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Guidelines for Best Practices for Establishing the Sterile Field in the Operating Room

Introduction

The following Guidelines for Best Practices were researched and authored by the AST Education and Professional Standards Committee and are AST approved.

AST developed the guidelines to support healthcare delivery organization's (HDO) reinforce best practices in establishing the sterile field in the operating room (OR) as related to the role and duties of the Certified Surgical Technologist (CST®), the credential conferred by the National Board of Surgical Technology and Surgical Assisting. The purpose of the guidelines is to provide information OR supervisors, risk management, and surgical team members can use in the development and implementation of policies and procedures for establishing the sterile field in the OR. The guidelines are presented with the understanding that it is the responsibility of the surgery department to develop, approve, and establish policies and procedures regarding establishing the sterile field in the operating room per surgery department protocols.

Rationale

Surgical team members must rigorously adhere to the *principles of asepsis* and implement those principles for every surgical procedure to reduce the risk of patient acquiring a surgical site infection (SSI).[1-4] During perioperative surgical case management, surgical team members must practice the principles of surgical conscience that demands if an individual breaks *sterile technique*, he/she will immediately communicate this to other team members, or if another team member points out a break in sterile technique, the individual who broke technique will take corrective action.[5,6] Additionally, surgical personnel should work together as a team to problem solve the break in technique and arrive at the optimal decision applying the principles of asepsis. Lastly, CSTs should apply the principles of economy of motion by applying these guidelines to develop a routine for establishing the sterile field.

Evidence-based Research and Key Terms

The research is completed using the Cochrane Database of Systematic Reviews and MEDLINE®, the U.S. National Library of Medicine® database of indexed citations and abstracts to medical and healthcare journal articles.

The key terms used for the research of the guidelines include: impervious; Mayo stand; Mayo stand drape; pervious; principles of asepsis; sterile technique; strike-through contamination; surgeon's preference card; suture bag. Key terms used in the guidelines are italicized and included in the glossary.

Guideline I

To provide for a safe and uneventful surgical procedure, the CST should have all the necessary instruments, supplies, and equipment needed to prepare the sterile field for the surgical procedure.

1. The CST should cross-check the *surgeon's preference card* against the instruments, supplies, and equipment that have been gathered or what is referred to as "pulled" for the procedure to confirm that everything needed for the procedure is available.[5]
    A. If updates or corrections are required, the CST should make a note of the items to be corrected and provide those to the individual in the surgery department who is tasked with updating the electronic preference cards.

Guideline II

The OR furniture and equipment should be grouped and positioned prior to opening the sterile items.

1. The CST should verify that all furniture, such as IV stands, sitting stools, anesthesia provider's cart, and equipment, such as electrosurgical unit and suction system, are in the OR.
    A. Any unnecessary furniture and equipment should be removed from the OR.[4]
    B. Equipment, such as electrosurgical unit, patient monitors, suction system, and specialty equipment, such as the tourniquet machine and microscope, should be tested for functionality prior to the start of the procedure.
    C. New suction liners should be placed in the suction canister and confirm that the suction tubing is connected to the wall vacuum outlet.
    D. Confirm that a separate suction system is prepared for use by the anesthesia provider.[4]
2. Furniture should be grouped and positioned.
    A. Furniture that will eventually be sterilely draped including the back table, *Mayo stand*, and basin ring stand should be grouped and organized together. It is recommended these items be positioned so that the sterile field will be established in an area furthest from the OR door. When the OR doors open and close, this causes air movement and particles are stirred up; therefore, the furniture should be positioned as far as possible from the OR doors and human traffic that occurs in and out of the room.[4,7,8]
    B. The furniture that will be set up and included in the sterile field should be positioned a minimum of 12 inches away from the wall and other non-sterile furniture and equipment.[5]
3. All other furniture that will not be included in the sterile field, such as linen and trash hampers, sponge/kick buckets, and sitting stools, should be positioned away from traffic patterns and the furniture to be used in the sterile field.
    A. A biohazard bag should be positioned in the linen and trash hampers.
    B. Sponge buckets should be lined with an *impervious* biohazard bag.
4. The OR table should be positioned according to the surgeon's preference under the OR lights.
5. The anesthesia machine should be positioned according to the anesthesia provider's preference and according to the position of the OR table.
    A. A clean lift sheet and arm board covers should be placed on the OR table.

B. The safety strap should be placed according to the patient surgical position that will be used for the procedure.

Guideline III

Sterile technique must be strictly adhered to by the surgical team members when opening sterile instrument sets, packages, and peel packs.

