Apply the safety belt.
4. To prevent the strap from cutting into or abrading the patient's skin.
5. By supporting the head with a small pillow, folded sheet, doughnut, or foam head positioning aid.
6. Foot-drop.
7. They may be placed on a special padded restraining board, or their arms may be secured with gauze loops loosely applied and tied to the OR bed side rails.

611

1. Six.
2. A draw sheet or patient roller.
3. (1) Protect the patient from injury and provide as comfortable a position as possible.
   (2) Prevent circulatory and respiratory impairment.
   (3) Avoid pressure on nerves and muscles.
   (4) Achieve a position that facilitates anesthesia administration and allows for adequate surgical exposure.
4. Legs and ankles must *not* be crossed. Slightly flex and pad the knees if possible. Ensure joints, (i.e., hips, knees) are not stressed and no pressure is on bony prominences. Separate and pad legs with pillow if they may rest against each other.
5. For dorsal (supine) positions, support the lower spine with a small pillow or pad if possible. Supporting the knees in a slightly elevated, flexed position also eases back strain. The head, neck, and spine should be maintained in a straight line.
6. When the patient is placed in a prone position.
7. (1) Anesthesia personnel can put ointment in the patient's eyes and tape the eyelids shut.
   (2) A towel can be wrapped around the patient's head and over the eyes.
8. By resting the patient's head on a doughnut or foam head positioning aid.

612

1. Supine or dorsal recumbent.
2. To flex the legs at the knees and hips to help relieve lower back strain and relax abdominal muscles.
3. The Trendelenburg position, because it puts the patient into a head-down position, and causes abdominal viscera to fall away from the pelvic region.
4. Reverse Trendelenburg.
5. The foot-down position decreases bleeding at the operative site by preventing the pooling of blood in the highly vascular neck region.
6. The head section must be removed and attached to the lower leg section, and the bed pad cover sheet must be readjusted to cover the repositioned headrest.
7. Because of the risk of crushing the patient's fingers in the bed break when the leg section is lowered and raised.
8. To prevent overabduction of the thighs and possible damage to structures in and around the hip joints, and to prevent a sudden drop in the patient's blood pressure.
9. Operations involving the male or female genitalia, rectum, or other perineal structures. Also for many laparoscopic procedures.

613

1. Rotate the arms through their normal range of motion.
2. Doughnuts or padding materials are placed under the knees and a pillow or other pad is placed under the lower legs to prevent pressure on the shins and raise the feet off the bed.
3. Operations on the posterior chest, torso, legs, and, occasionally, the rectum.
4. The patient is placed on the frame so that the part of the spine to be operated on lies directly above the high point of the frame arch.
5. To make the patient's back horizontal to the floor.
6. They are placed at the patient's sides, secured by the draw sheet, to allow the sterile team members access to the patient's head without obstruction by the arm boards.
7. Over the table break between the seat and leg sections.
8. The leg section is lowered, then the entire bed is tilted into a head-down position until the hips and buttocks are at the top of the inverted "V."
9. Primarily rectal surgery.

614

1. With the back next to, and parallel with, the side of the OR bed.
2. (1) Place lower arm on standard arm board; upper arm on an elevated arm board.
   (2) Place both lower and upper arm on a special double arm board.
3. The lower leg.
4. A large vacuum positioning device or pillows, sandbags, or chest rolls placed in front of and in back of the torso.
5. Operations involving the kidneys, upper ureters, or other retroperitoneal structures.
6. (1) Patient is positioned with lower iliac crest over the kidney elevator.
   (2) Kidney rests or vacuum positioning devices are used to support the abdomen and lower back.
   (3) OR bed is flexed at the middle break and tilted horizontally until the patient's flank (operative site) is parallel to the floor.
   (4) Kidney elevator may be raised under the patient's iliac crest to increase operative exposure.
7. Operations involving the anterior chest wall, lungs, heart, thoracic blood vessels, and upper abdomen.
8. The operative site is elevated using pillows, bolsters, rolls, sandbags, or folded sheets placed under the shoulder and buttocks; the leg on the affected side is flexed at the knee to relax abdominal muscles; the arm on the affected side may be suspended from an anesthesia screen.

615

1. Fowler's or semisitting.
2. (1) The leg section is lowered to flex the patient's knees.
   (2) The body section is usually raised to about 45°, depending on the surgeon's preference.
   (3) The entire OR bed is tilted in a slight head-downward direction.
3. The patient's torso is raised to an almost full upright position in a modified Fowler's.
4. The patient may have to be placed on the OR bed backwards, with the patient's head at the foot end of the bed; the headrest may have to be removed and repositioned at the foot of the bed to support the patient's head.
5. Folded across a pillow resting on the patient's lap, or on a padded table positioned in front of the patient.
6. Endoscopic or manual examination of the rectum, lower colon, and vagina.
7. (1) It provides adjustable traction to aid in reducing long bone fractures.
   (2) The surgeon can x-ray or fluoroscope virtually any area of the body without obstruction from the table.
   (3) It enables cast application to large areas of the body while proper bone alignment is maintained.
8. It provides counter-traction against the patient's perineum as leg traction is increased.

Do the unit review exercises before going to the next unit.

Unit Review Exercises

Note to Student: Consider all choices carefully, select the *best* answer to each question, and *circle* the corresponding letter.

13. (605) What factor determines the *first* position a patient is placed into on the operating bed?
    a. Type of surgery to be performed.
    b. Type of anesthesia to be administered.
    c. Surgeon's personal positioning preferences.
    d. OR nurse's preoperative patient assessment.

14. (605) To prevent impairing a patient's breathing during positioning, what must circulating personnel *always* do before moving the patient?
    a. Ask the anesthetist or anesthesiologist for permission to move the patient.
    b. Tell the patient to take several deep breaths to oxygenate his or her lungs fully.
    c. Check the patient's history and physical data for indications of respiratory problems.
    d. Control the patient's head to ensure that the airway is maintained and anesthesia devices are not disrupted.

15. (605) When positioning a patient, which circumstance must be considered?
    a. Each and every patient is different, but standard positioning routines must be followed.
    b. The surgeon's preference is relatively unimportant and seldom influences patient positioning routines.
    c. Individual physiological and physical differences of patients can dramatically alter standard positioning routines.
    d. The patient's physical condition does not influence the surgical position, the anesthesia provider can maintain the physical condition regardless of the positioning routine.

16. (606) During surgical positioning, the most frequent cause of restricted blood flow in the extremities is
    a. gravity.
    b. hemorrhage.
    c. thick padding.
    d. external pressure.

17. (606) When using arm boards, *never* extend the patient's arms more than
    a. 30 degrees.
    b. 45 degrees.
    c. 60 degrees.
    d. 90 degrees.

18. (606) When positioning your patients' arms, the palms of their hands should face
    a. up when on armboards and towards the patient's body when tucked at their sides.
    b. up when on armboards and away from the patient's body when tucked at their sides.
    c. down when on armboards and towards the patient's body when tucked at their sides.
    d. down when on armboards and away from the patient's body when tucked at their sides.

19. (607) What feature on a general operating bed is designed to stop the bed from rolling out of position once it is placed in the desired location?
    a. Floor lock.
    b. Pedestal base.
    c. Wheel braces.
    d. Chassis controls.

20. (607) Why should you *avoid* elevating the telescoping pedestal of an operating room bed to the highest position?
    a. Bed is more difficult to roll with the pedestal fully raised.
    b. Bed may jam due to unequal weight distribution with the bed fully raised.
    c. Horizontal and vertical tilt controls do not function with the bed fully raised.
    d. Pedestal is designed to automatically lower once it reaches the fully raised position.

21. (607) What feature of most general operating beds is designed to increase operative exposure but is *never* electrically controlled?
    a. "Flex" control.
    b. Shoulder braces.
    c. Kidney elevator.
    d. X-ray permeable top.

22. (608) Shoulder braces should *never* be used when the
    a. patient's arms are secured at the sides.
    b. patient's arms are extended on arm boards.
    c. table is tilted into an extreme foot-down position.
    d. table is tilted into an extreme head-down position.

23. (608) Which headrest supports the patient's head by the face and forehead when the patient is in the prone position?
    a. Occipital.
    b. Cerebellar.
    c. Mayfield tongs.
    d. Gardner skull clamp.

24. (608) Where is an arthroscopic leg holder usually positioned on a patient's leg?
    a. Two to three inches above the knee.
    b. Six to Eight inches above the knee.
    c. Immediately below the knee joint.
    d. Directly over the middle of the knee joint.

25. (609) Which best describes a *commonly* used orthopedic fracture table?
    a. Single pedestal with leg spars mounted from below and an x-ray penetrable top.
    b. Double pedestal with leg spars mounted from below and an x-ray penetrable top.
    c. Single pedestal with leg spars suspended from overhead and an x-ray impenetrable top.
    d. Double pedestal with leg spars suspended from overhead and an x-ray impenetrable top.

26. (609) Which device is *not* usually found on an orthopedic fracture table?
    a. Arm boards.
    b. X-ray cassette holders.
    c. Body or kidney elevator.
    d. Sling-type leg "basket" support.

27. (610) To minimize a pediatric patient's fear and anxiety during anesthesia administration, what is the *best* way to restrain the hands and arms?
    a. Hold their hands until they are asleep.
    b. Secure the hands to a special padded restraining board.
    c. Strap the hands tightly to small arm boards extended from the OR bed.
    d. Secure the hands to the operating room bed side rails using loosely applied roller gauze or kling loops.

28. (610) When very tiny babies are operated on, what device may be used to restrain them?
    a. “Spica” table.
    b. Arm “toboggan.”
    c. “Papoose” board.
    d. Extra-wide arm board.

29. (611) When patients are anesthetized on the transport gurney, how many people are *usually* required to move them into a prone position?
    a. Two.
    b. Four.
    c. Five.
    d. Six.

30. (611) What is *not* an objective of surgical positioning?
    a. Avoiding pressure on muscles and nerves.
    b. Maintaining respiratory and circulatory function without impairment.
    c. Providing circulators easy access to drainage catheters and electrosurgical grounding devices.
    d. Achieving a final position that allows for adequate surgical exposure and facilitates anesthesia administration.

31. (612) Which position is considered the “position of choice?”
    a. Prone.
    b. Supine.
    c. Trendelenburg.
    d. Reverse Trendelenburg.

32. (612) What is *not* a requirement for placing a patient in the Trendelenburg position?
    a. Tilting the entire operating room bed in a head-down direction.
    b. Lowering the foot section of the bed 30 to 40 degrees to flex the knees.
    c. Placing the patient with the buttocks even with the perineal cutout.
    d. Placing the patient supine on the operating room bed with the knees over the lower leg break.

33. (612) What position is *frequently* used for thyroid and gallbladder surgery?
    a. Anterolateral.
    b. Trendelenburg.
    c. Modified Fowler’s.
    d. Reverse Trendelenburg.

34. (612) When a patient is in the lithotomy position, how should you lower the legs, and why is this necessary?
    a. Remove the feet from the stirrups simultaneously, keep the knees separated, and slowly lower the legs simultaneously, extending them as you do so. This prevents damage to the knees and gradually reduces pressure on the diaphragm, increasing the patient’s oxygen saturation level.
    b. Remove the feet from the stirrups simultaneously, bring the knees together, and slowly lower the legs simultaneously, extending them as you do so. This prevents over abduction of the thighs and prevents a sudden drop in blood pressure.
    c. Remove the feet from the stirrups separately and slowly lower the legs individually, extending them as you do so. This prevents damage to the knees and gradually reduces pressure on the diaphragm, increasing the patient’s oxygen saturation level.
    d. Remove the feet from the stirrups separately and slowly lower the legs individually, extending them as you do so. This prevents over abduction of the thighs and prevents a sudden drop in blood pressure.

35. (613) What *is not* a requirement when placing a patient in the basic prone position?
    a. A pillow is placed beneath the lower legs to raise the feet off the operating room (OR) bed.
    b. The head is normally placed on a foam head positioned in a face down position.
    c. Chest rolls or bolsters are needed to raise the patient's chest and hips off the OR bed.
    d. The arms may be on arm boards, alongside the body, or raised above the head and rested on the bed pad.

36. (613) When a patient is positioned for neurosurgery using a cerebellar headrest, where do you normally place the patient's arms?
    a. On arm boards pointed towards the head.
    b. Suspended from the ether screen by roller gauze.
    c. Raised above the head and resting on the operating room bed top.
    d. Secured by the draw sheet alongside the patient's body.

37. (613) For what type of surgery is the Kraske position usually used?
    a. Orthopedic.
    b. Proctological.
    c. Genitourinary.
    d. Neurosurgical.

38. (614) During full lateral positioning for chest surgery, why is the patient's upper arm raised above the head and slightly flexed at the elbow?
    a. Raise the scapula and allow access to the underlying ribs.
    b. Relieve pressure on the cervical plexus at the base of the neck.
    c. Prevent hyperextension of the shoulder joint on the affected side.
    d. Decrease the stress on intercostal muscles by closing the space between the ribs.

39. (614) Which *best* describes placement of a patient's legs during lateral chest positioning?
    a. Legs are separated by a large pillow and both are flexed at the knees, the lower more flexed than the upper.
    b. Lower leg is flexed at the knee for stability and the upper leg is extended towards the foot of the bed.
    c. Legs are placed together in a straight line and are separated by a large pillow pulled up into the groin.
    d. Upper leg is flexed at the knee and the lower leg is kept straight for stability.

40. (614) When the patient is in a lateral kidney position, why is the operating room bed straightened before the surgeon attempts to close the flank incision?
    a. Prevent respiratory compromise.
    b. Facilitate venous return to the heart.
    c. Allow easier approximation of tissues.
    d. Prevent nerve damage near the incision site.

41. (615) All of the following adjustments are made to the operating room bed to place a patient in a semisitting position *except the*
    a. leg section is lowered slightly to flex the knees.
    b. entire bed is tilted in a slight head-down direction.
    c. head section is raised so it is perpendicular to the bed top.
    d. section supporting the body is raised to about45 degrees.

42. (615) What position is often used to perform posterior cranial neurosurgery?
    a. Kraske.
    b. Basic prone.
    c. Laminectomy.
    d. Modified Fowler's.

43. (615) When a patient is placed in a full sitting position, the arms are usually
    a. extended 90 degrees from the body on arm boards.
    b. folded across a pillow situated on the patient's lap.
    c. placed alongside the body and secured by the draw sheet.
    d. raised above the head and suspended from an anesthesia screen.

44. (615) When the patient is scheduled for an intramedullary nailing of the femur, their lateral position on the orthopedic fracture table would be with the operative leg as the
    a. upper leg, its foot and ankle are secured in a traction boot; and the unaffected leg is supported by a leg basket.
    b. upper leg, its foot and ankle are supported by a leg basket; and the unaffected leg is secured in a traction boot.
    c. lower leg, its foot and ankle are secured in a traction boot; and the unaffected leg is supported by a leg basket.
    d. lower leg, its foot and ankle are supported by a leg basket; and the unaffected leg is secured in a traction boot.

Please read the unit menu for unit 3 and continue ➔

Student Notes

Unit 3. Preparing and Draping the Operative Site

BEFORE AN OPERATION IS PERFORMED ON A PATIENT, the skin and area surrounding the surgical site must be as bacteria-free as possible. We do this by antiseptically washing and preparing the skin, and by applying sterile drapes over and around the surgically clean area. As a surgical technician, you aseptically prepare the operative site by removing hair from the patient's skin, performing routine antiseptic skin cleansing procedures, and helping the surgeon to apply sterile surgical drapes.

This unit contains information related to preoperative patient skin preparation and surgical draping. The first section is devoted to skin preparation of the operative site. We cover the removal of hair from the operative site and the procedures for performing a routine antiseptic "skin prep," including some special requirements for skin preparation of specific body areas. The second section in this unit expands on what you have already been taught about surgical draping. We discuss commonly used draping materials, the purpose and principles of surgical drape application, and guidelines and procedures for the most commonly performed draping routines.

3–1. Patient Skin Preparation

As you should remember from the previous discussion of infection control, the skin harbors both transient and resident micro-organisms. These are normally harmless, unless the body's first line of defense, the skin, is broken or penetrated. Since making a surgical incision creates a portal for micro-organisms to enter the deeper tissues, it is essential that the skin be as free from germs as possible before the incision is made. In most instances, this preoperative skin preparation (prep) consists of rendering the skin *surgically clean* by scrubbing and painting the incision site and surrounding area with a hospital-approved antiseptic. Sometimes, you will have to remove body hair from the area immediately adjacent to the surgical site before cleaning it.

616. Removing hair from the surgical site

Most surgical procedures can be performed safely without removal of the patient's body hair, but occasionally, you will have to remove it from the immediate operative area.

Purpose

Shaving a wide area around the incision site was once the standard of care. The patient would be shaved using a razor while on the patient care unit either the night before or the morning of surgery. Over the years, numerous studies showed that shaving the site posed a greater risk of wound infection, particularly when shaved more than an hour before the procedure, because shaving often damages the skin. When the skin barrier is compromised, micro-organisms can enter the deeper tissues and start the infectious process before the surgery even begins. Because of these studies, hair is usually removed only if it is so thick it interferes with exposure, closure, or dressings. Small

patches may also be removed if hair does not allow adequate contact of electrosurgical grounding pads or of electrocardiogram (ECG) electrodes.

Some surgeons still request hair removal because hair harbors micro-organisms. By eliminating hair from the area near the incision site, you may reduce the number of micro-organisms that may contaminate the wound. Loose hair can find its way into the wound; this may result in a foreign body reaction or may lead to an infection from the micro-organisms on the hair. Despite the potential infection source, most studies show postoperative infection rates are lower when the hair (and subsequently the skin) is left intact, as long as the area is thoroughly cleansed with antimicrobial agents.

General guidelines

When a shave prep is ordered, it should be done as close to the start of the procedure as possible to reduce the time microbes can penetrate the skin. Ideally, the shave prep is done in a special holding area within the surgical suite. This area must provide enough room to perform the procedure, but still afford the patient as much privacy as possible. Shaving patients in the room where the procedure will be performed should be avoided because it is difficult to prevent the bacteria-laden hair, skin particles, and prep lather solution from being dispersed around the room. Regardless of where the shave prep is done, confine and dispose of the removed hair in a manner that prevents it from becoming a possible source of contamination.

Male personnel should shave male patients, and female personnel should shave female patients. The reason for this rule should be obvious. Exceptions may be made during emergencies and other extenuating circumstances.

Never shave the scalp or eyebrows, and do not cut eyelashes on any patient unless specifically ordered by the surgeon. If hair must be removed from these areas, many surgeons prefer to remove it personally. Because of the psychological trauma that may be associated with removal of skull or facial hair, its removal may be delayed until after the patient is anesthetized. When scalp hair is removed, scissors and electric clippers are first used, and then a razor may be used if necessary. Long hair removed from the scalp should be saved and placed in a bag marked with the patient's identification data. Some patients have this hair fashioned into a wig or hairpiece to cover the bare skull.

When performing the shave prep, act professionally at all times. If patients choose to discuss aspects of their personal lives with you, listen and respond as a professional person who is interested in the patient's mental, physical, and social well-being. Talking to your patient helps take their mind off what you are doing and relieve some of their anxieties. Respect the patient's right to privacy by not prying into areas they do not wish to discuss. Also, never divulge personal information you have gained through your contact with patients.

Most surgeons do *not* want hair removed from the surgical site. We cover the procedure in this CDC because when a surgeon does want the hair removed, you, as a surgical technician, will most likely do the removing. *Always* check the surgeon's preoperative orders for guidance.

Methods

The surgeon specifies the method and extent of hair removal. Usually, this is done by written instructions in the patient's chart on AF Form 3066, Doctor's Orders. If there are no written prep orders, do not remove the hair unless the surgeon specifically directs you to do so. In addition, your department should have written policies and instructions to provide guidance for performing preoperative patient skin preps. These instructions usually outline the methods of hair removal and skin cleansing procedures approved for your hospital. As stated previously, when possible, hair removal should be performed in an area outside the room in which the procedure will be performed in order to reduce the risk of airborne hair contaminating the wound after incision. The three most commonly used methods for removing hair from a patient's skin prior to surgery are: (1) electric

clippers, (2) use of a depilatory (hair removal) cream, and (3) the "classic" shave prep, using lather and a razor.

Electric clippers

In the past, electric clippers were used mainly to remove hair from the head before neurosurgery, or to clip coarse body hair prior to performing shave preps. Most of these clippers resembled those used by barbers or hairstylists. Today, the clippers used for preoperative hair removal are usually rechargeable battery powered and have disposable sterile heads specifically designed for preoperative shaving. When you use non-disposable head hair clippers, clean and sterilize the head after use. The handles of both types are cleaned and disinfected after each use according to manufacturer directions and local policy.

Battery powered, disposable head electric clippers are a good compromise between not removing hair prior to surgery, and total hair removal by shave or depilatory prep. The clippers are much safer for the patient. They usually leave stubble about 1 mm long; this short stubble does not interfere with the action of the antiseptic used later. They also offer less risk of skin damage from nicks and cuts. Disposable clippers also pose no risk of allergic reaction, involve less setup or preparation time, require fewer supplies, and contribute to lower post-op infection rates (no breaks in the skin). Because they are battery powered and do not have attached power cords, they are not only convenient to use but also safer for the staff (less risk of an electric shock). The disposable shaving head contributes to infection control by preventing the spread of micro-organisms between patients and personnel (the clipper head that contacts the patient's body can be tossed in the trash).

Because electric clippers are so fast, convenient, and safe, preoperative hair removal is often delayed until the very last minute before the patient is brought into the operating room. In some hospitals, the patient is "shaved" with the clippers in the operating room, immediately after final positioning and just before the antiseptic skin prep is begun.

When using electric clippers, you need few additional supplies. You need bed-protector pads (or chux) to keep hair contained for easy disposal, gloves, and a roll of wide (usually paper) adhesive tape to help contain and remove loose hairs from the patient. To shave with electric clippers, most manufacturers recommend holding the disposable head flat against the skin and shaving against the direction the hair is growing. Because the design and function of the clippers vary, follow the manufacturer's instructions and any applicable local operating instructions.

Depilatories

Depilatories are chemical lotions or creams that temporarily remove body hair. Removing hair with a depilatory is the second preferred method of hair removal. It is safer than shaving with a razor because it does not produce cuts or nicks in the skin, but some people are sensitive to the chemicals used. Irritation, rashes, and other toxic reactions are possible. Orthopedic surgeons often order depilatory preps for extremity preps because there is greater chance of cutting a patient when razors are used to shave over the bony prominences in the arms and legs.

Although hair removal by depilation eliminates the risk of cutting, nicking, or abrading the skin, there are several disadvantages. One disadvantage is they are messy. The cream or lotion must be spread over the entire area where hair has to be removed, and left on the skin for several minutes. It is also difficult to contain the agent to the specific area intended. Another disadvantage is it is more time-consuming than other methods of hair removal. You have to do a preliminary skin reaction test, apply the depilatory, let it sit on the skin for several minutes, and then clean it off. As previously mentioned, some patients can develop an allergic skin reaction to the chemicals in the creams. If this happens, surgery may have to be canceled due to the reaction. Some depilatory agents also have a rather unpleasant odor that not only bothers the patients, but may bother you when you are applying the cream.

Supplies

Like all procedures, before starting any prep, gather all the supplies you normally require to perform the task. This is especially important when using chemicals such as those in the depilatories. While a patient is having a reaction to the cream is *not* the time to be searching for a warm wash-cloth to remove the agent. Commonly, you will need the following supplies:

- Depilatory cream.
- Warm water.
- Disposable shave prep set.
- Washcloths and extra towels.
- Scissors and clippers.

Most depilatory creams come in 100 gram (about 3.5 ounce) tubes. It may take several tubes to prep a large area. To ensure you have enough agent, always take a few more tubes than you think you will need.

A large basin of warm water must be immediately available to remove the agent in case of a reaction. It will also be used to rinse the area after application, but you probably will need to change the water to rewarm it.

A disposable shave prep set is not essential, but is a good idea to bring one along to remove any hair the depilatory missed (check with the surgeon before using). The supplies in the kit, such as the disposable towels, can also be used.

You will need a washcloth to wipe off the cream if a spatula is not recommended. Cloth, hand, or bath towels are much more effective than paper towels for drying off the prepped area and for helping you clean up.

To facilitate application of the depilatory cream and ensure effective hair removal, instructions sometimes recommend you clip long hair as close to the skin as possible. So have scissors and clippers handy.

General guidelines

When using depilatory creams, use these basic guidelines. Always perform a skin sensitivity test before applying the cream. This is necessary to determine if the patient is allergic to or sensitive to the chemicals in the depilatory cream. Normally, you perform a skin test by applying a small, dime-sized amount of cream to the palm side (a relatively hairless area) of the forearm. Leave the cream on the skin for several minutes (usually between 10 to 20 minutes), then remove it and inspect the skin. ***ALWAYS*** read and follow specific instructions on the depilatory container and accompanying literature.

Since depilatories contain potentially harmful chemicals, you must be very careful to avoid applying the cream to delicate and easily irritated tissue areas. *Do not* apply the cream to genitals, mucous membranes, or areas near the mouth, nose, or eyes. Also, *never* apply depilatories to non-intact or inflamed skin. If you accidentally get some cream on a sensitive area, immediately wipe it off, and thoroughly rinse the area with warm water. Infants and children usually do not require hair removal, but if one does, do not use a depilatory; their skin is too delicate to tolerate it. Also, do not use a depilatory cream to remove facial hair unless specifically ordered to do so. Facial use is very risky to the eyes, nose, and mouth.

As with all patient preparation, tell patients what you are doing and why you are doing it before you start the prep. Ensure that you tell them about the steps involved and approximately how long it will take. Stress that they must not touch the cream after it is applied to prevent them from transferring the cream to other areas of their bodies. Also, tell them about the odor so they are mentally prepared for several minutes of breathing noxious fumes; most depilatories smell like sulfur or rotten eggs.

When using the depilatory cream, *always* follow manufacturer's instructions. Always wear gloves and eye protection, and it is a good idea to wear a disposable long-sleeved gown. Specific procedures vary, but they are usually similar to the ones listed here:

1. If the body hair is very thick and coarse, saturate it with warm water for several minutes before applying the depilatory.
2. Apply the cream lightly with gloved hands *against the direction of hair growth.* Usually, a thick (1/8– to 1/4–inch) layer of cream is applied over the entire prep area. *Do not* rub the cream into the skin as this increases the risk of irritation.
3. Ensure you limit application to only the areas specified in the surgeon's orders. If in doubt, contact the surgeon before you begin.
4. Apply the depilatory to the skin and leave it on for the time recommended by the manufacturer, and no longer. Excessive exposure can cause severe irritation, even if the initial skin test indicates no sensitivity.
5. Continually observe for signs of inflammation or other reactions. Tell the patients to inform you immediately if they feel any pain or burning sensation. If any signs of reaction develop, remove the cream and immediately notify a nurse or the surgeon. Many depilatories contain strong alkaline chemicals; boric or acetic acid solutions may be indicated to neutralize and reduce the extent of chemical burns caused by the cream.
6. After the recommended exposure period, remove it according to directions. The cream is usually removed with a wet washcloth or a spatula that comes with the product. Wipe or scrape the skin against the direction of hair growth.
7. After removing the cream, rinse the entire area with warm water to remove any residue and loose hair remaining on the skin. Then pat the prepped area dry, and inspect for signs of reaction and for completeness of hair removal. If the area still contains hair, consult the surgeon for specific instructions. Usually, any remaining hair is removed with a razor rather than reapplying the cream and risking a chemical burn.

If depilatory creams are used in your hospital, your department should have specific written instructions and guidelines to follow.

Razor shave preps

Of the three methods of hair removal, the razor shave prep is the least desirable. This method is most likely to result in skin abrasion, nicks, and cuts, thereby making the patient more susceptible to infection. When it must be used, it should be performed as close to the surgical procedure as possible, usually immediately before the patient is brought into the surgical suite or operating room.

General guidelines

Regardless of when or where the shave prep is done, there are several guidelines you should follow when shaving a patient. Check the patient's skin for rashes, irritation, cuts, and other signs of compromised integrity before beginning the prep. Report positive findings immediately to the surgeon. If you try to shave an irritated area, you will cause the patient severe discomfort and increase tissue inflammation. This can result in cancellation of the surgery and lead to extended patient hospitalization.

Avoid scratching or cutting the skin since breaks in the skin invite infection. The risk of injury is reduced by wet shaving the patient, holding the skin taut as you shave, and being extremely careful when shaving over bony prominences. *Do not "dry shave"* a patient unless you are specifically ordered to do so by the surgeon.

Supplies

The supplies you use for performing shave preps vary from hospital to hospital. In most facilities, disposable shave prep kits are used for convenience and to prevent cross-contamination. The most frequently used supplies include these items:

- Disposable, double-edged safety razors.
- Solution basins.
- Plain gauze sponges.
- Detergent and water.
- Bed-protector pads.
- Scissors or clippers.
- Paper tape.

Depending on the size of the prep area and the quality of the razor, several disposable, double-edged safety razors may be needed. Reusable, single-blade straight razors normally are used only by the surgeon. Extra razor blades are required if a straight razor is used.

The container for disposable prep kits also doubles as a solution container or basin. Metal or plastic prep bowls can also be used.

Normally, you use 4–by–4 or 4–by–8 inch plain gauze sponges to apply soapy lather and to help dry the area after the prep. Disposable sets may contain small sponge applicators for applying lather to the skin.

Disposable shave prep kits usually come with a sponge impregnated with a pure soap. Povidone-iodine (Betadine) scrub or other antiseptic solution may also be diluted with water and used to lather the skin and hair before shaving.

Commonly called “chux,” bed-protector pads are placed under the patient to absorb excess detergent-water solution, and to help contain loose hair.

Scissors or clippers may be necessary to clip long hair close to the skin so it can be shaved easily. You can use a wide roll of paper tape to pick up the loose hairs from a patient’s skin following the shave prep.

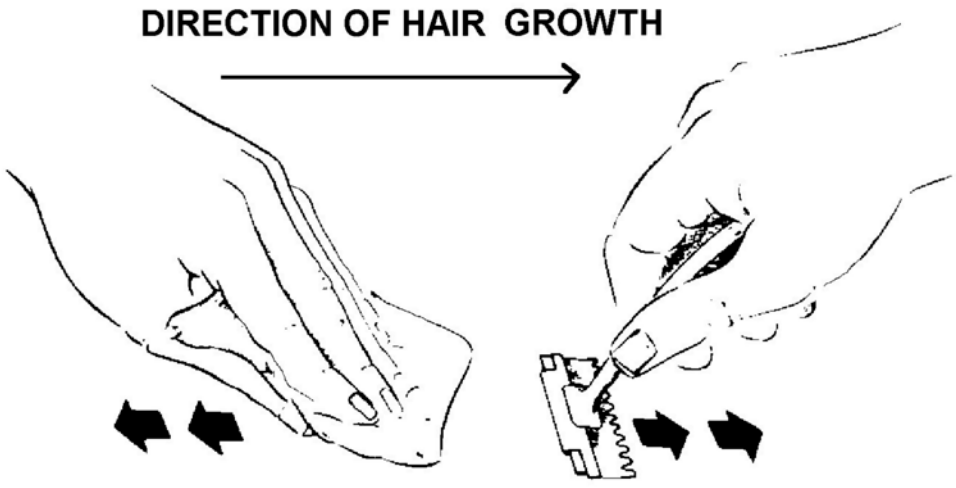

Figure 3–1. Technique for shaving with a safety razor.

