SURGICAL TECHNOLOGY LAB MANUAL 2023-2024

WELCOME to
THE DEPARTMENT OF SURGICAL TECHNOLOGY

Dear Students

On behalf of the faculty and staff of the Surgical Technology Department we welcome to our program. The Surgical Technology Program Lab Manual is intended to be a valuable source of information to facilitate the students' achievement of academic and professional excellence as a Surgical Technology student. All policies and guidelines set forth in this manual adhere to Mandl School policies and are guidelines specifically designed to reflect the expectations of every operating room in the real world.

This manual is a living document; therefore, the information contained in this manual is subject to revisions and amendments in order to maintain up-to-date practices.

ACCREDITATION

The Mandl School Surgical Technology Program has ongoing accreditation status through the Accreditation Board of Health Education Schools (ABHES). Accreditation exists to establish, maintain, and promote suitable quality standards for education programs. These standards are used to develop, evaluate, and self-teach surgical technology programs. Students who graduated from Mandl School ST Program are eligible to take the CST certification exam offered by the National Board of Surgical Technology and Surgical Assist (NBSTSA).

Accrediting Bureau of Health Education Schools (ABHES)
7777 Leesburg Pike, Suite 314
N. Falls Church, VA 22043
703-917-9503
info@abhes.org
www.abhes.org

II. THE ROLE OF THE SURGICAL TECHNOLOGY

The surgical technologist is a vital member of the operating room team. He / She is responsible for providing an optimal surgical environment for the surgical patient. Surgical Technologists (ST) function in the sterile as well as the nonsterile role. A proficient ST shows considerable care and commitment to the patient and the surgical profession by:

1. Applying the principles of Surgical Asepsis.
2. Interacting professionally within the operating theater, concerning all parties.
3. Performing in the role of surgical technologist on the surgical team and in the operating room surgical environment.
4. Identifying the structures and functions of the human anatomy and common pathologies.
5. Protecting and respecting the patient's right to privacy and safety.
6. Preparing sterile instrumentation, supplies, and equipment required for an operative procedure.
7. Assist with the sterile draping, gowning, gloving, case management, and other preparations essential to surgical procedures.
8. Dispose of contaminated items employed during surgery

10 GOLDEN RULES

The following are expected to be implicit in the surgical technology practice.

1. Follow aseptic techniques and work efficiently under supervision and without supervision.
2. Follow directions accurately to the smallest detail.
3. Carelessness and ignorance of the AST Recommended Practice may cost a patient's life.
4. Be able to quickly make changes sometimes without notice.
5. Anticipate the surgeon's needs. Be one or two steps ahead.
6. Learn to be organized.
7. Not assume that equipment is sterile. You must know.
8. Be patient to the impatient.
9. Be quiet, yet responsive, pleasant personality.
10. Be willing to work toward becoming the best possible surgical technologist.

THE OPERATING ROOM

The Mandl-ST Lab training is based on simulations resembling the actions performed in the operating room. Operating rooms are generally free of windows, spacious, easy to clean and well-lit, generally equipped with overhead lights and display screens and monitors. Temperature and humidity are controlled to maintain micro-organism growth to a minimum as well as patient comfort. Special air regulators filter the air and retain a slightly high pressure. The rooms are equipped with wall extraction, oxygen, and other anesthetic gases. In case of power outages, hospitals have back-up generators to provide electrical support while patients undergo surgery. The main equipment inside the operating room consists of the operating or surgical table, anesthesia machines, headlamps, stainless steel stationary table to set up the instruments, etc. Outside the operating room is a dedicated scrubbing area that is used by surgeons, Surgical Technologists, and nurses prior to surgery. All operating room suits typically have standard layout to facility cleaning and realignment of the operating table, equipment, and furniture to meet the needs of each procedure.

Operating Room Components

1. The operating or surgical table IS the center of the room. It can be raised, lowered, and tilted in any direction.
2. The operating room lights are over the surgical table to provide bright light, without shadows, during surgery.
3. The anesthesia machine is at the head of the operating table. This machine has tubes that connect to the patient to assist him or her in breathing during surgery, and built-in monitors that help control the mixture of gases in the breathing circuit.
4. The anesthesia cart is next to the anesthesia machine. It contains the medications, equipment, and other supplies that the anesthesiologist may need.
5. Sterile instruments to be used during surgery are arranged on a stainless-steel table called the back table. A smaller table that elevates and can be positioned over the patient during surgery to allow access to more immediate instrumentation and equipment is called a Mayo stand.
6. An electronic monitor (which records the heart rate and respiratory rate by adhesive patches that are placed on the patient's chest).
7. The pulse oximeter machine attaches to the patient's finger with an elastic band aid. It measures the amount of oxygen contained in the blood.
8. Automated blood pressure machine that automatically inflates the blood pressure cuff on

patient's arm.

9. An electrosurgical unit (ESU or “bovie machine”) uses high frequency electrical signals to cauterize or seal off blood vessels and may also be used to cut through tissue with a minimal amount of bleeding.

If surgery requires, a Heart-lung machine, or other specialized equipment, may be brought into the room. Heart lung machine takes the temporary control of the heart and lung during the surgery maintaining the circulation of blood and oxygen content of the body

Advances in technology now support Hybrid Operating Rooms, which integrate diagnostic imaging systems such as MRI and Cardiac Catheterization into the operating room to assist surgeons in specialized Neurological and Cardiac procedures.

STANDARD PRECAUTIONS

Standard precautions are a set of infection control practices used to prevent transmission of diseases that can be acquired by contact with blood, body fluids, non-intact skin (including rashes), and mucous membranes. These measures are to be used when providing care to all individuals, whether they appear infectious or symptomatic. OSHA recommends practicing the following safety measures to minimize risk of contamination.

HAND HYGIENE

It refers to both, washing and plain or anti-bacterial soap and water, and to the use of alcohol gel to decontaminate hands. When hands are not visibly soiled, alcohol gel is the preferred method of hand hygiene when providing health care to clients.

Hand hygiene should be performed before and after contact with a client, immediately after touching blood, body fluids, non-intact skin, mucous membranes, or contaminated items (even when gloves are worn during contact), immediately after removing gloves, when moving from contaminated body sites to clean body sites during client care, after touching objects and medical equipment in the immediate client-care vicinity, before eating, after using the restroom, and after coughing or sneezing into tissue as part of respiratory hygiene. Standard precautions are a set of infection control practices used to prevent the transmission of diseases

PPE

PPE includes items such as gloves, gowns, masks, respirators, and eyewear used to create barriers that protect the skin, clothing, mucous membranes, and the respiratory tract from infectious agents. PPE is used as a last resort when work practices and engineering controls alone cannot eliminate worker exposure. These appear infectious or symptomatic.

- Items selected for use depend on the type of interaction a public health worker will have with a client and the likely modes of disease transmission.
- Wear gloves when touching blood, body fluids, non-intact skin, mucous membranes, and contaminated items. Gloves must always be worn during activities involving vascular access, such as performing phlebotomies.
- Wear a surgical mask and goggles or face shield if there is a reasonable chance that a splash or spray of blood or body fluids may occur to the eyes, mouth, or nose.

- Wear a gown if skin or clothing is likely to be exposed to blood or body fluids. Remove PPE immediately after use and wash hands. It is important to remove PPE in the proper order to prevent contamination of skin or clothing. The CDC has suggested steps for correctly Donning and Removing PPE.

The surgeon may also wear special glasses that help him/her to see more clearly. Known as "loupes" these glasses have built-in microscopic lenses that magnify the field of vision for the surgeon. The circulating nurse and anesthesiologist will not wear a gown in the OR because they are not a part of the sterile team. They must keep 12-18 inches distance from any sterile object, person, or field.

III. SURGICAL LAB POLICIES

The practice of the surgical technology laboratory is based on simulation mirroring real events as they occur in the operating room. Students will be expected to treat the lab as if they are in a real operating room. This means that aseptic technique skills will be used at all times, as these actions will help students transition into the perioperative setting.

LAB PARTICIPATION

All students are required to come prepared for lab experience by having the required textbooks, folders, and supplies with them for each day of lab. Lab participation is essential to be prepared for entering the clinical site. Students must be checked-off on every specific surgical skill before entering any clinical site, therefore lab practice is mandatory and attendance policies will be strictly enforced.

Lab Etiquette:

- No gum chewing, food or beverages are allowed during lab practice.
- Clean up after every practice session.
- Students are expected to work as part of a team and help a fellow classmate.
- All instruments, supplies and equipment must be returned to their proper place at the end of each laboratory class.
- Instruments and equipment must be handled carefully.
- No instruments or equipment are to be "borrowed" or removed from the lab without the instructor's authorization.
- All drapes, packs, and supplies must be properly wrapped before leaving the lab.
- All trash, etc., must be disposed of in a proper container.
- Each student is responsible for cleaning his/her own area.
- OR furniture should be returned to its proper place.
- Negligent use of needles, sharps, etc. may result in injury.
- Negligent use of equipment may result in dismissal from the program and/or payment for said equipment.
- Scrubs, hats, shoe covers, and mask are to be worn in the lab.

EXAM POLICIES

Specific competencies must be met before the student is allowed to scrub in the clinical site. We typically have a Midterm and a Final exam. The school and program have a **NO MAKEUP** exam policy unless is due to COVID 19, with valid proof and this should be approved by the administration. Each semester, competencies must be signed off by a faculty member. Failure to complete the required competencies will result in failure of the clinical course

Lab grades will consist of lab skills evaluation and participation. A final grade for the lab class will be determined by:

- Lab class participation (attendance and involvement)
- Successful completion of specific skills
- Completion of lab assignments if any
- Quiz scores if any

For the 3rd and 4th semesters, successful completion of the final proficiency examination prior to reaching a clinical semester will consist of the assessment of the following competencies:

- Room preparation and opening of sterile supplies
- Surgical hand scrub, dry, gown, self-gloving following aseptic techniques
- Set up back table & mayo stand
- Count instruments and sterile supplies in the correct SSI fashion.
- Gown and glove the surgeon
- Construction of the sterile field around the patient and set up for surgery
- Assist surgeon during mockup procedure with instrumentation

Grading Criteria

The following competency testing policy is in effect for the Mandl School Surgical Technology program:

1. Lab final grade represents the **30%** of total grade of the lecture class.
2. Student must fully **follow dress code** and **nail policy** in order to be allowed taking lab exam.
3. Arrival on time is a must. No student will be allowed into the lab fifteen (15) minutes after competency exam begins or at the designated timeframe as designated by the instructor, unless demonstrates a valid excuse for lateness.
4. Talking, eating, drinking, or making excessive noise is discouraged during exam time.
5. Mandl School exam policy states **NO MAKE UP EXAMS**. However, if a student misses a competency exam due to sickness or an emergency, it is the student's responsibility to present valid written proof and schedule an alternate testing time at the convenience of the instructor.

Students that violate the dress code and nail policy will be denied taking their final lab competency. The clinical/lab competency must be passed with **77%** or better in order to continue in the program. Students who do not pass the practical exam with **77 %** on the final lab competency will receive an INCOMPLETE and will be placed in lab remediation and retested before the following semester begins. Failure of the second competency exam will result in withdrawal from the program.

Student attempting to take their practicum for second time will maintain an overall 74.5 grade in the course or better. In order for the student to pass the second lab competency attempt must obtain a minimum of **80 grade**.

ATTENDANCE and LATENESS

Attendance is taken for each lab class and serves as an indication of their commitment to the course and the surgical technology profession. In Surgical Technology, attendance to lab is **MANDATORY**. Clinical skills will be introduced, demonstrated, and practiced in the lab setting. As with the lecture course, laboratory practice is the most important portion of your training. Mastery of appropriate surgical techniques takes time and requires that students be fully engaged in all laboratory sessions. Missing a day may mean missing important lab skills. Laboratory time is to be spent on demonstration,

practice, observation, and evaluation of proficiency.

IMPORTANT REMINDER

Late arrival to class is very disruptive, so allow time for parking or public transportation issues. ***Fifteen (15) minutes after lab session has started, the door will be closed***, and it will up to the instructor's discretion to allow you into the lab during the break or send you home. **Three (3) late arrivals will constitute chronic lateness and will count as ONE absence.** The instructor might grant a late student access when there is a break. However, repetitive lateness the instructor has the right to send you home. Additionally, too many absences will lower your lab overall grade due to lack of practice as well as lowering your participation grade. Likewise, any absence due to COVID or ACUTE medical emergency will require a doctor's note before the student can return to class. Additional lab time will be assigned if missing class upon instructors' availability. - ***ONE UNEXCUSED lab absence constitutes 5% deduction of the final grade - TWO unexcused absences constitute 10% deduction of your lab grade - THREE UNEXCUSED lab absence constitutes 15% deduction of the lab grade. FOUR unexcused lab absences constitute 25% deduction of the lab grade. Students that exceed FOUR (4) absences will be withdrawn from class and awarded with an "F"*.**

Students are expected to communicate previously with your instructor if an absence or lateness will occur.

DRESS CODE POLICY

The Surgical Technology Program at Mandl School strictly adheres to the *AST Standards of Practice for Surgical Attire, Surgical Scrub, Hand Hygiene and Hand Washing and the standards that apply to all surgical facilities.* All Students must present themselves as professional role models. Failure to comply with the following requests will result in a program write-up. ***Repeated violations of these policies can result in your instructor preventing you from participating in lab, send you home after you are meeting with the Vice President of Academics, Dean of Academics, Department Chair, or evening Director, whomever is present on campus at that moment.***

Lab Attire

ST students must wear blue scrubs as designated by the school. Students that do not come to class prepared for lab in their scrubs will be dismissed and marked absent. The lab does not have a changing room and the bathroom on the fourth floor can be used as a changing room prior to the start of class. A student entering class and leaving to change will be re-admitted to the class at the discretion of the instructor so that the level of this disruption is kept to a minimum. **Undergarments such as T-shirts with short or long sleeves cannot be worn underneath the scrub tops (tank tops or sleeveless shirts are only acceptable).** Unless it is for religious purposes, all hats, hoods, and scarves must be removed prior to the start of the class. Students will be asked to leave the class to remove the undergarments. Your return to the lab will be at the discretion of the instructor.