1. Sterile items should be positioned for use in the OR, such as the back-table pack placed on back table, basin placed in ring stand, instrument sets placed on flat surfaces, and skin prep tray placed on prep table. The items should be placed on clean, dry surfaces. Items that will not be immediately opened, such as sterile dressing supplies, are placed in a location where they will be easily accessible to the circulator.
2. Prior to opening a sterile item, the following should be verified.[9,10]
    A. The chemical indicator or integrator has changed color indicating the item has been exposed to a sterilization process.
    B. The integrity of the packaging material is intact, such as no perforations, tears, or evidence of *strike-through contamination*.
    C. The expiration date is confirmed, if present.
3. The surgical team members should establish a routine for opening sterile items.
    A. The following is a recommended sequence for opening sterile items.
        1) Back table pack.
        2) Basin set.
        3) Small wrapped items, such as sterile towel pack.
        4) Peel pack items, including suture.
        5) Instrument sets/trays.
    B. The gown and gloves for the CST in the first scrub role should be opened on a separate flat surface, such as the Mayo stand. The gown and gloves should never be opened on the sterile back table, regardless if the CST performed a water-based scrub or waterless scrub, the gown and gloves should never be placed on the sterile back table.
        1) This prevents water inadvertently dripping from the arms and hands onto the back table.
        2) It prevents the CST from violating the principle of asepsis that a non-sterile person should not reach over a sterile field.[5,11]
    C. Small wrapped items, peel packs, and suture packets should be opened and "flipped" onto the sterile field using sterile technique. The glued area of peel packs and suture packets is considered the boundary between non-sterile and sterile.[5,12] Items should be opened in such manner that the non-sterile person is not reaching over the sterile field.[5,12]
    D. Peel packs that contain a difficult, heavy, and/or large item(s), such as pliers or multiple clamps, should not be opened and flipped onto the sterile field. The item could puncture the sterile cover. The item should be opened into a basin on a ring stand or preferably, a non-scrubbed person should open the peel pack and pass the sterile item(s) using sterile technique to the CST in the first scrub role.
    E. Items should be opened in a grouping manner the same way on all cases to establish a standard routine for establishing the sterile field.

1) The grouping of items minimizes movement and contributes to the efficiency of the set up.
2) Items opened in a grouping manner allow the CST to easily identify and locate similar items, such as all of the drapes are opened in the same area of the back table.

   Sharps should be grouped in one corner of the back table and other items should not be opened near the sharps to avoid covering/hiding them. This aids in minimizing the risk of an accidental sharps injury during the set-up.[13-15]
3) Items, such as drapes, should be opened in reverse order of use; for example, the last drape to be used will be opened first so it will be on the bottom and the first drape will be on top. This minimizes movement and contributes to efficiency.

4. Rigid instrument containers should be inspected prior to opening.
   A. If the container does not meet the following inspection criteria, it must be considered contaminated and the contents should not be used.
      1) The filter and/or valve system should be inspected to confirm they are intact.
      2) The chemical indicator on the lock should be visualized to confirm it changed color to verify the contents were exposed to a sterilization process.
      3) The tray locking mechanisms should be checked for integrity. If the locking mechanism is not intact, the set should be considered contaminated.
      4) Containers that have a gasket should be examined to make sure the gasket is intact. If the gasket is not intact, the set should be considered contaminated.
   B. To prevent contamination, the lid should be lifted straight upward, the individual step back, and the lid safely stored in the OR by placing inside the case cart.
5. When a sterile package is dropped on the floor it must be taken into consideration if the packaging material is *pervious* or impervious to determine if the package is unsterile or sterile.
   A. A dropped package sterilized in pervious reusable woven fabric materials must be considered unsterile and not transferred to the sterile field.[16]
      1) The pervious reusable woven fabric material allows the implosion of airborne contaminants and dust into the package.[4,5,16]
      2) The package should be opened and the enclosed item(s) returned to the decontamination area for reprocessing and sterilization.[9,17]
   B. A dropped package sterilized in impervious wrapping material can be considered sterile and safe for immediate use if the packaging is not compromised.[16]
      1) The packaging must be opened for immediate use if the integrity of the package has not been compromised, for example, punctures, signs of strike-through contamination, or tears.[4,5,16,18] The package must not be stored/placed on the shelf in the sterile storage room for future use.[16] The package must be carefully inspected before opening to confirm the packaging material is intact and the area of contact is dry.[1]
      2) If the packaging material is compromised, the package must not be opened onto the sterile field. If the package contains reusable items, they should be returned to the decontamination room for reprocessing and sterilization.

6. If a CST, upon opening a sterile package, commercial or sterilized in-house, identifies a foreign particle (FP) contained within, the package must be considered non-sterile and not usable for the procedure.
    A. Lint/fibers, bone fragments, burned tissue, and hair have been identified as frequent FPs contributing to post-operative complications.[19-22] The consequences of FP include adhesions, excessive scarring, delayed healing, granuloma formation, infections, poor scar strength, and prolonged inflammation.[19-22]

Guideline IV

Traffic in and out of the OR should be monitored and controlled when the surgical team begins to open sterile items.