Shaving technique

You may be proficient in shaving hair from your own body, but shaving someone else's can be a challenge.

The following procedures are basic guidelines only:

1. Arrange for a private area.
2. Assemble and set up supplies. This includes preparing *warm* detergent-water solution for developing lather. Make sure you have extra razors. Ensure adequate lighting is available.
3. Re-check the surgeon's prep orders in the patient's chart.
4. Explain the procedure to the patient.
5. Wash your hands and don gloves. (The gloves do not need to be sterile because they are to prevent cross-contamination only.)
6. Drape the patient to expose only the area to be shaved. Put bed-protector pads under the patient to catch excess solution and loose hair.
7. Inspect the skin. Apply prep solution to the patient's skin using sponges or soft sponge applicator. Apply solution for several minutes prior to beginning the shave prep. (Presoaking the hair for four to five minutes is usually sufficient.) This practice softens the area making it easier to shave.
8. Shave the area with short strokes made *in the direction of hair growth* (fig. 3–1). (Remember, the other two methods work against the growth.) Keep the skin taut by using a dry sponge and applying traction to the skin in the direction opposite from your shaving strokes. Be particularly careful when shaving over bony prominences and folds in the skin. Change razors as necessary to ensure a dull blade is not used.
9. After the hair is removed, rinse the skin and blot the patient dry with towels. Use strips of wide paper tape to remove loose hairs from the patient's skin. Inspect the shaved area. Remove hair from any areas you missed.
10. Remove bed-protector pads and replace soiled linens as necessary.

Remember, it is important to try to put the patient at ease during the prep. This can be done by striking up a casual conversation, looking and acting professional, guarding the patient's privacy, and performing your prep duties quickly and efficiently. If the patient is extremely embarrassed by being exposed and touched, stop the prep and tell the OR supervisor or surgeon. The prep can be done after the patient is anesthetized. Also, remember to notify the surgeon if you accidentally cut or scratch the patient during the shave prep. It is better to let the surgeon know you "goofed" and started the "surgery" in advance, than it is to have him or her find out after the patient is asleep.

Regardless of whether or not the surgeon orders hair removal, the patient's skin must be cleaned and disinfected before surgery to help reduce the risk of wound infection. This process is commonly known as the "skin prep" or simply the "prep." You learned the basics regarding skin preps in technical school. We now go a little more into detail on the procedures for different areas of the body.

617. Routine skin preparation of broad anatomical regions

Mechanical cleansing and antisepsis of the skin around the operative site is the last step of the circulator's preoperative patient preparation. The skin prep's primary purpose is to render the patient's skin *surgically clean* by reducing the number of resident and transient micro-organisms. We discussed in detail the antiseptic agents most often used for skin antisepsis in Volume 2 under infection control. Now we focus on the procedures and key considerations of routine skin preps.

Prep supplies

The basic supplies you need to perform routine preps are usually included in either locally processed or in commercially manufactured, disposable *prep sets*. These sets normally contain plain gauze

sponges (4 x 4 or 4 x 8 inches) for scrubbing the skin and applying antiseptic solution (“paint”). They also include cotton-tipped applicators for cleaning hard-to-reach areas like the umbilicus, and towels for draping off and drying the prep area. If the set is locally processed, it will most likely contain small stainless steel basins and prep cups, used to hold the different prep solutions, and two reusable sponge forceps. Disposable sets are often designed so the bottom part of the sterile package serves as the solution receptacle. Instead of sponge forceps, disposable prep sets usually have either small plastic forceps for holding onto sponges, or sponge-tipped plastic applicators.

If not included in the prep set, you need sterile gloves, antiseptic detergent or “scrub,” and antiseptic solution or “paint” solutions. You may also need sterile water to mix with and dilute the detergent scrub. Sterile scrub brushes may be required to cleanse grossly soiled skin and under the nails, or to remove scabs and dead tissue from wounds that are partially healed. A kick bucket with a plastic liner must be nearby for trash disposal. A small table or stand is usually used to set up your sterile prep supplies; most ORs have specifically designated *prep carts*. A linen hamper should be available for holding soiled towels or reusable wrappers. You also should have bed-protector pads under the patient’s body to prevent the OR bed linen from becoming soaked with excess prep solution.

Most of the time, prep supplies are assembled, opened, and set up by the circulating nurse or technician performing the prep. In some facilities, especially those using re-usable prep sets, the scrub technician assists with set up by arranging gloves, sponges, applicators, and solution containers for easy access. The scrub technician may also prepare the “sponge-sticks” by folding gauze sponges into approximately 1 x 2 inch rectangles, then clamping them in the sponge forceps to serve as a type of paint brush. If the scrub technician sets up the prep set, the solutions are not poured into the containers until he or she has stepped away from the prep cart.

Procedural steps and considerations

After the prep supplies are set up, prepare the patient for the prep. The first step is one you have seen before—ask the anesthesia provider for permission to touch the patient. Next, turn on and adjust the overhead surgical lights so they shine on the area to be prepped. Fold the cover sheet down toward the patient’s feet at least two to three inches below the desired prep area. Suspend a sheet between the IV poles to act as a screen; the distal edge of this sheet should form a top border two or three inches above the prep area. Tuck a bed-protecting pad on each side of the patient, absorbent side up. These pads catch and absorb any excess prep solution and prevent it from pooling under the patient. Allowing the patient to lie in prep solution can result in skin irritation or even chemical burns.

Before donning sterile gloves and beginning the prep, the circulator rechecks the patient’s chart to ensure the patient is not allergic to the antiseptic solutions that have been poured. Normally, known allergies are indicated by large stickers conspicuously displayed on the front of the chart. Patient allergies should also be documented on AF Form 1864, Perioperative Nursing Record, and the surgical checklist. At this time, the surgical consent forms are also checked to ensure the correct area has been exposed for the prep.

After checking the chart, the circulator begins the actual scrub prep. The following is an outline of the steps you follow when performing routine skin prep on a flat body surface such as the abdomen.

1. Don sterile surgical gloves using the open glove method.
2. Finish preparing and arranging prep supplies on the sterile prep setup. If the scrub technician has not prepared sponge sticks, do this before beginning the prep. These sponge sticks are used to “paint” antiseptic solution over the cleaned area at the end of the prep.
3. Move the prep stand and kick bucket next to the OR bed. The prep stand should be positioned near enough to the patient so you can reach the prep supplies easily, but far enough away to reduce the risk of contaminating the sterile setup. Place the kick bucket close to the prep stand so you can discard sponges or applicators as you use them.

4. Drape the prep area with sterile towels. At least four towels are required to outline the area. If a hair removal prep was done, drape off the area where hair was removed. If hair was not removed, drape a wide margin around the incision site. When applying the drape towels, follow these steps:
   a. Open the towel all the way and make a "cuff" to protect your gloved fingers and hand.
   b. Drape the far side of the prep area first, the area opposite the side at which you are standing.
   c. Place towels at the top and bottom of the prep area. Be careful not to contaminate the towels on nearby equipment, such as IV poles. Also, be careful not to contaminate the prep setup as you move back and forth applying the towels.
   d. Drape last the side of the prep area closest to you.
5. If the prep site contains a "dirty" area, such as the umbilicus in an abdominal prep, you should perform a "pre-prep" and clean it using cotton-tipped applicators; or you should squeeze some prep solution into the area and let it "pool" while you perform the actual prep.
6. Wet the sponges or applicators with detergent prep solution. Squeeze out the excess to reduce runoff and pooling under the patient.
7. Begin timing the prep. In most cases, the operative site is thoroughly scrubbed with the antiseptic detergent solution for at least 5 minutes (the same minimum time required for a surgical hand and arm scrub). Local policies and the surgeon's orders determine the specific time.
8. Start scrubbing the area you want to be the cleanest, the center of the incision site, and move outward in a spiral pattern. Avoid touching the skin with your gloves; try to touch it only with the wet sponges. Using a circular scrubbing motion, scrub firmly, but not too hard. Discard the sponge after scrubbing the outer perimeter of the operative area. The center of the prep area is considered clean, while the peripheries are considered contaminated. *Never retrace* or go back over an area with the same sponge; if you retrace, you drag micro-organisms from a "dirty" area back over a "clean" area.
9. Use a fresh sponge or applicator and repeat the scrub procedure. As you work, use a circular pattern, overlapping to ensure you cover all areas. Continue scrubbing the area for the prescribed time.
10. Make a cuff in a sterile towel as described previously, then blot or pat the washed area dry, keeping the cuff up on the side opposite you. Remove the towel by grasping the cuff and raising the towel off the scrubbed area, peeling it towards you. Be careful not to contaminate the prepped area, prep set, or your sterile gloves with the "dirty" edges of the towel. Discard the towel.
11. Using the sponge sticks, "paint" the antiseptic solution over the scrubbed area using the same technique as for the scrub. Start in the center of the incision site and work toward the edge of the prepped area in a spiral pattern. Always overlap your circular strokes so no area is left uncovered by the paint, and do not retrace.
12. Discard the sponge (not the forceps) or applicator in the kick bucket. Paint the area a second time, using a fresh applicator or sponge stick. If you missed an area on the first pass, ensure you cover it during the second application.
13. Remove the drape towels, one at a time, in the reverse order that they were applied. Do not reach over the prepped area, and do not drag the edges of the towel across it. After removing the towels, check for pooled prep solution under the patient. If there is any, soak up the excess and place clean bed-protector pads between the soiled sheets and the patient's skin.
14. Disassemble the prep setup and discard all items in the same kick bucket (lined with a plastic bag) you used for the prep sponges. Gather the noncounted trash from other kick buckets, and remove and discard soiled prep gloves in the bucket. Then seal it. Keep the bag in the room

until the procedure is over to validate counts if necessary. Remember to replace the kick bucket liner.

15. By the time you complete the prep and break down the setup, the surgeon and assistants will probably be in the operating room waiting to be gowned and gloved. If you timed the prep properly, you are able to "tie them up" without delaying the procedure.

As soon as possible, the circulator documents the skin prep. In Air Force hospitals, the entry is made on AF Form 1864, Perioperative Nursing Record, in the block labeled "surgical skin prep." If a reaction or other problem occurs during the prep, the appropriate block is checked and explanatory notes are annotated in the "comments" section. A hospital incident statement must also be completed. Usually, the circulating nurse will document the skin prep, but the duty may be delegated to another staff member who is familiar with completing the form.

618. Prepping specific body areas

The previous section dealt with performing routine skin prep on flat body surfaces such as the abdomen. Now, we look at how standard routines are varied to prep specific body areas or for certain medical conditions. We begin with prepping the extremities.

Prepping extremities

Several adjustments to the normal routine are made when prepping an extremity. Whether you are prepping an arm or a leg, the same basic principles and procedures apply. The entire circumference of the arm or leg must be prepped, so it must be elevated and held in position off the OR bed. Usually, this is done by having a second circulator (yes, we mean you!) don sterile gloves, and then hold the extremity by the hand or foot. If the hand or foot does not have to be prepped, attachments are available to suspend the limb during the prep. Regardless of the method used to hold the limb, it must be secure throughout the prep; if an arm or leg falls off the support, serious damage is likely.

Extremities are not "squared off" with sterile drape towels like an abdominal prep; they are prepped around their circumference, and often in their entirety. A tourniquet is often used for operations involving extremities, and serious chemical burns can occur from pooled antiseptic solutions under tourniquets. To prevent solutions from seeping or running under the tourniquet, chux pads or towels are usually wrapped around the extremity, immediately distal to the tourniquet. Some surgeons use plastic adhesive drapes to wall off the distal side of the tourniquet. The chux or towels should still be used to prevent run-off solution from the plastic drape from pooling. To protect the bed sheets and surface, prep-pads are often placed over them. These prep pads are usually about twenty inches wide by four feet long, with plastic on one side and an absorbent paper on the other. They are placed paper side up under the extremity being prepped, and removed before sterile drapes are applied.

If the hands or feet are grossly soiled, the fingernails or toenails are cleaned using a nail pick and scrub brush (like you use to scrub your arms before gowning) before the actual prep is started. There are two schools of thought regarding where to start an *extremity prep*. The most commonly used method is to start at the incision site, then work up the limb to the hand or foot; discard the sponge when you reach the distal end. Then, using a fresh sponge, again start at the incision and work down to the tourniquet. The theory behind this method is that using a fresh sterile sponge each time you cover the incision site makes it the cleanest area of the prep. The other method used involves starting at the highest point of the limb (the fingers or toes), and working down towards the tourniquet. The theory behind this method is that the solution, and the "bugs" in the solution, flows with gravity. By starting at the top, gravity helps you wash the potential contaminants down and away. Local policies and current national standards dictate the method you use.

When prepping the extremity, be particularly careful to cover the entire circumference. It sometimes helps to consider each extremity as a four-sided object, ensuring you thoroughly scrub all sides. When washing the fingers or toes, thoroughly scrub all sides and between each digit. Because the area of the prep is extensive, and because you usually have to change sponges more frequently, the scrub usually

takes more than five minutes to complete. You probably also need more plain sponges and prep solution than you use on a routine abdominal or back prep. Anticipate this, and ensure you allow extra time and include the extra supplies on the setup before you begin.

When the timed scrub is finished, fully open a towel and pat the extremity dry. Apply the two coats of "paint" in the same sequence you performed the scrub. After the extremity has been painted, the chux or towels are removed from around the tourniquet, and the prep pads are removed from the bed. Check to ensure no prep solution is pooled under the tourniquet cuff or under the patient's body. The prepped extremity must still be supported until draping is started and a sterile member of the team can assume control of the limb.

Prepping perineal and "septic" areas

Skin preps involving the vagina, rectum, or other "dirty" areas also require modification of prep procedures because these areas are considered grossly contaminated with micro-organisms. The two most important points to remember when prepping these areas are (1) to discard the sponge every time it crosses the anus or septic area, and (2) when the vagina is involved, it is prepped last.

Vaginal preps

Vaginal preps are usually performed with the patient in the lithotomy position. The prep area includes the pubic region, vulva, vagina, perineum, inner thighs, and anus. Place a prep pad under the buttocks and extending down over the lowered leg section of the OR bed. Most prep pads have a pocket at one end; place it at the bottom of the foot section, pocket open, to serve as a receptacle for prep solution runoff. If the pad does not have a pocket, place the lower end in a kick bucket so the excess prep solution does not drip on the floor. Cover the patient's lower abdomen with a towel, with the lower edge just above the pubis, to keep from soiling the cover sheet during the prep.

Start the scrub prep at the pubis, scrubbing downward. Continue down over the vulva and perineum. Scrub the anus last, and discard the sponge. Next, use a fresh sponge to scrub the inner aspect of one thigh from the labia of the vagina out toward the knees. Discard the sponge, then use another sponge to scrub the other thigh. Repeat the process for five minutes or for the time specified by local policy. After the external areas are scrubbed, clean the internal vagina and cervix using sponge sticks. Use copious amounts of scrub solution to ensure all the crevices and folds in the vaginal mucosa are thoroughly washed. After washing the vagina, use a dry sponge to wipe it out and absorb the excess solution. Use a sterile towel to pat the external surfaces dry, then paint all surfaces in the same sequence, using the same methods as for the scrub. The inside of the vagina is painted last. If the surgical procedure involves the possibility of entering the peritoneal cavity, such as a hysterectomy, use a dry sponge to soak up the excess solution after painting. If bladder catheterization is ordered, do it immediately after the prep.

Rectal preps

Like the vagina, prep the anus last. If the patient is in a lithotomy position, drape as described for vaginal preps. For a jackknife position, place towels above and below the buttocks, and place prep pads or chux on both sides of the patient. Place a folded hand towel between the thighs to catch excess prep solution and keep it from running under the patient and pooling.

If the patient is in the lithotomy position, the prep sequence is the same, treating the anus as you treated the vagina (except the rectum is not routinely washed internally). In the Kraske position, begin the scrub by washing the lower back, just above the buttocks. Continue down the inside of the buttocks on either side of the anus, then discard the sponge. Next, use fresh sponges to scrub the perimeter areas of the buttocks and the upper portion of the inner thighs (the peripheral areas). The anus is prepped last. Continue the procedure for the prescribed time, then blot the area dry with a sterile towel. Apply two coats of antiseptic paint with sponge sticks, following the same sequence used for the scrub.

Prepping septic areas

When performing cleansing preps on colostomy sites, draining sinuses, infected wounds, or other grossly contaminated areas, always wash and paint the dirtiest area last. Begin by packing the stoma or contaminated wound with detergent saturated sponges, then scrub a wide area around the operative site, discarding any sponge that becomes contaminated by touching the dirty area. Use separate sponges to scrub and paint the dirty area after prepping the surrounding skin. Be sure to use chux or prep pads to prevent solution from pooling or soiling the bed sheets.

Preparation of cancerous areas

Some studies indicate cancer cells may spread to other areas of the body through the blood and lymph vessels because of "seeding" through pressure exerted against the cancerous cells. For this reason, many surgeons request that a "gentle skin preparation technique" be used on known cancer or on biopsy patients. For instance, preps on breast biopsy patients are often limited to gently painting the solution on the skin; the usual 5–minute scrub is eliminated. Patients with confirmed malignancies are usually prepped in the same manner. If a scrub is ordered, ensure you apply minimal pressure.

Preparation of areas for debridement

When the surgical site contains necrotic tissue or foreign material such as dirt, tar, or other debris (common with orthopedic trauma injury), the surgeon may perform a "prep" procedure before actually starting the operation. In addition to the standard prep set, you should have the following items available:

- Sterile impervious drapes, as well as many sterile absorbent towels.
- A small soft tissue instrument set.
- Many bottles of sterile saline irrigation. Some surgeons prefer to use some type of antibiotic irrigation solution. This is often a pharmacy prepared irrigation containing an antibiotic such as bacitracin. Some surgeons mix an antiseptic such as povidone-iodine with saline to make a diluted antiseptic irrigation.
- Two bulb or "asepto" syringes.
- Large basins to catch the irrigation solution.
- Two suction setups, preferably with "quick-change" capability and large volume capacity.
- A power lavage unit (if available) to provide hydrostatic cleansing action. Most of these units require a compressed air tank and 3,000 cc bags of irrigation solution.
- A sterile scrub brush, like the one you use to scrub your hands.

The surgeon will use copious amounts of irrigation and instruments such as forceps, scissors, and scalpels to remove as much dead tissue or foreign matter as possible from the operative site. The scrub technician usually assists. The circulator keeps irrigation solution containers full and changes suction containers as they become full. The circulator also regulates the setting on the lavage unit and changes the bags of irrigation solution as required.

Irrigation and debridement (I&D) is often the sole surgical procedure performed. If further surgery is necessary, I&D is usually the first part of the prep. When I&D is finished, the wound is either prepped routinely, or only the "paint" solution is applied. A completely new sterile setup and new sterile drapes are required for the follow-on procedure. Before application of the new drapes, you must ensure all linen and bed surfaces are dry, and no solution has seeped under a tourniquet or the patient.

Preparing the face and surrounding structures

Preoperative cleansing of the eyes, ears, and other facial structures requires special considerations to prevent possible irritation or injury to delicate tissues. Whenever you prep the head or face, place a prep pad or chux under the patient's head. If the patient is asleep and intubated, the anesthesia

provider usually tapes the eyes shut. If the patient is awake, or if the eyes are not taped, place sponges moistened with sterile water over the eyes to prevent the prep solution from entering them. Place cotton balls in the patient's ears for the same reason. You may want to cover long hair with a surgical cap, or wrap a towel around the head, to keep hair out of the prepped area; in some cases, you will trim the hair. After the face is scrubbed, the surgeon may want you to rinse the prepped areas with sterile water to remove potentially irritating solution residues.

CAUTION: Antiseptic prep solutions containing chlorhexidine gluconate have been reported to cause serious permanent eye damage when used as a surgical prep, and permanent deafness if allowed to enter the middle ear canal. Chlorhexidine gluconate solutions (Hibiclens, Hibistat, Betasept) should *not* be used to prep any head or facial area. Prep solutions containing iodophors (Betadine) may cause corneal damage and must be used with extreme caution around the eyes.

Facial preps

The face contains "dirty" areas, such as the mouth, nose, and hairline that harbor large quantities of micro-organisms. The prep technique is similar to that for septic preps. The clean areas of the face are washed first; then separate sponges are used to clean the dirty areas. Preps for nasal or oral surgery are usually limited to gently washing or wiping the skin around the affected area with a mild antiseptic solution. If the incision will be made on the face, start by cleaning the skin around the incision site, and work outward toward the hairline. If the incision will be inside the mouth or nose, clean the incision site last using fresh sponges (cotton-tipped applicators may be used to clean the nostrils during a nasal prep).

Eye preps

The procedures for performing an eye prep are considerably different from those of a routine prep. Because of the delicacy of the eyes and susceptibility to injury, the surgeon often performs the prep. An eye prep must never be performed by someone who is not thoroughly trained and proficient in the procedure.

The first step of the procedure is performed at the discretion of the surgeon; trimming the eyelashes. When requested, the eyelashes are trimmed to prevent them from interfering with the surgical field and to prevent them from sticking into and injuring the eyes during the procedure. To trim the eyelashes, coat the blades of a pair of small iris scissors with petrolatum jelly; the jelly holds the cut hair and prevents it from falling into the eye. The eyebrows are never trimmed or shaved unless the surgeon specifically orders it.

The eyelids and areas around the orbits are gently washed with a mild antibacterial detergent solution, or may be lightly painted with the antiseptic. The skin around the eyes is scrubbed or painted from the center of the eyelids outward to include the forehead, nose, and cheeks. Care is taken to prevent the prep solution from getting into the eyes. If the patient is conscious, instruct him or her to close his or her eyes tightly during this phase. Next, the eyes are irrigated with saline, usually using a bulb syringe. An eyelid retractor is normally included on the prep set to hold the eyelids open during irrigation. The patient's head is turned to the side to allow the irrigant to run out of the eye, and an emesis basin is placed under the side of the patient's face to catch the solution runoff. Dry, sterile sponges and towels are used to help soak up the prep solutions before they enter the nose, mouth, and ears during the prep. They are also used to blot the prepped areas dry after the final eye rinse.

Ear preps

Ear operations often require removal of some scalp hair around the ear before beginning the scrub prep. The surgeon determines if this is necessary and may personally perform the hair removal. Cover the patient's hair with a towel. You may have to tape the lower edge of the towel, above the ear on the affected side, to keep it from sliding into the prep area. Turn the patient's head so the operative ear faces up.

Scrub the skin on the outer ear and surrounding area with a mild antiseptic detergent solution. Usually, an iodophor detergent, such as Betadine, is used in this area. If the patient is awake, tell the patient to close his or her eyes tightly during the prep. Use cotton-tipped applicators to clean the external ear canals carefully. After the ear and surrounding skin are washed, irrigate the ear canal with warm water or saline using a bulb syringe. Dry the prepped areas with a sterile towel or dry sponges. Follow the scrub with an antiseptic paint, if ordered.

Preparing two surgical sites

For some operations, such as skin, bone, or vascular graft procedures, two separate areas of the body must be prepped. In these cases, two completely separate prep sets are used to prevent cross-contamination between the different surgical sites. Never allow items used to clean one area to be exposed to the other area.

For skin graft procedures, the donor site (place where the skin graft is to be harvested) is usually prepped first. This is because the recipient site (damaged area to receive the skin graft) is normally considered more contaminated and more susceptible to infection because bacteria can enter through the broken skin. By prepping the donor site first, there is less chance of spreading bacteria to the broken area. Ideally, two circulators are available so the two sites can be prepped simultaneously. Also, the surgeon may request a skin graft patient be prepped with a nonstaining or colorless antiseptic. This helps determine circulation of blood through the graft site (by looking at the color of the skin).

We have covered all we are going to on skin preparation. After studying this section, you should have a better understanding of why and how patient skin preps are accomplished. We covered the purpose and methods for removing hair from the operative site, and the basic guidelines and steps for performing the most common skin preps. You will learn different methods and types of preps as you progress in your career; medical practice is never constant. The material we presented here is only a guideline, the “tried and true” methods that have been used effectively and consistently. Now, answer the following questions to see how much you learned.

Self-Test Questions

After you complete these questions, you may check your answers at the end of the unit.

616. Removing hair from the surgical site

1. Why is hair usually *not* removed from the operative site?

2. State the reasons why hair is sometimes removed from the operative site.

3. If ordered, when should the preoperative shave prep be performed? Why?

4. Why should shaving patients inside an operating room be avoided?

5. What areas of the body should never be shaved without the surgeon’s specific written orders in the patient’s chart?

6. Briefly explain what should be done with long hair that is removed from a patient's scalp.

7. List some advantages of a rechargeable battery powered clipper with disposable sterile head.

8. What is adhesive tape primarily used for during the shave prep?

9. What is a depilatory?

10. Specify four disadvantages associated with the use of depilatory creams.

11. Why is it necessary to perform a skin test before applying a depilatory agent, and on what part of the body is the test normally performed?

12. Cite the areas of the body or conditions where the application of depilatory agents should be avoided.

13. Why do you pre-soak the hair before beginning a shave prep?

14. In which direction do you shave hair when using a razor?

617. Routine skin preparation of broad anatomical regions

1. What is the primary purpose for performing a preoperative cleansing skin prep on a patient?

2. What is a sterile scrub brush used for during a prep?

3. What is the *first* step a circulator should take before actually starting a scrub prep procedure?

4. Why are bed-protecting pads tucked under the patient before beginning the prep?

5. Before beginning the timed scrub, what part of the prep area needs to be washed?

6. What is the *minimum* length of time normally required for the scrub phase of the cleansing skin prep?

7. Why is it important not to retrace over an area with a “used” sponge when scrubbing a patient’s skin?

8. How many times should the prep area be painted with antiseptic solution after the wash prep is done?

9. What do you do with the kick bucket liner containing the soiled prep sponges after the prep is completed?

618. Prepping specific body areas

1. How is an extremity supported during a scrub prep?

2. If a tourniquet cuff is applied to an extremity, how do you prevent solution from running or seeping under it during the prep?

3. When performing an extremity prep, what areas are normally washed first?

4. How long should an extremity be supported in an elevated position after the prep is done?

5. What areas of the body are normally included in a vaginal prep?

6. When performing a vaginal prep, which area is prepped *last*?

7. When performing a rectal prep on a patient in the jackknife position, what can you do to prevent prep solutions from running and pooling under the patient?

8. Briefly describe the procedure for performing a rectal prep on a patient in a Kraske position.

9. When prepping an infected wound, what areas are prepped last?

10. Why does a surgeon request a gentle “paint” prep over a suspected cancerous area rather than the usual scrub and “paint” prep?

11. What is one way a patient’s eyes can be protected from irritation during a facial prep?

12. Why should chlorhexidine gluconate solutions (Hibiclens, Hibistat, Betasept) *not* be used to prep any head or facial area?

13. When performing a facial prep that involves the nose and mouth, why do you prep these two areas last?

14. If a surgeon wants a patient’s eyelashes clipped during an eye prep, what can be done to prevent the clipped hairs from getting in the patient’s eyes?

15. When performing preoperative cleansing skin preps for a skin graft procedure, what area do you prepare first? Why?

3–2. Surgical Draping: Materials and Methods

Once the operative area is prepped, the unprepped areas of the patient and other surfaces must be blocked from the clean areas to prevent resident bacteria from migrating to the operative site. We do this by applying sterile drapes to all nearby surfaces, usually leaving only the operative site exposed.

You were introduced to basic types and methods of draping materials in technical school, focusing on the routine laparotomy draping technique. By now you have probably discovered there are numerous drape materials and draping methods available. We do not try to cover every method, nor do we want to waste your time by reviewing information you already know. What we do try to do in this lesson is provide you with some of the fundamental knowledge about drapes, and cover the principles and “whys” behind basic draping methods.

Every facility and surgeon uses different drape types and routines. To be an effective surgical technician, you should familiarize yourself with as many of the available drapes and their uses as possible. Do not get isolated or trapped into a specific surgeon’s or specific facility’s routine. A change in technology, manufacturer, or a reassignment can rapidly make a technique obsolete.

We begin by discussing some of the materials used for draping, including linen and various disposable synthetics. Next, we cover the purposes, basic principles, and guidelines for applying sterile drapes. The last lesson in this section describes a few typical patient draping and equipment draping routines.

619. Common surgical draping materials

Drapes are classified by their intended purpose (laparotomy drape), the material they are made from (plastic self-adherent drape), by their design and shape (split sheet), or by a combination of their characteristics (plastic adherent split sheet). They are made from either disposable or reusable materials. Their shapes can be simple rectangular sheets or complicated configurations that conform to various body contours or operative sites. Regardless of the material surgical drapes are made from, or what shape they are, they must meet certain criteria.

Desirable characteristics of surgical draping materials

The materials used to make surgical drapes must meet two basic criteria. It should provide an effective barrier to, or minimize the passage of, micro-organisms between sterile and unsterile areas. It should also be safe and comfortable for the staff and patient in the surgical environment. To meet these criteria, the drapes should have the characteristics listed in the following table.

Characteristics of Surgical Drapes	
Blood and fluid resistant	As you learned in technical school, micro-organisms can penetrate (strike-through) wet drapes through pressure or wicking. Seams of drapes should be constructed to meet the same fluid resistance.
Resist tears, punctures, and abrasions	The integrity of a drape is violated by these actions, allowing microbes to pass through.
Flexible	Drapes should be flexible or “drapable” enough to conform to the contours of the patient’s body and of the equipment involved. Rigid drapes or drapes with excessive “memory” can interfere with the surgical procedure.
Lint-free	Drapes should be as lint-free as possible to reduce the dispersal of particles into the surgical environment. Lint can not only cause a foreign body reaction, but can serve as an airborne vector and carry microbes into a wound.
Non-reflective	Drapes should be non-reflective and colored to reduce eye strain and distortion from reflected light.
Antistatic, nonflammable	Drapes should be antistatic, resist ignition, and have a low rate of flame spread. This usually means they meet or exceed the standards established by the National Fire Protection Association (NFPA). A fuel (the drape), oxygen (plentiful in an OR), and an ignition source are the three requirements for a fire. Drapes come in contact with many potential ignition sources; light sources, cautery units, and lasers are just a few.
Porous	Drapes should be porous enough to prevent excessive heat build-up, but not so porous as to abet patient hypothermia.
Nonabrasive and free of toxins, dyes, or odors	Drapes should be nonabrasive and free of toxic materials, nonfast dyes, and unpleasant or noxious odors. Obviously, we do not want to put drapes on a patient that are so rough in texture that they abrade the skin. Likewise, we do not want drapes that “bleed” dyes or chemicals into the wound. Noxious odors are not always harmful, but they can distract the surgical team from their primary task—patient care.