Shoes

Students are to supply their own shoes. Shoes should be comfortable and dark color.
The shoes should allow for adequate support since Surgical Technologists stand most of the day. Canvas shoes and shoes with openings near the toes are unsafe.

Fingernail Policy
Healthcare professionals such as surgical technologies follow healthcare facilities policy related to wearing nail polish. Artificial or long nails and other types of nail coverings, including nail polish **are not to be worn by any Surgical Technology student at no time during the semester is in progress.**

team role they are fulfilling as these harbor bacteria and possible fungus that can be transmitted to patients if there is an accidental tear or hole in the sterile glove.

Personal Hygiene
It is expected that each student will follow basic rules of hygiene: daily bath/shower, shampoo, clean underclothing, use of deodorant. Fingernails are to be kept short, clean, free of injury. The use of perfume or colognes should be kept to a minimum during lab, or not at all as these can cause allergic reactions to a fellow classmate. The use of perfume or colognes in the operating room are restricted to avoid patient's allergic reaction.

20 Sec. Surgical Handwash with Antisepsis/Hand Rub
Alcohol based solutions reduce bacterial counts on hands more rapidly than do antimicrobial soaps. However, alcohol only does not have the cumulative effect and hands could be back to re-rub microbial count within 1-3 hours. Alcohol based hand rub solutions also have a desiccating or drying effect on skin. Combination of alcohol, other antimicrobials and emollients.

Suggested Protocol:
1. Wash hands and forearms with soap and running water immediately for 20 sec. before beginning the procedure.
2. Clean the subungual areas of both bands under running water using a nail cleaner.
3. Rinse hands and forearms under running water.
4. Dry hands and forearms thoroughly with a paper towel.
5. Dispense the manufacturer-recommended amount of the surgical hand rub product.
6. Apply the product to the hands and forearms, following the manufacturer's written directions. Some may require the use of water as part of the process.
7. Rub thoroughly until dry.
8. Repeat he product application process if indicated in the manufacturer's written directions.

Jewelry
Jewelry is NOT to be worn during lab practice as it is prohibited in the operating room. It is prudent to leave all jewelry at home. All objects used in body piercings that can be seen must be removed. These include facial and ear piercings.

DECORUM
All cell phones, electronic games, recording devices, radios, tape or CD players, ear buds, or headphones or other devices that generate distraction or sound must be turned off or removed during lab. The instructor may asked the student to leave the classroom if any of these devices are in used

during class. Students must exit the classroom to make or receive emergency calls. Leaving the classroom to answer a phone call or use the bathroom is disruptive to the flow of the lecture; therefor re-admittance will be subject to the instructor's discretion. **Hats, hoods, and scarves** are to be removed when entering the lab for both lecture and lab.

GRADING CRITERIA

Grades are computed using the total points earned from coursework following the school's grading schematics.

A = 95-100	A- = 90-94	B+ = 87-89	B = 84-86	B- = 80-83	C+ = 77-79	F = 76

To successfully complete a lab course, students must earn a minimum of 77 out of 100 points. The Surgical Technology Department adheres to the official Mandl School grading policies.

- **MINIMUM PASSING score, 77% (C+)** and above. This includes **BIO 230** and **BIO 240**
- **FAILLING** "F" **score**, **76% and under**

IV LABORATORY LEARNING SKILLS

The lab provides a setting for students to practice and demonstrate skills in a mock surgical setting under faculty supervision. Each Surgical Technology course includes a lab component that is designed to prepare Surgical Technology students to function safely and effectively at the clinical facility. Students are to actively participate in on-campus lab learning activities. Surgical Technology students are required to successfully complete all lab skills in order to move on to their clinical rotation. Students are given a sufficient amount of time to master each skill. Skill demonstrations and return demonstrations are based on the assigned learning objectives and textbook readings.

LAB LEARNING OBJECTIVES

1. Demonstrate and discuss the principles of aseptic technique.	Students will be able to distinguish and demonstrate the boundaries of the sterile field through demonstration and debate. Theories defined in lecture are translated and put into practice during lab training. Students will successfully exhibit correct aseptic techniques while performing hands-on skills during lab practice as well as on the practicum examination.
2. Demonstrate and discuss the principles of scrubbing, gowning, and gloving.	Students will use the foundational knowledge of microbiology to apply the principles and peripheries of sterility. The practical rehearsal of these laboratory tasks will enable the student to identify and review the principles of aseptic technique as defined in the course. Students will successfully respond to questions during laboratory practice and demonstrate skills connected to these principles on the practical examinations.
3. Demonstrate and discuss the principles of skin preparation and patient positioning.	Through demonstration and laboratory practice, the student will be able to successfully perform all the basic steps of skin preparation following principles of aseptic techniques. Students will respond questions related to patient prep techniques, parameters, potential contamination issues, and positioning types, patient safety and potential injuries on the examinations

	as well as exhibit skills related to basic skin preparation on the practicum examination.
4. Demonstrate and discuss the principles of sterile draping methods.	Over the course of the academic year, students will apply appropriate techniques of sterile drapes to the patient on the operating table. During open lab, the student will have numerous opportunities to successfully practice these techniques, answer questions on the patient assessment, as well as exhibit skills learned during on the practicum examination.
5. Demonstrate and discuss case preparation, including instrumentation, sutures and surgical supplies and equipment.	Through the use of recall and review of learned material, the student will be able to recognize the difference between basic surgical instrumentation, supplies and equipment, as well as suture materials, and suturing techniques. The student will be capable of distinguishing the instruments through visual inspection and be able to relate the inventory to its proper usage. Students will successfully answer questions, as well as exhibit skills related to proper recall and handling and purpose of all equipment and supplies on the practicum examination.
6. Demonstrated and discuss the process of case management and the normal progression of surgical procedures from preparation, beginning, intraoperative and ending.	By means of practical exhibitions and interaction, the student will be able to demonstrate all the arrangements and constructions of the sterile field. and apply all of the theories learned during actual mock surgical procedures from the pre-operative, the intra-operative and post-operative phase of basic surgical interventions. Students will successfully demonstrate and respond questions during examinations skills related to surgical interventions on the practicum examination.

By repetitive demonstration and lab practice, students will be able to apply and state the issues concerning sterility and breaks of aseptic techniques in regard to self-gowning and gloving, gowning and gloving other team members, and hand washing strategies.

SURGICAL SKILLS: LEARNING OBJECTIVES BY SEMESTER

The following skills will be learned, practiced, demonstrated, and tested. Each academic semester throughout the academic year, the students will develop specific skills and progressively build up their surgical skills in preparation for their clinical experience.

1ST SEMESTER

Student enrolled in the first are required to learn and understand the most basic skills surrounding aseptic techniques and its application in the various surgical tasks as detailed as follow:

SRG 110L: Microbiology and Asepsis

SRG 111L: Surgical Technology and Fundamentals

Basic Skills:

- Review of basic aseptic techniques
- Donning PPE

- Learn basic surgical supplies & equipment, OR furniture
- Basic Hand wash
- Review techniques to open sterile packs and supplies
- Open of back table, basin, instruments, gown, and don closed gloving technique
- Flipping sterile items onto open back table
- Scrubbing (time & count method)
- Donning gown and gloves aseptically
- Removing soiled gown and gloves at the end of the case.

Instrumentation:

- Learn General & GYN instrumentation
- Load of blades, sutures, tie on a passer, peanuts, sponge on a stick.
- Time and process of Steam Autoclave, Steris, Sterrad, and Cidex, in accordance with lecture

Packaging Technique:

- Envelope Folding technique, Square Fold, Peel Pack, Container System

2ND SEMESTER

Students enrolled in the 2nd semester should be able to remember ALL skills learned in the 1st semester as they continue building up their surgical practical knowledge by learning new skills.

SRG 113L: Perioperative Principles I

Review of ALL skills learned in the 1st semester: handwash, the opening of sterile packs, supplies, flipping techniques, surgical hand scrub, gowning, and gloving. Review of loading blades, ties, peanuts, sponge on a stick, General and GYN instruments, packing techniques, etc.

Learn and practice new skills:

- Draw of medication and accepting irrigation on back table, correct identification and proper labeling, dosage and passing syringe to the surgeon
- Back Table and Mayo set up
- Surgeon gowning/gloving
- Introduction to instrument counts (SSI method)
- Positioning, skin prep, and draping of patient
- Introduction to basic Mock surgery for General and GYN
- Removal of soiled gown and gloves after procedures

3RD SEMESTER

The third semester is a key phase for preparing the student for externship. Students will review ALL skills learned in previous semesters and introduce to mock surgeries where they will incorporate new skills to develop suitable practical knowledge.

SRG 115L: Pathophysiology

SRG 210L: Surgical Procedures I

- **Review of ALL skills learned in the 2nd semester:** hand wash, the opening of

sterile packs, back table, supplies and instruments, gown, and glove. Back table and mayo set up, sterile supplies and instrument count (SSI method), draw medication and fluids, labeling, the load of blades and sponges. Assist the surgeon with gowning and gloving.

- **Mock procedures for General, GYN, Plastic, GU, Ophthalmology, neuro/spine.**
  - Assist with skin prep and drape of the patient
  - Demonstration of passing instruments, blades, and supplies in proper manner exercising anticipation and critical thinking.
  - Remove soiled gown and gloves following universal precautions

4TH SEMESTER

The *fourth* semester is the last didactic phase prior to externship. At this level, the students are expected to be independent in all basic surgical skills and practical knowledge. Students will engage and perform mock procedures, basic and advanced, and demonstrate appropriate skills, suitable for the operating room. Students that do not demonstrate proficiency in all basic skill may be held back and won't be allowed to go into externship.

SRG 114L: Perioperative Principles II
SRG 211L: Surgical Procedures II
SRG 212L: Surgical Procedures III
SRG 213L: Advanced Surgical Procedures III

- **Review of ALL skills learned in the 3rd semester:** hand wash, the opening of the sterile back table, supplies, and instruments. Back table set up and mayo, instrument counts (SSI method). Draw Up Medication in a Syringe (off the sterile field). Accept Medication into the Sterile Field (into a container). Correctly Identify Medication Dosage. Gown and glove surgeon.
- **Perform MOCK PROCEDURES for <u>ALL</u> basic and Advanced Procedures:** General, GYN, GU, Vascular, Neuro, Ortho, spine, thoracic, ophthalmic, tracheotomy, and tracheostomy.
  - Use of ESU: monopolar, bipolar
  - Hemostatic agents and devices
  - Intraoperative Cholangiogram Technique
  - Specimen management (frozen, permanent, cytology, bone, stones)
  - Culture and Sensitivity
  - Develop of Special techniques for:
  - Emergency Trauma surgery skills
  - Plate and Screw Fixation Devices Maxillary and Mandibular Fractures with Possible Arch Bar Application
  - Skin Graft

Ergonomics

Ergonomics is the science of fitting the job to the worker. When there is a mismatch between the physical requirements of the job and the physical capacity of the worker, work-related musculoskeletal disorders (MSDs) can result. It is the practice of designing equipment and work tasks to conform to the capability of the worker, it provides a means for adjusting the work environment and work practices to prevent injuries before they occur. Health care facilities especially nursing homes have been identified as an environment where ergonomic stressors exist.

POTENTIAL HAZARD

Employee exposure to work related MSDs from ergonomic stressors that have not been effectively identified and addressed in a facilities safety and health program. Many patients/residents (especially nursing home residents) are totally dependent on staff members to provide activities of daily living, such as dressing, bathing, feeding, and toileting. Each of these activities involve multiple interactions with handling or transferring of patients/residents and could result in employee injuries. Employee injuries lead to increased injury costs, higher turnover rates, increased sick/injured days, and staffing shortages.

Possible Solutions

OSHA's OSH Act of 1970 strives to "assure safe and healthful working conditions for working men and women..." and mandates that "each employer shall furnish to each of his/her employers' employment and a place of employment which are free from recognized hazards that are causing or are likely to cause death or serious physical harm to his/her employees." OSHA recommends minimizing manual lifting of patients/residents in all cases and eliminating lifting when possible. OSHA recommends that employers identify and address ergonomic stressors in their facility's safety and health plan. General safety and health plan information can be found in the Administration - Safety and Health Program.

Methods of Transfer and Lifting

Methods of transfer and lifting to be used by all health workers. Compliance with transfer and lift procedures. Procedures for reporting early signs and symptoms of back pain and other musculoskeletal injuries.

Employee Participation should include:

- Complaint/suggestion program which includes employee reports of unsafe working conditions.
- Prompt reporting of signs and symptoms as well as injuries.
- Never lift alone, particularly fallen patients/residents, use team lifts or use mechanical assistance.
- Limit the number of allowed lifts per worker per day.
- Avoid heavy lifting especially with spine rotated.
- Training in when and how to use mechanical assistance.
- Patient handling tasks pose increased ergonomic risk if they are: repetitive (e.g., repeatedly cranking manual adjustments for beds), done in awkward postures (e.g., reaching across beds to lift patients/residents) done using a great deal of force (e.g., pushing chairs or gurneys across elevation changes or up ramps), lifting heavy objects (e.g., manually lifting immobile patients/residents alone) or combining these factors.

Other potential hazards include:

- Overexertion; trying to stop a patient/residents from falling or picking patient/residents up from floor or bed.
- Excessive weight lifts (more than 40 pounds).
- Lifting alone (moving unconscious surgical patients from and to OR table require 4 people)
- Lifting un-cooperative, confused patients/residents.
- Lifting patients/residents that cannot support their own weight.
- Lifting in confined spaces
- Uneven floor surfaces may cause trips and falls
- Slippery on wet floors
- Poorly maintained walkways or broken equipment can potentially cause injuries
- Patient/residents weight (bariatric patients/residents).
- Expecting employees to perform work beyond their physical capabilities.
- Distance to be moved, and the distance the patient/residents is from the health care worker
- Awkward postures required by the activity.
- Ineffective training of employees in body mechanics and proper lifting techniques.