1. Only those surgical team members assigned to the surgical procedure should be entering and leaving the OR on a limited basis.
    A. Controlling the traffic aids in keeping air movement to a minimum, thus reducing the microorganisms and other contaminants, such as dust and debris, from entering the atmosphere. This can reduce the patient's risk for acquiring an SSI. Two studies highlight the importance of minimizing the number of OR door openings during procedures.

        Andersson et al., reported that airborne particle counts increase with the number of people in the OR and their movements as well as number of times the OR door was opened.[8] In the study, 26% of door openings were due to the need for additional procedural supplies indicating suboptimal preoperative preparation and 27% to the entry of OR personnel who had no role in the surgical procedure.[8]

        In 2014, a safety team at Peace Arch Hospital in British Columbia, Canada conducted a two-day study of OR door openings and traffic. Two nursing students manually counted door openings during nine total joint arthroplasties and one total joint revision procedure. They recorded between 42 to 70 door openings per procedure from incision time to joint capsule closure. Reasons given for entering and exiting the OR were needing additional instruments and equipment, retrieving charts, and taking a break. As a result, the surgery department implemented several strategies to reduce traffic including stopping all traffic into and out of the OR between joint capsule opening and closure, communicating by phone, and increasing the use of templates to identify implant sizes preoperatively. Audits recorded every six months indicated a significant reduction in door openings to 3.2 per procedure and a decrease in orthopedic procedure SSIs from 2.8 percent to 2.1 percent.[7]
        1) The doors to the OR should be kept closed to maintain a positive pressure.
        2) If the OR has more than one entry, the doors to the main corridor should be used as little as possible.
        3) OR personnel should limit the number of times that they enter and exit the OR once sterile supplies are opened to minimize stirring up dust and particles that can settle on sterile surfaces.
    B. Controlling traffic aids in keeping the level of conversation that is occurring in the OR to a minimum to reduce the spread of airborne droplets that can carry microorganisms.

Guideline V

Sterile supplies should be opened and set-up as close to the time of surgery as possible and for one surgery only.

1. Only one patient should occupy an OR and therefore, a single sterile field should be established.
    A. The performance of two procedures when there are two sterile fields, two surgical teams, and two surgical sites dramatically increases the risk for airborne particle and droplet cross-contamination. Additionally, surgical team personnel traffic patterns are limited, thus increasing the chance for contamination of a sterile surface or item.
    B. If the patient requires surgery at two different anatomical sites, such as a trauma patient, there should be two sterile set-ups of equipment, instruments, and supplies, and each set-up should be used exclusively for each site. Additionally, if one site has a tumor, the instruments should not be used on another surgical site due to the possibility of transferring cancerous cells to the second site.
2. Sterile fields should be established as close to the scheduled time of surgery as possible.[11,23]
    A. The potential for airborne contamination increases with the length of time a sterile field has been open and the risk of contamination is detrimental to the safety of the patient.[23,41] Dust and particles from the ambient environment can settle onto the surfaces of the sterile field.[19,23,37-39] However, the research is conflicting regarding environmental contamination of the OR. The OR may gradually become increasingly contaminated due to the increasing OR traffic and activity of surgical personnel.[36,40,43-49,51-53] This evidence is contradicted by other research reporting there is no increase in OR environmental contamination due to traffic and activity of surgical personnel.[45,50]

        Currently, there are no clear guidelines related to how long a sterile field can remain exposed to the open environment of the OR without being used.[23] Surgery departments should establish policies and procedures that address the issue and best serve the needs of the patient.

        1) The policy should include that the sterile field is kept under constant observation to identify contamination that may occur and control traffic in-and-out of the OR. A sterile field that is not kept under constant observation should be considered non-sterile and broken down.[4,12,14,16]

            The CST should not break scrub after setting up the sterile field to keep the field under constant observation, even if there is a delay in the start of the procedure. Additionally, the CST has a duty to be cost conscious to avoid the patient from incurring avoidable charges; for example, unnecessarily breaking scrub after setting up the sterile field to wait in the surgery department lounge for the patient to be transported to the OR, and the patient is charged for a second set of gowns and gloves when the CST scrubs back in.[5]

            While keeping the sterile field under observation, the CST should not sit down. Sitting down changes the level of sterility of the gown and upon standing up the CST should not reproach the sterile back table or Mayo stand until he/she has changed the gown.[4,5,6,12] The only time the CST should sit is if the surgeon will be seated during a procedure, and the

CST should only sit once the patient is draped and the surgeon is ready to make the skin incision.