In addition to the characteristics just discussed, reusable drapes should have these additional characteristics:

Additional Characteristics of Reusable Drapes	
Withstand sterilization	Reusable drapes must withstand multiple laundering and sterilization. The facility should have a method to keep track of and determine how many times a drape may be processed. Reusable drapes tend to lose their barrier effectiveness due to the expansion and contraction of individual fibers during processing.
Patched with similar material	If patched, the patch should be of the same material as the drape. Vulcanized or heat sealed patches are acceptable. The facility should establish guidelines for how extensive an area and how many layers may be patched.
Standard size	Reusable drapes used for similar purposes should be approximately the same size and shape. This facilitates inspection, folding, storage, and packaging. It also eliminates confusion during the draping procedure.

In addition to these characteristics of all drapes, individual facilities usually establish criteria that their surgical drapes must meet to fit their specific needs. These characteristics vary and are beyond the scope of this CDC, so we move on to look at the specific types of draping materials.

Reusable, cloth, or woven textile drapes

For many years, surgical drapes, gowns, and wrappers were made exclusively of woven cotton muslin fabric. Although still acceptable for use, muslin drapes and gowns have been nearly totally replaced by disposable, nonwoven synthetics. However, we briefly cover cloth drapes in this CDC because they are still considered a contingency asset. In a wartime or major conflict situation, disposable items may not be readily available.

Cloth drapes have three major disadvantages when compared with synthetics. First, they are more susceptible to saturation and wicking of fluids, providing an avenue for bacterial contamination. Second, cloth drapes must be reprocessed after each use. This involves laundering, pressing, inspecting, folding, wrapping, and sterilizing. This processing is time-consuming and expensive—it may cost as much as or more than using disposable drapes. Third, muslin drapes pick up, hold, and shed lint. Lint can serve as a transport mechanism for bacteria, and can cause tissue reaction.

Although muslin materials are not nearly as prevalent as they once were, you must at least be familiar with them in case you have to use and process them in a contingency.

Disposable, paper, plastic, or other nonwoven drapes

While not technically correct, disposable, nonwoven drapes are usually referred to as either paper or plastic. These drapes often resemble their cloth counterparts and are used similarly; most have adhesive tapes or areas that help increase the microbial barrier. Most disposable drapes are made of material that is, or is chemically treated to be, resistant to moisture. They are very effective barriers to bacterial migration. Some disposable drapes are absorbent, designed for use as towels.

Synthetic textile (paper) drapes

These drapes, often called paper drapes, are made of synthetic fibers such as nylon, rayon, or polyester, combined with other materials and compressed into nonwoven sheets. Many synthetic drapes are chemically treated or are layered with other synthetic material to increase moisture resistance. Fenestrations, or openings, are often surrounded and reinforced with layers of impervious material to provide a wide safety zone around the operative site. Splits or fenestrations often have adhesive strips or tape around their perimeter that allows the drape to be “stuck” to the patient; this reinforces the microbial barrier. Many disposable drapes also have added features and conveniences

such as cord and tubing holders, troughs, and foam pads to prevent instruments from sliding off the sterile field.

In addition to convenience, disposable drapes offer many advantages over reusable cloth drapes. We have already mentioned that disposable drapes can provide a better bacterial barrier because they are moisture resistant. They also are lint-free, flame resistant, antistatic, nonirritating, soft, lightweight, strong, tear resistant, and compact. Because these drapes come packaged and sterilized by the manufacturer, the need for washing, repair, folding, and sterile processing is eliminated. The use of disposable drapes also contributes to infection control because contaminants are contained and disposed of along with the drapes.

Synthetic textile drapes also have some disadvantages. First, the drapes are made of thin synthetic materials, and some chemical solvents or volatile agents may compromise the drape's integrity. Drapes improperly handled may crack or tear at the folds. Some drapes may not retain their moisture resistance for the entire surgical procedure, especially if exposed to greater than normal volumes of liquids. Also with heavy exposure to blood, body fluids, and irrigants, some drapes not only lose barrier effectiveness, but also become more susceptible to tearing and perforation. Finally, disposable drapes are expensive, though most studies show they are actually more cost effective than reusable ones.

Plastic drapes

Two types of plastic drapes are widely used in the OR. One type of plastic drape is designed to be an impermeable "base" sheet to paper drapes. The most common design is a large plastic "split sheet" frequently used to drape an extremity. The sheet is placed under the extremity, adhesive strips are removed, then the sides of the split are sealed above the operative site. A paper split sheet or extremity drape is then placed over the impervious plastic sheet.

Other common types of plastic drapes are transparent with adhesive backing; they are sometimes called isolation drapes. Figure 3–2 illustrates the three basic types of these drapes—incise, towel, and aperture. *Incise* drapes are solid, various sized sheets with an adhesive covering on most of one side. They are placed over the entire area surrounding the surgical site, and the incision is made through the drape. Some incise drapes are impregnated with an antiseptic agent such as povidone iodine. *Towel* drapes usually come in small and large sizes. They are a similar design to the cloth hand towels or paper utility drape; they also have an adhesive strip on one edge of the drape. Plastic towel drapes are frequently used to isolate the tourniquet to prevent solutions from pooling under them. *Aperture* drapes also come in various sizes and shapes; they have a fenestration or hole that is surrounded by adhesive. The hole is placed over the incision site. These drapes are frequently used in ear and eye surgery.

The use of transparent plastic surgical drapes offers several advantages:

- They are impervious to moisture and seal the incision site from contamination due to bacterial migration.
- They are transparent, allowing observation of the patient's skin color and anatomical landmarks.
- They facilitate draping irregular body surfaces, such as the face and extremities.
- They wall off contaminated areas, such as the anus, vagina, and infected wounds, from noncontaminated areas.
- They reduce the risk of sterile field contamination from towel clip perforation by using adhesive to secure the drapes.
- They are strong, flexible, and highly elastic.

Plastic drapes usually come in individual sterile peel packs. The larger drape packages are sometimes difficult to open without contaminating the contents. To open these drapes, peel the flaps back halfway and allow the scrub technician to pull the drape out of the package.

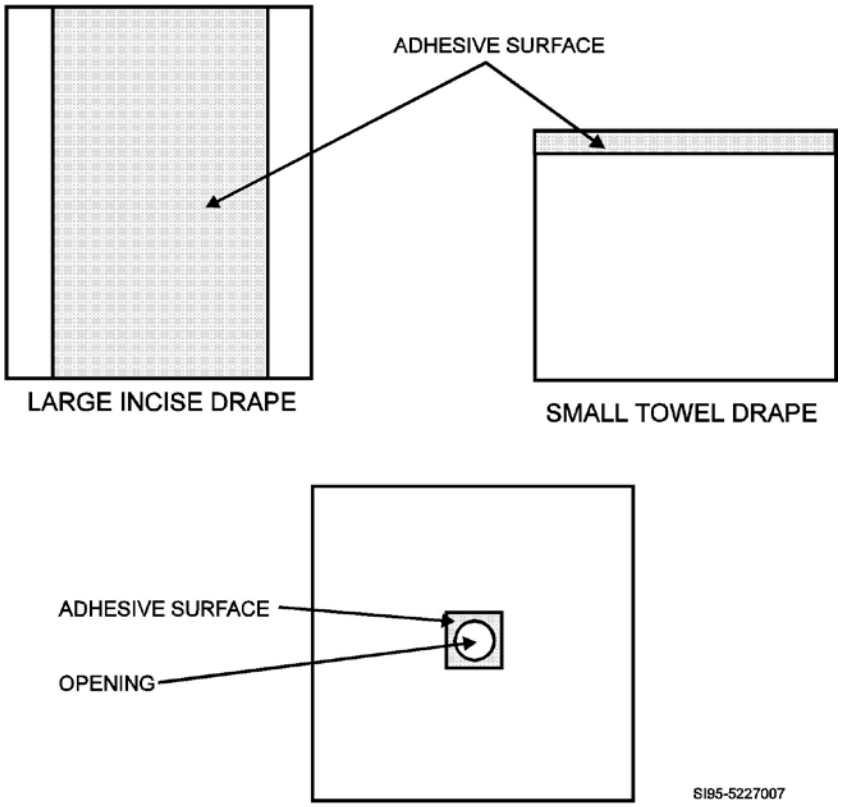

Figure 3–2. Plastic isolation drapes.

Paper-plastic drapes

These drapes combine the synthetic textile "paper" drapes with the impervious plastic drapes. The plastic may be bonded to one side or may be sandwiched between layers of the paper material. The entire drape may be paper-plastic, but usually only the areas most susceptible to moisture or stress are reinforced. The paper plastic frequently covers the front and sleeves of surgical gowns, and surrounds the fenestration of drape sheets. Two paper-plastic drapes frequently used are the back table cover and the mayo tray cover; these often have absorbable paper bonded to the plastic.

The paper-plastic combination offers the advantages of impermeability to moisture and increased strength. Disadvantages are the drapes are heavier and less flexible, and they are non-porous which makes them retain heat.

Styles of drapes

Whether constructed of cloth, synthetic textile (paper), or plastic, drapes come in numerous styles for various applications. We discuss some of the most common types.

Hand towels and drape towels

Blue, green, or white colored hand towels are the most commonly used cloth drapes. They may be processed locally in your Central Sterile Supply Service, or may be purchased prepackaged sterile. Sterile towels may also be disposable, either absorbable paper or moisture-resistant synthetic textile.

Hand towels are used to dry the hands before donning a gown and gloves. They are also used to dry the patient's skin between the scrub and paint portions of the skin prep. They are used as drapes to

outline the incision site and to reinforce other drapes when they become moist. They are often the only drapes for minor surgical or for surgically clean procedures. They are ideal for draping odd-shaped areas, such as making a “turban” drape for the head. Paper-type drape towels usually have an adhesive strip to hold them in place. Cloth towels are usually secured by penetrating or nonpenetrating towel clips; however, some surgeons sew them in place, and some use skin clips. Occasionally, surgeons even clip the towels to the skin using penetrating towel clips.

Sheets

Sheets are used for numerous draping purposes. Cloth sheets, usually green or blue muslin bed sheets, may be folded in half or quarters before sterilization. They may be used as a base sheet or “bottom” sheet to extend the sterile field beyond the hand towels. If cloth sheets are the only drapes used, two sheets must be layered to provide four thicknesses of muslin as the bacterial barrier.

Disposable sheets are usually made from impervious material. They come in numerous sizes, ranging from large whole-sheets to small quarter-sheets. Sheets are multipurpose drapes. They cover tables or equipment, reinforce contaminated areas of other drapes, serve as a bottom sheet, function as a screen between the anesthetist and operative site, and are used in countless other ways.

Procedure drapes

The procedure drape is usually the last drape sheet applied; it is the topmost layer in the draping routine. It may be linen, but most often it is a disposable, paper-type drape. Most procedure drapes have either a fenestration (window or opening) or a split to provide access to the surgical site. The fenestration, or window, is placed over the operative site, or the sides of the split are wrapped around the site, and the remainder is unfolded over the patient’s body.

The procedure sheet is usually long enough to cover the patient completely and extend over the foot of the table. The upper end of the drape is attached to IV poles on either side of the head of the OR bed, or it is draped over an anesthesia screen. The drape is usually wide enough to extend down the sides of the table. It is also either wide enough or has “wings” to cover the extended armboards. Here is a list of the most common procedure drapes.

Laparotomy sheets

This is the most commonly used drape, the one you probably learned to use in tech school. The average size of this sheet is 9 or 10 feet long by 6 feet wide. The window is centered from the sides about 4 feet below the top of the sheet. The size of the fenestration depends on the application, but a standard adult opening is about four inches wide by nine inches long. This sheet is primarily designed for abdominal surgery, but can be used to drape any flat surface area of the body. Smaller versions of this sheet are made for use on pediatric patients.

Thyroid sheets

Thyroid sheets are the same size as laparotomy sheets. The fenestration is closer to the top, usually slightly smaller, and transverse. As the name implies, the sheet is primarily designed for thyroid surgery, but may be used for any procedure involving the head or neck.

Breast or thoracic sheets

These drapes are also about the size of laparotomy sheets. The fenestration is usually slightly higher and larger. A typical thoracic sheet fenestration measures 11 x 11 inches. These drapes are used for thoracotomies, mastectomies, and other procedures involving the upper torso.

Kidney (transverse) sheets

This drape is almost identical to the laparotomy sheet. The main difference is that the fenestration is turned to provide a transverse slit for procedures on the flank or lateral chest.

Extremity sheets

Extremity sheets are usually slightly larger than laparotomy sheets. The fenestration is usually round, and often has a strong elastic fabric opening that stretches to fit snugly around the extremity. Extremity sheets are heavily reinforced with impermeable fabric in the area the extremity rests upon. Extremity sheets are primarily used for orthopedic procedures involving the limbs.

Lithotomy (perineal) drapes

There are two widely used types of lithotomy drapes: one-piece and three-piece. A one-piece sheet contains built-in leggings to fit over the patient's legs and feet when they are suspended in stirrups. A three-piece sheet has two leggings or boots to cover the legs, and a sheet to cover the remainder of the body. Both designs have a vertical fenestration in the middle, between the leggings. The lithotomy drape exposes the patient's perineal area for vaginal, rectal, urological, or other procedures.

Laparoscopy drapes

These drapes are a combination of the lithotomy and laparotomy sheets. They have leggings, a perineal fenestration, and an abdominal fenestration. Some of these drapes incorporate a flap to cover the perineal fenestration while the surgeon is working in the abdomen. Laparoscopy sheets are primarily used for gynecological procedures requiring access to both the abdominal and the perineal areas.

Split sheets

These sheets are most often used to drape limbs but may also be used to drape the head. A split sheet is simply a large sheet with a split in the center of one side. The split is usually about three feet long, and may be a simple slit or be a large U-shape. If designed for orthopedics, the split sheet is usually heavily reinforced with impermeable fabric.

Craniotomy sheets

Craniotomy sheets have an oval or round fenestration near the top of the sheet to allow the surgeon access to the skull. They are often very long and wide to incorporate draping of a Mayfield-type instrument table in the sterile field.

Mayo stand covers

Mayo stand covers are simply long, slender bags designed to slip over the top and down the stem of a mayo stand. Cloth mayo covers resemble long, heavy-duty pillowcases and are made of double-thickness muslin. Disposable mayo covers are plastic, usually with absorbent paper bonded to one side. In addition to covering the mayo stand, these drapes can be used as a pouch-style drape for extremities.

Stockinet

Stockinet is a porous, stretchable, sock-like cloth material, often tan colored. For surgical draping of extremities, it is cut into specified lengths; one end is closed, the other is rolled. Commercially prepared stockinets are usually cloth inside, covered by a layer of impervious plastic.

Stockinets can also be made and sterilized locally. Tube stockinets come in unsterile bulk rolls of various widths commonly used to cover extremities before cast application. The most common widths used in the OR are 6 inches, used for arms, and 10 inches, used for legs. There are two common methods used to make a drape stockinet.

To make a simple, one-layer stockinet, cut the stockinet long enough to cover an average arm or leg completely with about 12 inches to spare. Tie a knot in one end; then roll the open end of the stockinet until it forms a doughnut-shaped ring. To make a two-layer stockinet, unroll enough stockinet to completely cover an average arm or leg with about 12 inches to spare; then double it by rolling it back on itself. Cut the stockinet. Tie a knot in the center (so the knot is at the fold), and turn one side of the stockinet "inside-out" so it encases the other. Smooth any twists or wrinkles in both

layers; then trim the open end so both layers are equal in length. Roll from the open end to the knotted end until the stockinet looks like a doughnut. Wrap and (steam) sterilize it.

To drape with the rolled stockinet, place the knot at the center of the ring over the finger tips or ends of the toes, then roll it towards the proximal end of the limb. An extremity or split sheet is usually placed around and covers the open end of the stockinet. The surgeon will cut an opening in the stockinet at the operative site. Because stockinet is very porous, it is not considered an effective microbe barrier. Stockinet is also very elastic and tends to slip off the extremity. It is often wrapped with an elastic-thread "ace" bandage to reinforce the microbe barrier and secure it to the limb.

Drape packs

Most operating rooms carry and use a variety of preassembled disposable drape packs designed for specific procedures. These packs are self-contained draping systems that eliminate the need to open extra materials. Most of these packs are designed to be opened on the back-table; they have heavy plastic-paper laminated outer wrappers that unfold to create a sterile, impervious table cover. The pack contents are normally arranged in the order of use to reduce case setup time. With all or most of the draping materials contained in the pack, the risk of contamination is reduced because there are fewer items to open. Use of preassembled draping packs also improves inventory control because there are fewer supplies that have to be ordered and stored.

The type of disposable drape pack used varies in each facility. Most use the manufacturer's standard draping packs. These packs contain the basic draping supplies for the procedure. Some facilities, particularly large medical centers, have "custom-packs" manufactured. These packs can contain not only the drapes required, but also specialty supplies such as the cautery tips, sponges, basins, etc. used for the specific procedure the pack is designed for. Smaller hospitals may limit their drape packs to a basic pack that contains only the table cover, mayo cover, and drape towels. These packs are supplemented with individual specialty drapes as needed. Most manufacturers list the contents of their pack on the outside wrapper or dust cover.

620. Applying surgical drapes

Now that we have learned a little about the different types of surgical drapes, we'll get into why we use surgical drapes and some general draping guidelines. The first thing we want to look at is why we even use surgical drapes.

Why are drapes necessary?

The primary reason for using surgical drapes should be evident to you by now—to isolate the operative site by providing a microbial barrier to prevent contamination and reduce infection potential. Draping also creates a broad sterile field to provide a larger working area and margin of safety between sterile and unsterile areas. A large sterile work area reduces chances of accidental contamination.

Drapes allow us to create a large working surface that can be used by the sterile team to stand and position supplies and instruments close to the incision site with minimal risk of contamination. Drapes also provide an extra margin of safety by extending below the table top; this allows the scrub technician to position instrument tables and basin stands close to the OR bed.

Draping guidelines

Regardless of the type drapes, the following guidelines apply:

- Stack the drapes on a sterile area in the order they will be used. This saves time and confusion.
- Never allow your gloved hand to contact the patient's skin or any other unsterile area when draping. Remember, even the prepped area is only surgically clean, not sterile. Immediately

discard any drape if sterility is questionable. Remember the aseptic rule, “When in doubt, toss it out!”

- Have enough help. It usually takes at least two people to perform most draping procedures. Handle drapes as little as possible. The more they are handled, the greater the risk of contamination. When possible, unfold drapes over the operative field, and unfold them *slowly.*
- Never hold drapes under your arms. The armpits are considered unsterile. Always hold drapes above waist level, but not so high as to touch raised objects such as the OR light. If a drape falls below waist level before it is applied to the patient, it is contaminated and should be discarded. Never raise any portion of a drape that was below waist level or table top level back above waist level or above the sterile field.
- Protect gloved hands from unsterile surfaces by cuffing drapes during application. Discard a drape if it is opened incorrectly or if it cannot be used without possible contamination.
- Do not reach across unsterile surfaces to place a drape; walk to the other side. Avoid repositioning drapes once they have been placed. Drapes should *never* be dragged *toward* the incision site because this transfers bacteria from an unprepped area to the prepped surgical site. If necessary, drapes can be moved away from the incision without risk of contamination.
- Avoid removing drapes; cover them if they become contaminated. If removing a contaminated drape is necessary, have the *circulator* remove it. If it cannot be removed without contaminating other areas, re-drape.
- Never drape blindly. Always ensure you can see the area you are draping (the underside of a leg or hip, for instance).
- Use dry, sterile drapes to cover drapes that become moist with blood, body fluids, or irrigants during the procedure. Always keep the folded edge towards the incision site when folded drapes are used. This reduces chances of losing instruments and sponges between the folded layers. Place the drape from front to back when draping a table. This prevents reaching over an unsterile area, and causes any air current to flow away from your sterile gown.
- Ensure four thicknesses of linen are present when cloth drapes are used, or when reinforcing a contaminated area using cloth sheets. Never use drapes that have tears, holes, worn spots, or wet areas.
- Consider the area around and the tips of towel clips used to hold drapes in place contaminated because they may penetrate and contact unsterile surfaces beneath the drapes. Never remove them during the procedure. If they are removed, both the towel clip and the area of the drape from which it is removed are considered contaminated. Cover the contaminated area with a sterile utility or towel drape immediately, and pass the clip off the field. Use nonpenetrating towel clips *only* to secure cords and tubes to the sterile field. Also use them to hold drapes together where they overlap.
- Always drape the incision site first, followed by the outer areas. Tape or trim drapes that touch the floor after application so they do not trip sterile team members or become tangled in nearby cords and tubing.
- Last, but definitely not least—*always check* to make sure the electrosurgical ground pad or plate is properly secured to the patient *before* the draping procedure begins. This prevents the patient from being accidentally burned and ensures the electrosurgical unit functions properly.

621. Common draping routines

Draping procedures vary from hospital to hospital and from surgeon to surgeon. The prevalent use of prepackaged drape packs offers some degree of standardization. The guidelines we outline in this section apply to disposable drapes only. These are only *basic guidelines;* they do not allow for

differences in various manufacturers' drape design and pack contents. For specific guidelines and instructions, as always, follow local policy and manufacturer's guidelines. The first draping routine we discuss is often the base for other draping routines—handling and applying hand towels.

Handling and applying hand towels

The most common use of hand towels—often called utility drapes in disposable packs—during draping is to outline or frame the prepped incision site. Usually, four towels are placed in a rectangular pattern around the operative site, leaving a wide enough margin to extend the incision if necessary. In some instances, three towels are draped to form a triangular outline; two towels folded cross-corner (diagonally) can make a diamond outline. More hand towels are used to outline large or irregularly shaped areas.

Once positioned, you need some method to hold the towels in place. If you used cloth hand towels, you usually secure them at the corners by using perforating towel clips. If you used disposable towels or drapes, you use the adhesive strip to secure them. If towel clips must be used on paper towels, use only non-perforating clips to prevent excessive tearing and possible contamination.

Cloth hand towels are usually fan-folded before sterilization; paper-type hand towels usually are not; instead, they are usually folded so they can be opened lengthwise to remove the adhesive strip's paper backing. The exact fold varies by manufacturer, but most have arrows and instructions to make opening them foolproof. Regardless of how hand towels are folded, always protect your sterile gloves with a folded cuff (fig. 3–3) before applying them as drapes.

Present cuffed towels or drapes to the surgeon in the position of use. In most cases, this means you pass cloth towels with the folded cuff facing away from the surgeon; pass paper-type towels with the adhesive strip facing away from the surgeon. If the adhesive strip's paper covering is still in place, remove it as the surgeon holds the towel. Usually, you open disposable towels on the instrument table or mayo tray and remove the paper backing strips before presenting the towels to the surgeon. Ensure you stack them so they do not stick together. After the towels or utility drapes are placed, the rest of the drapes are applied.

Applying a plastic incise drape

A large, adhesive-backed incise drape is applied as the final step in many draping routines. As mentioned previously, these drapes may be awkward to open and should be passed to the scrub technician rather than be "tossed" on the sterile field. These drapes also will stick to themselves, making them unusable. It always takes at least two people to apply them; one to fully open and stretch the drape and the other to remove the protective strip or backing paper from the adhesive area. Both then apply the drape.

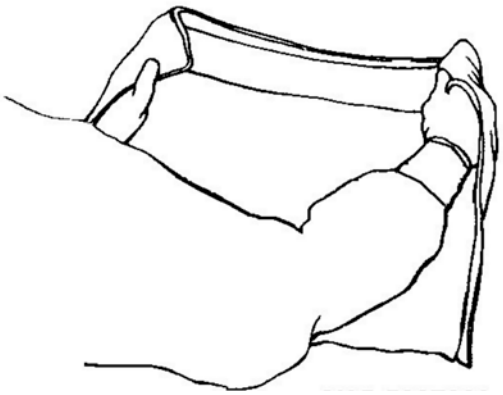

Figure 3–3. Protecting sterile gloves with a folded cuff.

Large incise drapes often need three people to apply them. Usually the surgeon and assistant fully open the drape with the adhesive surface down; the drape is usually opened over the patient. A third sterile team member (the scrub technician) carefully removes the paper backing as the surgeon and assistant apply tension to keep the drape from wrinkling. The surgeon then uses a folded hand towel to press the adhesive surface over the incision site as the other two sterile team members lower the drape. The surgeon applies pressure with the towel to remove any air bubbles and to smooth any wrinkles or creases.

Laparotomy draping

By now, you know *laparotomy* is an incision into the abdomen. The draping technique used for this abdominal surgery is also used for draping any relatively flat body surface, including the back, chest, flank, and neck. You learned this method in tech school, so we do not go into detail here. We review the major steps involved and mention one or two variations or options for this method—again, the steps we outline are basic guidelines.

Laparotomy draping is usually accomplished by "squaring-off" or outlining the incision site with four hand towels. The surgeon will usually apply the towels first to the top, next to the bottom, then to the side closest to the surgeon, and finally to the side opposite. If using cloth hand towels, pass four perforating towel clips immediately after the towels are placed.

If the surgeon desires, place a half- or three-quarter sheet (called a base, bottom, or foundation sheet) below the patient's waist, covering the legs. This sheet provides reinforcement of the aseptic barrier in an area of the sterile field where instruments and sponges are commonly placed during surgery.

Place the laparotomy ("lap") sheet fenestration over the incision site. Ensure the head is facing the proper direction (usually marked by an arrow and "TOP"), and ensure you do not contaminate your gown by touching the unsterile areas of the bed.

NOTE: Some surgeons prefer you to remove the backing paper from any adhesive strips around the fenestration before placing it over the operative site; others prefer to remove the paper themselves, often after the drape is completely opened and in place.

Open the sides of the laparotomy sheet first. Usually, the sides are unfolded simultaneously by two people. Do not drop your hands below waist level when you unfold the sides. Once the sides of the sheet are fully unfolded, allow them to drape over the sides of the OR bed.

Next, fully unfold the bottom section of the drape so it completely covers the patient's feet and hangs over the end of the OR bed. If the sheet is too short, place an additional utility sheet (half- or three-quarter sheet) over the bottom of the patient's legs after unfolding the top.

After the bottom section is opened, unfold the top section (fig. 3–4) and drape it over the anesthesia screen if used. Most often, you will hold the sheet (protect your hands with a cuff) until the anesthesia provider or circulator can clip it to the IV pole. As you open the top section, ensure you cover the armboards, especially if the sheet has built-in "wings." If the sheet is too narrow to cover the boards, use half- or three-quarter sheets to cover them; secure them with nonperforating towel clips. If the surgeon desires, a large, adhesive-backed, plastic incise drape is placed over the operative site after the laparotomy sheet is opened.

Figure 3–4. Opening the top section of a laparotomy drape.

Lithotomy draping

This draping technique is used when a patient is in the lithotomy position for operations on the perineum, rectum, or genitalia. Several different types of disposable draping systems or packs are used for lithotomy draping. Some use a large drape with built-in leggings; others use a fenestrated sheet and separate leggings. Here are the major steps for this type of draping.

Place a sterile, moisture-proof foundation sheet under the patient's buttocks to provide an extra layer of draping material. Protect your hands with a wide cuff. Allow the lower end of the drape to fall into a kick bucket (the circulator should place one at the foot after lowering the leg section of the bed).

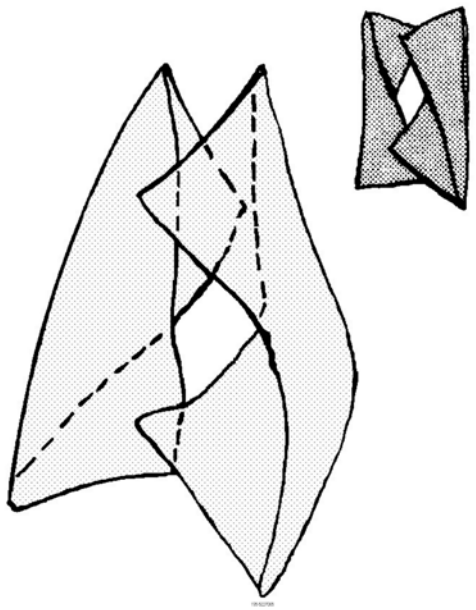

Figure 3–5. Outlining the operative site using two towels

Next, outline the operative site using either the two-towel method shown in figure 3-5 or if the procedure involves the genitalia, a modified three-towel method. Fold the first two towels cross-corner, as in the two-towel method, then place a third towel across the patient's buttocks to cover the anus. Secure the towels with towel clips. An alternative method requires the circulator's assistance. Fully open a sterile towel and fold it in half over a long piece of adhesive tape held outstretched by the circulator. The circulator then carefully positions the towel so the folded edge is just above the anus and sticks the tape to the back of the patient's thighs just above the buttocks. The other two towels are then cuffed lengthwise and placed to form a triangle around the genitals.

Apply the lithotomy sheet. To apply a one-piece lithotomy drape, pass one side of the sheet to the surgeon and hold the other. Fully unfold the drape and simultaneously slip the leggings over the patient's feet and legs. Be careful to touch only the outside of the drape. The circulator usually assists by guiding the inside of the sheet over the stirrups and legs. Adjust the fenestration so it covers the perineal area.

NOTE: Some surgeons prefer you remove the backing paper from any adhesive strips around the fenestration before placing it over the operative site; others prefer to remove the paper themselves, often after the drape is completely opened and in place.

To apply a three-piece lithotomy drape, one with separate leggings, apply the leggings first. Then, place the fenestration, facing down, over the perineum and hold the drape in place. Open the abdominal portion (top) of the sheet first; the circulator or anesthesia provider can help. Next, open the bottom portion of the drape, and allow the drape to fall into the kick bucket as you did with the foundation sheet.

The lithotomy position makes draping difficult, and the circulator must provide more hands-on assistance than for other draping routines. The sterile team must exercise great caution to avoid contaminating themselves and the drape. Always maintain a wide margin between sterile and unsterile team members.

Extremity draping

Surgery of the arms and legs is most often an orthopedic procedure. A tourniquet is frequently used to aid in hemeostasis and provide a clear operative field. If a tourniquet is used, apply it—but do not inflate it—before applying the drapes. As mentioned previously, the tourniquet is often isolated with unsterile adhesive towel drapes to prevent solution from pooling under it. Do not confuse these

isolation towels with the sterile drapes. After the tourniquet is applied and the prep is complete, a circulator (wearing sterile gloves) supports the limb in an elevated position until a sterile team member can safely assume control of it. The routine we describe in the following paragraphs refers to draping a leg, but the same steps apply to draping an arm. This is only a common routine; numerous variations are used by individual surgeons.

As the circulator supports the leg (fig. 3–6), pass one end of an impervious foundation sheet (some use a plastic split sheet) under the operative leg to the surgeon. Drape the lower end of the OR bed. Use another sheet to serve as a "top" sheet and drape the patient's upper body.

Pass a rolled towel to the surgeon. A rolled towel is made by folding a cloth hand towel in thirds, lengthwise, then rolling it from one end to the other. (Some surgeons prefer the towel be rolled from each end with the rolls meeting in the middle.) The surgeon wraps the towel snugly around the upper thigh, usually covering the tourniquet, and secures it with a perforating towel clip.