Forces on the spine increase when lifting, lowering or handling objects with the back bent or twisted. This occurs because the muscles must handle your body weight in addition to the weight of the patient/residents being lifted.
More muscular force is required when awkward postures are used because muscles cannot perform efficient. Fixed awkward postures (i.e., holding the arm out straight for several minutes) contribute to muscle and tendon fatigue, and joint soreness. Reaching forward or twisting to support a patient/residents from behind to assist them in walking.

TRANSFERRING PATIENTS

- **Lateral transfer devices:** Devices used to laterally transfer a patient/residents for example from bed to gurney. They usually involve multiple staff members to help do the lifting. This is often done with the help of a draw sheet, or similar device. Some new lateral transfer systems do not require any lifting by staff and are totally mechanical. This type of device helps prevent staff back injuries.
- **Sliding boards:** A slick board used under patients/residents to help reduce the need for lifting during transfer of patient/residents from bed to chair, or chair to car. Patients/residents are slid rather than lifted.
- **Slip sheets/Roller sheets:** Help to reduce friction while laterally transferring patients/residents or repositioning patients/residents in bed and reduce the force workers need to exert to move the patient/residents.
- **Repositioning Devices:** Mechanically pulls patient/residents up in bed eliminating manual maneuvering by staff.

Height adjustable electric beds that have height controls to allow for easy transfers from bed height to wheelchair height. These beds can be kept low to the ground for patient/residents safety and then raised up for interaction with staff. Avoid hand cranked beds, which can lead to wrist/shoulder musculoskeletal disorders such as strain or repetitive motion injuries. Wheelchairs with removable arms to allow for easier lateral transfers. Especially useful with height adjustable beds.

AST STANDARDS OF PRACTICE

Guidelines for Best Practices for Surgical Attire, Surgical Scrub, Hand Hygiene and Hand Washing

Rationale

The following are Recommended Standards of practice related to properly wearing the surgical attire and performing the surgical scrub in the perioperative setting. Bacteria residing on the hands of the surgical team can be the cause of surgical site infections (SSI). When the members of the sterile surgical team use a non-antimicrobial scrubbing agent, the bacteria rapidly multiply under surgical gloves (CDC, 2002). Even though the members of the sterile surgical team wear sterile gowns and gloves, studies have shown that bacterial growth is decreased when an antiseptic scrubbing agent is used when performing the surgical scrub, thus reducing the risk of SSI in particular if a glove sustains a puncture or tear. Healthcare facilities should evaluate and choose surgical scrub solutions based on their meeting US Food and Drug Administration (FDA) standards; ability to decrease to an irreducible minimum the number of bacteria on the hands and forearms immediately after performing the surgical lscrub, ability to provide persistent antimicrobial activity and to provide long-term cumulative activity. Of those items used to evaluate a scrub solution, immediate and persistent activity are considered the most important when determining the efficacy of the solution. FDA standards state that solutions used for the surgical scrub should substantially reduce microbes that reside on the skin, contain a nonirritating antimicrobial preparation, possess a broad- spectrum of antimicrobial properties, be fast-acting and have persistent, cumulative activity.

Additionally, wearing surgical attire has been shown to aid in containing the shedding and dispersal of skin squames into the environment. The human body is a major source of bacterial contamination in the surgical environment.

Surgical site infections (SSI) have been traced to bacteria from the hair, scalp and skin of surgical personnel. The purpose of the surgical attire is to protect the patient and staff by maintaining a limited microbial spread. In order to maintain a clean environment and adhere to OSHA regulations, surgical attire must be worn. The healthcare facility should establish policies and procedures for evaluating the efficacy of surgical attire prior to being purchased, proper wearing of attire and compliance by the surgical personnel.

In summary, the purposes of the surgical scrub and surgical attire is to promote patient safety by helping to prevent environmental contamination; prevent the transfer of transient microorganisms and debris from the hands and forearms; decrease the number of resident microorganisms to an irreducible minimum; and inhibit rapid proliferation of microorganisms on the nails, hands and forearms. All surgery department personnel should be involved in the process of developing and implementing healthcare facility policies and procedures for surgical attire and performing the surgical scrub.

Standard of Practice I

The proper surgical attire should be worn in the semi-restricted and restricted areas of the healthcare facility surgery department.

1. Surgical attire that should be worn in the semi-restricted and restricted areas of the surgery department includes the head cover, masks, scrub suit, warm-up jacket, and shoes.

A. The surgical team members are responsible for preventing SSI by properly donning and wearing the appropriate head cover or hood. The surgical department should follow recommended OSHA and CDC standards for personal protective equipment (PPE).

(1) The surgical head cover or hood should be lint-free and cover all head and facial hear. Head covers prevent the shedding of hair, squamous cells, and/or dandruff onto the scrub suit.
(2) To prevent shedding onto the scrub suit, the first item of the surgical attire to be donned should be the head cover.
(3) Surgeons (skull) caps/head covers are not recommended for use. The determination is that the surgeons head cover does not completely cover the hair exposing the patient to the possibility of acquiring a SSI.
(4) Disposable bouffant and hood head covers offer complete coverage of the head and facial hair and should be worn by all OR personnel.
(5) It is recommended that surgery personnel with facial hair wear a disposable hood to completely cover the facial hair.
(6) The surgical department should develop policies and procedures addressing the wearing of head covers by surgical personnel entering the semi-restricted and restricted areas of the surgical suite based on OSHA, CDC and APIC standards.
(7) The practice of allowing the use or not allowing the use of reusable cloth caps is governed by the healthcare facility policies and procedures. However, it is recommended that reusable cloth covers should not be worn.
(8) If worn, reusable cloth head covers should be laundered daily in the healthcare facility laundry services or third party health-care accredited laundry facility that is contracted by the healthcare facility
(9) If the reusable cloth head cover becomes contaminated with blood or body fluids it should be immediately removed and laundered.
(10) Disposable bouffant and hood covers should be discarded in a designated receptacle after use. If the disposable head cover becomes contaminated with blood or body fluids, it should be removed and discarded as soon as possible, and a clean head cover donned.
B. The mask must be worn at all times in restricted areas including the sub-sterile rooms and scrub sinks.2 The mask will only be effective when properly worn.
(1) The wearing of a surgical mask and safety eyewear to protect the mucous membranes of the eyes, nose, and mouth during procedures in which the possibility of splashes or sprays of blood, body fluids and other secretions could occur is mandated by the OSHA Bloodborne Pathogens Standard.
(2) The mask should be worn to completely cover the nose and mouth.
(3) Masks should fit in a comfortable, but secure manner to prevent venting at the sides. Venting can allow the entry of infectious microbes that could contact the surgical team member's nose and mouth or dispersal of infectious microbes to the sterile field by the surgical team member.
(4) The pliable metal or plastic noseband should be contoured to fit over the bridge of the nose to aid in providing a close fit and prevent the mask from slipping. To prevent fogging of safety eyewear, tape can be used to cover this portion of the mask.
(5) Masks should be either on or completely off. They should not be allowed to hang around the neck or folded and placed in a pocket for later use. Used masks harbor multiple microbes that can be transferred to the scrub suit and dispersed into the healthcare facility environment.
(6) When a surgical team member is performing the surgical scrub the mask must be worn; it should be secured in place prior to starting the scrub. When other surgery department personnel who are not performing the scrub are talking with a person who is performing the scrub, the non-scrub person should be wearing a mask.
(7) If wearing a mask with strings, the mask should be handled only by the strings when discarding to prevent contamination of the hands. When removing a mask, it should be immediately discarded

into the biohazard waste bag. The surgical team member should perform a hand wash after removing the mask.

(8) It is recommended that a new mask be used for each procedure or at the minimum, changed frequently and if it becomes wet and or/ contaminated by blood and body fluids.

C. Healthcare facility approved clean, freshly laundered surgical scrub suit designated for wear in the perioperative environment should be worn by surgical personnel who will enter the semi-restricted and restricted areas.

(1) Surgery personnel, including CSTs, should be involved with the decision-making process regarding the purchase of surgical attire.

(2) Surgery personnel, including CSTs, should be involved with the development and review of healthcare facility policies and procedures regarding surgical attire.

(3) Surgical attire fabric should be free of lint, provide comfort and allow for "breathability" (allow the escape of body heat) while containing the shedding of skin squames.

a. The fabric should be tightly woven to prevent skin squames from being released through the pores of the fabric into the environment does not meet the federal standard for flammability.

C. It is recommended that healthcare facilities purchase scrub suits that are made of 100% spun bound polypropylene in order to contribute to the decrease of the environment by the shedding of skin squames.

(4) The scrub suit should be donned in the healthcare facility designated changing room. Changing from street clothes to the scrub suit in the designated room aids in decreasing contamination of the environment.

a. Prior to donning the scrub suit the head cover should be donned to prevent shedding of microbes onto the scrub suit.

b. When donning a two-piece scrub suit (shirt and pants), the scrub shirt should be tucked into the pants to contain skin squames and prevent billowing outward in the operating room and contaminating a sterile surface.

c. T-shirts that are worn under the scrub shirt must be completely covered and should not extend above the scrub shirt neck or below the sleeves.

(5) Whenever leaving the healthcare facility, the surgical personnel should change into street clothes. Scrub suits worn outside the facility can come into contact with external microbes and contaminants and be transported into the facility environment.

a. A used scrub suit should not be stored in a locker or hung in the changing room to be worn again. The disposable single-use or reusable attire should be placed in the proper container that is indicated for used attire in the changing room. Scrub suit that has been contaminated with blood, body fluids or other potentially infectious material (OPIM) should be changed as soon as possible and freshly laundered scrub attire donned. Changing the attire aids in protecting the individual from pathogenic microbes and cross-contamination of patients.

b. Scrub suits (and other cloth surgical attire) should be laundered by the healthcare facility laundering services or by the thirdparty health-care accredited laundry facility that is contracted by the healthcare facility

D. Non-sterile surgical team members (anesthesia provider, circulator) should wear a healthcare facility approved, freshly laundered long-sleeved warmup jacket in the semi-restricted and restricted areas.

(1) The jacket aids in containing the skin squames shed from the arms and axillary regions.

(2) The jacket should be fully snapped or zipped shut to prevent it from billowing outward upon movement and contaminating a sterile surface or item.

(3) If a CST who will be performing the surgical scrub is wearing a jacket it must be completely removed prior to performing the surgical scrub. This includes not wearing/tying the jacket around the waist.

E. Cover apparel, such as a lab coat, cover gown or other appropriate clothing should be worn when exiting the surgery department.

(1) The cover apparel should be long-sleeve and full-length (knee length). Upon donning it should be completely fastened when leaving the surgical department to protect the integrity of the scrub suit. Covering scrub attire may eliminate the need for donning a freshly laundered scrub suit upon reentry to the surgical department and consequently decrease costs.

(2) The cover apparel must be removed prior to entering the semi-restricted or restricted areas.

(3) Healthcare facility policies and procedures should be followed pertaining to the wearing of cover apparel.

F. Surgical personnel should protect themselves from contact with blood and body fluids by wearing disposable shoe covers.

(1) The use of shoe covers has never been proven to decrease the risk or incidence of SSI, or to decrease the bacterial counts of the OR floors. However, shoe covers do protect the footwear and feet from exposure to blood and body fluids.

(2) Fluid-resistant disposable shoe covers should be worn in the semi-restricted and restricted areas of the surgery department.

(3) Disposable shoe covers should be worn if it is anticipated that contact with blood and body fluids, splashes and spills may occur.

(4) Knee-high impervious boot style covers should be work if it is anticipated that there could be a large amount of irrigation fluid use and/or large amount of blood and/or body fluid loss.

(5) Shoe covers must not be worn outside the surgical department to avoid tracking blood and body fluids, debris and other gross contaminants throughout the department.

(6) Clean shoe covers should be donned when returning to the semi-restricted and restricted areas.

(7) Shoe covers must be changed daily.

(8) Shoe covers that are soiled and contaminated, torn, moist/wet, must be changed as soon as possible. When removing the contaminated shoe covers, surgical personnel should wear non-sterile gloves to protect the hands from the gross contamination.

(9) When discarding shoe covers, they should be discarded in a designated receptacle.

(10) Shoe covers should be removed before entering the changing room and must be removed when leaving the surgical department.

(11) Shoe covers should be kept in close proximity to the semi-restricted area.

G. Surgical personnel should be aware of the hazards associated with workplace foot and toe injuries, and should protect himself/herself from injury by wearing the correct footwear.

(1) Sandals, shoes made of soft materials, and open toe and open heel shoes should not be worn in the surgery department. It is recommended that the footwear have low heels.

(2) Rubber boots and leather shoes are two recommendations for footwear that offer good protection.

(3) The footwear should be comfortable, supportive, breathable and protective.

(4) Surgical personnel who wear footwear that is designated for use only in the surgery department must make sure the footwear meets healthcare facility standards.

(5) Surgical personnel are responsible for keeping the footwear clean and in good repair. Gross contaminants should be cleaned from the footwear as soon as possible and not be allowed to build-up on the surface.

(6) If footwear is specifically designated for use in the surgery department and worn without shoe covers, the footwear must not be work outside the department.

Standard of Practice II

The surgical scrub should be performed by all members of the sterile surgical team, who will be donning a sterile gown and gloves.

1. The surgical scrub, when properly performed, has been shown to remove transient skin flora from the fingernails, hands and forearms; reduce the resident microbial population to an irreducible minimum; and slow the growth of bacteria in order to contribute to reducing the risk of a SSI

2. Surgical hand antisepsis should be accomplished using either an antimicrobial soap or an alcohol-based solution with cumulative, persistent antimicrobial activity before donning the sterile gown and gloves.

Standard of Practice III

The members of the sterile surgical team should complete the pre-scrub activities in preparation to performing the surgical scrub.

1. The fingernails should be kept clean, not extend beyond the fingertips and artificial nails should not be worn.

A. Fingernails that are long and extend beyond the fingertips can puncture the gloves placing the patient at risk of SSI from exposure to the transient and resident skin flora. Additionally, long fingernails place the patient at risk for injury when the surgical team member is providing direct care to the patient, eg aiding the patient in moving from the stretcher to the OR bed, patient positioning, etc.