2) A study by Dalstrom et al., showed a direct correlation between open instrument sets and contamination rate.[23] Forty-five sterile trays were opened in positive-air-flow ORs using sterile technique and exposed for four hours. Culture specimens were taken immediately after opening and every thirty minutes. 15 trays each were assigned to three groups: group 1 – open trays and left uncovered in the OR with no traffic; group 2 – open trays, uncovered with single-person traffic flow in-and-out of the OR from the nonsterile corridor every ten minutes; group 3 – trays were opened and immediately covered with a sterile surgical towel.

Three of the 30 uncovered trays were discovered to be contaminated immediately after opening and were eliminated. However, the contamination rates for the twenty-seven uncovered trays were 4% at thirty minutes, 15% at one hour, 22% at two hours, 26% at three hours, and 30% at four hours. No difference was noted between the uncovered trays with traffic versus those with no traffic. The covered trays were not contaminated during the testing period.

The recommendation of the researchers is that open sterile trays that are not immediately used should be covered by a sterile towel to minimize exposure to environmental contaminants.[23]

3. If a patient is transported into the OR but, for unforeseen reasons, the surgical procedure is cancelled prior to its start, the sterile field and sterile items should be considered contaminated.[4] The sterile field should be broken down and the OR cleaned. It is recommended that the disposable items be saved and donated to a CAAHEP-accredited surgical technology program if one is near the HDO.
    A. When sterile supplies have been opened, the sterile field is established, and the procedure is canceled, but the patient was not brought into the OR, the room may still be used if the subsequent procedure is the same or similar.[4]
4. The research supports covering a sterile field to reduce the potential for contamination in the OR.[23,37-39,41] Instances of when a sterile field may need to be covered include delays in the start of a surgical procedure, the CST is managing multiple sterile back tables and a table that may not be initially used should be covered, or during periods of increased activity, such as the patient activities that take place prior to the skin incision.[24] However, a sterile field should **not** be covered with a sterile cover or drape that extends below the edges of the sterile table to prevent patients from acquiring a post-operative SSI.
    A. The applicable principles of asepsis that support not covering a sterile field with a sterile cover or drape that extends below the edges of the sterile table include the following.[5,11,12,16]
        1) A sterile field is established for each surgical procedure.
        2) Once sterile drapes have been placed, they should not be repositioned.
        3) Any item extending or falling below the table edge is considered non-sterile.
        4) The top of a sterile, draped table is the only portion that is considered sterile.
    B. When applying the above principles, the part of a sterile cover or drape extending below the edge of the sterile table is non-sterile because only the top of the draped table is the only portion considered sterile.[5,11,12] Additionally, once the sterile cover

or drape is placed over the sterile field, it should not be moved or repositioned to prevent the contaminated portion that is hanging below the table edge from contacting the sterile field.[5,11,12] Lastly, removing the cover using sterile technique that prevents contamination of the sterile field cannot be achieved because the contaminated sides of the cover will likely touch the sterile field upon removal.[5,11,12] Human error is the factor that particularly cannot be controlled; studies of human error have confirmed that errors involve variations from established practice.[24,25]

C. Removal of the sterile cover can result in the sides of the cover below the sterile field stirring the air current in an upward direction causing airborne contamination of the sterile field by microorganisms and other debris, such as dust, to settle on the sterile field.[24]

D. Preventing the patient from acquiring a post-operative SSI is of primary importance to the surgical team. Healthcare-acquired infections (HAI) is the 10th leading cause of death in the U.S.; additionally, more than 20 percent of HAIs are due to SSIs.[2] The 2006-2009 data provided by the National Healthcare Safety Network reported an overall SSI rate of 1.9 percent based upon 849,659 operative procedures and, of that number, 16,147 SSIs.[26] This results in the patient incurring a lengthy hospital stay that greatly increases the hospital bill, as well as possibly facing a life-threatening SSI. Cardiovascular surgical SSI increased the cost by $37,513 and length of hospital stay by 13.7 days.[3] Conservative calculations indicate overall, that an SSI increases the length of hospital stay by an average of 9.7 days and cost of treatment by $20,842. Pediatric patients are impacted even more with hospital stays increased by 10.6 days and an additional cost of $27,288.[3]

E. If a sterile field is covered, the CST should cover the instrument sets, instruments, and supplies on the sterile back table using reusable green towels that are easily removed and disposed of in the linen hamper to prevent the build-up of dust and other contaminants on the instruments and supplies.[23,37-39,41,42] See Guideline V, 2, A, (2) for additional information.
    1) The research has not definitively established the length of time a sterile field may remain covered. Studies have indicated that contamination of sterile items covered for four and eight hours did not occur, but there were no differences in contamination rates for sterile fields covered for 24 hours.[23,41]
    2) Further definitive research, including randomized controlled trials, needs to be conducted to determine the best practices for covering a sterile field to prevent environmental contamination. [24]

Guideline VI

The CST should apply the principles of economy of motion when establishing a routine for setting up the back table and Mayo stand. While set ups will vary according to surgical specialty, procedure, and facility policy, there are principles that can be applied to all back table and Mayo stand set ups.