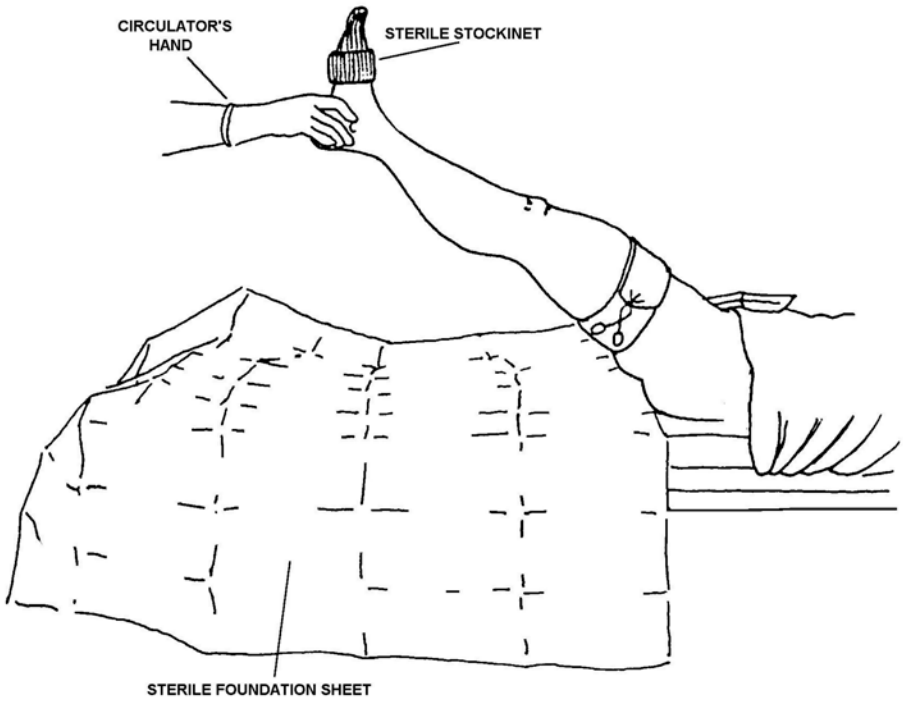

Figure 3–6. First phase (steps 1–3) of extremity draping.

Next, place the rolled stockinet over the patient's toes and unroll it over the distal foot. The circulator ***MUST NOT*** let go of the leg until the sterile member states specifically it is safe to do so.

As shown in figure 3–7, a sterile team member (usually the scrub technician) now grasps the foot tightly through the stockinet. When the sterile member has a firm grip and can support the leg, he or she tells the circulator to let go.

NOTE: The sterile team member supports the elevated leg from this point until the end of the draping routine.

The surgeon unrolls the stockinet until it reaches or covers the rolled towel over the tourniquet, or a point well above the incision site. The surgeon now applies a plastic, impervious split sheet. This sheet had an adhesive strip around the perimeter of the "U" or split. Place the split sheet on the foundation sheet so the "tails" point toward the patient's head; open the solid section of the split sheet to cover the foot of the bed. Remove the backing strips from the adhesive, and wrap the tails, crossing them over the top, to encircle the leg completely just distal to the rolled towel.

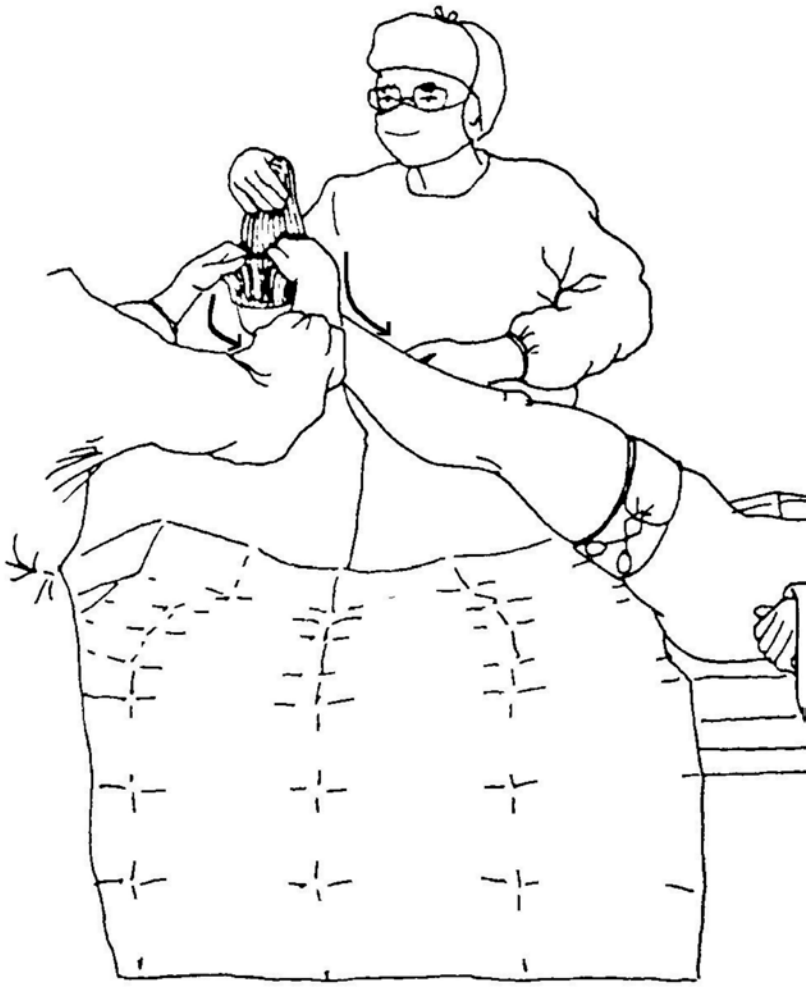

Figure 3–7. Middle phase of extremity draping.

The topmost drape is applied next, usually a paper-type synthetic textile drape. This drape may be a larger split sheet, or it may be an extremity drape. A split sheet may be applied as the impervious split was, or it may be applied with the tails covering the foot instead of the top of the table. An extremity drape is applied by putting the patient's leg through the fenestration, then pushing the fenestration up the leg until it reaches the upper thigh (fig. 3–8). Pay particular attention to the arrows or other directions on the extremity sheet to ensure you place the long end over the lower table.

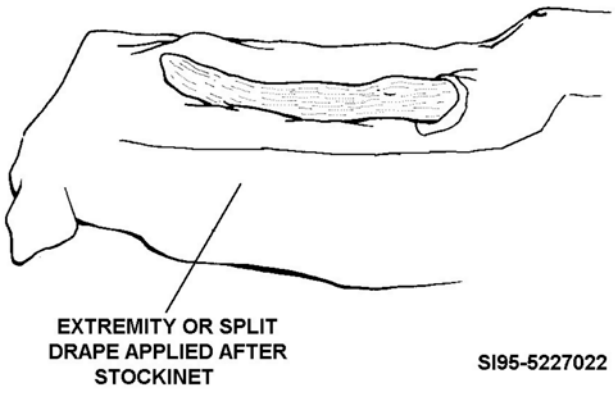

Figure 3–8. The draped extremity before the stockinet is cut.

The surgeon now squeezes the blood out of the leg, or exsanguinates it, using an elastic “ace” bandage or an elastic rubber Esmarch bandage. With the leg still elevated, the bandage is tightly wrapped around the extremity from the toes to the tourniquet. The tourniquet is then inflated, and the bandage is removed. The circulator notes the tourniquet inflation time on the operation report and perioperative nursing record, and the anesthesia provider notes it on the anesthesia record.

The leg is lowered to the table, and the scrub technician passes sterile bandage scissors to the surgeon. The surgeon cuts a window in the stockinet over the incision site.

As a final draping step, a large, plastic incise drape, often iodophor impregnated, may be applied over the exposed operative site (fig. 3–9).

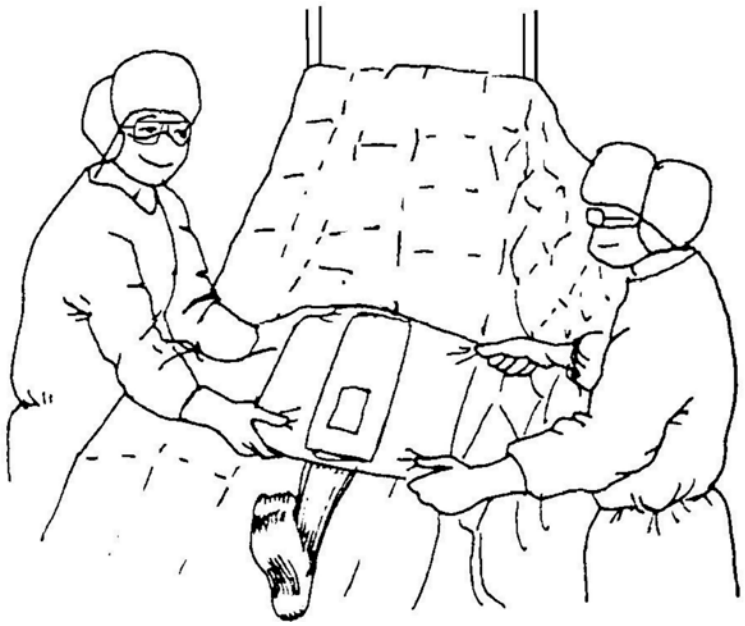

Figure 3–9. Completing the extremity draping procedure.

As you see from the previous steps, the scrub tech may be supporting the leg through most of the draping procedure, particularly if no surgical assistant is present. It is imperative that extremity drapes are prepared and stacked in the order they will be used, *before* the draping routine begins. If the scrub tech is supporting the leg and cannot reach the other drapes, the surgeon should not have to hunt for the next required item; it should be right on top of the stack. It is also a good idea to stack the drapes on a separate single ring stand that can be rolled within arm’s reach of the OR bed after the foundation sheet is applied.

Hip and shoulder draping

If the surgeon does not anticipate the need to manipulate the leg or arm during surgery, the operative site is “squared-off” and draped using a similar routine as for laparotomy. If the arm or leg will be manipulated, a combination of laparotomy draping and extremity draping techniques is often used. Here are the basic steps.

The operative site and proximal extremity is prepped with the extremity elevated and supported by a circulator. The circulator continues to support the limb until relieved by a sterile team member. The operative site is “squared-off” using a similar method to that for laparotomy.

Foundation sheets are applied under the extremity. For shoulder draping, the foundation sheet may be wrapped under and up the sides of the perimeter of the towel outline. A foundation sheet may be placed over the patient’s torso as well.

A sterile team member slips the stockinet over the patient's hand or foot and firmly grasps through the stockinet to support the limb. The surgeon unrolls the stockinet to the desired length.

NOTE: As in extremity draping, the sterile team member supports the elevated extremity until after the topmost drape is applied.

An impervious split sheet with adhesive strips is placed under the extremity. The tails of the sheet point toward the patient's head. The "U" is pulled snugly into the arm-pit or crotch, and the adhesive strips are secured along the perimeter of the operative site. Some surgeons place a second impervious split sheet over the first, with the tails facing the opposite direction and the "U" secured to the perimeter of the operative site.

The topmost procedure drape is usually a paper-type synthetic textile drape, but the design varies. Two split sheets, or a split sheet and a flat sheet, may be used for either hip or shoulder draping. Extremity drapes may be used for either application, depending on the procedure and the size of the extremity sheet fenestration. A laparotomy drape may be used for shoulders; it is placed in a similar fashion as an extremity drape, with the arm through the fenestration. A thoracic sheet or a laparotomy sheet with an extra large window may be used to drape the hip; the leg is passed through the fenestration. An incise drape may be applied as a final microbial barrier.

Face, neck, and head draping

Draping the face and neck requires close coordination with the anesthesia provider due to the proximity of anesthesia equipment and the need to move the patient's head after anesthesia administration. From an aseptic viewpoint, the neck is more adequately prepared than the face. It is impossible to decontaminate the nose and mouth, particularly when patients are connected to anesthesia breathing circuits and monitoring devices. Though we cannot create a truly "sterile" field, prepping and draping are done following the same guidelines used for other body areas. This eliminates as many micro-organisms as possible and prevents migration of contaminants from other areas.

Face draping

Draping a patient for facial surgery usually involves applying a "turban" drape to the patient's head. To start, the anesthesia provider and circulator gently lift the patient's head, neck, and shoulders while a sterile team member places a half-sheet (foundation) on the bed, under the patient's head, and a cloth hand towel on top of the foundation sheet (fig. 3–10). The anesthesia provider and circulator gently lower the patient without touching the sterile drape or towel.

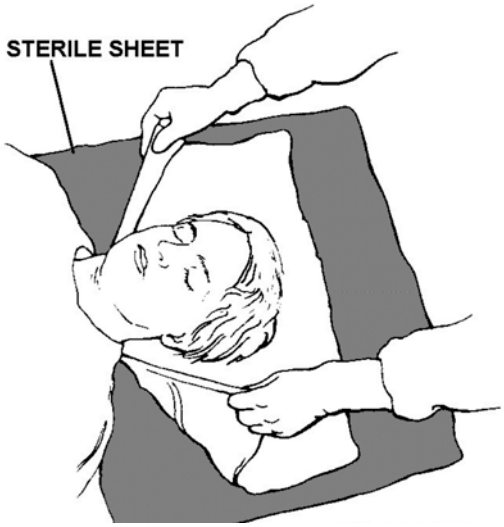

Figure 3–10. Sterile hand towel placed on sterile foundation sheet under patient's head.

As shown in figure 3–11, the surgeon draws each side of the hand towel up and over the bridge of the nose, being careful not to touch the patient's hair or face. While holding the sides of the towel together at the bridge of the nose, the surgeon then lifts the top of the towel up and over the top of the patient's head until it meets the intersection of the towel sides. A small perforating towel clip secures the drape at the intersection (fig. 3–12).

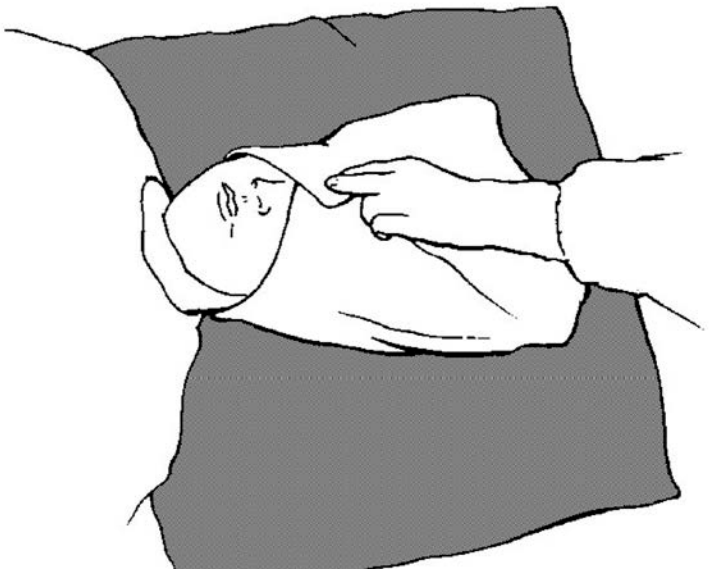

Figure 3–11. Ends of towel drawn over the bridge of the patient's nose.

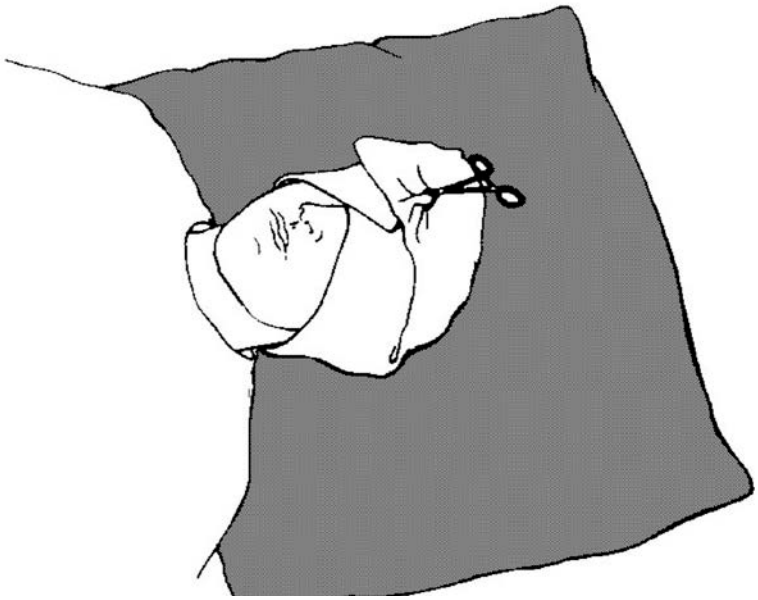

Figure 3–12. "Turban" secured with a perforating towel clip.

As illustrated in figure 3–13, drape a large sheet over the patient's body from the neck to the feet to extend the sterile field. If the patient is under general anesthesia, the breathing circuit may be wrapped or otherwise isolated with a towel or utility drape.

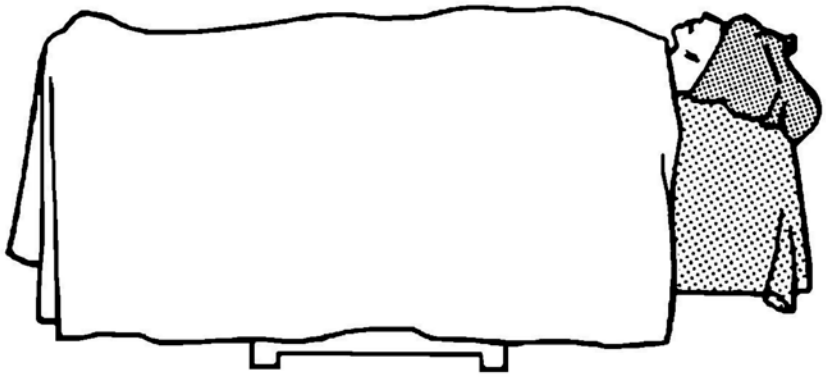

Figure 3–13. Completed face draping.

Neck draping

Most neck draping is usually similar to laparotomy draping. The surgeon often uses skin clips to fasten the towels to the skin and prevent them from slipping, although some surgeons use suture to sew them in place. If the surgeon sews the drapes to the skin, the scrub must ensure the needles, needle holder, and suture scissors used to do so are passed off the sterile field to the circulator. A thyroid sheet or other specialty procedure drape may be used. Incise drapes are frequently used to reduce chances of microbial migration from the relatively close mouth and nose.

Head draping

Head draping is usually reserved for craniotomy patients. The procedure is similar to laparotomy draping, with the primary exception being the location of the procedure sheet's fenestration. Cloth hand towels are usually used to outline the site; they may be clipped or sewn in place. If x-rays are likely, metal clips are usually not used. A foundation sheet may be wrapped around the head, bordering the perimeter of the towel outline, and secured. Another sheet may be placed over the patent's upper body. If a Mayfield-type overhead table is used, it is often draped in conjunction with the head using the craniotomy sheet. Some craniotomy sheets have a "built-in" incise drape over the fenestration.

622. Draping specialty equipment

Any piece of equipment brought into or over a sterile field must be draped if it cannot be sterilized. Microscopes, C-arm fluoroscopy units, and portable x-ray units should be draped before being positioned over the sterile field. X-ray cassettes, some video cameras, laser handpieces, and other arms, cords, or tubing must also be draped before use on a sterile field.

If a piece of equipment is designed to be draped before it is used, the manufacturer usually offers a custom drape for the purpose. The design and features vary from equipment to equipment and from manufacturer to manufacturer. As always, read and follow local instructions and manufacturer's directions. This lesson offers some generic descriptions of and basic guidelines for applying specialty equipment drapes.

Microscope drapes

A microscope drape is a large, clear plastic bag that more or less conforms to the shape and size of the microscope head(s). It usually has individual sleeves for each ocular head and for each eyepiece. A plastic-covered ring built-in to the drape usually snaps tightly over the lens to isolate it from the sterile field; the ring also keeps the drape off the field. Most manufacturers include handprints, arrows, and other guiding stickers or stamps to designate the recommended way to place the drape.

Microscope draping is awkward; never attempt to drape one without circulator assistance. These are the basic application steps:

1. Place your hands inside the protected cuff of the drape with the opening facing away from you. Use the arrows or hand placement stickers, if present, for guidance. Ensure the plastic lens-ring is at the bottom of the drape.
2. Slide the drape over the microscope head, just enough to keep it from falling. The circulator can begin to pull the drape, from the inside, by opening it and draping it over the extension arm of the scope, but should leave plenty of slack in the bag.
3. Use one hand to stabilize the top of the microscope head; then snap the plastic ring over the microscope lens. The ring usually fits very tightly, so securing it may be difficult.
4. Starting with the most distal ocular head, slide the drape sleeves over the eyepieces. Secure the sleeves to the eyepieces using the foil or rubber band provided. Remove most of the slack from the distal ocular head before proceeding to the next head. Ensure you do not remove all the slack; the head must be free to tilt, rotate, or swivel without pulling the drape.
5. Repeat step (4) with each of the remaining ocular heads. Pay particular attention to the head used by the surgeon; it must be completely free to swivel, tilt, or rotate.
6. The circulator now finishes pulling the drape over the extension arm and removes most of the slack. Enough slack is left to allow the microscope to be positioned. The scrub then secures the loose or hanging areas of the drape with the rubber bands or the tapes provided.
7. Carefully tear off the plastic tabs or cups covering the eyepieces. Ensure you do not touch any unsterile areas of the scope.

X-ray film cassette drapes

X-ray film cassettes are placed in sterile, clear, heavy-duty plastic bags (logically called cassette drapes or covers) before they are used on the sterile field. To drape a cassette, protect your hands by sliding them under the cassette drape cuff. Hold the cassette drape with the opening pointing away from you. The circulator or x-ray technician slips the cassette into the open bag. Grasp the cassette through the drape; when the circulator releases it, slide the cassette drape over the cassette and fully extend the drape bag. Fold the drape under or wrap it around the cassette. Ensure you remove any air from the bag slowly to prevent the air current from spreading microbes.

NOTE: The cassette should not be dropped into the bottom of the cassette drape as it may tear or stretch the drape. Keep a firm grasp on the cassette and slide it to the bottom of the drape.

After the x-ray is taken, the circulator dons gloves and the draped cassette is passed off the field. The circulator opens the cassette cover and the x-ray technician reaches in to retrieve the cassette. The cassette drape is discarded.

X-ray and fluoroscopy unit drapes

Portable x-ray units are seldom draped before use; when they are, a cassette cover or other large, sterile, plastic bag-type drape is used. The bag is placed over the x-ray head and secured to the machine’s frame using large, sterile rubber bands or tapes. Usually, the portable unit is not draped; the operative field is covered with a sterile towel or small sheet. The x-ray unit is then positioned and the x-ray taken. Immediately after taking the film, the unit is moved from the sterile area, and the cover towel or sheet is removed from the operative site and discarded.

Fluoroscopy units, or C-arms, are frequently draped. A C-arm drape is a very large, clear plastic bag. The scrub technician applies the drape over the top half of the “C,” the part that will be over the surgical site. (There is no need to drape the bottom of the “C” since it is below the sterile field.) The drape is large and awkward; so when applying it, be very careful not to contaminate yourself or the drape. Place your hand under the cuff of the bag with the opening facing away from you. Slide the bag over the cylindrical head of the C-arm. The circulator should grasp the drape from the inside and

pull it over the machine as the scrub tech unfolds the bag. Secure the loose ends and any slack with the provided tapes or large rubber bands. Ensure the drape does not interfere with movement of the C-arm.

An alternative method of isolating the C-arm from the sterile field is to use a vertical drape. A vertical drape is very different from a standard drape. A vertical drape is a very large sheet of plastic, usually clear, with an adhesive incise drape in the center instead of a fenestration. The incise drape portion is placed over and adheres to the incision site, then the drape is unfolded up and from side to side. Instead of the drape lying on the patient (horizontal), the drape is suspended from a frame or rods above the patient. Most vertical drapes have pouches and pockets to hold electrocautery pencils, suction tips, and other surgical apparatus. Here's a simple description—using a vertical drape is like operating through a big plastic picture window. The C-arm and other non-sterile equipment and apparatus stay on the (unsterile) patient's side of the window, while the surgical team operates on the sterile side. Primarily orthopedic surgeons use this drape when using a fracture table with overhead suspended spars, but it can be used with an independent steel frame. One note of caution: when using this drape, the floor gets very slippery from various fluids and solutions, so watch your footing.

Drapes for video cameras and other handpieces with cords or tubing

Many operating rooms use video cameras and other handpieces that are sterilizable. Some video cameras and other corded or tubing attached equipment cannot be sterilized. When the latter is used, it must be draped.

Drapes for corded equipment come in two basic styles. One type of drape is a long, narrow "stockinet" drape; it has a stockinet lining with a plastic outer cover. The closed end of the stockinet is clear plastic. The other, more common type of corded equipment drape is simply a long, clear plastic bag.

Draping the equipment is simple but sometimes awkward. Usually, the scrub tech makes a "mini-cuff" in the open end of the drape to protect her or his fingers. The circulator feeds the camera into the opening. The scrub tech then slides the camera through the snake-like drape by manipulating it from the exterior of the drape. The circulator feeds the cord(s) and prevents tangles or snags. When the camera head reaches the end of the drape, the drape and cords are secured to the patient drapes using nonperforating towel clips. The circulator plugs the cord into the machine, and the surgeon attaches the camera to the endoscope.

That is all we cover on surgical draping; you are almost ready to start the operation. Remember, draping routines and supplies vary, so ensure you learn the routines used by your surgeons. In this unit, we discussed preoperative patient skin preparation, including hair removal and the cleansing skin prep. Next, we covered common surgical draping materials, then moved to applying them to the patient. In the next unit we cover routine duties of the scrub technician and the circulator during the operative procedure; but before you move on, answer the following questions to ensure you learned about draping.

Self-Test Questions

After you complete these questions, you may check your answers at the end of the unit.

619. Common surgical draping materials

1. How are drapes classified normally?

2. List the desirable characteristics that all surgical draping materials should have.

3. Describe the advantages of disposable draping materials.

4. List the advantages of transparent plastic surgical drapes.

5. What linen draping materials are commonly used to outline incision sites and reinforce moist areas on other drapes?

6. What must be done to muslin sheets when they are the only drapes used for draping?

7. What are the windows or openings in a procedure drape called?

8. Specify five different types of windowed drapes and for what they are commonly used.

9. What draping material is commonly used to cover extremities?

620. Applying surgical drapes

1. What is the main reason for applying surgical drapes to an operative site?

2. What is done with a drape if there is a question of sterility?

3. How many persons are normally required for most draping procedures?

4. Where should drapes be opened, whenever possible?

5. Why do you avoid holding sterile drapes under your arms?

6. Once a drape is placed, why should it never be moved toward the incision site?

7. Who should remove a drape that becomes contaminated during a surgical procedure?

8. Why should cloth drapes be placed with the folded edge facing the incision site?

9. How many thicknesses of material are required to form an adequate sterile field when linen drapes are used?

10. If a penetrating towel clip is removed from a drape during a surgical procedure, what areas are considered contaminated? What actions must be taken to prevent further contamination?

621. Common draping routines

1. When applying towel type drapes, how do you protect your gloved hands from being accidentally contaminated?

2. In most cases, how do you pass a cuffed towel or small utility drape with an adhesive attaching strip to a surgeon?

3. Briefly describe placing a plastic incise drape.

4. What areas of the body may be draped using a laparotomy draping routine?

5. Briefly describe a laparotomy draping routine.

6. What is normally the first drape applied during lithotomy draping?

7. What parts of the lithotomy sheet are positioned with the circulator’s assistance?

8. What is normally the first step in draping a leg?

9. When you are draping an extremity, what drape do you usually apply immediately after the tourniquet has been covered with a sterile towel?

10. What is used to remove blood from an extremity prior to tourniquet inflation?

11. What draping materials are placed under a patient's head during the first step in a face draping procedure?

12. Why is the patient's body covered with a sterile sheet during draping of the face?

13. During a neck-draping procedure, what method may the surgeon use to stop the hand towels from sliding out of position?

622. Draping specialty equipment

1. Briefly describe a microscope drape.

2. Who places the cassette inside the x-ray cassette drape?

3. Describe the procedure commonly used to protect the sterile field when taking an x-ray.

4. How does a vertical isolation drape differ from a standard drape?

5. Describe the two basic types of drapes for corded equipment.

Answers to Self-Test Questions

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1. Because shaving often damages the skin barrier, and when compromised, micro-organisms can enter the deeper tissues and start the infectious process before the surgery even begins.
2. (1) If it is so thick it interferes with exposure, closure, or dressings.
   (2) If hair does not allow adequate contact of electrosurgical grounding pads or ECG electrodes, small patches may be removed.

(3) Some surgeons still request hair removal because hair harbors micro-organisms. By eliminating hair from the area near the incision site, you may reduce the numbers of micro-organisms that may contaminate the wound.

(4) Loose hair can find its way into the wound; this may result in a foreign body reaction or may lead to an infection from the micro-organisms on the loose hair.

3. As close to the start of the procedure as possible to reduce the time microbes can penetrate the skin.
4. Because it is difficult to prevent bacteria-laden hair, skin particles, and prep lather solution from being dispersed around the operating room.
5. Never shave the scalp or eyebrows, and do not cut eyelashes on any patient unless specifically ordered by the surgeon.
6. It should be saved and placed in a bag marked with the patient's identification data. Some patients have this hair fashioned into a wig or hairpiece to cover the bare skull.
7. It usually leaves a one mm short stubble that does not interfere with the action of the antiseptic used later. It also offers less risk of skin damage from nicks and cuts. It poses no risk of allergic reaction, involves less setup or preparation time, requires fewer supplies, and contributes to lower post-op infection rates (no breaks in the skin). Cordless models are also safer for the staff because they pose less risk of electric shock. The disposable shaving head contributes to infection control by preventing the spread of micro-organisms between patients and personnel (the clipper head that contacts the patient's body can be tossed in the trash).
8. To help contain and remove loose hairs from the patient.
9. A chemical lotion or cream that temporarily removes body hair.
10. Any four of the following:
    (1) They are messy and must be spread over the entire area where the hair is being removed.
    (2) It is difficult to contain the agent to the specific area intended.
    (3) Depilatory preps are more time-consuming than other methods of hair removal.
    (4) Patients may develop an allergic skin reaction to the agent that may cause surgery to be canceled.
    (5) Depilatory agents have an unpleasant odor that may bother the patient and person performing the prep.
11. To determine if the patient is allergic or sensitive to the chemicals in the depilatory. On a hairless area on the palm side of a forearm.
12. (1) Genitals.
    (2) Mucous membranes.
    (3) Mouth.
    (4) Nose.
    (5) Eyes.
    (6) Broken or inflamed skin.
    (7) Pediatric patients or infants.
    (8) Face.
13. To soften the area so it is easier to shave.
14. In the direction of hair growth.

617

1. To render a patient's skin surgically clean by reducing the numbers of resident and transient micro-organisms.
2. To cleanse grossly soiled skin and nails or to remove scabs and dead tissue from partially healed wounds.
3. Ask the anesthesia provider for permission to touch the patient.
4. To catch and absorb any excess prep solution and prevent it from pooling under the patient. Allowing the patient to lie in prep solution can result in skin irritation or even chemical burns.
5. The dirtiest area (umbilicus on an abdominal prep; fingers or toes on an extremity prep).
6. 5 minutes.
7. If you retrace, you drag micro-organisms from a "dirty" area back over a "clean" area.