B. The subungual has been identified as harboring the majority of microorganisms as compared to the skin of the hands and forearms. Debris should be removed from the subungual area with the use of a sterile, plastic single-use, disposable nail cleaner that is usually provided with the scrub brush package. Reusable nail cleaners are not recommended. Orangewood sticks should not be used to clean the fingernails due to the tendency of the wood to splinter and harbor *Pseudomonas* organisms. The fingernails should be cleaned under running water at the scrub sink. After use, the disposable nail cleaner should be disposed according to healthcare facility policy. The dirty nail cleaner should not be discarded into the scrub sink in order to prevent cross contamination.

C. Nail polish, if worn, should be freshly applied and free of chips. Studies have not established a correlation between the wearing of freshly applied nail polish and an increase in microbial growth.8 However, nails with chipped polish or polish that has been worn for more than four days harbor a greater number of bacteria as compared to unpolished nails.20 Surgical personnel should follow healthcare facility policy related to wearing nail polish.

D. Artificial nails and other types of artificial nail coverings, such as silk overlays should not be worn by any member of the surgical team, no matter what team role they are fulfilling.9 Cultures of surgical team members who wear artificial nails demonstrate increased bacterial and fungal counts as compared to personnel who do not wear artificial nails. Additionally, hand carriage of Gram-negative organisms has been shown to be greater among wearers of artificial nails than among non-wearers.

E. Cuticles should be kept clean and intact; the cuticles should not be trimmed or cut.

2. The intact skin layer is the first line of defense for preventing the entry of microbes into the body. When the skin is damaged by burns, lesions, abrasions, and cuts, it creates an opening for the invasion of microbes, placing the patient and surgical team member at risk for acquiring an infection. Additionally, the sterile team member could transfer pathogens, if bodily fluids in the form of exudate from burns, lesions, abrasions, and cuts, come into contact with the patient.

A. The skin of the hands and forearms should be intact with no burns, lesions, abrasions, and cuts

present. The surgical team member should inspect the hands and forearms prior to performing the surgical scrub to confirm the skin is intact.

B. If there is a break in the integrity of the skin, the surgical team member should determine if the extent of the damage to the skin prevents performing the surgical scrub and participating as a member of the sterile team.

3. All jewelry including rings, bracelets, and watches should be removed prior to performing the surgical scrub.

A. Jewelry is not sterile and can harbor microorganisms. Studies have reported a significant increase in the bio load on the hands of personnel who wear rings after performing a hand wash as compared to personnel who perform a hand wash not wearing rings. Studies have also demonstrated that the skin underneath rings is more heavily colonized as compared to areas of the skin on the fingers where rings were not worn. Lastly, studies show that the bio load and concentration of microorganisms increase exponentially correlated to the number of rings worn.

B. Jewelry is removed in order to allow the surgical scrub solution to make contact with the entire skin and sides (planes) of the fingers, hands, and forearms.

Standard of Practice IV

Scrub solution dispensing containers should be a closed container that is maintained in working condition.

1. Scrub solution dispensing containers should not be an open container and have a lid.

2. The use of single-use containers is recommended, and they should be discarded when empty according to healthcare facility policy.

3. If reusable containers are used, it is recommended that the container be evaluated prior to purchase for ease in cleaning, including the tubing and dispensing spout, ability to maintain its function for long periods of time, and ability of tubing and dispensing spout to remain free from obstruction.29 If reusable containers are used, it is recommended that healthcare facilities purchase reusable containers that can be sterilized between uses.

4. Prior to reuse, the decontamination process should be completed to include the outside and inside of the reusable container, sterilized if possible and dried. The container should be dry in order not to "water-down" the scrub solution and reduce its microbial effectiveness.

5. The container should never be refilled or what is referred to as "topping off."

Refilling or topping off without first decontaminating the container can cause contamination of the scrub solution and container, thus contributing to the risk of cross contamination.

Standard of Practice V

The healthcare facility should provide an FDA-approved scrub solution that has immediate, cumulative and persistent antimicrobial action for use by the surgical personnel.

1. The surgical personnel and infection control officer should be involved in the process of evaluating and selecting scrub solutions. In the US antiseptic scrub solutions are regulated by the FDA's Division of Over-the-Counter Drug Products. The evaluation should involve the review of the manufacturer's information to confirm that the scrub solution was tested according to FDA requirements and to review the results of the testing to confirm efficacy.

A. The involvement of the surgical personnel in the decision-making process has been shown to contribute to compliance with hand washing and scrub procedures. The surgical personnel are able to evaluate the properties of the scrub solution, including effects on the skin and contribute to the final decision about the scrub solutions that are the most effective antimicrobial solutions and least harmful to the skin. The cost of the surgical scrub solution product should not be a factor that

influences the decision-making process.

Standard of Practice VI

Alcohol-based solutions are an effective scrubbing agent (CDC, 2000). The selection of an alcohol-based solution should be based upon the solution being FDA-approve that provides persistent, cumulative activity and is approved by the healthcare facility.

1. The antimicrobial action of alcohols is the denaturing of proteins. Alcohol solutions that contain 60%-95% alcohol are the most effective. Solutions higher in alcohol concentration are less effective since the denaturing of proteins does not easily occur in the absence of water.
2. Alcohols have a broad-spectrum of antimicrobial properties, including the ability to destroy Gram-positive and Gram-negative bacteria, as well as multi drug resistant pathogens, including MRSA and VRE, *Mycobacterium tuberculosis* and fungi.
3. Alcohols have rapid activity when applied to the skin, but alone do not have a persistent, cumulative activity; however, when combined with another scrub solution persistent, cumulative activity results.8 Therefore, if a healthcare facility adopts the use of alcohol, it is recommended that the agent be a combination of alcohol and another scrubbing agent (alcohol-based solution).

A. Alcohol-based solutions have a greater antimicrobial activity as compared to other scrub solutions. Studies have shown that alcohol-based solutions immediately lower the microbial count on the skin post scrub more effectively than other scrub solutions.8

B. Alcohol-based solutions that contain 0.5% to 1% chlorhexidine gluconate have been found to have a persistent antimicrobial activity that is equal to, or greater than, that of chlorhexidine gluconate alone. The next most effective scrubbing agents are chlorhexidine gluconate, iodophors, and Triclosan. Studies of parachlorometaxylenol (PCMX) have produced contradictory results and therefore, further studies are required in order to determine the efficacy of the agent with other scrubbing agents.

4. When using an alcohol-based solution, the healthcare facility procedure for performing the surgical scrub should follow the manufacturer's instructions since the instructions can vary according to the solution that is being used.
5. The alcohol-based solution should not be used when the hands and/or forearms are visibly dirty or contaminated with proteinaceous materials since that decreases the antimicrobial action of the alcohol.

The hands and arms should be prewashed with a non-antimicrobial soap unless it is suspected that hands are contaminated with *Bacillus anthracis* and in that instance anti-microbial soap must be used. The hands and forearms should be thoroughly dried before using the alcohol-based solution.

6. Alcohols are a flammable liquid and therefore, must be properly stored according to National Fire Protection Association recommendations, as well as local and state regulations.

A. Alcohol containers should be stored in a dry, cool area that is approved by the healthcare facility for the storage of flammables and removed from sources of flames, heating vents, and high temperatures.

B. Alcohol is the gold standard for hand washing and surgical scrub in Europe where it has been used extensively for years. Reports concerning the use of alcohol-based solutions indicate a very low incidence of fires.

C. Careful planning should occur related to the placement of the scrub solution dispensing containers. Because alcohols are highly volatile, the solution dispensing containers should be located away from light switches (source of sparks) and sources of heat, but still situated in a manner that is convenient for use by the surgical team members.

D. The solution dispensing containers must be designed to prevent evaporation due to the volatility of alcohols.
E. The surgical team member must allow the hands and forearms to be thoroughly dry before donning the sterile gown and gloves.

Standard of Practice VII
Surgical team members should perform a standardized surgical scrub procedure based upon manufacturer's written instructions that are specific to the scrub solution to be used and according to healthcare facility policy and procedures.
A. The American College of Surgeons recommends the duration of at least two minutes for the surgical scrub.52
B. Several European and Australian studies indicate that three to four minute scrubs are just as effective as a five- minute scrub.
C. Several studies have shown that a five-minute scrub is as effective as a 10- minute scrub in reducing the microbial count.
D. Other studies have also shown that a two- to-three-minute scrub reduces the microbial count to an acceptable level.
E. Lastly, additional studies have indicated that a two-stage surgical scrub, using an antiseptic agent, followed by the use of an alcohol-containing preparation is as effective as a five-minute scrub with only an antiseptic agent.
F. The advantages of a shorter scrub time include less damage to the skin and water conservation.
2. The anatomical timed method or counted stroke method of performing the surgical scrub is acceptable. The surgical team member should follow healthcare facility policy.
3. The surgical team member should follow the general principles of completing a surgical scrub.
A. Prewash the hands and forearms with non-antimicrobial soap.
B. The subungual area should be cleaned with the use of a disposable nail cleaner under running water. The nail cleaner should not be discarded into the scrub sink and disposed of according to healthcare facility policy to prevent cross-contamination of the scrub sink.
C. The scrub should begin at the finger tips and end 2" above the elbows without returning to a clean area. The fingers, hands and forearms should be visualized as having four sides (planes) that must be thoroughly scrubbed, including the web space between each digit.
D. One hand and forearm should be scrubbed, the scrub brush switched hands, and the other hand and forearm scrubbed.
E. Hold hands higher than the elbows so that water runs from the finger tips toward the elbows. Additionally, keep the hands and arms away from the scrub attire, while keeping the elbows in a flexed position to avoid water from wetting the scrub suit and causing strike-through.
F. If possible, when the water is not in use, it should be turned off to conserve.
G. The scrub brush should not be discarded into the scrub sink and dispose of according to healthcare facility policy to prevent cross-contamination of the scrub sink.
H. The surgical team member, after entering the OR, should thoroughly dry hands and arms using aseptic technique prior to donning the sterile gown to prevent strike-through contamination. If an alcohol-based solution is used, it is necessary that the hands and arms be completely dry.

Standard of Practice VIII
Performing the surgical scrub without a brush or sponge is acceptable.
1. The practice of using a brush can damage the skin resulting in increased shedding of microorganisms from the hands and arms. Scrubbing with a brush also contributes to an increase in the shedding of skin cells.

2. Several studies confirm that the use of a brush or sponge is not necessary as well as demonstrating lower bacterial counts when a brushless surgical scrub is performed, as compared to the use of a brush, in particular when an alcohol- based solution is used that consists of 1% chlorhexidine gluconate and 61% to 70% alcohol.

Standard of Practice IX

On a daily basis healthcare workers should practice hand hygiene in the work place and at home.

1. Hand hygiene is simple, inexpensive and focuses on the practical care of the hands by the individual.

A. Hand hygiene focuses on general care of the hands including the following:

(1) Preventing abrasions, cuts and open lesions that break the integrity of the skin

(2) Proper care of the fingernails and cuticles (see Standard II)

(3) Preventing over drying of the skin leading to discomfort and breaks in the skin

2. Lotions aid in preventing the drying of the skin and maintaining the overall health of the skin.

A. Surgical team members should be involved in the selection process of lotion(s) that are provided by the healthcare facility.

B. The lotion should be approved by the healthcare facility infection control officer.

C. Verification and documentation must be completed verifying the lotion used in the healthcare facility does not disrupt the effectiveness of the antiseptic scrubbing agent and sterile gloves.

(1) Many of the over-the-counter hand lotions have been found to counteract the antimicrobial cumulative proper of chlorhexidine gluconate.

(2) Petroleum-containing hand lotions have been found to break down latex gloves causing an increase in their permeability.

(3) The hand lotion product selection process should involve reviewing the manufacturer's information in order to

verify the product can be used without compromising the effectiveness of sterile gloves or antiseptic scrubbing agent.

Standard of Practice X

Hand washing should be performed before and after each patient contact, when contact has been made with a source of contamination and after removal of non-sterile or sterile gloves.

1. Hand washing is the simplest and least expensive method for the prevention of cross contamination. The surgical scrub is not a substitute for hand washing and it is just as important for surgical personnel to wash the hands between patient contacts in the surgery department as compared to the nonsurgical departments. The following is a list of instances when it is recommended that hand washing should be performed. This list is based on CDC and APIC recommendations.

A. Between patient contacts including contacts with patients in the operating room.

B. Before and after assisting the surgeon with invasive procedures that includes placing the sterile-gloved hands onto or within a surgical and/or traumatic wound.

C. After the removal of non-sterile or sterile gloves:

(1) Gloves should not be considered a substitute for hand washing. A high risk of contamination can occur when a healthcare worker removes non-sterile gloves and reaches into a glove box without performing a hand wash. The potential exists for contaminating the opening to the box as well as the gloves inside the box.

D. After handling and/or touching a fomite such as when emptying a Foley catheter bag.

E. After contact with blood and body fluids, e.g. cleaning up small area of blood on floor of OR, handling soiled linen and waste.

F. In-between performing patient care on different body regions of the same patient to prevent cross

contamination, e.g. insert urethral catheter and then perform dressing change on leg.

2. Surgical personnel should use a topical antimicrobial agent that removes transient and resident microorganisms when performing the hand wash.

3. The hand wash should be performed for a minimum of 20 seconds applying friction and washing all surfaces of the hands and fingers as well as under the nails. All jewelry should be removed such as rings and watches prior to performing the hand wash. If the faucet is not knee or foot operated it should be turned off using a paper towel.

4. Options for drying the hands include the use of cloth paper or paper towels and air dryers. All methods have been proven to further reduce the microbial count.

5. Other products that are acceptable in lieu of performing a traditional hand wash at the sink include hygienic hand rub products, hand wipes impregnated with alcohol, and foams that consist of an alcohol and antimicrobial agent mixture.