1. Prior to entering the sterile field, the CST must complete the surgical scrub, enter the OR, dry hands and arms, unless brushless/waterless scrub was performed, and don the sterile gown and gloves. Refer to the *AST Guidelines for Best Practices for the Surgical Scrub and Gowning and Gloving* for additional information.

2. The CST should apply the eight principles of economy of motion to establish a logical, sequential routine for setting up the back table and Mayo stand.[5,12] Utilizing a routine for setting up the back table and Mayo stand contributes to economizing time and supports the principles of asepsis. Variations occur, including considering surgeon's preferences, emergency procedure versus scheduled procedure, and product differences. The CST should plan the steps for setting up that reflects these variations.
    A. Think fast, but move carefully.
    B. Motions should be simple, productive, minimal, and non-repetitive.
    C. Divide the back table into sections and work in sections at the table.
    D. Establish a logical, sequential, and efficient pattern for back table and Mayo stand set up.
    E. Handle each item once; avoid rearranging items. Once an item has been placed, leave it.
    F. Move about as little as possible and face the sterile field at all times; the CST should not turn his/her back to a sterile field.
    G. Be aware of the total OR environment to develop a "sixth-sense awareness" related to movement of others in the OR who are non-sterile, and areas that are sterile and non-sterile.
    H. Be aware of the total OR environment to develop a "sixth sense awareness" related to movement of others in the OR who are non-sterile, and areas that are sterile and non-sterile.
3. The CST should be knowledgeable of the contents of the back-table pack, basin set, instruments, and supplies that were opened to establish an efficient routine for setting up the back table. Items should be arranged in a manner that allows the CST to limit movement as he/she retrieves instruments and supplies during the surgical procedure.
    A. Items that are used first should be organized first to facilitate efficiency. A typical order the CST may utilize from top to bottom: gowns and gloves of the other sterile team members; draping items including pre-arranging the four towels for squaring off the incision site; light handle covers; corded items, such as the Bovie and suction tubing with suction tip attached. The order of use may change depending on the procedure, surgeon preference, and facility policy. These items may be placed in an area of the back table such as the corner or in an empty basin.[4] Drapes and gowns should not be placed on a basin that contains irrigation solution to avoid strike-through contamination.[5,27]
    B. As drapes and accessory items are organized and space becomes available, the CST should lay opened towels, often referred to as "green or blue towels", on the surface of the back table, edge-to-edge, side-by-side to cover the back table cover for reinforcement. The thin, lightweight sterile paper towels should not be used because they do not provide adequate reinforcement. Additionally, reinforced back table covers are commercially available.
    C. The CST should remove the kidney basin and medicine cup(s) from the basin set. The medicine cup(s) should be placed as close to the edge of the back table as possible that allows the circulator to pour solutions and medications using sterile technique, and then repositioned away from the edge. Additionally, if a graduated pitcher will be used, it should be set as close to the edge of the back table as possible to prevent the circulator from reaching over the sterile field to pour a solution.

When the circulator is pouring medications or sterile solutions into a basin or medication cup, the entire contents must be poured out or the unused portion disposed, and the cap or container cover should not be replaced.[5.24] The sterility of the contents of the opened container cannot be guaranteed if the cap or container cover is replaced. Additionally, re-pouring left-over contents could contaminate the sterile solutions in the basin or medication cup due to drops that might have made contact with unsterile areas of the container and then reenter the container through its opening.[24]

Irrigation and IV solutions are to be used for one patient. Using left-over solutions for another procedure places the patient at risk for acquiring a SSI due to cross-contamination.[5,6,12,16,24,]

D. A skin marker and labels, blank or preprinted, should be available on cases where dye, medications, and/or solutions will be used.
    1) The CST must label containers and syringes as outlined in *ASTs Guidelines for Safe Medication Practices in the Perioperative Area*.

E. The CST should arrange sharps, including suture packets, in a manner that facilitates completing the counts in an efficient manner. Refer to the *AST Guidelines for Best Practices for Completing Counts* for additional information.
    1) Sharps should be placed together near the back-table sharps container that is positioned in a place that is easily accessible to the CST during the surgical procedure, usually a corner of the back table.
    2) Suture should be arranged in sequence of use.

F. The CST should arrange sponges in a manner that facilitate completing counts in an efficient manner; a typical order is placing sponges left to right according to size, such as lap sponges and then 4 x 4s, in an upper corner of the back table. The band around the sponges should be left in place and not removed until ready to count. Refer to the AST *Guidelines for Best Practices for Completing Counts* for additional information.