8. Twice.
9. Seal the bag, but keep it in the room until the procedure is over to validate counts, if necessary.

618

1. By having another staff member don sterile gloves and holding the extremity by the hand or foot. If the hand or foot does not have to be prepped, attachments are available to suspend the limb during the prep.
2. Chux pads or towels are usually wrapped around the extremity, immediately distal to the tourniquet. Some surgeons use plastic adhesive drapes to wall off the distal side of the tourniquet.
3. The incision site.
4. Until draping is started and a sterile member of the team can assume control of the limb.
5. Pubic region, vulva, vagina, perineum, inner thighs, and anus.
6. The inside of the vagina.
7. Place a folded hand towel between the patient's thighs.
8. Begin the scrub by washing the lower back, just above the buttocks. Continue down the inside of the buttocks on either side of the anus, then discard the sponge. Next, use fresh sponges to scrub the perimeter areas of the buttocks and the upper portion of the inner thighs (the peripheral areas). The anus is prepped last. Continue the procedure for the prescribed time, then blot the area dry with a sterile towel. Apply two coats of antiseptic paint with sponge sticks.
9. The infection site, which is the "dirtiest" area.
10. To prevent the possible spread of cancer cells by seeding resulting from pressure on the skin over the cancerous area during the prep.
11. By placing sponges moistened with sterile water over the eyes.
12. Antiseptic prep solutions containing chlorhexidine gluconate have been reported to cause serious permanent eye damage when used as a surgical prep, and permanent deafness if allowed to enter the middle ear canal.
13. Because the nose and mouth harbor large numbers of micro-organisms and are considered"dirty" areas.
14. Coat the blades of a pair of small iris scissors with petrolatum jelly; the jelly holds the cut hair and prevents it from falling into the eye.
15. The donor site. Prepping the donor site first reduces the chance that it will be contaminated by bacteria from the dirtier recipient site.

619

1. By their intended purpose, the material they are made from, by their design and shape, or by a combination of their characteristics.
2. They should be blood and fluid resistant; resist tears, punctures, and abrasions; be flexible or "drapable"; be as lint-free as possible; be non-reflective and colored; be antistatic, resist ignition, and have a low rate of flame spread; be porous; and be nonabrasive and free of toxic materials, nonfast dyes, and unpleasant or noxious odors.
3. They are moisture-resistant, lint-free, flame resistant, antistatic, nonirritating, soft, lightweight, strong, tear resistant, and compact. Because these drapes come packaged and sterilized by the manufacturer, the need for washing, repair, folding, and sterile processing is eliminated. The use of disposable drapes also contributes to infection control because contaminants are contained and disposed of along with the drapes.
4. They are completely impervious to moisture and seal the incision site from contamination due to bacterial migration; transparent to allow observation of the patient's skin color and anatomical landmarks; facilitate draping irregular body surfaces; wall off contaminated areas from noncontaminated areas; reduce the risk of sterile field contamination from towel clip perforation by using adhesive to secure the drapes; and are strong, flexible, and highly elastic.
5. Hand towels.
6. They must be folded in half and layered together to form four thicknesses of muslin.
7. Fenestrations.
8. Any five of the following:
   (1) Laparotomy sheets are primarily designed for abdominal surgery but can be used to drape any flat surface area of the body. Smaller versions of this sheet are made for use on pediatric patients.

(2) Thyroid sheets are primarily designed for thyroid surgery but may be used for any procedure involving the head or neck.

(3) Breast or thoracic sheets are used for thoracotomies, mastectomies, and other procedures involving the upper torso.

(4) Kidney (transverse) sheets are used for procedures on the flank or lateral chest.

(5) Extremity sheets are used primarily for orthopedic procedures involving the limbs.

(6) The lithotomy drape exposes the patient's perineal area for vaginal, rectal, urological, or other procedures.

(7) Laparoscopy sheets are used primarily for gynecological procedures requiring access to both the abdominal and the perineal areas.

(8) Craniotomy sheets have an oval or round fenestration near the top of the sheet to allow the surgeon access to the skull. They are often very long and wide to incorporate draping of a Mayfield-type instrument table in the sterile field.

9. Stockinet.

620

1. To isolate the operative site by providing a microbial barrier to prevent contamination and reduce infection potential.
2. Immediately discard any drape if sterility is questionable.
3. Two.
4. Over the operative field.
5. The armpits are considered unsterile.
6. Because bacteria from unprepped areas will be transferred to clean, prepped areas if it is moved.
7. A circulator.
8. To prevent instruments and sponges from getting lost between the folded layers of the drapes.
9. At least four.
10. The tips of the towel clip and the area of the drape where the towel clip was removed from; the towel clip is passed off the sterile field to the circulator, and the drape is immediately covered with a sterile utility drape or towel.

621

1. Make a folded cuff over the fingers of your gloved hands.
2. With the cuff or adhesive strip facing away from the surgeon.
3. Two members of the sterile team (usually the surgeon and assistant) fully open the drape (usually over the patient) with the adhesive surface down. A third sterile team member (the scrub tech) carefully removes the paper backing as the surgeon and assistant apply tension to keep the drape from wrinkling. The surgeon uses a folded hand towel to press the adhesive surface over the incision site as the other two sterile team members lower the drape. The surgeon applies pressure with the towel to remove air bubbles and smooth any wrinkles or creases.
4. Any relatively flat body surface, including the abdomen, back, chest, flank, and neck.
5. (1) "Square-off" or outline the incision site with four hand towels.

   (2) If the surgeon desires, place a half- or three-quarter sheet (called a base, bottom, or foundation sheet) below the patient's waist and covering the legs.

   (3) Place the laparotomy ("lap") sheet fenestration over the incision site. Ensure the head is facing the proper direction.

   (4) Open the sides of the laparotomy sheet first.

   (5) Fully unfold the bottom section of the drape so it completely covers the patient's feet and hangs over the end of the OR bed. If the sheet is too short, place an additional utility sheet (half- or three-quarter sheet) over the bottom of the patient's legs after unfolding the top.

   (6) After the bottom section is opened, unfold the top section. If the sheet is too narrow to cover the arm boards, use half- or three-quarter sheets to cover them.

(7) If the surgeon desires, a large, adhesive-backed plastic incise drape is placed over the operative site after the laparotomy sheet is opened.

6. A sterile, moisture-proof foundation sheet under the patient's buttocks to provide an extra layer of draping material.
7. The leggings.
8. Draping the lower end of the OR bed with a moisture-proof sheet.
9. The stockinet that covers the extremity.
10. An Esmarch or elastic "ace" bandage.
11. A half-sheet and a cloth hand towel.
12. To extend the sterile field.
13. The towels may be clipped or sewn to the skin.

622

1. It is a large, clear plastic bag that more or less conforms to the shape and size of the microscope head(s). It usually has individual sleeves for each ocular head and for each eyepiece. A plastic covered ring usually snaps tightly over the lens to isolate it from the sterile field; the ring also keeps the drape off the field.
2. The x-ray technician or circulator.
3. The operative field is covered with a sterile towel or small sheet. The x-ray unit is then positioned and the x-ray taken. Immediately after taking the film, the unit is moved from the sterile area, and the cover towel or sheet is removed from the operative site and discarded.
4. A vertical drape is a very large sheet of plastic with an adhesive isolation drape in the center instead of a fenestration. The incise portion is placed over the incision site, then the drape is unfolded up and from side to side. Instead of the drape lying on the patient (horizontal), the drape is suspended from a frame or rods above the patient. Most vertical drapes have pouches and pockets to hold electrocautery pencils, suction tips, and other surgical apparatus.
5. One type of drape is a long, narrow "stockinet" drape; it has a stockinet lining with a plastic outer cover. The closed end of the stockinet is clear plastic. The other, more common type of corded equipment drape is simply a long, clear plastic bag.

Do the unit review exercises before going to the next unit.

Unit Review Exercises

Note to Student: Consider all choices carefully, select the *best* answer to each question, and *circle* the corresponding letter.

45. (616) What *most accurately* reflects current studies regarding removal of hair from the incision site?
    a. Remove all body hair before any major surgical procedure.
    b. Remove hair from the area around the surgical site for all surgical procedures.
    c. Hair should be removed only if it is so thick it interferes with electrode placement or surgical exposure, closure, or dressings.
    d. Hair should be removed from the incision site, from the area under the electrosurgical grounding pad, and from under the EKG electrodes on all surgical patients.

46. (616) Hair is removed from an operative site for all of the following reasons *except* to
    a. decrease the risk of infection from microorganisms on loose hair entering the open wound.
    b. decrease operative exposure and allow the surgeon better visualization of anatomical landmarks.
    c. reduce the risk of foreign body reactions caused by dislodged hairs entering the open wound.
    d. reduce the numbers of microorganisms on the skin by eliminating hair as a bacterial breeding ground.

47. (616) What is done *first* when using a depilatory cream?
    a. Rinse the entire area with warm water to remove any existing loose hair.
    b. Wipe the skin against the direction of hair growth using a wet washcloth.
    c. Apply a small amount of cream to the palm side of the forearm for several minutes, then inspect the skin.
    d. Apply the cream only to the area specified in the surgeon's orders. and leave it for the recommended time.

48. (616) When removing hair from a patient with a razor, in which direction do you make the shave strokes?
    a. In the same direction of hair growth.
    b. Opposite the direction of hair growth.
    c. Perpendicular to the direction of hair growth.
    d. At an oblique angle to the direction of hair growth.

49. (617) What is the *first* action you take in preparation for performing a cleansing skin prep?
    a. Ask the anesthesia provider for permission to touch the patient.
    b. Turn on and focus the overhead surgical lights on the prep area.
    c. Examine the patient's skin for remaining hair and possible damage.
    d. Expose the operative site by folding back the patient's cover sheet.

50. (617) When a prep area is draped with four sterile hand towels, you should *first* drape the side
    a. facing the foot of the operating room (OR) bed.
    b. facing the head of the OR bed.
    c. nearest the person performing the prep.
    d. opposite the person performing the prep.

51. (617) What *best* describes what should be done with the trash bag containing the soiled prep sponges after the cleansing skin prep is complete?
    a. Leave in the kick bucket and use as a receptacle for the surgical sponges used to clean the powder from the sterile team's gloves, then seal and remove from the room before the start of the procedure.
    b. Use to contain the disassembled prep setup, the soiled prep gloves, and other trash, then sealed and kept in the room until the procedure is over.
    c. Use to contain the disassembled prep setup and soiled prep gloves only, then sealed and take out of the room before the patient is draped.
    d. Use to contain all surgical sponges, then sealed and take out of the operating room immediately after the surgical procedure is over.

52. (618) How is the patient's arm or leg usually supported during an extremity prep?
    a. A second circulator dons sterile gloves and holds the extremity by the hand or foot.
    b. The scrub dons a second pair of sterile gloves and holds the extremity by the hand or foot.
    c. The surgeon or assistant dons sterile gloves and holds the extremity by the hand or foot just before gowning and gloving.
    d. The surgeon or assistant dons a second pair of sterile gloves and holds the extremity by the hand or foot just after gowning and gloving.

53. (618) Solutions containing which agents should *not* be used to prep any head or facial area, and why?
    a. Iodophors because solutions have been reported to cause corneal damage to the eye and allergic reactions to the skin.
    b. Chlorhexidine gluconate because solutions have been reported to cause corneal damage to the eye and allergic reactions to the skin.
    c. Chlorhexidine gluconate because solutions have been reported to cause serious permanent eye damage and permanent deafness if allowed to enter the middle ear canal.
    d. Iodophors because solutions have been reported to cause serious permanent eye damage and permanent deafness if allowed to enter the middle ear canal.

54. (618) When you clip an awake patient's eyelashes before eye surgery, what should you do to prevent the clipped hairs from irritating the patient's eyes?
    a. Tape the eyelids shut with paper tape.
    b. Continually irrigate the eyes with sterile water.
    c. Tell the patient to close his or her eyes very tightly.
    d. Coat the tips of the lash scissors with petrolatum jelly.

55. (619) What is *not* a desirable characteristic of a surgical draping material?
    a. Resists tears, punctures, and abrasion to preserve the integrity of the drape.
    b. Is blood and fluid resistant to prevent strike-through contamination of the sterile field.
    c. Is non-reflective and should be colored to reduce eye strain and distortion from reflected light.
    d. Is hyperstatic, support ignition, and have a high rate of flame spread as established by National Fire Protection Association standards.

56. (619) What characteristic *is not* an advantage associated with the use of plastic surgical drapes?
    a. Strong, flexible, and highly elastic.
    b. Porous and allows the patient's body heat to readily dissipate.
    c. Can be transparent and allows the surgeon to view the patient's skin color.
    d. Completely moisture-proof and seals the incision against bacterial migration.

57. (620) Which attribute is the *primary* purpose of sterile drapes?
    a. Create a broad sterile field.
    b. Isolate the operative site by providing a microbial barrier.
    c. Protect the patient's privacy by covering all areas except the surgical site.
    d. Provide a margin of safety below the surgical site and allow instrument stands and tables to be positioned closer to the field.

58. (620) What rule applies to the movement of sterile drapes after they have been positioned at the operative site?
    a. Drapes should not be rearranged once they have been placed.
    b. Drapes may be moved only from one sterile area to another sterile area.
    c. A drape may be moved only from an unsterile surface to a sterile surface.
    d. A drape may be moved only from a sterile surface to an unsterile surface.

59. (620) What action should the scrub take if a sterile drape becomes moistened during a surgical procedure?
    a. No action is necessary.
    b. Moist areas are covered with dry, sterile drapes.
    c. Wet drapes are removed and replaced with dry drapes.
    d. Wet areas are removed and replaced with impervious plastic drapes.

60. (621) During laparotomy draping, some surgeons like to place a drape sheet over the patient's legs before applying other drapes. This additional drape is called a
    a. base sheet.
    b. vertical sheet.
    c. security drape.
    d. perimeter drape.

61. (621) When does the scrub usually take control of and support the extremity during a typical extremity draping routine?
    a. Before the foundation sheet, rolled towel, and stockinet is applied, and before the stockinet is unrolled and the split or extremity sheet is applied.
    b. After the foundation sheet and rolled towel is applied, but before the stockinet is applied and unrolled, and before the split or extremity sheet is applied.
    c. After the foundation sheet, rolled towel, and stockinet is applied, but before the stockinet is unrolled and the split or extremity sheet is applied.
    d. After the foundation sheet, rolled towel, and stockinet is applied, and after the stockinet is unrolled and the split or extremity sheet is applied.

62. (621) The *first* step of face draping involves the
    a. two sterile team members gently lifting the patient's head, neck, and shoulders while a third sterile team member places a cloth hand towel on the bed, under the patient's head, and a half-sheet (foundation) on top of the hand towel.
    b. two sterile team members gently lifting the patient's head, neck, and shoulders while a third sterile team member places a half-sheet (foundation) on the bed, under the patient's head, and a cloth hand towel on top of the foundation sheet.
    c. anesthesia provider and circulator gently lifting the patient's head, neck, and shoulders while a sterile team member places a cloth hand towel on the bed, under the patient's head, and a half-sheet (foundation) on top of the hand towel.
    d. anesthesia provider and circulator gently lifting the patient's head, neck, and shoulders while a sterile team member places a half-sheet (foundation) on the bed, under the patient's head, and a cloth hand towel on top of the foundation sheet.

63. (622) Microscope lenses are usually isolated from the sterile field by
    a. sterilizing a reusable rubber ring that snaps over the lens.
    b. tightly securing the microscope drape to it using sterile rubber bands.
    c. a plastic covered ring on the microscope drape that snaps tightly over the lens.
    d. the circulator removing the adhesive paper backing inside the drape, then the scrub presses the adhesive area against the lens to secure it.

64. (622) How is a "C-arm" usually draped using a large, plastic bag type drape?
    a. Scrub technician applies the drape over the top half of the "C".
    b. Scrub technician applies the drape over the bottom half of the "C".
    c. X-ray technician applies the drape over the top half of the "C".
    d. X-ray technician applies the drape over the bottom half of the "C".

Please read the unit menu for unit 4 and continue ➔

Student Notes

Unit 4. Basic Surgery Routines

PREVIOUSLY, WE DISCUSSED THE MAJOR PREOPERATIVE ACTIVITIES that occur after a patient has been wheeled into the operating room, including positioning, skin preparation, and draping the operative site. Now, we continue this chronological progression and look at the specific events and practices that occur during the course of a typical surgical procedure. The focus of this unit is on the activities of the scrub technician and circulator at different phases of an operation.

We explain the major intraoperative responsibilities and duties of the scrub and circulator, including passing instruments, opening additional supplies, maintaining the sterile field, and handling specimens. Finally, we discuss the activities accomplished during and immediately following wound closure, ending with the initial steps of case "break-down" as the patient leaves the operating room.

4–1. Intraoperative Routines

The true test of your abilities as a surgical technician comes during an operation after the initial skin incision is made. Preoperative preparations require a certain amount of skill, knowledge, and teamwork. However, they do not require the same degree of physical and mental stamina, manual dexterity, and concentration that are required when actually performing duties as a scrub or circulator *during* an operation. Once the surgeon makes the initial skin incision, the entire surgical team must focus their concentration on the patient and on every detail of the operation. There is little margin for error, and effective teamwork is essential. When you watch a highly skilled, well-coordinated surgical team, all activity seems to occur automatically. It can appear as though the team members read each other's minds.

Everything the surgeons need is ready and usually in their hands before it is asked for. To achieve this level of performance, you must know and understand your duties, both as a scrub technician and as a circulating technician. You must also be familiar with the sequence of events, or routine, that occurs during a typical operation, from the moment the surgeon "drops the knife," until the patient is transferred from the operating room.

In the previous units, we discussed your major duties and responsibilities in preparing for an operation. Now, we take you a step further and talk about activities you can expect during the procedure. These activities include such things as maintaining the sterile field; anticipating the surgical team's needs; documenting the procedure; handling instruments, solutions, and additional sterile supplies; assisting with blood loss determination and intraoperative x-rays and handling specimens.

623. Common scrub and circulator duties

After draping the patient, the scrub and circulator still have some preliminary preparations to make before the surgeon can make the incision. We approach this from a scrub technician's perspective.

Positioning surgical equipment

After the surgeon applies the last drape, move the Mayo stand into position. For many operations, you place the stand at the patient's draped lower legs; slide it so the tray is above the legs and the stand's stem is against the bed rail. If this placement is not practical, then position the stand as close to the operative site as possible. Do not place the stand where it interferes with the surgeon or assistants. Regardless of where you position the stand, ensure the stand *never* rests on the patient.

To move the stand, grasp the front portion of the tray holder with one hand and the top of the stem with the other. Standing to one side, slightly raise the tips of the "feet" off the floor; then pull the stand into position. Hold and stabilize the tray as you move the stand to keep from dumping the contents on the floor. While the scrub often moves the Mayo stand alone, the circulator can assist with a particularly heavy or awkward one by grabbing the lower portion of the stem (below waist level) and pushing the stand as the scrub pulls it.

After you position the Mayo stand, immediately pass the light handles, Bovie cord, suction tubing, and any light cords or power cords to the surgeon and assistant. As the surgeon and assistant position and secure these items and pass off the connecting ends, a circulator should help you move any back tables or ring stands. Move the back table by applying downward pressure to the top of the table only; do not grab the sides as they are not sterile. Move the ring stand by placing your hands inside the basin(s) and applying downward pressure as you roll the stand. The circulator helps move the back table or ring stand by pushing on the legs or shelf below the drapes. When all draped furniture is positioned, the circulator positions kick buckets, emptied of all trash, on both sides of the OR bed.

Before the surgeon makes the incision, the circulator positions the electrosurgery machine and places the foot pedal (if used) near the surgeon's feet. When connecting the cords to the electrosurgical unit, ensure power to the unit is off. *The circulator always connects the patient ground cord first*, and then plugs in the active electrode cord from the field. The circulator positions and turns on the suction apparatus and connects the suction tubing next. Finally, the circulator positions any video apparatus, light sources, air tanks, or other equipment, and connects the cords as the surgeon or assistant pass them off the field. When connecting the various cords and tubes, the circulator must not touch any portion that rests on the sterile field. The members of the sterile team must not pull any portion of a cord or tube from the unsterile area to the sterile area.

While the circulator is busy positioning and connecting the equipment, the scrub prepares for the incision.

Preparing for the incision

Unless the surgeon, room configuration, or procedure dictates otherwise, you (the scrub technician) usually stand at the stem side of the Mayo stand on the side opposite the surgeon. If not already done, wet towels or sponges and pass them to the surgeon and assistant(s) so they can wipe the powder from their gloves. If you use sponges for this purpose, be sure to drop them into the kick buckets so they are counted; do not toss them in the trash. Next, place two dry sponges, one on each side of the incision site that the surgeon and assistant can use to absorb blood and apply traction to the wound edges. The surgeon or assistant adjusts the surgical lights if necessary. (The circulator should have adjusted the lights before doing the skin prep; only fine adjustments should be necessary.)

The assistant should pick up the Bovie pencil to help control superficial bleeders. Then the scrub passes the skin knife (usually a #10 scalpel blade on a #3 handle) to the surgeon. The surgeon asks the anesthesia provider if the patient is ready, and then makes the incision. The circulator usually notes the incision start time and begins filling out the required reports and forms.

The operation has started! We next discuss the major duties and responsibilities of the scrub and circulator during a typical procedure.

624. Duties of the scrub from incision to wound closure

As a scrub technician, your primary functions during the procedure are to watch the field, remain alert for and listen to the surgeon's or assistant's requests, and to anticipate and provide all specific sterile instruments and supplies needed. Along with the circulator, you are also responsible for preventing contamination of the sterile field and surgical wound, and must keep track of and account for all items used in the procedure.

You may also find yourself in the secondary role of "assistant" to the surgeon; you hold retractors, suction or sponge the wound, cut "stitches," and use the Bovie pencil to cauterize vessels. You will usually assist only when another surgeon is not available, or when the procedure is relatively minor and a surgeon assistant is not cost effective. This can be particularly challenging; you not only have to set up and maintain your sterile field, you must also simultaneously pass instruments while helping the surgeon. This obviously takes a high degree of skill and knowledge, a tremendous amount of concentration, and a lot of "hustle." You must know every item needed for the procedure, from start to finish, and ensure you know where the items are. You must make sure all items are on the Mayo tray where the surgeon can find them if both your hands are busy with more critical tasks. Because this situation is so demanding only the most qualified surgical specialists and technicians scrub and assist at the same time.

One of the most important attributes you can develop is the ability to remain calm under pressure. You cannot effectively assist the surgeons if you panic or get confused during a case. This is particularly crucial in emergency cases or when something goes wrong during elective procedures. When surgeons are confident in your abilities, when they trust you and know you are "on the ball" at all times, they can focus their total concentration on the operation. If surgeons are constantly asking for commonly used instruments or supplies, or if they must ask for something more than once, you are not doing your job. Even the "high-strung" or "excitable" surgeons generally remain calm when a competent scrub is standing at the Mayo tray. Your role is critical—a good scrub is like a surgeon's "third hand"; a bad scrub is more like "handcuffs."

Anticipating the surgeon's needs

Competent scrub techs do not simply "pass instruments" as needed; they fully concentrate on and apply themselves to *anticipate* the surgeons' needs. Watch the technicians considered "good scrubs" in your OR. You will probably find they are holding the item a surgeon needs next in their hand, before the surgeon asks for it (sometimes even before the surgeon knows he or she needs it).

Do not "daydream" during surgery—pay attention! Your inattention can result in mistakes or delays that make the operation a surgeon's "nightmare." Whenever possible, watch what the surgeon is doing. Look into the wound and try to determine what structures the surgeon is working on. Then, use your knowledge of the use of various surgical instruments and supplies to figure out what the surgeon will most likely need next. If the surgeon is cutting, get ready the instrument the surgeon uses for hemostasis (hemostat, Debakey forceps, etc.). If you just passed a suture, give the suture scissors to the assistant, or have them in your hand if you are assisting. As you gain experience, you learn routines common to most surgeons. You should also get to know the idiosyncrasies and techniques of the particular surgeons you work with. Use this knowledge!

If you cannot see what the surgeons are doing, you may have a hard time anticipating the surgeons' needs. Pay attention to what the surgeons, assistants, anesthesia providers, and circulators are doing; they often give clues to what will happen next. Do not hesitate to ask questions, but watch your timing. Ask during a slow or non-critical point in the operation. Do not bother surgeons when they are in the middle of trying to control a serious hemorrhage, or when they reach a critical stage of the operation. You only break their concentration and jeopardize the patient's safety. Most surgeons welcome questions, especially if the answer helps you prepare what they need in advance instead of them having to ask for and wait for an item. Take every advantage to "pick the surgeons' brain." Augment your self-study preparations (you did prepare, didn't you?) by asking why and how the

surgeons perform certain steps of a procedure. Watching, listening, and asking help you fit all the things learned in technical school, and in this course, together like pieces of a giant puzzle. Anyone can pass instruments and supplies only on demand; we expect more. Apply yourself. Do your best; do it right. Perform, as you would want someone to perform if *you* were the patient!

Types, usage, and function of instruments

As you learned in technical school, each instrument is designed to perform a particular function. It is very important that the instrument be used for its intended purpose. Improper use of an instrument can cause harm to a patient or staff member, as well as damaging the instrument itself.

For our purposes, we are going to sort instruments into nine classifications. These classifications are cutting, grasping/holding, clamping, retracting, probing, dilating, suturing, suctioning, and accessory instruments. Let's look at each classification, its function, and some different types of examples of each. The examples listed are a very small sample of all the types of instruments available.

Classifications of instruments	Usage/function of instruments	Examples of types of instruments
Cutting	Instruments with sharp edges that are used for incision, sharp dissection, or tissue excision.	Knife handles and blades, scissors, bone cutting instruments (osteotomes, curettes, chisels, gouges, and ronguers), saws, drills, adenotomes, and dermatomes.
Grasping or Holding	Designed to manipulate tissue to facilitate suturing or dissection. Can also be used to stabilize fractured bone during internal fixation. May or may not have a locking mechanisms. Tissue forceps are used in the nondominant hand to grasp and hold tissue during suturing or dissection.	Tissue forceps- adson's with teeth, brown adson, russian, and bonney. Dressing forceps- smooth adson, DeBakey. Other forceps- allis clamps, babcock, kochers, bone holding forceps.
Clamping	Designed to occlude or constrict tissue. Constructed with opposing ringed handles for fingers, interlocking ratchets to lock the instrument in place, and two shanks that connect the ringed handles to the box lock. May be straight or curved with varying degrees of angulation.	Hemostatic clamps –mosquito, crile, kelly, and tonsil clamp. Vascular clamps- Colley vena cava clamp, DeBakey occlusion clamp, Cooley patent ductus clamp, Glover curved clamp.
Retracting	Designed to expose the operative site. May be hand-held or self-retaining, and constructed in a variety of sizes and designs. May be double ended or single ended. Some of the larger self-retaining retractors may even attach to the operating room bed.	Hand-held retractors- Richardson, Army/Navy, Harrington (sweetheart), Deaver, Sims. Self-retaining- Weitlaner, Gelpi, Balfour, O'Conner O'Sullivan, Judd Mason bladder retractor
Probing	Malleable, wire-like instruments used for exploration of a structure such as a fistula or a duct. Typically used in abdominal, gallbladder, or rectal surgery. Also used in some ophthalmic and cardiac surgeries.	Malleable probe, gallstone probe, fistula probe, groove director, lachrymal probe.
Dilating	Instrument used to dilate a duct or orifice gradually to allow for the introduction of a larger instrument or to open a stricture. Structures are dilated starting with the smallest and moving to the larger dilators. Because of their different sizes, they are usually found in numbered sets. You will see the use of dilators in numerous specialties.	Van Buren ureteral sound, Hegar and Hank uterine dilators, Bakes common bile duct dilator, Tubbs mitral valve dilator, Trousseau tracheal dilator.

Classifications of instruments	Usage/function of instruments	Examples of types of instruments
Suturing	Instruments used to hold curved needles during suturing. Vary in length and may be fine, medium, or heavy. The depth used depends on type of needle and suture used and the depth of the wound. May be straight or curved. The jaws of the needle holder are designed to keep the needle from moving during suturing.	Hegar needle holder, curved Haney needle holder, Crile-Wood needle holder, Webster needle holder.
Suctioning	Instruments used to remove blood and bodily fluids from the operative site by negative pressure. The suction tip is a hollow tube that is attached to a suction tubing that is attached to a suction device. Suction is used to provide better visualization to the surgeon.	Poole suction tip, Yankauer suction tip, Frazier suction tip, De Lee suction device.
Accessory	Other instruments that do not easily fit into any of the above classifications.	Sponge forceps, towel clips, rectal speculum, ligating clips, metal ruler, trocars, and gallstone scoops.

By learning the types and usage of surgical instruments, you will be better able to handle these instruments safely during an operation.

Handling instruments

When the anesthesia provider gives the surgeon permission to start, pass the “skin knife” to the surgeon. Depending on the surgeon and local policy, you either “hand” the surgeon the knife or, preferably, use a “hands-free” technique. If you must hand the knife to the surgeon, always hold it firmly by the handle, with the sharp side of the blade down and tip pointing towards you, ***NEVER*** toward the surgeon. Hold it firmly between your thumb and index finger with the palm of your hand facing down. Flex your wrist to keep the blade well away from your hand and arm.

The hands-free method is a much safer technique for passing the knife and other sharps, such as armed needle holders. To use this technique, the surgical team establishes a “neutral zone” by placing a specially designed pad or basin between the scrub and the surgeon. When sharps are needed, the scrub places the instrument on the neutral zone in the position the surgeon will use it, and then announces its placement. The surgeon then picks up the instrument, uses it, and returns it to the pad or basin where the scrub can remove it. The hands-free technique is highly recommended as it reduces the chance of sharps injury, but it is not suitable for all procedures or all surgeons. You must know how to use both methods safely.

Because the skin is only surgically clean, not sterilized, many surgeons and other team members consider the “skin knife” contaminated. Local policy dictates exactly how you treat the knife, but if it is considered contaminated, you usually place it in a basin and isolate it from the field. Once contaminated by the skin knife, do not touch the inside of the basin during the case. Numerous studies have shown the risk of this knife transferring microbes to deeper tissues in minimal, but you must always follow the surgeon’s preference and local guidelines.

During the surgical procedure, the surgeon must cut or excise through the different layers of tissue. Other times the surgeon dissects around the tissue. You will see the surgeon perform two types of dissection—blunt and sharp.

Sometimes the surgeon needs to dissect or cut around veins, arteries, or other delicate tissue. The underlying and surrounding tissue needs to be dissected away from the delicate tissue without damaging it. In this instance, the surgeon will use blunt dissection. Blunt dissection is separating the tissue layers with an instrument that has no cutting abilities. When blunt dissection is used, the tissue layers are gently peeled away from each other. One of the items you will see the surgeon use to

perform blunt dissection is a kitner. The surgeon will grasp tissue with one hand and take a kitner on a kelly clamp in the other, and dissect the surrounding tissue. During a hernia repair, a surgeon often uses his or her finger or a sponge to separate the tissue plans of the inguinal area. Another common blunt dissection uses the scalpel handle or the blunt side of tissue scissors.