Strategies to Prevent Surgical Site Infections in Acute Care Hospitals

Previously published guidelines are available that provide comprehensive recommendations for detecting and preventing healthcare-associated infections (HAIs). The intent of this document is to highlight practical recommendations in a concise format designed to assist acute care hospitals in implementing and prioritizing their surgical site infection (SSI) prevention efforts. This document updates "Strategies to Prevent Surgical Site Infections in Acute Care Hospitals,"1 published in 2008. This expert guidance document is sponsored by the Society for Healthcare Epidemiology of America (SHEA) and is the product of a collaborative effort led by SHEA, the Infectious Diseases Society of America (IDSA), the American Hospital Association (AHA), the Association for Professionals in Infection Control and Epidemiology (APIC), and The Joint Commission, with major contributions from representatives of a number of organizations and societies with content expertise. The list of endorsing and supporting organizations is presented in the introduction to the 2014 updates.2

Rationale and Statements of Concern

SSIs are common complications in acute care facilities. SSIs occur in 2%–5% of patients undergoing inpatient surgery. Approximately 160,000–300,000 SSIs occur each year in the United States. SSI is now the most common and most costly HAI.

Outcomes associated with SSI

Up to 60% of SSIs have been estimated to be preventable by using evidence-based guidelines. SSIs account for 20% of all HAIs in hospitalized patients. Each SSI is associated with approximately 7–11 additional postoperative hospital- days. Patients with an SSI have a 2–11-times higher risk of death compared with operative patients without an SSI. Seventy-seven percent of deaths in patients with SSI are directly attributable to SSI. Attributable costs of SSI vary depending on the type of operative procedure and the type of infecting pathogen. SSIs are believed to account for $3.5 billion to $10 billion annually in healthcare expenditures using the CPI (consumer price index for inpatient hospital services with all cost estimates adjusted for 2007 dollars).

Background—Strategies to Detect SSI

Surveillance definitions

The Centers for Disease Control and Prevention's (CDC's) National Healthcare Safety Network (NHSN) definitions for SSI are widely used for public reporting, interfacility comparison, and pay-for-performance comparisons. Superficial incisional (involving only skin or subcutaneous tissue of the incision).
Deep incisional (involving fascia and/or muscular layers).

Deep incision primary (DIP)—SSI identified in a primary incision in a patient who has had an operation with 1 or more incisions.

Deep incision secondary (DIS)—SSI identified in a secondary incision in a patient who has had an operation with more than 1 incision.

Organ/space (involving any part of the body opened or manipulated during the procedure, excluding skin incision, fascia, or muscle layers).

Methods for surveillance of SSI

The direct method with daily observation of the surgical site by the physician, physician extender, registered nurse, or infection prevention and control (IPC) professional starting 24–48 hours postoperatively is the most accurate method of surveillance. While the direct method is used as the gold standard for studies, it is rarely used in practice because of its resource utilization requirements and impracticality. The indirect method of SSI surveillance consists of a combination of the following: Review of microbiology reports and patient medical records. Surgeon and/or patient surveys. Screening for readmission and/or return to the operating room. Other information, such as coded diagnoses, coded procedures, operative reports, or antimicrobials ordered. The indirect method of SSI surveillance is less time- consuming and can be readily performed by IPC personnel during surveillance rounds. The indirect method of SSI surveillance is both reliable (sensitivity, 84%–89%) and specific (specificity, 99.8%) compared with the gold standard of direct surveillance.30,31 Components of the indirect methods that were associated with highest sensitivities included review of nursing notes, International Classification of Diseases, Ninth Revision codes, and antimicrobials used. Indirect methods for SSI surveillance are not reliable for surveillance of superficial incisional infections, particularly those occurring post discharge.

Automated data systems can be used to broaden SSI surveillance.

SSI surveillance can be expanded by utilizing hospital databases that include administrative claims data (including diagnosis and procedure codes), antimicrobial-days, readmission to the hospital, and return to the operating room and/or by implementing a system that imports automated microbiologic culture data, surgical procedure data, and general demographic information into a single surveillance database. These methods improve the sensitivity of indirect surveillance for detection of SSI and reduce the effort of the infection preventionist. Medicare claims data can be used to enhance traditional surveillance methods for SSI and to identify hospitals with unusually high or low rates of SSI. Use of administrative data can increase the efficiency of SSI reporting and validation.

Post discharge surveillance

Over the past 3 decades, advances in medical technology and changes in payment arrangements have increasingly shifted performance of surgical procedures from the acute care setting to the

ambulatory (free-standing or hospital- affiliated) outpatient care setting. Concurrently, postoperative hospital length of stay has steadily declined. These trends highlight the increasing importance of post discharge surveillance, without which SSI rates will be underestimated and opportunities for improvements in healthcare delivery, patient safety, and SSI prevention will be missed.

The proportion of SSIs detected through post discharge surveillance can vary by surveillance method, operative setting, type of SSI, and surgical procedure. No standardized or reliable method for post discharge surveillance has been established. Post discharge surveillance based on surgeon and patient questionnaire results have been shown to have poor sensitivity and specificity. The ambulatory care setting represents a challenge because patients do not return to it for routine postoperative care or for management of complications. Research is needed to better understand how definitions and post discharge surveillance protocols developed for the acute care setting can be translated to the ambulatory care setting.

Superficial incisional SSIs are most commonly detected and managed in the outpatient setting. In contrast, deep incisional and organ/space infections typically require readmission to the hospital for management. In the Netherlands, the proportion of deep SSIs identified after discharge from the hospital ranged from 6% for colon resections to 88% for knee Arthroplasty. The differences between these procedures could be explained by potential differences in both w o u n d contamination class and the duration of post discharge surveillance (30 days versus 1 year for an implant- related procedure). A pilot study in general surgery reported that 10.5% of SSIs following colon procedures were identified after discharge from the hospital.

By improving completeness of reporting, the overall institutional SSI rate typically increases after post discharge surveillance methods are implemented regardless of which method is used To improve interfacility comparisons and minimize potential bias introduced by differences in post discharge surveillance methods, national public reporting focuses on no superficial incisional SSIs detected during hospitalization for the index procedure or after discharge and requiring readmission for management.

Background—Strategies to Prevent SSI

Summary of existing guidelines, recommendations, and requirements

After review of published guidelines, an expert panel identified 3 performance measures for quality improvement related to antimicrobial prophylaxis: Delivery of intravenous antimicrobial prophylaxis within 1 hour before incision (2 hours are allowed for the administration of vancomycin and fluoroquinolones). Use of an antimicrobial prophylactic agent consistent with published guidelines. Discontinuation of the prophylactic antimicrobial agent within 24 hours after surgery (discontinuation within 48 hours is allowable for cardiothoracic procedures in adult patients). The SIP project focused on 7 procedures: abdominal hysterectomy, vaginal hysterectomy, hip Arthroplasty, knee Arthroplasty, cardiac surgery, vascular surgery, and colorectal surgery. Many hospitals that implemented and improved compliance with SIP performance measures decreased their rates of SSI.

Surgical Care Improvement Project (SCIP)

The SCIP, a multiagency collaboration created in 2003, is an extension of SIP. In addition to the 3 performance measures of SIP, the SCIP also focuses on 3 additional evidence-supported process measures to prevent SSIs and expanded the types of operations eligible for the performance

measures. Proper hair removal: no hair removal, although hair removal with clippers or the depilatory method is considered appropriate. Use of razors is considered inappropriate with exception of use on the scrotal area or on the scalp after a traumatic head injury. Because of near-universal compliance with this performance measure, CMS retired the measure in 2012.

Controlling blood glucose during the immediate postoperative period for cardiac surgery patients: controlled 6 am blood glucose (200 mg/dL or lower) on postoperative days 1 and 2, with the procedure day being postoperative day 0. In 2014, this measure will be revised to assess glucose control (180 mg/dL or lower) in cardiac surgery patients in the time frame of 18–24 hours after anesthesia end time.

Maintenance of perioperative normothermia in surgical patients who have anesthesia duration of at least 60 minutes.

The Joint Commission National Patient Safety Goals

(6) The Joint Commission's National Patient Safety Goal 07.05.01 includes several evidence-based practices for prevention of SSI.64.

Guidelines for Best Practices for preventing SSI: recommended for all acute care hospitals Table 1.

Grading of the Quality of Evidence

Grade	Definition
I. High	Highly confident that the true effect lies close to that of the estimated size and direction of the effect. Evidence is rated as high quality when there is a wide range of studies with no major limitations, there is little variation between studies, and the summary estimate has a narrow confidence interval.
II. Moderate	The true effect is likely to be close to the estimated size and direction of the effect, but there is a possibility that it is substantially different. Evidence is rated as moderate quality when there are only a few studies and some have limitations but not major flaws, there is some variation between studies, or the confidence interval of the summary estimate is wide.
III. Low	The true effect may be substantially different from the estimated size and direction of the effect. Evidence is rated as low quality when supporting studies have major flaws, there is important variation between studies, the confidence interval of the summary estimate is very wide, or there are no rigorous studies, only expert consensus.

Administer antimicrobial prophylaxis according to evidence-based standards and guidelines (quality of evidence: I).

Begin administration within 1 hour before incision to maximize tissue concentration. Administering agent closer than 1 hour is effective, and some studies show superior efficacy for administration between 0 and 30 minutes prior to incision compared with administration between 30 and 60 minutes. Two hours are allowed for the administration of vancomycin and fluoroquinolones.

Many experts believe that antimicrobials should be infused prior to inflation of tourniquets in procedures using "bloodless" techniques, although data are insufficient to support this

recommendation. Select appropriate agents on the basis of the surgical procedure, the most common pathogens causing SSIs for a specific procedure, and published recommendations. Discontinue agent within 24 hours after surgery.

Although guidelines suggest stopping the antimicrobial agent within 24 hours of surgery, there is no evidence that agents given after closure contribute to efficacy, and they do contribute to increased resistance and the risk of Clostridium difficile disease. Adjust dosing on the basis of patient weight

Use 30 mg/kg for pediatric patients, 2 g of cefazolin for patients weighing 80 kg or more, and 3 g for patients weighing 120 kg or more. Vancomycin should be dosed at 15 mg/kg. Gentamicin should be dosed at 5 mg/kg for adult patients and 2.5 mg/kg for pediatric patients. For morbidly obese patients receiving gentamicin, the weight used for dose calculation should be the ideal weight plus 40% of the excess weight. Redose prophylactic antimicrobial agents for long procedures and in cases with excessive blood loss during the procedure. Prophylactic antimicrobials should be redosed at intervals of 2 half-lives (measured from time the preoperative dose was administered) in cases that exceed this time.

Use a combination of parenteral antimicrobial agents and oral antimicrobials to reduce the risk of SSI following colorectal procedures. The additional SSI reduction achieved with mechanical bowel preparation has not been studied, but the data supporting use of oral antimicrobials have all been generated in combination with mechanical bowel preparation. Mechanical bowel preparation without oral antimicrobials does not decrease the risk of SSI. Do not remove hair at the operative site unless the presence of hair will interfere with the operation. Do not use razors (quality of evidence: II). If hair removal is necessary, remove hair outside the operating room using clippers or a depilatory agent. Control blood glucose during the immediate postoperative period for cardiac surgery patients58 (quality of evidence: I) and noncardiac surgery patients94-98 (quality of evidence: II). Maintain postoperative blood glucose of 180 mg/dL or lower.

The recommendation of maintaining postoperative blood glucose less than 200 mg/dL at 6 am on postoperative days 1 and 2 is being replaced. In 2014, this measure will be revised in the SCIP to assess glucose control (180 mg/dL or lower) in cardiac surgery patients in the time frame of 18–24 hours after anesthesia end time. Several societies, experts, and the National Quality Forum support this new recommendation. Intensive postoperative glucose control (targeting levels less than 110 mg/dL) has not been shown to reduce the risk of SSI and may actually lead to higher rates of adverse outcomes, including stroke and death.

Maintain normothermia (temperature of 35.5°C or more) during the perioperative period (quality of evidence: I). Even mild degrees of hypothermia can increase SSI rates. Hypothermia may directly impair neutrophil function or impair it indirectly by triggering subcutaneous vasoconstriction and subsequent tissue hypoxia. In addition, hypothermia may increase blood loss, leading to wound hematomas or need for transfusion, both of which can increase rates of SSI. Randomized controlled trials have shown the benefits of both preoperative and intraoperative warming to reduce SSI rates and to reduce intraoperative blood loss. Optimize tissue oxygenation by administering supplemental oxygen during and immediately following surgical procedures involving mechanical ventilation (quality of evidence: I).

Supplemental oxygen is most effective when combined with additional strategies to improve tissue oxygenation, including maintenance of normothermia and appropriate volume replacement. The available evidence is in patients undergoing surgery with general anesthesia using mechanical

ventilation. Seven randomized clinical trials have been published comparing 80% with 30%–35% FiO2 (4 with nitrogen and 3 with nitrous oxide) in patients undergoing general anesthesia with intraoperative mechanical ventilation and postoperative oxygen delivered for 2–6 hours via a non-rebreathing mask.

Three trials in patients undergoing elective colorectal resection and 1 each in open appendectomy108 and total gastrectomy with esophagojejunal anastomosis112 reported an approximate 40% decrease in the rate of SSI. Three of the studies reported protocols that included maintenance of perioperative normothermia and liberal fluid replacement.

Two trials in mixed surgical populations undergoing emergency or elective laparotomy for gastrointestinal, gynecologic, or urologic procedures reported different results. The large multicenter trial that restricted perioperative fluid replacement reported no difference. A follow-up study performed in this population noted that patients undergoing cancer surgery who received 80% FiO2 had higher rates of mortality than patients undergoing cancer surgery who received 30% FiO2.113

Use alcohol-containing preoperative skin preparatory agents if no contraindication exists (quality of evidence: I). Alcohol is highly bactericidal and effective for preoperative skin antisepsis but does not have persistent activity when used alone. Rapid, persistent, and cumulative antisepsis can be achieved by combining alcohol with Clorhexidine gluconate or an iodophor. Alcohol is contraindicated for certain procedures, including procedures in which the preparatory agent may pool or not dry (eg, involving hair) due to fire risk. Alcohol may also be contraindicated for procedures involving mucosa, cornea, or ear. The most effective disinfectant to combine with alcohol is unclear.