G. The CST should position the single basin or double basin set in a manner that allows the circulator to pour water and saline solutions without having to reach over the sterile field.[5,11]
    1) The CST should designate one basin for patient irrigating purposes.
    2) A second basin should be used for wetting sponges for patient use. However, the basin used to wet sponges should only be used for sponges throughout the procedure because lint from the sponges is released into the solution. Lint has been shown to contribute to foreign body reaction and tissue granulomas in surgical patients.[12,19,21,22]

H. The CST should place the instrument set(s) on the back table in a manner that facilitates being able to quickly retrieve additional instruments that may be needed during the surgical procedure. A typical placement of a single set is in the upper right-hand corner or upper middle of the back table. If there are multiple instrument sets, the CST may need an additional smaller table or back table that is covered by a sterile drape.
    1) Prior to positioning an instrument set on the back table the CST should confirm that the internal indicator or integrator has changed to the correct color to verify exposure to the sterilization process.[9,10,28] If an instrument

set has multiple levels of trays of instruments each tray should have an internal indicator/integrator, or the entire set is considered contaminated.[10]

If the basket or tray of instruments is within a rigid sterilization container, the CST should remove the basket by lifting it vertically without the gloves or basket touching the outside of the container and stepping away. The CST should avoid the instrument basket touching the front of the gown and should not place it on the back table until the indicator/integrator has been verified, the circulator has verified there are no perforations in the filters, and there is no residual condensate/moisture at the bottom of the container.[4,9,10] If the indicator has not properly changed color, there are perforations in the filters, and/or residual condensate is present, the instrument tray/basket should be considered non-sterile.[9] The CST should change gloves after handing the tray/basket off to the circulator.

2) Additionally, prior to positioning an instrument set on the back table, the CST should confirm that are no foreign particles (FP), such as bone fragments, burned tissue or hair, within the instrument set.[19] This includes inspection of bone cutting instruments in orthopedic sets to confirm there are no bone and/or tissue fragments present. If FP is identified, the instrument set must be considered non-sterile and passed off by the CST to the circulator. It is recommended that the CST changes his/her sterile gloves. See Guideline III, 6, A for additional information regarding FP.

I. The CST should organize the instruments by category when removing from the instrument pan or tray.
   1) Before removing any instruments with ratchets from the tray, the CST should confirm that all of the instruments are open and not ratcheted. One or more ratcheted instruments are considered contaminated, and therefore, the whole instrument tray should be considered contaminated. When an instrument is ratcheted, it prevents penetration and contact of the sterilant with the surface of that area of the instrument.[9,28]
   2) Instruments on a stringer should be placed on a roll towel and the stringer removed.
   3) Heavy instruments, such as retractors, should be kept in the instrument tray or placed flat on the back-table. Care should be taken in positioning sharp retractors and other large sharp instruments, such as the Gelpi retractor, rake retractors, and bone hooks. They should be positioned in a manner that facilitates the CST or surgeon being able to avoid a sharps injury when obtaining the instrument from the tray.[13-15,29]
   4) If instruments are placed within an instrument tray, they should be arranged so they are easily visualized by the CST and circulator to facilitate counting.
   5) Forceps, such as Adson and DeBakey forceps, should never be positioned ("hung") over the edge of the instrument tray as this may damage the instrument; they should be laid flat on the back table.
   6) Tip protectors, covers, and sleeves should be removed from all instruments and from the sterile field. These covers are not radiopaque and have the potential to become a retained surgical item (RSI) in the surgical wound causing a SSI.[1]

7) Instruments and power equipment should be inspected for damage and functionality.[5] If an item is damaged or does not properly function, the CST should immediately hand it off to the circulator who will tag the item for repair or disposal. If it is a counted item, it should be kept in the OR until the end of the procedure and included in the final counts.
    a) The cutting edges of scissors should close smoothly.
    b) The points of non-disposable trocars should be smooth and sharp.
    c) Power equipment should be tested prior to the patient transported into the OR.
    d) The jaws of clamps should close with no gaps and the tips in even proximation.
    e) The ratchets of ringed instruments and self-retaining retractors should securely lock.
    f) Instruments that require assembly should be assembled and tested for proper functioning.[5,12]
    g) The tips of forceps should be in even proximation and teeth fit evenly in the groove of the opposite side.

J. In some instances, it may be necessary to establish another sterile field using a second back table.
    1) The back-table cover should be opened when all other sterile supplies are opened.
    2) If necessary, the CST in the first scrub role can drape the back table. When draping the second back table, the CST will unfold the cover toward himself/herself to cover the front area of the table to reduce the chance of contamination.[5,11] The CST will unfold the other portion of the table cover away from self.
    3) The second back table should be organized with minimal movement just as the primary back table set up was accomplished.