The second type of dissection is sharp dissection. Sharp dissection is simply cutting tissue apart or separating tissue layers with sharp instruments. The most common type of sharp dissection is done with a scalpel or pair of scissors.

As tissues are incised, the basic rule of "cut, clamp, and control (or tie)" applies. When the surgeon *cuts* through tissue and severs blood vessels, the resultant bleeding is usually *clamped* in a hemostat or forceps, and it is *controlled* before the operation continues. To help control bleeding, the scrub passes hemostats; the hemostats are clamped to the ends of the bleeding vessels. Then, the bleeding is stopped using either a tie or ligature (a single free tie or continuous reel) or by using electrosurgery. If using a ligature, pass the suture scissors to the assistant as the surgeon ties the knot. If assisting the surgeon, touch the Bovie tip to the forceps or hemostat clamping the vessel only when the surgeon tells you to do so. Never directly cauterize tissue unless (1) you are fully trained in the technique, (2) the surgeon directs and supervises you as you apply the Bovie, and (3) local policy allows you to do so. These methods and other hemostatic agents and devices are discussed in the next volume of this CDC.

As discussed previously, anticipating the surgeon's needs is an integral part of the scrub technician's duties. You must have a basic knowledge of the surgical technique involved in the specific procedure being performed. You must understand the purpose of the instruments used and identify the anatomical structures the surgeon is working on. You must also apply logic when deciding whether to pass a long or short instrument. Generally, the instruments you initially place on the Mayo tray are often relatively short; then replaced with longer ones as the surgeon moves deeper into the wound. Instrument selection reinforces the need for preoperative preparation. If you know your patient is very obese, you can ensure larger retractors and longer clamps are available. If, on the other hand, a patient is very thin or is smaller than average, you may need shorter instruments than you normally would. Knowing what is involved in the surgical technique used, and knowing the size and depth of the wound, are two other keys to anticipating instrument needs.

Pass each instrument firmly, decisively, and in the position of use. By delivering it in this way, the surgeon knows it is there and does not have to look up from the wound or adjust his or her grasp of the instrument. The following guidelines generally apply:

- Pass ring-handled instruments, such as needle holders or clamps, by holding the hinge (box) joint. Keep the tips of the instruments pointing up, and pass them so the curve, angle, or needle tip points toward the surgeon's midline; the ring handles contact the surgeon's palms. (**NOTE:** If passing an armed needle holder, use the hands-free technique if possible; if not, use caution and keep your hand well away from the needle point).
- Pass thumb forceps (pickups) by grasping the fused end. Place them between the surgeon's outstretched thumb and index finger with the fused end toward the surgeon's body.
- Pass hand-held, double-ended retractors, such as Army-Navy and Richardson retractors, by grasping the middle portion of the handle. The end of the retractor the surgeon wants to use (deep or shallow end) faces away from the surgeon's body. Pass single-end retractors by grasping the handle near the *retracting* end and placing the end of the handle in the surgeon's palm.
- Pass heavy instruments, such as orthopedic instruments and large retractors, gently and deliberately.
- Do *not* "slap" instruments into the surgeon's palm. It may look and sound impressive, but it can be extremely painful and could possibly injure the surgeon's hand. Efficient passing produces a firm but gentle "snap" as the instrument contacts the palm of the surgeon's glove.

A slight twist of the wrist is usually sufficient to seat the instruments firmly in the outstretched hand. Do not move your whole arm when passing instruments; you waste energy and risk contaminating the instrument and your gown.

- Do not allow instruments to accumulate on the drapes. Unless otherwise directed by the surgeon, always retrieve instruments that are not being used (particularly sharp ones) and return them to your Mayo tray, back table, or soak basins.
- Avoid passing instruments over the incision or over delicate areas. Internal structures are inherently delicate; if you drop an instrument, you may cause serious hemorrhage or tissue damage.
- If an instrument pricks or tears a sterile glove, both the instrument and glove are contaminated. Pass the instrument off the sterile field and change the glove.
- As a rule, do not hold instruments in both hands simultaneously. Keep one hand free to meet unexpected requests. As you become proficient, you may learn to hold several instruments (especially hemostats) in one hand and still be able to pass them properly.

Many surgeons use *hand signals* to indicate the next instrument they need. You were taught the basic hand signals a surgeon uses for hemostats, scissors, scalpels, forceps, retractors, suture (stick ties), and free ties in technical school. Be alert for them!

Controlling sponges on the sterile field

As stated earlier, a good scrub technician knows exactly how many, what type, and where all counted items are at all times. Besides knowing where counted items are, you must also know how to handle them. We covered handling sharps in the unit on safety in Volume 1. We will cover suture and suture handling in the unit on wound closure in Volume 5. For now, we highlight some of the guidelines for intraoperative handling of surgical sponges.

To maintain effective control of counted sponges on the sterile field, you should do many things. Some of these are listed here.

A good “rule of thumb” is to replace sponges one-for-one. As you remove soiled sponges from the field, immediately replace them with clean ones. Be sure to put the clean sponges on the field *before* discarding the soiled sponges so the surgeon always has something to “mop up” blood.

Before you discard grossly soiled sponges into a kick bucket, carefully and fully open and inspect them to aid the circulator in retrieval and to be certain nothing is wrapped inside. The first time you drop a bone, vein, skin, or other autologous graft in a kick bucket, the surgeon will *strongly* remind you of this little detail.

If the surgeon uses small sponges, such as 4 x 4 or 4 x 8 Raytex, during the initial stages of the operation, you normally remove them when the wound is deep enough or large enough to lose one. Replace them with larger laparotomy sponges. Normally, surgeons only use “lap” sponges inside body cavities to reduce the chance of losing smaller sponges in the wound. The primary exceptions are listed:

- Kittners are secured in a heavy jawed hemostat, such as a Kelly, and used for blunt dissection.
- 4 x 8 radiopaque sponges are folded and used for sponge sticks.
- Tonsil sponges are usually used in the throat, but some surgeons use them as stick sponges.
- Cottonoids are used to aid hemostasis, particularly in neurosurgical procedures.

The scrub must keep a close watch on these small sponges. Ensure the surgeon returns all sponges you passed; use the one-for-one rule.

When the surgeon enters a body cavity, such as when the peritoneum or pleura is incised, remove all dry sponges from the immediate sterile field and replace them with saline-moistened sponges. If the

surgeon wants a dry sponge, he or she will specifically ask for it. Moist sponges reduce trauma to delicate tissues; dry sponges stick to or abrade them. Use warm saline to moisten sponges. The saline helps reduce the amount of lint on the sponges. Warm saline is preferable to cool, to help prevent increased hypothermia, and to help blood coagulation. Sponges should be moist, not wet. The exception is when the surgeon requests a "sloppy wet" sponge at the end of the procedure.

Keep two additional clean sponges on the field, either on the Mayo tray or on the drapes, within reach of the surgeon and assistant. Do not place stacks of sponges on the immediate field; you practically invite an incorrect sponge count because you cannot track the total number of sponges, or when they were used. Keep extra sponges on the back table or in a basin on the ring stand, and pass them to the surgeon as needed.

Performing additional sterile duties

The scrub also performs other duties to assist the surgeon. In addition to passing instruments and supplies and assisting the surgeon, the scrub must keep the surgeon's "tools" clean and functional. If using a Bovie pencil, keep the tip clean by scraping the debris *away* from the wound using the *blunt side* of a scalpel. After using a scalpel to clean a Bovie tip, do not use the scalpel in the wound. A better alternative to clean the Bovie tip is to use a self-adhesive, sterile abrasive "Bovie cleaner" or "scratch" pad. If the tip does not clean easily, exchange it for a new one.

You must also keep the suction tip clean and functional throughout the procedure. Many suction tips have a specially designed wire, or *stylet*, designed to keep the tip clear. Simply insert the stylet into the open end of the suction tip, then run it through the lumen until you clear the debris. You can also keep a suction tip clear by flushing it with sterile irrigation solution. Flushing the tip simply involves filling a cup or basin with irrigation solution, then immersing the tip and applying suction until the tip and tubing clears. There are two very important points to remember when using this method; tell the anesthesia provider before you suck any irrigation solution, and keep track of exactly how much irrigation you flush through the tip. The anesthesia provider estimates blood loss by monitoring the volume in the suction container; if he or she does not know how much solution you added, the estimate would be artificially high. You may have to clear the suction tip at regular intervals throughout the procedure. If a tip frequently becomes clogged, ask the circulator for an extra, then attach the new tip as you clean the old. A large syringe can help you flush the suction tip.

You must also properly handle drugs and solutions on the sterile field. We will cover this in depth in Volume 5, but the listed guidelines need mentioning now:

- Use separate basins for wound irrigation, to clean instruments, and to moisten sponges. This helps prevent lint from sponges and debris from instruments from causing a foreign body reaction.
- Ensure you use only saline that is *warmed to approximately body temperature* for irrigation and sponges. Too hot solution may damage the internal tissue; too cold increases hypothermia and may even help initiate a cardiac arrest.
- Ensure you know and label exactly what solution is in each basin on your field. If you have both saline and water on the field, ensure you use only saline for irrigation unless the surgeon specifically requests sterile water (this is very, very, rare).
- When using more than one kind of drug or solution on the sterile field, always label them individually so all team members can clearly see what each basin contains.
- If ever in doubt about the identity of a drug or solution—toss it out!

A good scrub technician maintains a neat and orderly sterile field—it is a sign of competence and efficiency. Keep instruments clean by periodically wiping them off with a moistened sponge or towel. If they are grossly soiled, clean them by immersing in a basin of sterile solution. This helps protect the instrument's finish and keep it fully functional. If you let blood or tissue dry in the jaws of a hemostat, then pass it to the surgeon, it may not fully close to clamp the vessel. If you pass an

instrument covered with wet, slippery blood or body fluid, it may slip in the hand as the surgeon tries to use it. Ideally, *instruments are cleaned with or immersed in only sterile water* ; because saline can damage the instruments finish and lead to pitting and corrosion. However, the more types of irrigation solution you have on the field, the more chances of a mix-up or error. For this reason, local policy sometimes allows you to use saline to clean instruments while they are on the sterile field. Regardless of how it occurs, use *water* to thoroughly clean and rinse any instrument that is exposed to saline as soon as possible after the contact occurs.

As we stated earlier, retrieve used instruments from the sterile field, clean them, then return them to your instrument setup. You should always know exactly where each instrument is on the sterile field. Ideally, all instruments are separated and laid out where they can be seen easily by all members of the team. This facilitates instrument counts and allows another team member to retrieve something when you suddenly find both hands holding retractors at a critical point in the procedure. Sometimes, it is impossible to lay out all instruments, particularly when a procedure requires multiple instrument sets. In this case, separate and lay out all the instruments the surgeon usually uses for the procedure; then if you have room, also lay out the instruments sometimes used. Sort and arrange the seldom or never used instruments by type, but leave them in the instrument pans.

Immediately replace, remove, and fully open all grossly soiled sponges; discard them in the kick buckets. Sterile trash, such as suture packages and suture fragments, should not be discarded in kick buckets. It gets tangled in the sponges, soiling the floor as the trash falls out of the bucket when the circulator retrieves the sponges. Also, if you inadvertently discard a needle with the suture, it is easier to find in a sterile trash bag than it is if it was on the floor and was kicked across the room. Consolidate this trash in a basin or in a sterile trash bag. Many packs include sterile trash bags; if not, you can make one by folding a disposable drape or towel (that is not needed) into a pouch. Using the bag or pouch to hold suture packages and suture remnants allows you to search the bag in the event of a missing counted item. This reduces the amount of trash the circulator has to search through, which brings us to our next section—circulator duties during the procedure.

625. Intraoperative duties of the circulator

New or inexperienced surgical technicians often fall into a trap; they think circulating is an easy job. This is untrue. Like good scrub technicians, *good* circulators can make the job *look* easy. In fact, a good circulator must be a surgical “jack of all trades.” Good circulators must thoroughly understand the roles of the various team members and must be very knowledgeable in pharmacology, surgical procedures, equipment operation, administrative practices, common surgical supplies and instruments, anesthesia administration, safety procedures, infection control practices, and a variety of other subjects. Because the circulator’s duties and responsibilities are so varied, they often require knowledge beyond what is initially taught to surgical technicians. Many of these duties are also governed by legal regulations and requirements. For these reasons, a registered operating room nurse is assigned as the primary circulator on most surgical procedures. Your role as a circulating technician is to help the nurse by performing non-regulated tasks in support of the sterile team and anesthesia provider. To perform these supporting duties, you must remain alert to the evolving needs of the sterile team and anesthesia provider. Anticipate the items needed and have them in the OR, ready to use, *before* they are required. You also help monitor the sterile field for breaks in aseptic technique.

The scope of duties you actually perform depends a great deal on how much you know about surgical technology, your past job performance, your level of experience, and the legal limitations inherent to the task. Training and legal restraints prohibit technicians from performing certain tasks, and prohibit other tasks unless under direct and visual supervision. These include but are not limited to the following tasks:

- Mixing drugs and solutions.
- Injecting or administering drugs (particularly narcotics).

- Drawing blood from a vein or artery (without direct supervision).
- Counting sponges without a licensed team member (nurse).

These tasks are only examples. Always follow local policy. Regardless of policy, *never* perform any circulating task you have not been trained to do. Also, learn and *do not exceed* the scope of your duties and responsibilities. Even if you think you have the skill and knowledge to perform a task safely, do not do it unless you have been fully trained, the training has been documented, and you are completely sure you are authorized by competent medical and legal authority to do it. If a surgeon asks you to do something you are not sure you can (or should) do—say so! Then find someone who can, usually a nurse. Take the extra time needed to locate a nurse rather than risk injuring (or even killing) a patient by foolishly attempting to do something beyond your responsibilities.

Supporting the surgical team

As the scrub attends to and anticipates the needs of the sterile team, the circulator must be alert to and anticipate *all* needs of the entire surgical team, including the anesthesia provider. One of the best ways to support the team—yet one of the most neglected—is to tell the scrub where you are going, and why, anytime you must leave the room. This allows the scrub to make sure he or she has all immediately foreseeable needs before you leave. While the circulator potentially can be involved in almost any activity during the normal course of an operation, we outline here some of the most common duties.

Opening additional supplies and instruments

An alert circulator continually watches the sterile field and listens to the sterile team members' conversations to anticipate any additional items that may be needed. If the circulator pays attention, the scrub rarely has to ask for anything. Before you open and transfer any supplies or instruments to the sterile field, tell the scrub. The scrub then knows the item is open and can locate it and prepare it for use. When possible, pass additional items directly to the scrub rather than projecting them onto the back table or Mayo tray. The scrub can control the item and prevent it from falling off the field or landing on and disrupting the sterile setup. If you are opening counted items (sponges, sutures with needles, instruments, etc.), the circulating *nurse* must perform the count with the scrub. Ensure all counted items are added to the appropriate count record.

Preparing and transferring drugs and solutions

As you should already know, before you transfer any drug or solution to the sterile field, proper identification procedures must be followed. They are always identified *three times*; when you take them from storage, before transfer to the field, and immediately after transfer to the field.

For most procedures, the only solution you use on the field is saline irrigation. If other types of irrigation are needed, you must work with, and closely coordinate with, the scrub to identify and label each solution. Accidentally using sterile water to irrigate a wound can result in serious patient complications.

When it comes to preparing and transferring drugs to the scrub, a good rule to follow is—let the nurses handle the drugs!

Controlling sponges off the sterile field

After the scrub discards soiled sponges into the kick buckets, the sponges must be separated by size to facilitate counting. As we previously stated, it is normally permissible for these sponges to be bundled in multiples of five or ten and placed in labeled plastic bags after they have been counted by the scrub and circulator. *When handling soiled sponges, always wear gloves, use forceps, or do both. Never* handle soiled sponges with bare hands; it exposes you to diseases carried by bloodborne pathogens such as HIV and hepatitis. Sponges should be controlled and placed in impervious containers as soon as possible, but they must remain in the room until completion of the procedure.

Determining blood loss

As a circulator, you monitor all suction devices. Adjust the suction "flow control" (if present) to the desired setting. As canisters or containers become full, seal them and replace them with empty containers. Before changing any suction container, tell the anesthesia provider you are doing so, and advise the surgeon the suction will be off for a brief time. Keep the full container in the room until the procedure ends. If the anesthesia provider requests, you can then estimate blood loss by subtracting the amount of irrigation solution used from the amount of suction fluid collected. The result is added to the estimated sponged blood volume to estimate total blood loss.

In addition to monitoring suction drainage, anesthesia personnel may request the circulator to weigh sponges to estimate blood loss. Use a scale calibrated in grams for this purpose. Before weighing soiled sponges, determine the weight of a dry sponge, and the weight of a moist sponge, in grams. Ask the scrub to moisten the sponge you weigh to get the best estimate of the weight of the sponges the team actually will use. Do this for each type and size sponge used on the field to obtain the *control* weights. (In some ORs, a chart is attached to the scale that lists the control weights of the sponges used.) To estimate blood loss, weigh each soiled sponge immediately after it is discarded from the field, before the sponge dries. Subtract the control weight from the wet weight to determine weight of the absorbed blood. One weighed gram of blood is equivalent to one cubic centimeter or milliliter of lost fluid. Maintain separate tallies of estimated loss from monitoring suction drainage and weighing sponges. Report the amounts to the anesthesia provider and surgeon at specified intervals or when they ask. You should only estimate blood loss if you are fully trained and local policy allows you to do so, as an inaccurate estimate can result in an unnecessary blood transfusion.

Assisting with transfusions

When a transfusion is indicated, the anesthesia provider and circulator must both identify the unit of blood, then prepare the unit and patient for the transfusion. While the circulating nurse is identifying the unit, as circulating technician you primarily attend to the needs of the sterile team. If the sterile team does not need anything, you can help by retrieving and setting up the blood warmer and the administration set. In a severe hemorrhage situation, you may also have to set up a pneumatic blood pump. If blood is needed but not requested or reserved, or if additional blood is needed, you can assist by doing the following:

- Helping the anesthesia provider with drawing a blood sample.
- Filling out the transfusion request (SF 518) Medical Record–Blood or Blood Component Transfusion.
- Stamping labels for blood tubes.
- Contacting the blood bank technicians to give them a "heads-up" that a request is on the way.

For more information on blood and blood component transfusions, refer back to the unit on anesthesia in Volume 3.

Assisting with x-rays

Normally, a routine intraoperative x-ray is scheduled and coordinated with the radiology department before to the start of the operation. If the x-ray was not scheduled, the circulator has to fill out the proper request forms (SF 519B, Radiologic Consultation Request/Report. In either case, the circulator should contact the radiology department and ensure the x-ray technician and all required equipment are ready before the surgeon is ready to "shoot" the film.

When notified, a radiology technician comes to the surgical suite, changes into surgical attire, and prepares the x-ray machine or image intensifier (C-arm). Experienced radiology techs know how to don scrub clothes properly and function in an OR, but the "rookies" may need some help. As a circulator, it is your job to ensure these (and any) visitors in the surgical environment meet all infection control standards and follow proper aseptic technique. As with all equipment, before the x-

ray machine may be brought into the operating room, it is thoroughly cleaned with a germicidal detergent solution. The x-ray tech normally does this, but you may be asked to help if time is short. Closely monitor the sterile field to ensure nothing is contaminated as the x-ray machine is positioned. Also open any required drapes or x-ray cassette covers before they are needed; you usually have to help the scrub apply them.

One of the most important things to consider when x-rays or fluoroscopy studies are done in the OR is proper protection for surgical team members and the patient. Most surgical suites have large rolling lead screens that can be brought into the OR and used as a shield for the sterile team members. Usually, if x-rays are anticipated, the entire surgical team dons protective aprons before the start of the procedure. Aprons are available that fit under sterile attire and "drop-away" when the radiation emitting device is no longer being used. Whenever possible, sensitive parts of the patient's body (particularly the head and genitals) are protected by a lead vest. One note of caution: store all lead aprons on hanging racks or on a flat surface, never folded or crumpled. Folding or wrinkling lead aprons causes the internal lead to crack and makes them ineffective.

In some hospitals where x-rays are frequently taken in surgery, certain surgical team members may have film badge dosimeters that they wear each time they are involved with an x-ray procedure. If they are not wearing them, the circulator may have to obtain the badges and ensure they are properly worn. The easiest and best way you can ensure surgical team members are protected from x-ray exposure is to tell all nonessential personnel to leave the room while the x-ray is being taken.

Performing additional unsterile activities

One of your duties is to keep perspiration off the brow of sterile team members. It is a simple task, but it is essential to prevent the contaminated "sweat" from dripping onto the sterile field. Use a folded hand towel and "blot," but do not lean over a sterile field or contaminate a gown as you do so.

The circulator is primarily responsible for adjusting the lights. Sterile light handles can allow the sterile team to make minor adjustments, but major changes require circulator assistance.

Maintaining general order and neatness in the operating room is also the circulator's responsibility. Remove all wrappers, suture strands, and linen from unused furniture (check with the scrub if it is sterile). Keep the floor clear, and arrange all cords and tubes so they do not pose a tripping hazard. Return all supply containers (cans, boxes, jars, etc.) and supplies that aren't needed to their storage cabinets. Clean up any solution, body fluid, or blood spills immediately—wearing protective attire. Disinfect these areas with a detergent germicide after the gross spillage is cleaned up.

Common sense dictates that circulating personnel must stay in the room as much as possible. (You cannot help anybody if you are not available!) If you are the only circulator and must leave the room during a procedure, always inform the scrub, anesthesia provider, and the surgeon where and why you are going before you leave. Whenever possible, try to get someone to relieve you temporarily so the room is not left unattended. Many surgical suites assign additional technicians and/or nurses to act as float circulators. These "floats" are usually experienced personnel, capable of helping whenever and wherever they are needed in the surgical suite.

Documenting the procedure

All significant events and information relating to a surgical procedure must be documented. The anesthesia provider documents anesthesia events; the surgeon is sterile, so the circulator documents surgical events. These documents, or operative records, are often considered legal documents; they become part of the patient's medical record. Because of the legal implications, ultimate responsibility for recording the procedure rests with the circulating *nurse*. As a circulating technician, do not "start the paperwork" unless the nurse specifically asks you to do so. However, most nurses will ask you to fill out some of the most frequently used forms, particularly as you gain experience, so you need to be at least familiar with them.

SF 516, Medical Record—Operation Report

The SF 516 is exactly what the title implies, a medical record of the operation. In some Air Force hospitals, it is the primary record for all operations. (Many hospitals use the AF Form 1864, Perioperative Nursing Record, as the primary document.) The SF 516 is filled out in stages by different members of the surgical team. Usually the technician transporting the patient to surgery uses the patient's hospital admission card and stamps the patient identification data. The surgeon may complete the preoperative diagnosis section before the procedure, but the circulator often does it as he or she enters the other information on the form. Complete all sections of the form; if an area does not apply, write N/A in the block. Most entries on the form are self-explanatory; we briefly cover some of the others.

The time blocks on the form are sometimes incorrectly completed. "Time began" and "time ended" refer to the time administration of anesthesia started and ended. Ask the anesthesia provider for this information. "Time operation began" refers to the time the operation officially starts; the moment the surgeon makes the incision. The "Time operation completed" is the time the last skin stitch (or staple) is placed to close the wound. Be very careful to place the correct time in the appropriate block; people tend to ask questions if the operation ends *after* anesthesia does.

Ask the surgeon for the "operative diagnoses" in order to complete that block on the form. While the diagnosis is often the same as the preoperative diagnosis, surgeons sometimes discover other problems or conditions during the procedure. The operative diagnoses may also specifically define or elaborate on the preoperative diagnosis. For example, the preoperative diagnosis may be "obstructed bowel." As the surgeon performs the operation, the reason for the obstruction may become evident. The operative diagnoses may be "obstructed bowel due to adhesions."

Do not automatically assume that the operation on the surgery schedule will be the exact operation performed. The schedule may not list all parts of the procedure. The surgery schedule may list "laparoscopic BTL" (bilateral tubal ligation) as the procedure. The actual operation performed may be an "EUA (exam under anesthesia), fractional D&C (dilatation and curettage), laparoscopic bilateral tubal fulguration via electrocautery." The operative diagnoses may also influence the operation performed. The patient with the pre-op and operative diagnoses in the previous paragraph may have been scheduled for a "Bowel resection with anastomosis." With the discovery of the adhesions, the actual operation performed may be "Correction of bowel obstruction via adhesiolysis."

The "description of operation" block is used to record specific events occurring during the procedure. Here are some examples:

- The exact time of inflation and deflation of tourniquet cuffs.
- The time of delivery, the sex, and the condition of the infant (Apgar score), and the delivery of the placenta during a Cesarean section.
- The type, number, and status of operative counts.

The nurse indicates the number and type of counts; whether the counts were correct or incorrect; and signs this block after the final count is complete. After the procedure, the surgeon verifies that all information on the operation report is accurate and adds any information he or she feels is appropriate; then signs and dates the form.

AF Form 1864, Perioperative Nursing Record

In many Air Force Hospitals, the AF Form 1864 is the primary record of a surgical patient's preoperative and intraoperative care. It is gradually replacing the SF 516. The AF Form 1864 is used by the circulating nurse to document a wide variety of direct patient care activities that occur before, during, and immediately after (until transfer to the recovery area) a surgical procedure. This form is almost entirely dedicated as a record of intraoperative nursing care activities and surgical events. The AF 1864 also has designated areas for preoperative assessment of the patient, for preoperative preparation of the patient, and for documentation of potential patient outcomes. The entries for each

section of the form are very specific, and there are so many entries that a detailed discussion of each is impractical in this course. The first few times you are tasked to complete this form, ask the circulating nurse to review and "walk you through" the correct procedures.

It is extremely important that both AF Form 1864 and SF 516 are filled out legibly and in ink. If a correction needs to be made to an entry, draw a single line through it, write in the corrected information, and initial the correction. Never use correction tape, white out, or completely "scribble" over an entry on any document that goes in the patient's chart.

In addition to the forms mentioned, the circulator also fills out any laboratory request forms, completes specimen labels, and does any other paperwork required during the procedure. Since documentation procedures vary from hospital to hospital (especially in this age of electronic media), we do not attempt to cover specific forms or procedures. If you are asked to fill out these forms, your trainer or one of the OR nurses will show you how to do it properly.

Communicating with the team

Good communication between the circulator and other members of the surgical team is absolutely essential during a procedure. This communication should be nonverbal when possible; limit spoken communication to reduce chances of microbial contamination from your oral and nasal passages. Excessive talking can also distract or annoy team members, and upset an awake patient. The scrub should communicate with the circulator using gestures and eye contact. The surgeon usually has no trouble communicating, especially in urgent or emergency situations. The alert scrub or circulator listens and watches for subtle changes. The surgeon's tone of voice, gestures, or sudden change in mannerism can indicate an emergency, such as a massive hemorrhage, or that the surgeon is having difficulty with a phase of the operation. As these changes occur, the scrub and circulator must continually communicate with each other to ensure they have all supplies or instruments needed to adjust the situation.

All verbal communications need to be heard the *first time*. Voices muffled behind masks are easily drowned out by the sounds of suction apparatus, electrosurgery devices, cardiac monitors, respirators, and other equipment commonly used during surgery. Speak loudly and distinctly to ensure there is no misinterpretation of what is said. If you do not understand what someone says to you, politely ask the individual to repeat the information. Courteous, respectful communication among all surgical team members, no matter how tense a situation may become, is essential to maintain good professional relationships and increase team effectiveness.

626. Care and handling of surgical specimens

As a scrub or circulating assistant, you handle a variety of surgical specimens after they are removed from your patients' bodies. It is critically important for you to know how to care for specimens properly, as improper handling can alter their characteristics and make it virtually impossible for the pathologist to study them. If specimens are handled improperly, it may be impossible to diagnose a patient's condition accurately.

What is a specimen?

A specimen is a sample or part of *anything* physically removed from a patient to show or determine the character or condition of the (whole) thing. Common surgical specimens include diseased or damaged tissues and organs (or parts of organs); body fluids and wound drainage; and foreign bodies (natural and man-made). Send all tissue or other items removed from a patient to the laboratory; *never* throw them away.

Purpose of preserving specimens

We preserve specimens to ensure their characteristics are retained long enough for the pathologists to study them. (A pathologist is a doctor who studies structural and functional changes in tissues to determine the nature of diseases). The pathologist performs microscopic examinations and laboratory

tests that may help the surgeon make an accurate diagnosis or confirm a preoperative diagnosis. In disease processes such as cancer, the information obtained by laboratory analysis of specimens may dictate the type of further medical or surgical treatment.

In Air Force hospitals, a tissue committee reviews all surgical procedures. The members also review the pathologist's examination and test results. Then the committee compares the surgical procedures and test results with documentation in the patient's medical record to determine if the surgeon was justified in performing the operation. This analysis helps prevent performance of unnecessary surgery and provides the senior medical staff an indicator of the competency of the hospital's surgeons.

In addition, national standards and medical/legal requirements mandate that specimens be saved and preserved. Some specimens (such as bullets) may be used as evidence in a court of criminal or civil law. As you can well imagine, both legal and medical authorities want these specimens preserved so they appear exactly as they did when removed from the patient's body. If you mishandle the specimen, it may not be admissible as evidence or you may damage it to the point where it is useless. For example, if you drop a bullet or roughly handle it with an instrument, you may make ballistics' testing impossible.

Types of specimens

You will encounter four common types of specimens in the operating room—routine pathological specimens, frozen sections, cultures, and foreign bodies.

Routine pathological specimens

Routine specimens comprise the vast majority of the specimens you will handle. Usually, they are not needed to establish an operative diagnosis, but are sent to pathology to confirm a diagnosis or to be used as evidence that the appropriate tissue was removed. Routine specimens include such things as sections of tissue, whole organs or parts of organs, and, in some instances, even whole body parts.

Frozen sections

Frozen sections are also pathological specimens, but they are handled differently from routine specimens. Frozen sections are usually biopsies; small pieces of tissue that are immediately examined by a pathologist to determine whether evidence of malignant cancer is present. Occasionally, a surgeon requests several frozen sections to differentiate between two closely related tissues or to determine the extent, or *margins*, of a tumorous growth. When possible, the surgeon coordinates with the pathologist in advance and makes arrangements for performing frozen sections. The circulating nurse notifies the pathologist immediately after the specimen is removed, and the tissue is then sent to the laboratory. In some larger hospitals, the pathologist may do the frozen section in the surgical suite if the required equipment is available.

To do a frozen section, the pathologist quick-freezes a small piece of the removed tissue, then slices it into extremely thin sections using a device called a *microtome* (the miniature medical version of a delicatessen's meat slicer). The pathologist then mounts these thin slices on glass slides, stains them, and microscopically examines them. The pathologist immediately notifies the surgeon whether the tissue is benign or malignant.

Culture specimens

Cultures may consist of fluid, small bits of tissue, or contact swabs of tissues and body fluids. These specimens are cultured on different types of growth media, incubated for a period of time, and examined under a microscope to identify the micro-organisms present in the area the specimen was taken. Cultures require time to incubate, so results may not be known for several days.