A recent trial of 849 patients undergoing clean-contaminated surgery randomized patients to preoperative skin antisepsis with Clorhexidine-alcohol or povidone-iodine.116 The overall rate of SSI was significantly lower in the Clorhexidine-alcohol group than in the povidone-iodine group (9.5% vs 16% [P = .004]; RR, 0.59 [95% confidence interval (CI), 0.41–0.85]). In contrast, a single-center study compared povidone-iodine followed by isopropyl alcohol versus Clorhexidine-alcohol versus iodine-alcohol using a sequential implementation design.117 General surgical patients who received skin antisepsis with iodine-alcohol had the lowest rates of SSI (3.9 per 100 procedures), compared with 6.4 per 100 procedures for patients who received povidone-iodine followed by alcohol and 7.1 per 100 procedures for patients who received Clorhexidine-alcohol. In the absence of alcohol, Clorhexidine gluconate may have advantages over povidone-iodine, including longer residual activity and activity in the presence of blood or serum. These disinfectants are not interchangeable. Follow the manufacturers' instructions to ensure correct application. Use impervious plastic wound protectors for gastrointestinal and biliary tract.

Surgical Needles and Sutures

History: Medical writing of ancient Egypt and Assyria mentions various materials used for suturing and ligating. The concept of suturing is described in the writing of Hypocrites, born in 460BC. But of sheep intestines was first mentioned as suture materials. In Persia catgut was described about 200AD for suturing abdominal wounds. The word catgut is a misnomer and its use inappropriate.

The principle reason surgery did not progress in early times was the critical problems of pain, hemorrhage and infection. The French surgeon in the mid 1500s developed the technique for ligating that would replace cautery in treating war wounds. He was confronted with the problem that severe

pain and infection curtailed advancements made possible by surgical repairs. Crawford Long of the USA demonstrated the use of ether and Joseph Lister of England used carbolic acid to attempt antiseptic surgery. Lister also experimented with surgical gut as a suture material and recognized the need for sterile sutures. Progress in the development of sutures was rapid after the mid 1800s. By 1901 surgical gut and kangaroo gut were available in sterile glass tubes. Gold, silver, wire, silkworm gut, silk, cotton, linen, tendon and intestinal tissue from nearly every creature have been used at one time or another. During the early 20th century surgical gut, silk and cotton emerged as the most commonly used materials. The last half of the century saw the introduction of synthetic fibers such as nylon, polyester, polypropylene and other polymers. Since the early 1950s the trend has been toward individually packaged and presterilized materials, many with pre-attached needles, delivered to the surgical field in ready to use form. This is relieved the perioperative staff of time-consuming preparations for suture materials.

Suture: A generic term used for all materials used to sew severed body tissue together and to hold these tissues in their normal position until healing takes place.

Ligature: a strand of suture material used to tie off blood vessels to prevent hemorrhage and simple bleeding or to isolate a mass of tissue to be excised.

Noun
Verb

The "perfect" suture should exhibit the following characteristics:

- It should be pliable and flexible with good handling characteristics
- It should be easy to tie and would hold knots securely.
- It should not fray as tied.
- It would slide through tissue effortlessly
- The smallest diameter would never break
- The tensile strength of the absorbable suture would be maintained only as long as the wound required support
- It would not cause tissue reaction of any sort
- Absorption would be predictable in every patient
- It could be used in infected wounds
- It could be used in every surgical situation
- It would be inert, nonallergenic and economical to use.
- It would be inexpensive and easily sterilized

Filament – thin strands of thread
Absorbable – reabsorbed into the body by natural processes
Tensile strength – the amount of weight needed to break a suture
Inert vs. reactive – how it reacts with the body tissue.

Characteristics:

Physical:

- Physical configuration. Single strand (monofilament) or multiple strands (multifilament) containing a number of fibers rendered into a single thread by twisting or braiding.
- Capillarity. Ability to soak up fluid along the strand.

- Diameter. Determined in millimeters and expressed in USP sizes with zeros. The smaller the diameter, the more zeros. Sizes range from #7 to 11-0. 0 to 4-0 are the most commonly used. The surgeon will select the finest suture possible for the tissue being closed. The finer diameter provides better handling qualities and smaller knots.
- Tensile strength. The amount of weight is needed to break a suture. Varies with different materials
- Knot strength. The force necessary to cause a given type of knot to slip
- Elasticity. Inherent ability to regain original form and length after having been stretched.
- Memory. Capacity of the suture to return to its original shape after being reformed. High memory yields les knot security.

Handling:

- Pliability. How easily the material bends
- Coefficient of friction. How easily it slips through the tissue. A suture with a high coefficient of friction drags through the tissue. It is more difficult to tie. Some sutures are coated to reduce the coefficient of friction. This improves the way they pull through the tissue but also affects the force needed to remove the sutures after the wound is healed. If it is too low, however, the knots can become undone too easily.

Tissue Reaction:

- All sutures causes some tissue reaction. It begins when the suture inflicts injury to the tissue during insertion. Tissue reaction to the suture material itself occurs. This reaction begins with an infiltration of white blood cells into the area; macrophages and fibroblasts. By the seventh day fibrous tissue with chronic inflammation is present. The reaction persists until the suture is encapsulated (nonabsorbable) or absorbed by the body.

Types:

Absorbable – "sterile, flexible strand prepared from collagen derived from healthy animals or synthetic polymer." It is capable of being absorbed by living tissue but may be treated to modify its resistance to absorption. It may be modified with respect to body or texture. It may be coated. A coloring agent approved by the FDA may color it. Absorbable suture can be digested (by enzyme activity) or hydrolyzed (by reaction of water in tissue fluids to breakdown) and assimilated by the tissues during the healing process. Absorbable sutures vary in treatment, color, size, packaging and resistance to absorption. These include plain and chromic surgical gut, collagen and glycolic acid polymers.

- *Surgical gut* is obtained form the collagen of the submucosal layer of the small intestine or sheep, cattle or hogs. The strands are either untreated (*plain*) or treated with chromium salts (*chromic*.) Treatment with chromium delays absorption of the suture in living tissue. It enables a wound with slow healing power to heal sufficiently before the suture is entirely absorbed. The process is elaborate and sterilization is achieved with ionizing radiation and storage in hermetically sealed packages. Absorption takes place by digestion of the gut by the tissue enzymes. The type of body tissue it contacts as well as the patient's general physical condition influences the rate of absorption. It is absorbed faster in serous or mucous membranes than muscle. It is packaged wet in an alcohol solution to provide maximum pliability and used be used immediately after removed from the package. Alcohol evaporates and causes the strand to lose pliability. It may be necessary to dip the strand in normal saline for a few seconds to assist the pliability.

- *Collagen* is obtained from the tendons of cattle and chemically treated to have characteristics superior to surgical gut. Collagen is most often used as a fine suture material for the eye.
- *Synthetic Absorbable:* The base materials are a combination of lactic and glycolic acid polymers. (Vicryl, Dexon, Polysorb). They have a tensile strength for approximation of tissue for 2-3 weeks followed by rapid absorption. The newer synthetics (PDS, Maxon, Monocryl) provide wound support for longer periods up to 3 months. They are used when prolonged support is needed as with fascial closure or for elderly or oncological patients. They combine the desirable qualities of extended wound support and eventual absorption. They are absorbed by hydrolysis as the polymer reacts with water to cause an alternation of breakdown of the molecular structure. They are packaged dry and should NOT be dipped in saline prior to use. Some are coated to decrease tissue drag.

Nonabsorbable- are strands of material that effectively resists enzyme activity in living tissue.

-Class I suture us composed of silk or synthetic fibers of monofilament, twisted or braided construction

- Class II suture is composed of cotton or linen fibers or coated natural or synthetic fibers where the coating affects the thickness of the strand but not the strength.
- Class III suture us composed of monofilament or multifilament metal wire.

The coating may be Teflon, silicone or other polymers. They may be uncolored, naturally colored or dyed.

Nonabsorbable sutures are encapsulated or walled off by the tissue around it during the process of wound healing. The most common suture materials are silk, nylon, polyester fiber, polypropylene and stainless steel.

- Silk – is either twisted or braided for high tensile strength and better handling qualities. Silk handles well, is soft and forms secure knots. It has capillary action that may transmit infection along the length of the strand. For this reason it may be treated to decrease the capillary action. It may, by convention, NOT be used in potentially infected wounds. It should be kept dry until used. Silk sutures may cause tracts as the suture migrates gradually to the wound's exterior surface. The spontaneous migration is called "spitting" and may occur weeks or years after placement.
- Cotton use is very rare.
- Nylon (Dermalon, Ethilon, Surgilon, Nurolon, Bralon, Monosof) is a synthetic polyamide material. It is available as monofilament or multifilament.. Multifilament has a high tensile strength and is relatively inert in tissue. It has the disadvantage of poor knot security and multiple knots must be throw. It is used in eye and microsurgery because it can be made in extremely small sizes.
- Surgical polyester (Ti-Cron, Dacron, Mersilene, Tevdek, Polydek, Ethibond, Surgidac) is available as nontreated suture or coated with a lubricant to enhance passing through tissue. It is frequently braided for use. It has advantages over other braided, nonabsorbables. It has greater tensile strength, minimum tissue reaction and maximum visibility. It does not absorb fluids like silk. It is frequently used as a general fascia closure as well as in CV surgery for valve replacements, graft to tissue anastamosis and revascularization procedures.
- Polypropylene (Prolene, Surgilene, Surgipro, Dermelene) is a clear or pigmented polymer. It is monofilament and used for CV, general and plastic surgery. It is extremely inert and may

be used in the presence of infection. It has high tensile strength and causes minimal tissue reaction.

- Stainless steel is made to be compatible with implants and prosthesis. Monofilament and multifilament steel is known for its inertness, strength and low tissue reaction. It is very difficult to place and tie. It can pull or tear out of tissue. Necrosis can occur if tied too tightly. Kinks in the wire can render it useless making packaging important. Available in long, packets and on spools.

Suture absorption Process:

- Phagocytosis
- Enzymatic action
- Hydrolysis

Packaging: The suture material is sealed in a primary inner packet inside an outer, peel packet and then sterilized. Double wrapped, peel pack. This permits easy access to the sterile field. Each primary packet is self contained and its sterility ensured as long as the integrity is maintained. Some packets have expiration dates on them that relate to stability. Suture packets may contain single or multiple strands, with or without needles. Some sutures are double armed, with a needle at each end of the strand. Most manufacturers to make identification easier use color-coding. The package and the boxes are coded. Most color codes are universal across companies.

The inner wrapper of a suture-needle combination is made of stiff paper. The swage of the needle is exposed so one can load the needle onto the needle holder.

Package information contains the type of material, size, length, and indication of needle(s), needle variety, needlepoint variety, catalogue number, lot number and expiration date.

- Open the minimum number of suture packs required. As more as needed, they can be added quickly… Stay ahead of the surgeon.
- Keep unopened suture packs clean.
- Most sutures are packed dry. Gut is packed in alcohol solution. This is flammable and must not be splashed onto the field.
- Gut is dipped in saline before use to soften it and prevent tissue drag. Do not SOAK. Prolonged contact with saline weakens the strands.
- Dry packed sutures should be stretched slightly to remove excess memory.
- Care with stainless steel sutures and glove puncture.

Ligatures: “ties” are used to occlude vessels for hemorrhage control or for organ removal. Ties are available as full length or precut strands. Standard length for reels is 54 inches for absorbable material and 60 inches for nonabsorbable materials. They may be cut by the scrub into appropriate lengths for use. Single strand ligature are prepackaged as 18, 24 or 30-inch strands. Ligatures are placed around a hemostatic clamp that has been affixed to a bleeding vessel. After the first knot is thrown, the assistant removes the clamp and the ligature is secured with a knot. Monofilament sutures are typically cut leaving ½-1 inch tails because the knot can slip. Multifilament sutures can be cut closer to the knot because they do not slide as readily.

Ligating Methods:

- *Free tie*: either as continuous ties on a reel or single strands placed into the opened extended hand of the surgeon.

- *Suture Ligature: (Stick tie*) used for large vessels. They are used to prevent slippage that can lead to uncontrolled hemorrhage. Stick ties are sutures with a swaged atraumatic needle loaded onto a needle holder for placement through a large vessel after a hemostatic clamp has been applied.
- *Continuous Tie (Ligature Reel*): usually used for superficial bleeders. The most common are plain, chromic, vicryl. Silk reels are also available. Ligature reels are radiopaque and are counted in many institutions. The size of the material is indicated on the reel itself and the reels are color coded to correspond to the suture material.
- *Instrument Tie:* Deep-bleeding vessels may be inaccessible for a free hand tie. A strand of suture material may be loaded onto a Passer (adson, mixter etc) for placing the suture around a deep clamp.

Suture Preparation: The choice of suture depends of the procedure, the tissue being sutured, the general condition of the patient and the surgeon's preference. The preference card must be followed for obtaining the required sutures for a procedure. Open only as many packets as are necessary to avoid waste. The circulator can open additional sutures as required. Good communication between team members is essential. After the sutures are opened, they can be arranged in a logical manner. They can be arranged according to use. Free ties should be opened and accessible. They should be arranged in a size order. Some sutures will be loaded onto needle holders. Experience will dictate the level of preparation of suture. Suture needs can be anticipated by paying close attention to the comments of the surgeon and assistants.

Placement of Field:

Sutures can be flipped or manually transferred.

Loading Suture:

Sutures are loaded onto needle holders with the size of the suture and needle corresponding to the size of the needle holder, the depth of the tissue to be sutured and the surgeon's preference. The needle should be grasped one-third away from the swaged end. Tougher tissue may require this to be changed to the halfway point. The swaged area of the needle should never be clamped. Packets are made to present the needle to the CST so loading can take place without handling the points. After loading, the suture can be straightened with a gentle tug.