4. The CST should establish a logical, sequential, and efficient routine for setting up the Mayo stand in accordance with the procedure, physician preference, and facility policy.
    A. The principles of asepsis state that only sterile items should be placed or moved within a sterile field or in other words, sterile-to-sterile.[5,11] Therefore, the underside of a sterile-draped Mayo stand is considered sterile because the Mayo stand is positioned over the patient after the sterile drapes have been placed.[5,11,16]
        1) Questions have historically existed concerning the underside of a sterile draped Mayo stand with the concern being if it can't be seen and monitored by the CST then it should not be considered sterile. However, the CST places a sterile cylindrical *Mayo stand drape* that encloses the upper portion of the stand that ensures the sterility of the underside of the stand.
        2) Sterile items such as the electrocautery cord, power cords, and suction tubing that are positioned underneath the Mayo stand are considered sterile with the CST having passed the ends of the cords and tubing off the foot of the OR table to the circulator using sterile technique prior to the placement of the Mayo stand.

B. To reinforce the top of the sterile Mayo stand cover, the CST should place a sterile cloth towel(s). The thin, lightweight sterile paper towels should not be used because they do not provide adequate reinforcement.
C. The CST should select the instruments and supplies that will be used most frequently during the surgical procedure for placement on the Mayo stand.
D. Instruments should be briefly inspected for functionality and damage.[5]
E. Instruments should be handled carefully, either individually or in small lots, to avoid possible damage.
F. The CST should place instruments on the Mayo stand in even numbers.
G. The instruments should be grouped with similar instruments as they are on the back table.
H. The instrument should only be closed to the first ratchet to facilitate the surgeon's ability to quickly open the instrument for use.
I. Sharps placement should allow the CST to safely pick up the sharp and place in the neutral zone or pass to the surgeon.[4, 13-15]
J. A rolled towel or other device, such as a foam role, is recommended for use. The ring handles of the instruments should be placed over the rolled towel. Placing the ring handles over the edge of the Mayo stand is not recommended.
K. Curved instruments should be placed together with the curves facing in one direction.
L. Curved instruments that are not placed on a roll towel should be positioned on the Mayo stand to avoid sharps injuries and facilitate safe, easy retrieval, such as sharp and blunt-pointed scissors.
M. The skin marker, needle on syringe (local anesthetic), and skin knife should be included on the Mayo stand set up, but moved to the back table after initial use.
N. The sterile *suture bag* should be placed on the side of the sterilely draped Mayo stand opposite the operative side to minimize the risk of items, such as empty suture packets and suture ties, from entering the surgical wound site.
    1) The bag should not be positioned on the back table because the principles of asepsis state any items that extend or fall below the sterilely draped table edge is considered non-sterile and only sterile items may be touched by the sterile team member.[5,11]
    2) If the contents of the bag need to be searched, for example, the sharp count is incorrect and the contents need to be searched to confirm that a suture needle was not thrown into the bag, the CST should prevent sustaining a sharp injury by handing the bag off to the circulator who can empty the contents to safely search the contents.[5,11,35]
O. The Mayo stand set up may change during the intraoperative phase to better facilitate the procedure. Therefore, the frequently used instruments may change during the procedure.

5. At the appropriate time, per surgery department policy, the initial count is performed with the circulator. Refer to the *AST Recommended Standard of Practice for Completing Counts* for additional information.

Guideline VIII

The electrosurgery active electrode handpiece should be controlled when not in use to prevent inadvertent activation to avoid burns to the patient and sterile surgical team members, and ignition or puncture of the drapes.

1. The active electrode handpiece should always be placed in a dry, nonconductive safety holster when not in use.[30-32] This is the most effective method for preventing inadvertent activation of the handpiece to prevent patient burns.[30-32] Even with an audible activation alarm, accidental activation of the active electrode can arc through surgical drapes causing immediate ignition of the drapes or vapors from flammable skin prep agents that collected under the surgical drapes.[30] ECRI has indicated they continue to investigate incidents of surgical fires that have started in this manner.[30] The Pennsylvania Patient Safety Reporting System (PA-PSRS) has reported that approximately 56% of all electrosurgery-related events are attributed to inadvertent activation and 14% of those incidents are the result of not placing the active electrode handpiece in a safety holster when not in use.[31]
    A. The safety holster should be attached to the sterile field using an atraumatic towel clamp, preferably non-metal.
        1) Only atraumatic towel clamps should be used to secure cords and tubing on the sterile field. Traumatic towel clamps, also referred to as perforating towel clamps, must never be used because they create holes in the drape that can allow microorganisms to migrate onto the sterile field from the skin of the patient.[1,2,4,5,12,16] The argument that has historically been made is the ends of the perforating towel clamp "fill" the hole, thus preventing microbes from entering the field; however, this is an incorrect assumption because the integrity of the drape has been compromised.