Foreign or loose body specimens

Foreign bodies include any objects removed from but not normally found in the body. Bullets, shrapnel, glass, thorns, splinters, and other people's teeth are foreign bodies. Artificial prosthetic

implants (orthopedic hip implants, screws, nails, etc.) are also foreign body specimens, even if they are intentionally placed. Inadvertently retained sponges, needles, and instruments are definitely foreign bodies—the kind we do not want to see. Even though a microscopic examination may not be required, foreign bodies are still considered specimens and should be sent to the laboratory. Local policy dictates the procedures for handling different types of foreign body specimens.

Loose bodies are objects that naturally occur in a patient's body but have become unattached from their normal location. Examples include pieces of cartilage or bone fragments in joints or other areas. Loose bodies do not usually cause a harmful tissue reaction but may interfere with the normal function of the area in which they are located. For example, a loose piece of cartilage in a knee joint may wedge between the femoral and tibial condyles (the rounded ends of the bones) and prevent the knee from fully extending or flexing.

Specimen handling guidelines

The surgeon determines precisely how specimens are handled and tells the other members of the surgical team. Some medical and legal standards hold the *circulating nurse* responsible for proper preservation, preparation, and labeling of all specimens removed during an operation. In reality, the scrub shares this responsibility. The scrub is responsible for the care and handling of all specimens from the moment the surgeon removes them until they are transferred off the sterile field. The circulator is responsible for the specimen after it is passed off the field.

Local policy for specimen handling may vary, but it must comply with national standards. Although specific details of specimen handling, preservation, identification, and recording may vary, the following general guidelines usually apply.

Caring for specimens on the sterile field

The surgeon usually announces the delivery of a specimen by saying "specimen," and follows that with a description of what the specimen is and where it was taken from. If the surgeon does not provide this information and you are the scrub, ask. If the specimen is a routine pathological (tissue) specimen or foreign body, place the specimen in a sterile cup or basin. Obviously, the size of the basin required depends on the size of the specimen, but, in most cases, an emesis basin or small round bowl will suffice. After receiving the specimen, place it on the back table. Remove all attached instruments unless the surgeon indicates otherwise, or unless the specimen is considered contaminated (such as when the appendix, a section of bowel, or infected tissue is removed). Removing instruments from a contaminated specimen contaminates the scrub's gloves and any area of the sterile field that the instruments contact. Leave the instruments attached, and pass them off the field with the specimen. If the specimen is not immediately passed off the field, keep it moistened with saline to prevent it from drying. The surgeon may direct you to wrap the specimen in a sterile damp sponge to keep it moist.

Passing specimens off the sterile field

Do not pass any specimen off the sterile field *until the surgeon gives you permission to do so*. Many surgeons prefer to examine certain specimens at some point in the procedure. By keeping the specimen on the back table, the surgeon can usually examine it without having to re-gown and re-glove. In some instances, the surgeon may want to dissect the specimen before it is passed off the field. The skin knife is usually used for this purpose.

After receiving the surgeon's permission, pass the specimen to the circulator. During the transfer, be careful not to contaminate your fingers or gloved hand. Do not touch the inside of the basin if the specimen is contaminated; be careful not to touch the circulator's hand. Do not drop a specimen into a cup or basin containing formalin; if the solution splashes, it contaminates your gloves. If a specimen was wrapped in a wet sponge, remove it from the sponge before passing it off the field. Do not pass a specimen off the field in a counted sponge. If the sponge is inadvertently taken out of the room or

accidentally thrown in the trash, the count will be incorrect. If the specimen is not removed from the sponge, it may be accidentally discarded in the kick bucket.

As you pass the specimen to the circulator, tell her or him what the specimen is and where it came from. The circulator records this information on the tissue examination form, on the specimen container label, and on the Operation Report. If there are any questions about the specimen's identity, the scrub or circulator immediately asks the surgeon.

Preserving specimens

Many different containers are used to hold and transfer specimens to the laboratory. Examples include glass or plastic jars, plastic "zip-lock" bags, test tubes, glass slides, and numerous specially designed containers. Depending upon the type of specimen and the type of tissue examination desired, specimens are placed in a dry container or in one containing solution. Specimen solutions are designed to preserve the specimen or to aid in the prospective test. The solutions commonly used include formalin, saline, alcohol, and special culture media. We now list basic guidelines for handling and preserving different types of specimens.

Routine tissue specimens

Immerse routine tissue specimens in 10 percent formalin solution to prevent tissue decay and preserve them permanently. They are kept either in the surgical suite or taken to the pathology lab at the end of the day. Place the specimens in a container large enough to ensure the specimen is *completely covered* with the formalin solution. Before receiving the specimen from the scrub and placing it in a container, the circulator should don gloves, cover an area on a utility table or stand with a towel or drape, and prepare the specimen container. If the circulator touches the specimen while receiving or placing it in the container, the circulator should remove the contaminated gloves *before* touching the outside of the container. Failure to remove the contaminated gloves before touching the outside of the specimen container (like screwing on a specimen jar lid), may transfer potential pathogens to other areas of the facility. It may also result in personnel exposure to bloodborne pathogens. If the outside of a routine specimen container becomes contaminated, the circulator should disinfect it with a detergent germicide solution before removing the container from the OR.

Frozen section specimens

Unlike routine pathological specimens, *frozen section specimens are never placed in formalin.* The formalin may react with the tissue and affect the pathologist's diagnosis. Frozen section specimens are placed in a *dry container* or, if the surgeon requests, one containing *normal saline,* and then taken immediately to the pathologist. The method of transfer and the container used depends on the proximity of the pathology lab and the time it normally takes to transport the specimen. If the lab is nearby, a dry container may be used because the specimen remains moist and "fresh."

It will not dry out before it is frozen and examined. If a delay is anticipated, or if the laboratory is fairly far way, the specimen is placed in saline or in a saline-moistened hand towel. Whatever method is used, the tissue must not be allowed to dry out.

Stones

Any stones, such as kidney or gall stones, removed from the patient's body should be placed only in a *dry container.* Many solutions, even saline, will dissolve or alter the chemical composition of certain stones.

Foreign bodies

As we stated earlier, handle foreign bodies in accordance with local policies and procedures. Most are sent to pathology as a routine specimen, but some (like bullets) require special handling to ensure they can be used as legal evidence. Regardless of how they are handled, a record of the foreign body must be maintained for legal purposes; the record must include a complete description of the object. If a patient desires to keep a foreign body as a souvenir, or if it must be turned over to the police or

other legal authority for use as evidence, it is usually sent to the laboratory first. The laboratory handles the final disposition.

Amputated extremities

Amputated extremities are normally wrapped in a plastic bag in the operating room and taken directly to the hospital morgue for refrigerated storage. Because of their large size, it is usually impossible to immerse amputated arms and legs in formalin solution for transport to the morgue. Smaller amputated extremities such as fingers and toes are usually handled as routine specimens.

Aerobic and anaerobic cultures

Normally, all cultures are sent to the lab as soon as possible after they are taken during surgery (usually within an hour or less) so that they can be prepared and incubated immediately. In some instances, cultures are refrigerated and then sent to the lab later in the day. It is absolutely essential that you follow specific instructions for the type of culture specimen involved. Improper handling can lead to inaccurate results and misdiagnosis.

All culture specimens must be collected using aseptic technique, then placed in sterile, leakproof containers. The container must protect the specimen from contamination by the environment and must protect the environment from contamination by the specimen. One type of culture, anaerobic culture specimens, must also be maintained in an oxygen deprived atmosphere. Medical device manufacturers have developed some convenient culture collection systems for taking both aerobic and anaerobic cultures. Follow the instructions for the specific type.

Aerobic cultures are commonly taken using sterile culturette tubes with self-contained swabs. When using these culturettes, it is very important to open, use, receive, and transport them without contaminating the outside of the culturette. One way to take a culture is to use these procedures:

1. The circulator opens the culturette and presents the swab to the scrub.
2. The scrub takes the *swab only*, while the circulator holds the container.
3. The surgeon takes the culture swab, then hands the swab back to the scrub.
4. The scrub inserts the swab; then the circulator caps and seals the container.

These procedures would be another way to take a culture:

1. The circulator peels back the wrapper flaps and presents the top of the culturette to a sterile team member (usually the surgeon), who then removes the cap and swab assembly.
2. The circulator remains in position, holding tube portion still inside the wrapper.
3. The sterile team member who takes the swab culture carefully inserts the swab back into the tube. The swab is pushed into the tube until the cap is firmly seated.
4. After the swab is returned to the tube, the circulator covers the culturette with the wrapper and seals it in a small plastic bag.

Regardless of the method used to take the culture, the culture swab must be sealed, and the culture media must completely cover the swab. The culture media is usually released over the swab either by squeezing the end of the tube or by firmly pushing the top of the tube until the swab enters the media.

As we said, *anaerobic cultures* require careful handling to prevent introduction of air into the culture collection and transport container. Some anaerobic culturettes are similar to the aerobic ones; the difference is in the media and in the exact handling procedure after the culture is taken. Anaerobic cultures are also taken by aspirating infected fluids with a sterile needle and syringe. To ensure you maintain an anaerobic environment when using this collection method, cap the *syringe, not the needle*. A better alternative is to inject the fluid into anaerobic culture vials immediately.

Smears of tissue or fluid are usually placed on glass slides and transferred to the lab in dry containers or special slide containers. One type of smear is handled differently, a *Papanicolaou (pap) smear*.

These tissue smears are placed in a container filled with an ether/alcohol solution. Because handling of smears is critical and complex, the surgeon usually prepares them.

Handling graft or transplant tissue

Graft or transplant tissues are not true specimens and should be handled following local policies for tissue collection and tissue banking. There are two types of graft tissues—allografts and autografts. *Allografts* are taken from living or cadaver donors, then transplanted to a different recipient. A corneal transplant is an example of an allograft. *Autografts* are grafts taken from one part of a person's body to be used in another area of the same body. A common skin graft is an example of an autograft.

All tissue harvested for future transplant must be collected using strict aseptic technique. Many cultures are usually done when allografts are collected to minimize possible transmission of disease between a donor and a recipient. Cultures may be taken when autografts are harvested, but this is usually not done since the risk of transferring an infectious micro-organism from one area of a patient's body to another is minimal. Grafts stored for later transplant must be stored and maintained in sterile, labeled containers. If a storage solution is used, the container must be labeled with the name of the solution. Autografts transplanted immediately after harvest do not require sterile storage. Keep skin grafts (a type of autograft) on the sterile field until they are placed on the recipient site. Many tissues harvested for grafting, such as bone, cartilage, and skin, are stored in a regulated refrigerated or frozen storage area. If you become involved with tissue harvesting procedures, make sure you are thoroughly familiar with the proper techniques for handling the grafts. To ensure scarce transplant organs and grafts are not ruined, specially trained harvest teams may be called to harvest and handle tissue and organs for transplant.

Identifying and recording specimens

All specimens removed from a patient must be properly identified and recorded on appropriate forms. Each specimen must be labeled before it is sent to the laboratory. The officer in charge of the laboratory determines the type of label or labeling device affixed to each type of specimen container used in your facility. In most hospitals, standard white, rectangular adhesive labels are used to label specimen containers. These labels are usually stamped with the patient's hospital information card, and then annotated with additional information required by local policies and Air Force instructions. Specimen labels usually contain the minimum information:

- Name of the patient.
- Last four digits of the sponsor's social security number.
- Hospital register number.
- Inpatient unit number, or outpatient clinic.
- Specimen name and location from which it was taken.

Most specimen labels routinely include other information also:

- Patient's age.
- Number designation of the operating room where the specimen was taken.
- Primary surgeon's name.
- Date and time the specimen was removed.
- Urgency of the requested tests (routine, elective, or stat).
- Exact name of the specimen and location from which it was removed.

If multiple specimens are removed, each one is placed in a separate labeled container and numbered in sequence (#1, #2, #3, etc.) so it can be individually identified by the pathologist.

In addition to labeling the containers, all specimens need to be recorded on appropriate forms and in log books. In Air Force hospitals, all routine pathological specimens and frozen sections are recorded on the tissue examination form. The form is usually stamped with the patient identification card. The circulator enters the name of the surgeon and the date the specimen is taken. Each specimen is listed individually on the form, usually in numerical sequence (the order they were removed from the patient), in the block marked "specimen." Either the circulating nurse or the surgeon enters a brief clinical history, preoperative and postoperative diagnoses, and the operative findings. (This information is found in the history and physical section of the patient's chart.) The surgeon signs the tissue examination form before it leaves the operating room with the specimen. The tissue examination form is sent to the laboratory with the specimen, and the pathologist uses the bottom half of the form to document all laboratory findings.

In addition to filling out the appropriate laboratory request form, the circulator also records all specimens removed from the patient on the operation report. Once again, multiple specimens are individually numbered; they should be listed the same way they are listed on the tissue examination form. A variety of other special forms may be filled out for different types of specimens. These include culture requests, chemistry requests, microbiology requests, and numerous others. Some hospitals have computerized all laboratory requests and reports. These automated systems may eliminate the need for using the tissue examination form as well as other standard laboratory request forms commonly used in most hospitals.

Transporting specimens to the laboratory

Record each specimen taken to the laboratory in a log book maintained in the surgical suite. This book accompanies the specimens when they are taken to the laboratory. The laboratory technician who receives the specimens checks the information on each specimen container label against the information annotated in the log book. If all the information corresponds, the lab technician accepts the specimens and signs the log book. If specimens are missing, incorrectly labeled, or are not properly contained, the technician notes the errors and may not accept some of the specimens. To avoid problems of this nature, a member of the surgical staff (usually an experienced nurse or technician) checks to ensure all specimens, forms, and container labels are properly filled out. Then he or she checks the entries in the specimen log book. Once the lab technician signs for the specimens, surgical personnel are not responsible for them.

As we mentioned earlier, routine pathological specimens are often collected in a central location within the surgical suite and taken to the lab at the end of the duty day. On the other hand, cultures, smears, and fluids are normally sent to the lab immediately, usually within 30 to 60 minutes from the time they are taken. Amputated limbs are sealed in plastic bags and taken to the hospital morgue immediately, when possible. When transporting specimens to the laboratory or morgue, make sure all containers are upright and secure to prevent fluid preservatives and specimens from leaking. Promptly clean up any spills with an approved detergent germicide. Also, personnel responsible for transporting the specimens should make every effort to conceal them from patients, hospital visitors, and other staff members. The unexpected sight of a basket or tray loaded with bloody body parts and tissue has a tendency to make people rather nervous and more than a little queasy.

The purpose of this section was to familiarize you with the most common intraoperative routines of the scrub and circulator. First, we focused on the main activities of the scrub and circulator from draping the patient to the incision. Then we covered the duties of the scrub from the skin incision until the surgeon is ready to begin closing the wound. Next, we looked at what the circulating nurses and technicians normally do during an operation. The section you just completed was devoted to handling surgical specimens. Answer the following questions, then review what you discover you have not learned yet!

Self-Test Questions

After you complete these questions, you may check your answers at the end of the unit.

623. Common scrub and circulator duties

1. Briefly describe how you move the draped Mayo stand into position near the OR bed.

2. How do you avoid contaminating your gloved hands when moving the back table or ring stand?

3. Where does the circulator position kick buckets?

4. When connecting the active and inactive (ground) electrode cords to an electrosurgical device, which one does the circulator connect *first*?

5. Where does the scrub normally stand in relation to the surgeon after all sterile tables and stands have been positioned?

6. Why does the scrub pass a moist sponge to the surgeon and assistant before the operation begins?

7. What does the scrub place on either side of the incision site before passing the skin knife to the surgeon?

8. What does the surgeon do immediately before making the incision?

624. Duties of the scrub from incision to wound closure

1. What are the primary functions of a scrub during a surgical procedure, including those shared with the circulator?

2. What specific actions can a scrub take to anticipate a surgeon’s needs?

3. When should you *not* ask a surgeon or assistant a question?

4. Briefly describe the safer “hands-free” technique for passing sharps.

5. What does the rule “cut, clamp, and control” refer to?

6. When scrubbing, list the ways preoperative preparation can help you determine the length of the instruments you need for an operation.

7. Why are instruments passed firmly, decisively, and in the position of use?

8. Briefly describe how the following instruments are passed to the surgeon:

   a. Scalpel.

   b. Curved-tip, ring-handled hemostat.

   c. Armed needle holder.

   d. Thumb forceps.

   e. Single-end, hand-held retractor.

9. What does the scrub do with instruments that are lying on the drapes and not immediately needed by the surgeon?

10. What should you do with a sponge before discarding it from the sterile field? Why?

11. What should the scrub do with sponges when the surgeon enters a body cavity?

12. Describe the two methods commonly used to clean a Bovie tip. Which is the better of the two methods?

13. What two points are important to remember when flushing a suction tip with irrigation solution?

14. Describe the actions a scrub takes to maintain neatness and order on the sterile field.

625. Intraoperative duties of the circulator

1. Who is assigned as the *primary* circulator on most operative procedures?

2. What is your role as a circulating technician?

3. What factors determine the scope of duties you perform as a circulating technician?

4. List the tasks a circulating technician is legally prohibited from doing.

5. Why does the circulator always inform the scrub before opening anything on the sterile field?

6. How does the circulator retrieve soiled sponges from the kick buckets?

7. When circulating, what do you always do *before* changing a full suction container?

8. You are asked to weigh sponges to keep track of a patient's fluid loss during surgery more accurately. How do you determine the amount of fluid in milliliters that each sponge contains?

9. As a circulating technician, what is your primary duty during a blood transfusion?

10. List the other tasks you can do to assist with the transfusion.

11. How do you store x-ray protective lead aprons? Why?

12. If you are the only circulator in OR and have to leave for any reason, what do you do before you leave?

13. What form is used as the primary record for all operations performed in Air Force medical facilities?

14. When does an operation officially start and end?

15. Why should communication among surgical team members be primarily nonverbal during a procedure?

626. Care and handling of surgical specimens

1. Which items removed from a patient are simply thrown away and not sent to the laboratory as a specimen?

2. What is a frozen section?

3. Describe the difference between a foreign body and a loose body.

4. Who is responsible for the proper care and handling of all surgical specimens?

5. What should a scrub do with instruments attached to a contaminated specimen?

6. When is it permissible to pass a specimen off the sterile field?

7. Why is a specimen never passed off the sterile field in or on a counted sponge?

8. How are routine tissue specimens preserved after they are passed off the sterile field to the circulator?

9. Why is it important for the circulator to remove gloves after handling a specimen and before touching the outside of the specimen container?

10. How is tissue for frozen section transferred to the laboratory?

11. When are cultures (taken during surgery) usually sent to the laboratory?

12. What type of smear must be immersed in a container filled with an ether/alcohol solution before transport to the laboratory?

13. Describe the difference between an allograft and an autograft.

14. Specify the minimum information usually appearing on specimen labels.

15. If multiple specimens are removed from a patient, how does the circulator handle and record them?

16. When are surgical personnel relieved of responsibility for the care and handling of a surgical specimen?

4–2. Wound Closure and Immediate Postoperative Activities

When the surgeon is ready to close the wound, the scrub and circulator duties do not decrease—they increase. The scrub must help re-approximate tissues to close the wound, and begins breaking down the sterile setup. The circulator finishes the paperwork and gets the supplies and equipment ready to transfer the patient from the OR. Both the scrub and circulator work closely to perform final counts, to prepare any drainage devices, and to get all dressing supplies open and ready for use. Because surgical time is so valuable, they must also begin common activities to help speed room turnover but must remain focused on the present patient while doing so.

In this section, we discuss some of the more common duties performed by the scrub and circulator during the final stages of a typical operation. We start with the routine sterile and unsterile duties performed while the surgeon closes and dresses the wound. We finish this unit (and volume!) with activities that occur from the moment the dressing is secured in place until the patient is wheeled from the operating room.

627. Scrub and circulator duties during wound closure

The final stage of the operation is the wound closure. The scrub and circulator have different duties to perform during this time. Let’s begin by taking a look at the final preparations leading up to the wound closure.

Preparing for closure

The surgeon completes the primary objectives of the surgery; then irrigates the wound and controls all bleeding. The circulator obtains and opens fresh bottles of sterile saline from the warming cabinet and pours the solution into basins on the sterile field. This irrigation solution must remain clean and warm until used, so the scrub should provide an empty bowl or basin by pouring all the "old" saline into a large basin. The volume of irrigation needed at the end of a procedure varies with the type of surgery, the surgeon's technique, and the size of the wound. The scrub must make sure the saline is not too hot or cold. Check the temperature by squirting some of the solution on the back of your gloved hand, or dip a *clean* gloved hand in the solution. Both the scrub and circulator should keep track of the amount of saline transferred to the sterile field; the scrub should know the amount used in the wound.

The circulator can easily determine how much irrigation fluid was transferred to the field by counting the number of empty bottles in the room and multiplying by the milliliters per bottle. The scrub's task is more difficult, but several different calculation methods can be used. One method is to measure the volume contained in the irrigation syringe you use, then multiplying by the number of syringes-full the surgeon uses. You can use the graduations on the side of the syringe to get a rough estimate of the volume. To get a more accurate measurement, completely fill the bulb and barrel of the syringe, then empty it into a graduated cylinder or other container with a known volume. Some surgeons prefer to use the "pour" method; they use several bowls of irrigation and pour them into the wound. Calculate the total volume used by multiplying the volume of the bowl by the number used. You may have to measure the contents of the bowl if it is not graduated. For a rough estimate, most stainless steel "round bowls" used in surgery hold approximately 900 ml.

Since much irrigation may have been used before wound closure, the circulator should closely monitor all suction containers. If a container must be replaced, the circulator notifies the surgeon and anesthesia provider before changing it. Blood loss estimates should be updated before the container is changed.

The scrub makes sure the suction tip and tubing on the sterile field is clear and functioning. The scrub also keeps an adequate supply of clean, counted sponges on the field during wound irrigation. Keep some of these sponges in reserve as "sloppy-wets," and keep some dry for use during and immediately after wound closure. Any additional sponges needed for wound closure should be opened and counted before the final sponge count is started.

After thoroughly irrigating the wound, the surgeon closely inspects all areas for signs of hemorrhage. The scrub should keep a sufficient number of hemostats and ligatures on the Mayo tray so the surgeon does not have to wait when a bleeder is found. The scrub also keeps the Bovie pencil tip clean and ready for use. Other hemostasis techniques are discussed in Volume 5.

While the surgeon is irrigating the wound and attaining hemostasis, the scrub prepares the sutures and other wound closure materials. To ensure the proper sutures and staplers are open, the circulator double-checks the surgeon's preference card. If there is any question or doubt, the simplest and most effective way the scrub can find out what wound closure materials are required is to ask the surgeon. Ensure all required materials are opened and ready to prevent delay, but do not open and waste expensive sutures or staples by opening them unnecessarily. The circulator should always have (in the room) at least one "backup" for each type of suture the surgeon is using for closure. This minimizes delay if a suture breaks or an additional one is needed, and also prevents wasting unneeded sutures. Extra staple cartridges and guns should also be immediately available in the room and opened only *as needed* to prevent waste.

One of the most important activities is performed by both the scrub and circulator as the wound is being closed—the counts. Refer back to the guidelines we discussed previously for specific instruction. Ideally, you perform a complete count just before the surgeon begins closing the first layer of tissue; this allows the wound to be easily searched if any items are missing. The final count

should start when the surgeon begins closing the skin. The circulator reports the results of the counts to the surgeon and documents the count on the appropriate records.

Assisting with wound closure and removing unneeded items

The scrub prepares and passes all suture material and stapling devices required for closing each layer of the wound. As each layer is closed, the scrub retrieves the instruments used in the deeper areas of the wound, and places the instruments in a basin of sterile solution to soak and help remove gross soil. If time permits, the scrub wipes visible blood and tissue from the surface of the instruments before placing them in the soak basin. The scrub discards all sponges into the kick buckets as they become too soiled to use, and replaces them with fresh, dry sponges. The circulator retrieves the soiled sponges and prepares them for the counts.

As the surgeon closes the wound—and if the surgeon has an assistant to retract tissue and cut stitches—the scrub usually has time to begin "breaking down" the sterile setup. When breaking down the setup, *do not contaminate yourself or the sterile field.*

Remove no longer needed instruments from the Mayo tray, placing them in the soak basin. Keep some basic instruments, such as hemostats, forceps, and scissors, on the Mayo tray for use to stop bleeding or for use in an emergency. *After obtaining the surgeon's permission,* disconnect light cords, power equipment, and other corded items no longer needed. Pass them off the field to the circulator. Do *not* disconnect the suction or Bovie on the sterile field until the surgeon is ready to apply the dressing, or when he or she specifically directs you to do so. After the final counts, re-string and assemble the instruments on the back table, and place them in the instrument pans. Consolidate all disposable items and trash in one area for rapid disposal, and separate all linen items.

While the scrub helps with wound closure and begins to break down items on the sterile field, the circulator begins disconnecting unneeded equipment, consolidating all soiled sponges, and bagging up all trash. The circulator also initiates all counts at the appropriate times, finishes taking care of any specimens removed, and begins preparing for room cleanup. Place x-rays in the designated storage area for return to the radiology department. Remove unused blood or blood products from the room; place them in the surgical suite blood refrigerator or give to transport personnel for return to the blood bank. The circulating nurse makes final entries on the operation report and perioperative nursing record.

As the surgeon begins closing the skin, the circulator and scrub begin the final count. When the count is verified as complete, the circulator places and seals all soiled sponges in impermeable containers and then opens the dressing materials. The circulator also notifies float personnel (if available) so they are ready to help move the patient and to turn over the room between cases.

Assisting with tubes and wound drains

Before closing the wound, the surgeon may want to insert a drain or tube to evacuate air, excess body fluids, blood, or pus. Drains provide a pathway for releasing fluids from the body. They also allow nursing personnel to monitor the type and volume of fluids lost during the postoperative recovery period. The surgeon uses this information to help calculate the amount of fluid replacement necessary to prevent dehydration. Drains can also indicate postoperative hemorrhage. While drains are intended to help prevent postoperative complications, if they are not properly handled or cared for before and during use, they can cause complications. A drain can provide a pathway for bacteria, causing a deep wound infection to develop, especially if contaminated before insertion or if not properly cared for during the postoperative period.

Drains are usually inserted through a separate "stab" incision made in the skin next to the primary incision. The surgeon usually uses a #10 or #11 blade to make a stab incision through the skin and underlying tissues. Next, the scrub passes a large, heavy clamp, such as a long Kelly. The surgeon forces the clamp through the stab wound, grasps the end of the drain, and pulls it through the skin. Some drains have a sharp trocar attached for inserting them (fig. 4–1); these drains do not require the

use of a scalpel. After insertion, some drains are self-retaining, while others must be secured with suture, tape, or other device. When placing a drain, the scrub should keep a pair of heavy suture or bandage scissors for cutting and trimming the tubing.

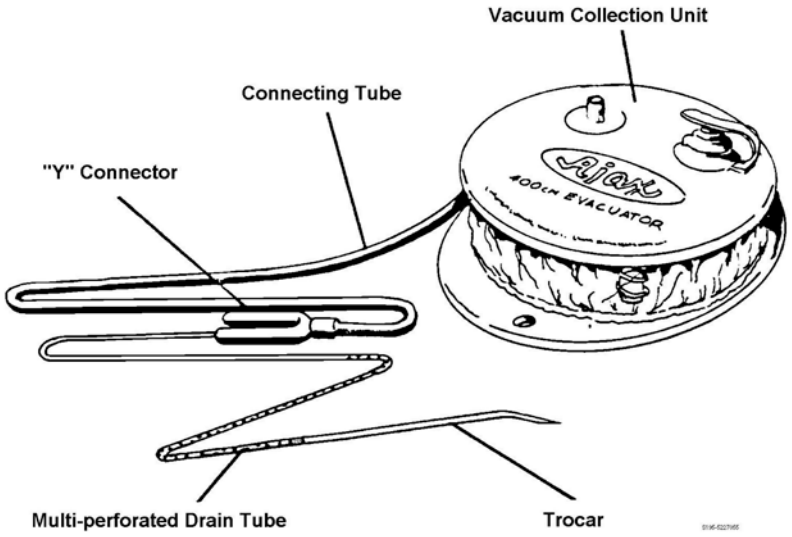

Figure 4–1. A drain with attached trocar and vacuum reservoir.

There are many different types of drains and tubes used for wound and body cavity drainage. Some common ones are shown in figure 4–2. Each of the drains shown may be used to drain various areas of the body. The Malecot and mushroom catheters may be used as feeding tubes after gastrostomy. The Robinson catheter is often used to perform a “straight cath” of the bladder; it is inserted to drain urine immediately before the procedure and then removed when the bladder is empty. The Foley catheter is also primarily used for urinary bladder drainage, but is usually left in place and retained by inflating its balloon. (The balloon is inflated after the catheter is inserted and keeps the catheter from slipping out of the bladder.) T-tubes may be used for drainage of the common bile duct or gallbladder bed after cholecystectomy. When a Penrose drain is used, it is often placed in the superficial layers of the wound; a stab wound is not usually used, the drain usually protrudes from one end of the closed incision.

Some drains rely on gravity to evacuate wound contents; others are connected to a suction device. When using a gravity drainage system, it is important to keep the collection reservoir below the level of the drain tube so fluid does not back up into the wound. T-tubes and Robinson catheters are examples of drains usually relying on gravity. The trocar-type drain and other multiperforated drains often rely on suction. These drains may be connected to reservoirs that apply suction by acting as a reverse bellows. The reservoir is squeezed to remove all air, the drain is attached, and the reservoir is capped to form an air-tight seal. As the reservoir expands, it creates suction that drains the fluid out of the wound. Regardless of the tube or catheter used, it is important to keep the tubing between the drain and the reservoir unobstructed. The tubing should not be kinked, bent, or stretched. Take care to prevent tension on the drainage system to avoid pulling the drain out of the wound, particularly when the patient is moved. *Never clamp drain tubes or catheters* unless specifically ordered to do so by the surgeon.

Most drains and catheters are connected to collection containers that are graduated to allow monitoring of drainage. The containers are usually emptied by the circulator before the patient leaves the OR, by the PACU staff before the patient leaves the PACU, and later, by the nursing unit staff. All drainage is documented in the patient’s record. When you are asked to empty a reservoir, wear gloves, and be careful not to touch the drainage port. Follow all local guidelines to ensure you use proper technique when handling any drains. Drains not connected to a collection reservoir may be

covered with several layers of highly absorbent dressing material. This type of drainage system requires frequent postoperative monitoring and dressing changes; it does not provide an accurate accounting of postoperative fluid drainage. (Nursing personnel have to estimate the amount of drainage on the dressing.) Since drains provide a portal for bacteria to enter deep body tissues, the surgeon normally removes them as soon as possible after surgery (usually within a couple of days). (**NOTE:** Anytime drains or catheters are inserted, the circulator records the type, size, and quantity on the operation report and the perioperative nursing record.)