- Do not pull or stretch gut or collagen
- Do not pull-on needles
- Avoid crushing suture with instruments
- Keep gut away from heat
- Never soak gut
- Do not wet rapidly absorbing sutures
- Keep silk dry
- Do not bend stainless steel
- The needles are passes with the needle pointed toward the surgeon's thumb
- The CST should control the tail to prevent snags.

Suture Guidelines:

- Keep suture packs organized. Know where each is located.
- As soon as a needle is returned, place it on the sharps holder.
- Have a loaded needle holder available at all times

- Pass on an exchange basis/
- Use of neutral zone
- Load the needle before removing the suture from the inner package.
- Retain the suture packages.
- Keep suture packages organized by type

Surgical Needles: Vary in shape, size, point design and diameter. The appropriate needle is selected depending on the type and location of tissue being sutured. Surgical needles are made from stainless steel or carbon steel. They must be strong, and able to withstand the stress imposed by tough tissue. Stainless steel is most popular because in addition it is noncorrosive.

Eye

- Eyed needles which must be threaded with suture strands
- Spring or French eyed needles in which the suture is snapped through the spring.
- Eyeless or swaged needles in which the suture and needles come packaged as a unit. This is the most universally used type. It eliminates the need for threading increasing intraoperative efficiency. There is less tissue damage as the eye is a large diameter than the swaged needle and only one strand of suture is passed through the tissue. The needle must be cut off with scissors or may be a controlled release variety. The needle remains attached to these until the surgeon releases it with a straight tug of the needle holder. May be single or double armed.

Body

- The body or shaft of the needle may be round, triangular or flattened. Surgical needles may also be curved or straight with the curve being described as part of an imaginary circle. As the radius of the circle increases, the size of the needle increases. The body of a round needle gradually tapers to a point.
  Shape may be 1//4 circle, 1/3 circle, ¼ circle, 5/8 circle. Micro needles are frequently 3/8 circles. Keith, “U needles”

Point

The choice of needlepoint relates to the density of the tissue to be penetrated. Delicate tissue requires a taper or blunted point whereas skin, which is dense, requires a cutting edge. Taper points tend to tear tissue less than cutting needles and leave smaller holes. Interest in blunt points has developed due to blood borne diseases. Triangular needles have cutting edges on three sides. The cutting action may be conventional or reverse. The conventional cutting needles have its cutting edge directed along the inner curve of the needle. The reverse cutting needle is preferred for cutaneous suturing when it transects the skin lateral to the wound, the outside edge is pointed away from the wound edge. This reduces the tendency for the suture to tear through the tissue. For certain types of delicate surgery, eye, micro, require needles with special honing for precision point quality. Trocar points, Tapercut

Blunt: Pushes tissue aside – does not puncture. Least traumatic and safest
Friable tissues or organs (liver, spleen, kidney)

Tapered: round body with sharp point – suture soft tissue (muscle, fat, peritoneum, GI, GU, vascular structure

Cutting: Cutting edges on 3 sides – triangular body – Inside (conventional)
Outside (reverse). Actually incises the tissue as it passes through it.
Skin, tendon, joint capsule

Tapercut: combination of taper point with a reverse cutting edge. Suturing

Of dense fibrous tissue like tendon, periosteum, fascia.
Spatula: side cutting that are flat on top and bottom with side cutting edges
Designed for eye surgery to separate corneal and scleral tissue.

Choice of suture materials:

- Type of procedure
- Condition of tissue
- Disease process
- Surgeon preference
- Cost and availability

Surgical Gut:

Sheep intestinal mucosa
Absorbed quickly in the presence of infection
Packed in alcohol
Dipped, NOT soaked in saline, prior to use.
Avoid extensive handling to prevent fraying.

- Plain – quickly digested – (7-10Days)
- Chromic – treated with chromic salts to resist breakdown – (21 days)

Vicryl: (Polyglatin)

Braided or monofilament
56-72 days
Soft tissue approximation
Violet or undyes

PDS: (poydiaxanone)

Synthetic monofilament
Minimal tissue reaction
Absorption – 6 months
Violet, blue and clear

Monocryl:

Monofilament synthetic suture
Minimal tissue drag
90-120 days
Soft tissue approximation
Violet and undyed

Silk:

Soft pliable, good knot security
General tissue approximation and ligation
Black and white

Cotton:

Multifilament
Low tensile strength
Inflammatory properties
GI tract surgery
Umbilical tapes

Nylon: Ethilon/Dermalon/Nurolon/Surgilon

Mono or multifilament

Very inert
Easily passed through tissue
High tensile strength
Can cut through tissue
Low knot security
Skin closure
Black, blue, green, clear

Polyester: (Ethibond/Mersilene/Dacron/Ti-Cron/Tevdek/Surgidac)

Polyester
Braided or monofilament
High tensile strength
Minimal memory
Good knot security
Multifilament coated with silicon or teflon to reduce tissue drag.
CV surgery, tendon repair, opth surgery

Polypropelene: (Prolene/Surgipro)

Synthetic monofilament
Little inflammatory response
CV and micro surgery
Skin closure
Blue/clear

Stainless steel:

Orthopedic procedures
Sternum and ribs
No inflammatory properties
Minimal tissue drag
Puncture precautions
Abdominal wound closure

Suturing Techniques:

- The Primary Suture Line refers to the sutures that obliterate dead space, preventing serum from accumulating in the wound and hold the wound edges in approximation until healing takes place.
- The Secondary Suture Line refers to sutures that supplement the primary suture line. They are placed on each side of the suture line to help eliminate tension and reduce the risk of evisceration. They are called retention sutures.
- Continuous – A series of stitches of which only the first and last are tied. With this type, a break at any point means disruption of the entire suture line. It is used to close tissue layers where there is little tension but tight closure is required, such as peritoneum or on blood vessels. Running locked
- Interrupted – each stitch is placed and tied individually. This is widely used and considered strongest and most secure. Simple interrupted, Interrupted horizontal mattress, Interrupted vertical mattress, figure of eight.
- Retention sutures are placed at a distance from the primary suture line to relieve strain. Wound dehiscence is the result of a combination of factors including technical problems of closure, local wound factors (infection/hematoma), poor wound healing and undue stress on

the wound (abdominal distension, dilated bowel, vomiting, coughing, COPD. Predisposing factors such as sepsis, poor nutrition, diabetes, chemotherapy, advanced malignancy and steroids contribute to poor wound healing. These patients may require retention sutures. Usually heavy, interrupted sutures are used. Heavy nonabsorbable nylon or wire in conjunction with bolsters. Or bridges.

- Purse string – A continuous circular suture placed to surround an opening in a structure and cause it to close. This type of suture may be placed around the appendix before its removal or in an organ such as a cecum before it is opened so that a drainage tube may be inserted, followed by tightening of the suture around the tube.
- Subcuticular – Buried, are those placed completely under the epidermal layer of the skin.
- Traction – used to retract a structure that may not be easily retractor with an instrument. Ends are held with a hemostatic clamp. The structure is pulled to the side using the clamps.

Suture Passing Techniques:

Needle holder: left v right-handed; double armed
Suture ties/ligatures: length and passing, tie on a passer
Vessel clips: stainless steel v titanium

Cutting suture edges:

Short enough to reduce the amount of foreign material in the wound but long enough that the knot doesn't untie. Institutional policy may restrict the CST from performing this function.

- use suture scissors only; not tissue scissors
- use only the tip of the scissors
- steady the blade with your index finger over the top of the scissors
- "palming" the scissors
- Remove cut ends of suture from the wound

Accessory devices:

- Bolsters/bridges – used to keep retention sutures from cutting into the skin. Plastic devices that lie between the suture and the abdominal wall. Bolsters have the retention sutures threaded into them on top of the abdomen.
- Buttons
- Tapes – Cotton umbilical tapes used to retract and isolate structures, i.e. vessels, nerves, ducts. It comes prepackaged and is moistened with saline prior to use. It is part of the count.
- Vessel loops – Silicone loops also used for isolation and retraction of vessels. Elastic so they are superior to umbilical tapes for delicate structures. They are packaged with a variety of colors and may be used color-coded in some institutions. They are also counted.
- Adhesive closures - Steri-strips come in widths from 1/8. ¼. ½ and 1 inch. Must be applied to dry skin. An adhesive adjunct such as tincture of benzoin or mastisol may be applied in a thin film to the skin at the wound edges before tape application.
- Liquid sutures – Collodian, Dermabond
- Ligating Clips – small, v shaped staple like devices that are placed around the lumen of a structure to close it off. May be reloadable or preloaded disposable. Clips may be stainless steel, titanium, or tantalum. Titanium clips have gained popularity even though they are more expensive because they do not interfere with scans. Absorbable clips made of

synthetic materials are also available. Clips are available in various sizes, each with its own applicator. These clips are available in disposable, prepackaged units. Preloaded, disposable clip appliers are available that can be used through an opened wound or through a endoscopic instrument

- Wound Zipper
- Looped suture
- Endoscopic sutures – Suturing through an endoscope.
    - Extracorporaeal method – tied outside the abdomen and slide into place using a knot pusher. They can be tied rapidly and securely.
    - Intracorporeal method – Done completely within the abdominal cavity when fine sutures are being placed for reconstructive purposes. Required excellent hand-eye coordination and good visualization on video equipment.
    - Endo loop – preformed ligature loops.

Procedure Considerations: Sutures must be kept sterile, prevent prolonged exposure and unnecessary handling and avoid waste. The CST should prepare only one or two sutures during prelimary preparation, but the circulator should have an adequate supply of sutures available for immediate dispensing. Custom kits for particular procedures that are predictable.

- To remove strands to be used for ties, the lose end is pulled out with one hand while the folder is grasped with the other. To straighten a long suture, the free end is grasped; the kinks are removed by gentle pulling. Kinks are not removed by running gloved fingers over the strand. This causes fraying. Especially with catgut, sudden jerks may damage the suture so that it breaks during use.
- To prepare individual lengths, the strand is folded in equal parts and divided. 54-inch reels may be halved, thirds or quartered. For those strands packaged in labyrinth packs, single strands may be dispensed directly from the package.
- To remove a suture-needle combination, the CST grabs the needle with a needle holder and gently pulls the strand. To straighten it, the strand is grasped 2 inches from the needle and pulls gently. The jaws of the needle holder grasp the flattened surface of the needle to prevent breakage and bending. To facilitate suturing the needle is secured 1/8 inch down from the tip of the needle holder. The holder is placed on the needle about 1/3 from the swaged end.
- A suture should not be too long or too short. A long suture is difficult to handle and has an increased risk of contamination. A short suture makes tying difficult and if threaded on a needle, may slip out of the eye.
- When threading free needles, suture is advanced from within the curvature. This prevents accidental pullout. The CST pulls the suture about 4 inches through the eye to prevent accidental pullout.

Accountability:

- Exchange methods – During the procedure needles should be accounted for as they are handed to the surgeon on a one for one exchange basis. On those cases that required multiple needles to be used simultaneously, the CST must develop a method for keeping track of the number of needles in the field. One method is to keep the empty packets in clear sight and only discard them as the corresponding needle is returned.

- Count – Initial counts provide the basis for subsequent counts. Items added during the procedure should be counted and documented. The count should be audible and with items visualized by both persons. Subsequent counts are performed when cavities are closed, when either person is relieved and immediately before completion of the procedure. It is necessary to verify the actual number of needles in multipacks as they are opened for use. To facilitate counted, used needles should be kept on a needles pad or counter on the CST's table. Broken or missing needles must be reported to the surgeon and accounted for in their entirety. Follow the institutional policy for incorrect counts.
- Sharps precautions – Scalpel blades and suture needles account for 17% of reported injuries from solid devices in hospitals. They occur most frequently in the OR. Recommendations for eliminating hand-to-hand passing have been developed. They are difficult to enforce. Based on OSHA and CDC regulations, institutions should have written policies regarding the handling of contaminated equipment. OSHA recommends passing only clean sharps to the surgeon. After use, the surgeon placed the contaminated object in a predesginated basin, tray, collection device or a safe "neutral" zone on the field. This technique eliminates hand-to-hand passing so that no 2 people touch the same sharp at the same time reducing the chance of accidental needles punctures and cuts.

Suture Selection by Procedure

Principles of Suture Selection

1. When a wound reaches maximal strength, sutures are no longer needed. Therefore:
    a. Close slow healing tissues (Skin, fascia, tendons) with nonabsorbable sutures or a long lasting absorbable.
    b. Close hast healing tissues (Stomach, colon, bladder) with absorbable sutures.
2. Foreign bodies in potentially contaminated tissues may convert contamination to infection. Therefore:
    a. Avoid multifilament sutures in a contaminated wound
    b. Use monofilament sutures which resist harboring infection

3. Where cosmetic results are important, close and prolonged apposition of tissues and avoidance of irritants will produce the best results. Therefore:
    a. Use the smallest inert monofilament suture (nylon, prolene)
    b. Avoid skin sutures alone. Use subcuticular
    c. Use skin closure strips to secure apposition of wound edges

4. Foreign bodies in the presence of fluids may cause precipitation and stone formation.
    a. Use absorbable sutures in the urinary and biliary tracts

5. Regarding suture size
    a. Use the finest suture commensurate with the natural strength of the tissue being sutured
    b. Use retention sutures to reinforce primary sutures when the patient is at risk of dehiscence.

Suture alternatives:

Stainless steel or titanium staples are commonly used to reapproximate tissue and ligate. The staples

are designed in a noncrushing B shape when inserted into the tissue. This allows blood to pass through the line of staples, preventing tissue necrosis and promoting healing.