            If the CST uses a perforating towel clamp, it should be removed, passed off the sterile field to the circulator, and the drape replaced. Covering the openings in the drape with green towels or another drape, such as a ¾ sheet, is not adequate enough to prevent microbes from entering and contaminating the sterile field.
    B. The safety holster should be placed in a location on the sterile field according to the surgical procedure that facilitates easy retrieval by the sterile surgical team members, particularly the surgeon.
        1) Endoscopic active electrode handpieces are longer than normal and usually do not fit inside the safety holster. In this instance, the handpiece should be placed on the Mayo stand.[30,31]
        2) If the surgeon maintains that the handpiece be placed on the drapes and the safety holster is not used, this should be recorded in the operative record.
    C. Radiofrequency is not always restrained by insulation and current leakage can occur.[32] Therefore, the sterile cord to the active electrode handpiece should not be strung through the handles of or wrapped around a metal clamp that has been attached to the drapes; this also prevents damage to the cord.

Guideline IX

The surgery department should review the policies and procedures regarding the sterile field, including principles of asepsis on an annual basis.

1. The surgery department should include members of the surgical team and administration when reviewing the policies and procedures, including CSTs, surgeons, RNs, risk management and infection control officer.
    A. The surgery department should document when the policies and procedures were reviewed, revision completed (if necessary), and who participated in the review process.
2. CSTs should be familiar with the policies and procedures for the sterile field and principles of asepsis. The orientation of new employees should include reviewing the policies and procedures.

Guideline X

CSTs should complete continuing education to remain current in their knowledge of the sterile field and principles of asepsis.[33]

1. The continuing education should be based upon the concepts of adult learning, referred to as andragogy. Adults learn best when the information is relevant to their work experience, the information is practical, rather than academic, and the learner is actively involved in the learning process.[34]
2. It is recommended surgery departments use various methods of instruction to facilitate the learning process of CSTs.
    A. If the education is primarily lecture, one method to engage learners includes presenting case studies for discussion providing suggestions for reinforcing establishing a sterile field and principles of asepsis.
    B. Other proven educational methods include interactive training videos, computerized training modules, and teleconferences.
    C. The continuing education should be delivered over short periods of time, such as in modules, and not in a one-time lengthy educational session.
3. Continuing education programs should be periodically evaluated for effectiveness, including receiving feedback from surgery department personnel.
4. The surgery department should maintain education records for a minimum of three years that include dates of education, names and job titles of employees that completed the continuing education, synopsis of each continuing education session provided, and names, credentials and experience of instructors.

Competency Statements

Competency Statements	Measurable Criteria
1. The CST has the knowledge and skills for implementing the principles of asepsis, including monitoring traffic within the OR to reduce the risk of SSI to the patient. 2. The CST is qualified to prepare and work within the sterile field utilizing their knowledge of the principles of asepsis. 3. The CST has the knowledge and skills to implement the principles of economy of motion to contribute to the efficiency of the surgical procedure and safety of the patient.	1. Educational standards as established by the *Core Curriculum for Surgical Technology*.[11] 2. The didactic subjects of principles of asepsis, sterile technique, preparing the sterile field, traffic flow patterns in the surgery department and OR, surgical conscience, and principles of economy of motion are included in a CAAHEP accredited surgical technology program. 3. Students demonstrate knowledge of the above listed didactic subjects in the lab/mock O.R. setting and during clinical rotation. 4. As practitioners, CSTs implement the principles of asepsis when preparing and working within the sterile field, monitoring traffic flow in the OR, and apply the principles of economy of motion. 5. CSTs complete continuing education to remain current in their knowledge of sterile technique, as well as, to learn new information for reducing the risk of SSI as related to establishing the sterile field.[33]

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Glossary

Impervious: Not allowing fluid to penetrate; impermeable.

Mayo stand: Small portable stand with tray on top that is covered with a sterile drape and on which the instruments and supplies that are most frequently used for the surgical procedure are placed; it is positioned over the patient.[5]

Mayo stand drape: A sterile cylindrical drape that is placed over the top portion of the Mayo stand as part of establishing the sterile field.

Pervious: Allows fluid to penetrate; permeable.

Principles of asepsis: Practices of the surgical team members to prevent the patient from acquiring a postoperative surgical site infection.[5]

Sterile technique: The application of the principles of asepsis.

Strike-through Contamination: Contamination of a sterile field or package that occurs from the passage of fluid through a microbial barrier such as a peel pack or wrapping material that allows microorganisms to enter and contaminate the inner, packaged items.[5]

Surgeon's preference card: The list of equipment, instrument sets and supplies a surgeon needs for a specific surgical procedure; the card is used to "pick" the items that are placed in the case cart that is eventually brought into the OR. Many health care facilities save the cards electronically to make it easier to update the cards to maintain their accuracy.

Suture bag: A paper bag that is included in the majority of back table procedural packs that the CST uses to place small trash items such as suture packets and used suture ties.

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