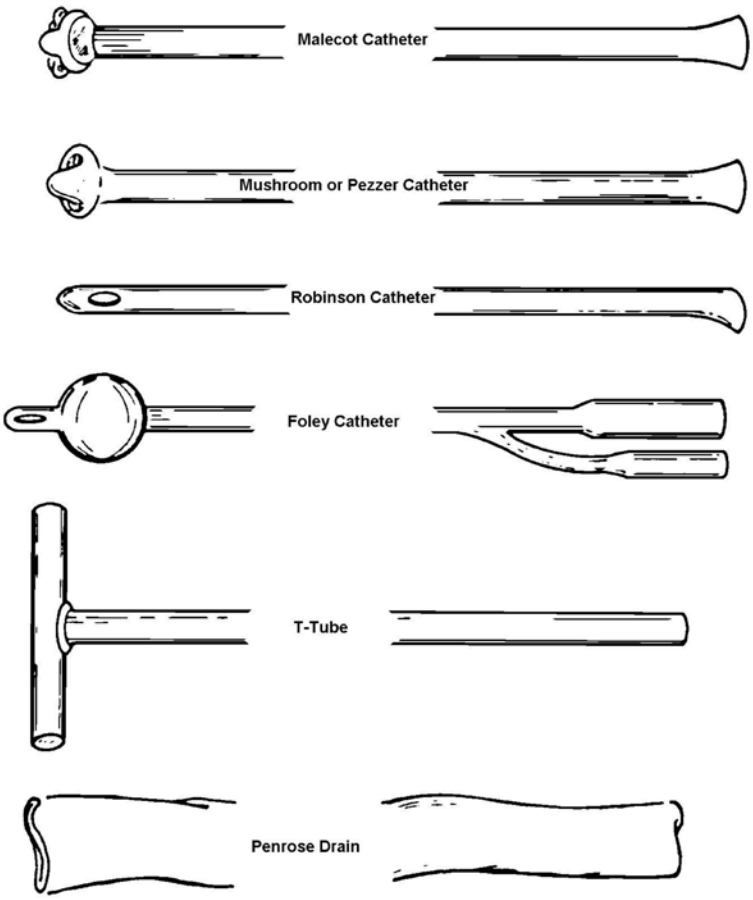

Figure 4–2. Some commonly used surgical drains.

628. Dressing application and immediate postoperative activities

After the skin is closed, the dressing is applied and the patient is readied for transfer from the operating room.

Surgical dressings

Some type of surgical dressing is applied to the incision after nearly all operations. To assist a surgeon with a dressing application effectively, you should understand the purpose of dressings, the materials frequently used for dressings, and the procedures to apply the most common dressings.

Purpose of dressings

There are pros and cons to covering wounds; the pros usually outweigh the cons, so most surgeons cover the incision with some type of dressing material. These reasons are the most important ones for dressing a surgical wound:

- To help keep micro-organisms out of the wound.

- To absorb postoperative wound drainage.
- To cushion and protect the wound from trauma and gross contamination.
- To immobilize, support, or splint the incisional site and surrounding areas to reduce postoperative pain and allow for adequate healing of the tissues.
- To aid in controlling bleeding and reduce swelling, as when a pressure dressing is applied tightly over the surgical site.
- To make the operative site more aesthetically acceptable to the patient and other people who may view it.

Sometimes, a surgeon may decide to leave a wound uncovered. This is done for four basic reasons:

1. Friction and irritation caused by the dressing may destroy the developing tissue and result in delayed healing.
2. The presence of a dressing may rub or "wick" micro-organisms from nearby "dirty" areas into the incision site, triggering an infection.
3. The dark, warm, moist environment created under conventional dressings may accelerate bacterial growth rates and increase the possibility of an infection.
4. Many patients are allergic to or sensitive to tape or synthetic dressing materials, which makes it difficult to cover or secure dressing materials in place.

Some wounds are routinely left uncovered to help keep the healing tissues dry. Dry wounds generally form scabs and heal faster than damp ones do. Example of wounds that are not usually "dressed" include extensive burns, small lacerations, and abrasions. You may have personally experienced more rapid wound healing when you left a cut uncovered instead of covering it with a Band-Aid.

Common dressing materials and methods

Dressings vary with the surgery performed, but most consist of three distinct layers. The first layer, the one directly on top of the wound, is the *contact layer*. It allows fluids from a draining wound to pass through it to the absorbent layers above, or it prevents outside contaminants from entering a nondraining wound. The second layer usually consists of plain gauze sponges, and it is referred to as the *intermediate layer;* it absorbs drainage and cushions the wound. The outermost layer is called the *wrap* or *securing layer*. As the name implies, it holds the underlying intermediate and contact layers in place.

For a typical dressing, the surgeon may request a nonadherent Telfa or petrolatum gauze pad for the contact layer. Before applying this first layer, many surgeons like to spread antiseptic ointment over the incision. (Bacitracin and povidone-iodine ointment are the ones most commonly used.) In some instances, the surgeon uses an antiseptic-impregnated gauze, such as iodophor gauze, to cover or pack the wound before applying the absorbent sponges.

The number and type of sponges used for the intermediate absorbent layer depend on the size of the area to be dressed, the amount of drainage anticipated, and whether or not pressure is required. For small, non-draining wounds, a small stack of 4 x 4 or 4 x 8 plain sponges usually suffices. Larger wounds, such as those created during major abdominal surgery, may be dressed using layers of highly absorbent abdominal (ABD) pads. If the surgeon wants to apply a pressure dressing to help reduce postoperative bleeding and swelling, the scrub has to prepare a stack of *fluffs*.

Fluffs may be commercially purchased, open-celled gauze sponges, or they can be plain gauze sponges completely unfolded (teased open) and wadded up in a pile over the operative site. Fluffs increase the absorbent and protective capacity of the intermediate dressing layer and provide extra bulk over the incision site that can be tightly secured to provide pressure. Fluffs are often covered by ABD pads before they are secured in place.

On some orthopedic leg operations, such as major knee reconstructive surgery, the surgeon applies an extremely bulky dressing, sometimes called a Robert-Jones dressing. This dressing consists of a nonadherent or antiseptic gauze contact layer, followed by two intermediate layers. The first intermediate layer is formed by covering the contact layer with plain gauze sponges. The second, bulky layer is formed by wrapping the leg with wide rolls of absorbent cotton (similar to the material used to make cotton balls). The intermediate layers are then secured by wrapping the leg with wide elastic bandages.

Dressings are secured or wrapped in many different ways. Standard dressings on relatively flat body surfaces, such as the abdomen, back, or chest are usually secured with tape. Many different kinds of tape are available; the surgeon chooses the type used. Foam tape is often used to secure large, bulky dressings because it adheres to the skin very well and stretches to increase the pressure over the incision. Another highly adherent type of tape that may be used to secure bulky dressings or create pressure dressings is *elastoplast*. This tape is an elastic bandage with an extremely sticky adhesive on one side. Various types of nonallergenic paper, synthetic fabric, and plastic tapes are also available for securing dressing sponges to the skin. These tapes are usually not as sticky as adhesive or elastoplast tape, so they cause less patient discomfort and stress on wound edges. Because they are made of nonallergenic materials, the patient is less likely to experience a skin reaction. In addition, the pores built into many of these tapes allow the air to circulate to the underlying skin, thereby keeping it dry and reducing favorable conditions for bacterial growth. (Remember, bacteria usually grows faster in warm, moist environments.)

When securing dressings to the head or extremities, the surgeon often uses rolled materials such as Ace elastic bandages, kling, or kerlix. If the surgeon anticipates frequent dressing changes, he or she may secure the sponges using *Montgomery straps*. These straps are rectangular adhesive strips approximately 1–1/2 to 2 inches wide with reinforced eyelets in one end. The strips are placed on either side of the wound, usually two to a side, with the eyelets facing each other. ABD pads are placed over the contact layer and then held in place by threading narrow gauze tapes through the eyelets on the Montgomery straps and tying them over the dressing sponges. When the time comes for the dressing sponges to be changed, all that has to be done is to untie the gauze tapes—no tape has to be pulled off the skin.

Some surgeons choose not to cover a wound with dressing sponges. Instead, they coat the incision with a protective spray or liquid dressing, such as collodion. These coatings form a clear, moisture-proof layer over the wound (which resembles a thin layer of plastic). The coating usually peels off after a few days or is removed with a solvent. You will see this type of dressing film often used to dress pediatric wounds, particularly in an area usually covered by a diaper.

Several synthetic dressing materials are available that form a vapor-permeable “second skin” over the wound. Some of these films are clear polyurethane and allow viewing of the wound without having to remove the dressing. This prevents gross contamination, and conforms to irregular body surfaces. These synthetic dressing films allow for dissipation of excess water vapor from the wound so bacterial growth is minimized, but they retain enough moisture to keep the wound edges moist. When the wound is kept moist, the healing process is accelerated because the scab formation stage is eliminated and epidermal cells more rapidly fill the space between wound edges.

Dressing application procedures

When the surgeon starts closing the skin, the scrub prepares the “sloppy wet” and dry sponges for cleaning any blood and antiseptic “paint” residue from the area around the incision. The circulator may prepare wet and dry hand towels to clean the rest of the patient’s skin. The circulator opens the sterile dressing materials on the operative field (back table or Mayo tray) after the sponge count; then prepares the tape and other materials required to secure the dressing in place.

As the surgeon gets close to finishing the skin closure, the scrub separates the dressing materials into those used for the contact layer and those used for the absorbent layer. If fluffs are used, the scrub

fully opens them and piles them together. If drains are in place, the scrub may have to cut notches, "Ys" or slits, to fit around the drainage tubes and catheters. When the surgeon wants to use an antiseptic ointment, the scrub places a sponge or disposable towel near the edge of the Mayo tray or back table. The circulator dispenses the ointment on the sponge. When possible, stack all dressing materials on the Mayo tray in the order it will be used. Also keep a pair of bandage scissors or other scissors designated for cutting dressing.

Immediately after the last skin stitch or staple is placed, pass the wet sponge to the surgeon, followed by a dry one. Next, pass the antiseptic ointment (if used), then the contact dressing, then the sponges. The surgeon or assistant usually holds the dressing in place while the drapes are removed. The circulator dons gloves and any other required protective attire, then secures the dressing using tape, gauze rolls, or other methods.

Immediate postoperative activities

After passing the last of the dressing materials to the surgeon, the scrub moves the Mayo stand, and all other tables and stands comprising the sterile field, away from the OR bed. In many hospitals, local policy requires you to maintain the sterile field until the patient leaves the room. This policy keeps the instruments and setup immediately available if emergency surgery becomes necessary. This policy also dictates whether the scrub remains sterile or helps remove the drapes and assists with the patient.

After the equipment and furniture is out of the way, the surgeon or assistant usually removes the soiled drapes from the patient. If local policy does not require the sterile field be maintained, the scrub may remove them. Regardless, only gowned and gloved personnel remove soiled drapes or otherwise handle contaminated items because they are protected by their attire. Circulating personnel *never* handle soiled drapes, trash, or instruments without donning protective attire.

After securing the dressing, the circulator cleans antiseptic residue from, then dries, the patient's skin. Remove the electrosurgery grounding pad, and wipe off any gel remaining on the patient. Inspect the patient's skin for any signs of burns or pressure injuries. If any are found, notify the surgeon at once. Next, cover the patient with a warm blanket, and turn off the overhead surgical lights.

The circulator should untie the surgeon's and assistant's gowns so they can remove them without contaminating themselves, and then stand by the OR bed to assist anesthesia personnel with the patient. If only one circulator is available to do all these tasks, the circulator concentrates on taking care of the patient first. Turning off lights and untying gowns can wait. When time permits, the circulator logs operation ending and anesthesia ending times in the patient's record and completes other last-minute paperwork. (The moment the last skin stitch or staple is placed is usually considered to be the official finish of the procedure.) As the circulator helps the anesthetist and the scrub is breaking down the sterile setup, the surgeon usually writes postoperative orders in the patient's chart and completes the tissue examination form.

When the anesthesia provider feels the patient is ready to be moved, the recovery bed is brought into the room. The bed is wheeled into position next to the OR bed and secured to the floor. Intravenous lines, drainage systems, and any monitoring leads attached to the patient are carefully separated, freed up, repositioned, or detached to prevent them from being stressed or dislodged when the patient is transferred to the recovery bed. Before moving the patient, the anesthesia provider takes and documents a complete set of vital signs. Since the patient is still under the influence of anesthesia and may be unconscious or semiconscious, at least four people transfer the patient. As when the patient was transferred to the OR bed, the anesthesia provider controls the head and shoulders and gives the signal to move. One person moves the feet and legs, and two others lift the patient from the sides. On signal, the patient is moved slowly and smoothly to the recovery bed.

The patient's position on the recovery bed is determined by the type of surgery performed and the patient's level of consciousness. For instance, tonsillectomy or oral surgery patients may be placed on

their sides to permit drainage from their mouths. Otherwise, they may aspirate oral secretions and bloody drainage into their lungs.

After transferring the patient, the anesthesia provider again takes a set of vital signs to ensure that the move has not adversely affected the patient. All drainage reservoirs, IV solution containers, and other apparatus are fastened to the recovery bed as needed. The side rails are raised and the leg strap is secured. Normally, the circulating nurse accompanies the anesthesia provider and assists with transporting the patient to the recovery room. The circulating technician, scrub, and any other available operating room personnel finish the cleanup and room turnover process. The circulator completes any reports not yet finished while the details are still fresh in his or her mind to avoid mistakes. The circulator also logs the specimen(s) in the log book and ensures they are properly contained and stored.

After the drapes are removed, (and after the patient leaves the room if necessary) the scrub should make sure all reusable towel clips and instruments that were attached to the drapes are accounted for and placed with the instrument set. The scrub also handles soiled linen and deposits it in the appropriate receptacle. The scrub also rolls disposable drapes so the dirty outer areas are sealed inside the rolled bundle, then places them in a plastic trash bag. After properly disposing of the drapes, the scrub removes the soiled light handles and any contaminated instruments or other items in the OR. Then the scrub breaks down the remainder of the sterile setup in accordance with local policies for handling sharps and blood-borne pathogens. The scrub keeps all protective attire on until the setup is completely broken down and all items are ready for transport to the decontamination or the disposal area.

This brings us to the beginning of the postanesthesia period for the patient, and to the beginning of between-case cleaning activities in the operating room. The basic routines and activities in this unit are designed to give you a better understanding of what goes on immediately before, during, and after a typical procedure, both from the standpoint of the scrub and the circulator. The exact methods and procedures used in your facility may vary, but the basic guidelines and principles still apply. This also brings us to the end of this unit and this volume. Before you go on to the next volume, answer the following questions to make sure you understand what you have read so far.

Self-Test Questions

After you complete these questions, you may check your answers at the end of the unit.

627. Scrub and circulator duties during wound closure

1. What two methods does the scrub use to check the temperature of irrigation solutions?

2. What is the simplest and most effective way to determine what wound closure materials a surgeon needs?

3. Ideally, when is the first closing count performed?

4. Why does the scrub leave a few basic instruments on the Mayo tray during and immediately following wound closure?

5. What does the scrub or circulator do before disconnecting a piece of equipment during wound closure?

6. Cite three reasons why a surgeon may place a drain in a surgical wound.

7. How are drains usually inserted?

8. When a gravity drainage system is used, where is the collection reservoir or container located? Why?

9. When is a drain tube or catheter clamped?

10. When does the surgeon remove the drain(s)? Why?

628. Dressing application and immediate postoperative activities

1. List six reasons for applying a dressing to a wound.

2. What are the three basic layers of a dressing?

3. What factors determine the type and number of sponges required for the absorbent layer of a dressing?

4. What are fluffs? What are they used for?

5. What type of tape is often used to secure bulky dressings and create a pressure dressing?

6. What does the sterile team use to clean the wound before dressing application?

7. Who usually holds the dressing in place while the surgical drapes are removed?

8. What is the circulator's role in assisting with dressing a surgical wound?

9. Who removes the soiled drapes from the patient? Why?

10. List the tasks you perform as circulator after the dressing is applied and before the patient is transferred to the recovery bed.

11. Who normally assists anesthesia personnel with transporting a patient from the operating room to the postanesthesia recovery room?

12. How does the scrub prevent instruments from being lost during the immediate postoperative period?

13. When does the scrub remove his or her gown and gloves?

Answers to Self-Test Questions

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1. Grasp the front portion of the tray holder with one hand and the top of the stem with the other. Standing to one side, slightly raise the tips of the "feet" off the floor; then pull the stand into position. Hold and stabilize the tray as you move the stand to keep from dumping the contents on the floor.
2. Move the back table by applying downward pressure to the top of the table only; do not grab the sides or edges as they are not sterile. Move a ring stand by placing your hands inside the basin(s) and applying downward pressure as you roll the stand.
3. On both sides of the OR bed.
4. The inactive electrode or patient ground cord.
5. On the side of the OR bed opposite the surgeon.
6. So that they can wipe powder from their gloves.

7. Two dry sponges.
8. Asks the anesthesia provider if the patient is ready.

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1. Watch the sterile field, listen to the surgeon's and assistant's requests, anticipate specific instrument and supplies needed, prevent contamination of the sterile field and surgical wound, and must keep track of and account for all items used on the procedure.
2. Pay attention, try to watch what the surgeon is doing, learn the surgeon's idiosyncrasies (preferences) and techniques, and ask questions at the appropriate time.
3. When they are in the middle of trying to control a serious hemorrhage, or when they reach a critical stage of the operation.
4. The surgical team establishes a "neutral zone" by placing a specially designed pad or basin between the scrub and the surgeon. When sharps are needed, the scrub places the instrument on the neutral zone in the position the surgeon will use it, then announces its placement. The surgeon then picks up the instrument, uses it, and returns it to the pad or basin where the scrub can remove it.
5. When the surgeon *cuts* through tissue and severs blood vessels, the resultant bleeding is usually *clamped* in a hemostat or forceps, and it is *controlled* before the operation continues.
6. Know the size of the patient. Know the surgical technique used. Know the size and depth of the wound.
7. So the surgeon knows it is there and does not have to look up from the wound or adjust his or her grasp of the instrument.
8. a. Using the hands-free technique (preferable) if you must pass it, hold it firmly by the handle, with the sharp side of the blade down and tip pointing towards you, NEVER toward the surgeon. Hold it firmly between your thumb and index finger with the palm of your hand facing down. Flex your wrist to keep the blade well away from your hand and arm.
   b. Pass by the hinge joint with curved tip pointing in toward the surgeon's midline; ring-handles contact surgeon's palm.
   c. Use the hands-free technique if possible; if not, use caution and keep your hand well away from the needle point. Hold the hinge (box) joint. Keep the tip pointing up, and pass them so the needle tip points toward the surgeon's midline; the ring handles contact the surgeon's palms.
   d. Pass by grasping fused end and placing instrument between surgeon's outstretched thumb and index finger.
   e. Passed by grasping the handle near the *retracting* end and placing the handle end in the surgeon's palm.
9. Retrieve instruments that are not being used (particularly sharp ones) and return them to your Mayo tray, back table, or soak basins.
10. Carefully and fully open and inspect it. To aid the circulator in retrieval and to be certain nothing is wrapped inside.
11. Remove all dry sponges from the immediate sterile field and replace them with saline-moistened sponges.
12. Keep the tip clean by scraping the debris *away* from the wound using the *blunt side* of a scalpel, or use a self-adhesive, sterile abrasive "Bovie cleaner" or "scratch" pad. The better alternative is to use a sterile abrasive pad.
13. Tell the anesthesia provider before you suck any irrigation solution, and keep track of exactly how much irrigation you flush through the tip.
14. (1) Keep instruments clean by periodically wiping them off with a moistened sponge or towel, or immersing grossly soiled instruments in a basin of solution.
    (2) Retrieve used instruments from the sterile field, clean them, and return them to your instrument setup.
    (3) Separate and lay out all instruments (if possible) where they can be easily seen by all members of the surgical team.
    (4) Immediately replace, remove, and fully open all grossly soiled sponges; discard them in the kick buckets.
    (5) Consolidate all trash in a sterile trash bag; do not discard it in the kick buckets.

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1. A registered operating room nurse.
2. To help the nurse by performing nonregulated tasks in support of the sterile team and anesthesia provider.
3. How much you know about surgical technology, your past job performance, your level of experience, and the legal limitations inherent to the task.
4. Mixing drugs and solutions, injecting or administering drugs (particularly narcotics). drawing blood from a vein or artery (without direct supervision), counting sponges without a licensed team member (nurse), and any circulating task you have not been trained to do.
5. The scrub then knows the item is open, and can locate it, and prepare it for use.
6. By always wearing gloves, using a forceps, or doing both; never handling them with bare hands.
7. Tell the anesthesia provider you are doing so, and advise the surgeon the suction will be briefly turned off.
8. Obtain control weights by weighing a clean, dry and a clean, moist sponge of each type. Then weigh each soiled sponge immediately after it is discarded from the field, before the sponge dries. Subtract the control weight from the wet weight to determine weight of the absorbed blood. One weighed gram of blood is equivalent to one cubic centimeter or milliliter of lost fluid.
9. While the circulating nurse is identifying the unit, you attend to the needs of the sterile team.
10. (1) Retrieve and set up the blood warmer and the administration set.
    (2) In a severe hemorrhage situation, set up a pneumatic blood pump.
    (3) Assist the anesthesia provider with drawing a blood sample.
    (4) Fill out the transfusion request (SF 518).
    (5) Stamp labels for blood tubes.
    (6) Contact the blood bank technicians give them a “heads-up” that a request is on the way.
11. On hanging racks or on a flat surface, never folded or crumpled, because folding or wrinkling lead aprons causes the internal lead to crack and makes them ineffective.
12. Inform the scrub, anesthesia provider, and surgeon where you are going and why before you leave.
13. SF 516, Medical Record—Operation Report.
14. It starts the moment the surgeon makes the incision, and ends when the final skin stitch (or staple) is placed to close the wound.
15. Because talking during a procedure increases the threat of wound contamination; it may distract or annoy team members; and it may upset the patient, if awake.

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1. None. You send all tissue or other items removed from a patient to the laboratory; *never* simply throw them away.
2. A small piece of tissue that is quick-frozen, sliced into thin slices with a microtome, put on slides, stained, and microscopically examined immediately to determine whether the tissue is malignant or benign.
3. Foreign bodies include any objects removed from but not normally found in the body. Loose bodies are objects that naturally occur in the patient’s body but that have become unattached from their normal location.
4. The circulating nurse. The scrub shares this responsibility, especially from the moment the surgeon removes the specimens until they are transferred off the sterile field.
5. Leave them attached to the specimen and pass them off the field along with the specimen.
6. After the surgeon gives permission.
7. If a sponge is taken out of the room or thrown in the trash, the count will be incorrect. Also, the specimen may be accidentally discarded.
8. They are completely immersed in a 10 percent formalin solution.
9. To prevent transfer of potential pathogens to other areas of the facility, and to prevent personnel exposure to bloodborne pathogens.
10. In a dry container or one containing normal saline.
11. As soon as possible after they are taken, usually in an hour or less.

12. A Papanicolaou or “pap” smear.
13. An allograft is taken from living or cadaver donors for transplantation into a different recipient. An autograft is taken from one part of a person’s body to be used in another area of the same body.
14. (1) The name of the patient.
    (2) The last four digits of the sponsor’s social security number.
    (3) The hospital register number.
    (4) The inpatient unit number, or outpatient location.
    (5) The specimen name and the location from which it was taken.
15. Each one is placed in a separate labeled container and numbered in sequence (#1, #2, #3, etc.) so that it can be individually identified by the pathologist.
16. Once the laboratory technician signs for the specimens (in the specimen log book).

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1. Squirting some of the solution on the backside of a gloved hand, or dipping the fingers of a clean gloved hand in the solution.
2. Double-check the surgeon’s preference card and, if there is any doubt, ask the surgeon.
3. Just before the surgeon begins closing the first tissue layer.
4. So that they are immediately available to stop bleeding or for use in an emergency situation.
5. Ask the surgeon’s permission.
6. (1) To evacuate air, excess body fluids, blood, or pus.
   (2) To allow nursing personnel to monitor the type and volume of fluids lost during the postoperative period.
   (3) To detect postoperative hemorrhage.
7. Through a separate stab incision made in the skin next to the primary incision, or by using an attached trocar.
8. Below the level of the drain tube, so that fluid does not back up into the wound.
9. Only when the surgeon specifically orders it clamped.
10. Normally, as soon as possible after surgery (usually within a couple of days) because drains provide a portal for bacteria to enter deep body tissues,

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1. (1) Help keep micro-organisms out of wounds.
   (2) Absorb postoperative drainage.
   (3) Cushion and protect wounds.
   (4) Immobilize, support, and splint incisional site to reduce postoperative pain and promote healing.
   (5) Aid in controlling bleeding and swelling.
   (6) Make operative site aesthetically more acceptable.
2. Contact, intermediate or absorbent, and wrap or securing.
3. Size of the area to be dressed, amount of drainage anticipated, and the need for pressure on the wound.
4. Commercially purchased, open-celled gauze sponges, or plain gauze sponges that are fully opened and wadded up in a pile over the operative site. They increase the absorbent and protective capacity of the intermediate layer of a dressing and provide extra bulk that can be secured to provide pressure.
5. Foam and elastoplast tape.
6. A sloppy wet sponge, followed by a dry sponge.
7. The surgeon or assistant.
8. The circulator obtains and opens sterile dressing materials, and assists with securing the dressing.
9. The surgeon, the assistant, or (if policy allows) the scrub. Because they are protected from contamination by their gown and gloves.
10. (1) Clean and dry the patient’s skin.

(2) Remove the electrosurgical grounding pad and gel.
(3) Inspect the patient's skin for pressure injuries and burns. Notify the surgeon at once if found.
(4) Cover the patient with a warm blanket.
(5) Turn off surgical lights.
(6) Untie surgeon's and assistant's gown.
(7) Take care of the patient and assist anesthesia personnel as needed.

11. The circulating nurse.
12. By making sure all reusable towel clips and instruments that were attached to the drapes are accounted for and placed with the instrument set.
13. Not until the setup is completely broken down and ready for transport to the decontamination or disposal areas.

Unit Review Exercises

Note to Student: Consider all choices carefully, select the *best* answer to each question, and *circle* the corresponding letter. When you have completed all unit review exercises, transfer your answers to Field Scoring Answer Sheet.

Do not return your answer sheet to the AFCDA.

65. (623) When connecting the cord to an electrosurgical unit, the circulator should ensure power to the unit is
    a. on, connect the active electrode cord from the field first, then plug-in the patient ground cord.
    b. on, connect the patient ground cord first, then plug-in the active electrode cord from the field.
    c. off, connect the active electrode cord from the field first, then plug-in the patient ground cord.
    d. off, connect the patient ground cord first, then plug-in the active electrode cord from the field.

66. (623) What happens to the used wet laparotomy sponge that a scrub technician gives to the surgeon and assistant to remove powder from their gloves before the incision?
    a. Dropped into a kick-bucket so it will be counted.
    b. Dropped in the trash bag containing the prep sponges.
    c. Rinsed in the basin to remove the powder and used when the surgeon enters a body cavity.
    d. Rinsed in the basin to remove the powder and saved as a “sloppy wet” for the end of the procedure.

67. (624) What describes the *safest* technique for delivering a scalpel to the surgeon?
    a. The scrub holds the scalpel by the handle, firmly between the thumb and index finger with the palm facing down. The sharp side of the blade is down and the tip points towards the scrub.
    b. The scrub holds the scalpel by the handle, firmly between the thumb and index finger with the palm facing down. The sharp side of the blade is up and the tip points towards the surgeon.
    c. A basin is placed between the scrub and surgeon to establish a neutral zone. The scrub places the scalpel in the basin in the position the surgeon will use it, then announces its placement. The surgeon then picks up the scalpel.
    d. The scrub places the scalpel in the basin in the position the surgeon will use it, then hands the basin to the surgeon. The surgeon then picks up the scalpel and places the basin between the surgeon and assistant to establish a neutral zone.

68. (624) The scrub can clean a cautery tip with a scalpel by scraping the debris away from the wound using the
    a. blunt side of the scalpel and the scalpel is then not used in the wound.
    b. sharp side of the scalpel and he scalpel is then not used in the wound.
    c. blunt side of the scalpel and the scalpel is then wiped off with a damp sponge before it is used in the wound.
    d. sharp side of the scalpel and the scalpel is then wiped off with a damp sponge before it is used in the wound.

69. (625) Circulating technicians are *generally legally prohibited* from
    a. operating specialized equipment.
    b. administering a drug to the patient.
    c. making entries on the patient’s medical records.
    d. opening additional sponges during the procedure.

70. (625) When handling bloody sponges, the circulator always
    a. dons surgical gloves, uses forceps, or does both.
    b. counts and stacks the sponges on a linen towel or sheet.
    c. removes bagged sponges from the room as soon as wound closure begins.
    d. carries all sponges above waist level so the scrub and anesthesia provider can see them.

71. (626) Routine tissue specimens are preserved by placing them in
    a. a dry container.
    b. an ether/alcohol solution.
    c. a 0.9 percent saline solution.
    d. a 10 percent formalin solution.

72. (626) Which specimen is *never* placed in a preservative solution?
    a. Tonsils.
    b. Kidney stones.
    c. Uterine curettings.
    d. Amputated fingers.

73. (627) What is the simplest and most effective way a scrub can determine what materials are required to close a wound?
    a. Ask the surgeon before wound closure begins.
    b. Ask the circulating nurse before the case begins.
    c. Study suture use manuals and surgical textbooks.
    d. Double-check the preference card after the wound is irrigated.

74. (627) The circulator opens dressing sponges
    a. anytime during a surgical procedure.
    b. when supplies are opened during initial case setup.
    c. after the final complete count has been taken and verified as correct.
    d. as soon as the surgeon finishes closing the first layer of tissue in the wound.

75. (628) Which personnel may remove the soiled drapes from a patient at the end of an operation?
    a. Scrub technician.
    b. Circulating nurse.
    c. Anesthesia provider.
    d. Surgical housekeeping personnel.

76. (628) Which personnel *normally* assist the anesthesia provider to transport the patient to the post anesthesia care unit?
    a. Scrub technician.
    b. Circulating nurse.
    c. Circulating technician.
    d. Post anesthesia care room nurse.

Student Notes

Glossary of Abbreviations and Acronyms

ABD	abdominal
ASU	ambulatory surgery unit
BTL	bilateral tubal ligation
cc	cubic centimeters
CO_2	carbon dioxide
CSSS	Central Sterile Supply Service
D&C	dilatation & curettage
D/W	dependent wife
ECG (EKG)	electrocardiogram
ENT	ear, nose, and throat (surgical specialty)
ESU	electrosurgical unit
EUA	exam under anesthesia
GU	genito-urinary
I&D	irrigation and debridement
ICU	intensive care unit
IV	intravenous
ml	milliliter
mm	millimeter
MTF	medical treatment facility
NCOIC	non-commissioned officer-in-charge
NFPA	National Fire Protection Association
OB/GYN	obstetrics and gynecology
OR	operating room
PACU	post anesthesia care unit
psi	pounds per square inch
TF or T/F	to follow—usually applied to the procedures following the first surgical case in each operating room.

Student Notes

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AFSC 4N151
A4N151 04 1507
Edit Code 03