- Staples may be disposable or nondisposable with color-coded cartridges. Nondisposables are not considered as reliable and must be meticulously disassembled, cleaned and reassembled. Disposables are preassembled, and sterilized by the manufacturer. They have removable, disposable cartridges so that a new stapler is not required each time one is fired on the field.
- Caution: still require good basic surgical technique, atruamatic dissection, careful hemostasis, attention to tissue condition and blood supply.
- "If you wouldn't sew it, don't staple it."
- Advantages
    - Less tissue reaction. Stainless steel is the least reactive of all wound closure materials.
    - Accelerated wound healing. Tissues are not handled as mush, increasing the chance that the wound will heal without incidence.
    - Less operating and anesthesia time. Decreased blood loss
    - Efficiency. Staples create and airtight and leak-proof anastamosis or closure.
- Disadvantages
    - Increased cost
    - Staples must be precisely placed. Errors in technique are more difficult to correct than suturing errors.
- External
    - Skin staples approximate skin edges.
    - Supplied in a variety of staple quantities or widths.
    - A single squeeze of the trigger releases and places the staple
    - Different widths and may have reticulating heads
- Internal
    - Hemaclips/Surgiclip – occludes vessels and other tubular structures. Applier shaft with attached handles and multiple clips in the prefilled cartridge. Small, medium, large AND long and short. Visualize the clip. Also endoscopic model.
    - Fascia stapling. This thick, tough layer takes long to heal and the non-reactive nature of staples is suited for use here
    - Linear Staples – Used to insert 2 straight evenly spaced side-by-side rows of staples into tissue. Usually used to staple tissue to be transected within the GI tract or in the chest. They are available in various sizes. They can be inserted through a trocar for endoscopic use. TA (transaction and anastamosis) – row of titanium staples
      They can be articulating/reticulating.
    - Linear Cutters - GIA (gastrointestinal anastomosis) – 2 rows of staples with ligation between them. May be endoscopic as well.
    - Ligation/Dividing Stapler (LDS) – This device staples and then divides the tissue between the staples with a single firing. It is especially useful during GI surgery for ligation and division.
    - Intraluminal Circular Staplers – These are used to anastamose tubular structures within the GI tract. It fires a double row of circular staples and then trims the lumen with a knife located within the head of the stapler. These are commonly used during resection and reanastomosis of the distal colon of the rectum.

SUTURE CONVERSION CHART

SUTURES	DESCRIPTION	ETHICON
Caprosyn	Monofilament synthetic absorbable	
Biosyn	Monofilament synthetic absorbable	Monocryl
Polysorb	Coated braided synthetic absorbable	Vicryl
Dexon	Uncoated & coated braided synthetic absorbable	
Maxon	Monofilament synthetic absorbable	PDS
Plain Gut		Plain Gut
Chromic Gut		Chromic Gut
Surgipro	Non absorbable monfiiment polypropylene	Prolene
Novafil	Non absorbable monofilament polyester	
Ti Cron	Non absorbable coated braided polyester	Ethibond
Monosof	Non absorbable monofilament nylon	Ethilon
Surgilon	Non absorbable coated braided nylon	Nurolon
Sofsilk	Non absorbable coated braided silk	Silk
Steel	Non absorbable stainless steel	Steel
Indermil	Topical skin adhesive	Dermabond

TEST YOUR KNOWLEDGE

Suture	Braided / monofilament	Absorbable / non-absorbable	Material	Material color	Package color	Alternate Company name if applicable
Plain Gut						
Vicryl						
Chromic Gut						
Monocryl						
Prolene						
Ethibond						
PDS						
Mersilene						
Ethiln						
Silk						
Dexon						
Biosyn						
Cotton						
Nurolon						

Guidelines for Best Practices for Sharps Safety and Use of the Neutral Zone

Rationale

The following are Standards related to sharps safety and use of the neutral zone in the OR as well as recognizing the possible hazards in order to prevent injuries to the patient and surgical team members. The Standards aid in ensuring safe handling of all sharps in the OR, including implementing hands free techniques. The following results are from various recent studies to put sharps injuries in perspective for the surgical team members:

• Cuts or needle sticks may occur up to as many as 15% of surgical operations.

• Surgeons are at the highest risk for injury suffering up to 59% of injuries in the OR.

• Individuals performing in the role of the first scrub sustain the second highest number of injuries at 19% in the OR.

• Suture needles are involved in 77% of the injuries making them the most frequent source of injury.

• Up to 16% of injuries occur while passing sharp instruments on a hand-to-hand basis.

• The body part most commonly injured is the non-dominant hand.

• One-third of devices that cause injuries to healthcare workers (HCW) come into contact with the patient after the HCW injury increasing the risk of disease transmission to the patient.

• Double gloving reduces the risk of exposure to patient blood by as much as 87% when the outer glove is punctured.1

• The volume of blood on a contaminated solid suture needle is reduced by as much as 95% if it passed through both gloves.

These injury patterns and information concerning double gloving confirm the importance of preventing sharps injuries in the OR to protect the surgical team members and patient.

Standard of Practice I

A neutral zone should be utilized during all surgical procedures to prevent two individuals from simultaneously handling a contaminated sharp, including but not limited to scalpel blades, suture needles, hypodermic needles, and sharp surgical instruments.

1. Utilization of the neutral zone will decrease accidents to patients.

2. Utilization of the neutral zone will decrease accidents to perioperative personnel.

3. Before the first incision is made the surgeon and CST should agree on a location on the sterile field where all sharps are placed in which the surgeon and CST can obtain the sharp, and avoid hand-to-hand transfer of the sharps.

4. It is recommended that the sharps be placed in the neutral zone using an emesis basin, instrument mat or magnetic pad.

5. It is recommended that each time a sharp is placed in the neutral zone the surgeon or CST indicates this action verbally and completely withdraws his/her hand from the zone until the sharp is retrieved.

A. The surgeon or CST should announce the sharp by name when placing it in the neutral zone or indicate in some other manner such as “sharp” or “safety zone”.

6. Only one sharp should occupy the neutral zone at any time.

7. The CST should orient the sharp in a manner in which the surgeon may pick it up without needing to turn or reposition, and positioned so when the surgeon picks it up their hand is behind the sharp end or point.

8. To accommodate the needs of the surgeon during the surgical procedure, the surgeon and CST should openly communicate in determining if the agreed upon space for the neutral zone should be moved due to the changing parameters of a surgical procedure.

Standard of Practice II

If the procedure necessitates reuse of a hypodermic needle multiple times on the same patient, recap the hypodermic needle between uses utilizing a one-handed approach or a safety device that enables one-handed recapping.

1. Utilization of one-handed recapping will decrease accidents to patients.

2. Utilization of one-handed recapping will decrease accidents to OR personnel.

3. It is recommended that the CST use the “scoop” method by laying the needle cap toward the back of the Mayo stand and sliding the needle within the cap.

A. The concept of not recapping needles has been driven by patient care situations that exist outside the OR, i.e. nursing care units and clinics, when a needle is not used more than once. However, in the OR when a syringe with hypodermic needle has the potential for multiple uses on the same patient, leaving the needle uncapped presents a greater threat of possible needlestick and, therefore, is dangerous to leave unprotected on the Mayo stand. AST recommends that the CST perform one-handed recapping of the hypodermic needle on a routine basis in the OR.

Standard of Practice III

A sterile sharps container should be used on every case to store used sharps.

1. Utilization of the sharps container will decrease accidents to patients.

2. Utilization of the sharps container will decrease accidents to surgical team members.

3. It is recommended that the sterile sharps container can be closable, puncture resistant, and leak-proof.

4. It is recommended the HCF annually review the type of sterile sharps container that is being used to determine its effectiveness.

Standard of Practice IV

When organizing the sharps in the work area, e.g. Mayo stand, back table, the sharps should be pointed away from the handler and receiving personnel.

1. Keeping sharps pointed away from the handler and receiving personnel will decrease the chances of an injury.

Standard of Practice V

Visually inspect the field and all waste material for the presence of sharps before disposal.

1. Confirming that sharps are not present will ensure that no injuries occur to HCWs or patients.

Standard of Practice VI

Utilize mechanical safety devices to remove or attach blades, needles, or other sharps.

1. Utilization of mechanical devices will decrease the possibility of sharps accidents sustained by the surgical team members.

A. Mechanical devices or instruments, rather than the fingers, should be used to grasp hypodermic needles to load onto and take off of syringes, load and unload suture needles, and load and unload scalpel blades onto the knife handle.

Standard of Practice VII

The routine use of double gloving by all surgical sterile team members is recommended for all surgical procedures.

1. Double gloving is recommended for all surgical procedures including endoscopic procedures in which trocars will be used.

2. Double gloving reduces the risks for the patient and surgical team members associated with exposure to Bloodborne pathogens.

Standard of Practice VIII

A non-sterile sharps container must be used for the disposal of all needles and other sharps to decrease the risk of injury to HCWs and patients.

1. The decision on the type/style of non-sterile sharps container to be used should be based on four criteria: functionality, accessibility, visibility, and accommodation.

A. OSHA requires non-sterile sharps disposable containers to be closable, puncture-resistant, leak-proof on all sides and bottom, accessible, ability to be maintained in an upright position, and be labeled with the biohazard symbol.

2. The opening of the non-sterile sharps container should be large enough to accommodate the intended sharps devices and unobstructed.

3. The non-sterile sharps container should not be overfilled.

A. It is recommended that the container be replaced and properly disposed when three-fourths full.

4. Surgical team members must never reach into a non-sterile sharps container with fingers or instruments. Once disposed, sharps must not be retrieved from the container.

5. It is recommended that a person or persons be designated and responsible for changing and replacing full containers for a matter of consistency.

Medication Administration

The role of the CST varies from state to state and from facility to facility. The CST should have a first hand knowledge of medication administration. Institutional policies should be clearly understood and followed. Handling medications is a critical function of the CST. Several types of medications and handled and passed to the surgeon.

Administration of medication is a team effort.

Surgeon: Orders the medications

Circulator: Obtains the correct medication
Delivers the medication to the sterile field
Documents all medications used on the sterile field.

Scrub: Identify medications
Accept medications onto the sterile field
Label the medications immediately
Pass the medications to the surgeon as requested

The Six "Rights" of medication administration

- **the right drug**
- **the right dose**
- **the right route**
- **the right patient**
- **the right time**
- **the right documentation**

Drug: preference cards must be clearly written.
Correct spelling and strength
Similar names (pitocin and pitressin)

Dose: the actual dose is a combination of the volume and strength
(0.5% lidocaine with 1:100,000 epinephrine)
Heparin (1000, 5000, 10,000)

Route: Most drugs are IV in the OR administered by the anesthesia provider
IV, IM, PO, SC, topical, inhalation

Patient: Patient allergies

Time: In the sterile field, the surgeon administers all the medications
Administered periodically throughout the procedure

Documentation: all medications administered on the sterile field are documented on the Intraoperative log. The CST must keep track of the amount of each drug administer. (Irrigation fluids, lidocaine, dyes)

Medication Identification:

- Circulator reads label

- Circulator reads the label aloud to the CST
- Circulator shows the label to the CST with the expiration date
- CST states medication information out loud
- CST accepts medication
- CST labels medication immediately

Medication Labels:

- Name (brand and generic)
- Strength
- Amount
- Expiration date
- Administration route
- Manufacturer
- Storage directions
- Warnings or precautions
- Lot number

Delivery to the Field:

- sterile technique
- the circulator handles only the outside of the container
- CST draws air into the syringe
- Injects the air and withdraws the medication
- Usually 18g needle
- Powder form – reconstitution with NS
- Unsterile hands should NOT touch the plunger
- Medications "Poured"
- Decanter
- Ampules (break glass)
- Medications intended for topical application should NEVER be in a syringe!
    - Thrombin
- Labeling with Drug and strength
- Anything unlabeled should NOT be used
- Controlled substances (Cocaine)

Supplies:

- syringes (TB, insulin, 3ml, 5ml, 10ml, 20ml, 50ml)
- luer loc
- needles (gauges)
    - hypodermic
    - spinal
    - huber
- DO NOT used 2 hands to recap.

Guidelines for Best Practices for Patient Identification, Correct Surgery Site and Correct Surgical Procedure

Rationale

The following are Practices related to the proper identification of the surgical patient, verification of the correct surgery site and surgical procedure by the surgical team. There are many instances when patient misidentification, wrong site surgery and wrong patient can occur, including invasive procedures, medication administration, transfusion of blood products, and matching pathology specimens to the correct patient.

The Practices are meant to contribute to the efforts of patient safety and reduce the risks of patient errors.

Standard of Practice I

The patient should have at least two corroborating patient identifiers as evidence to confirm identity.

1. The use of two patient identifiers improves the reliability of the patient identification process and decreases the chance of performing the wrong procedure on the wrong patient. Additionally, the use of two patient identifiers is necessary in the instances of a name patient alert because two (or more patients) have the same name that can be spelled the same, close to being spelled the same and/or pronounced the same. Examples of acceptable patient identifiers include:

A. Name

B. Assigned identification number

C. Telephone number

D. Date of birth

E. Social security number

F. Address

G. Photograph

2. The patient's room number should not be used as a patient identifier; room numbers are not person-specific identifiers, since patients can be moved from room to room.

Standard of Practice II

All patients undergoing a surgical procedure should wear an identifying marker.

1. Identification markers on the patient will prevent wrong patient surgery.

2. Identification markers on the patient will prevent wrong-procedure and wrong-site surgery.

3. Identification markers can include the following:

A. Wristband as identification bracelet

B. Wristband with unique bar-coded patient identifier

C. Radio frequency identification (RFID) marker3

4. Healthcare facilities should still be aware that the reliance on wristbands for identification of the correct patient has, obviously, not eliminated the problem of patient misidentification. Surgical technologists should still follow all other patient identification policies to prevent an error. Surgical technologists should be aware of the six most common types of wristband errors as an aid in foreseeing the hazards associated with wearing a wristband:

A. Wristband is not present

B. Wrong wristband, ie another patient's wristband

C. Presence of more than one wristband, and conflicting information is written on both.

D. Partially missing information on the wristband

E. Erroneous information on the wristband

F. Written information on wristband is illegible

G. Patient's name is written the same, written close to the same, and/or pronounced the same as another patient's name

5. Surgical technologists should avoid removing the wristband.

A. The wristband should be placed on the wrist of the non-operative/nonaffected side of the body.

B. If the wristband must be removed, it is recommended that it be placed with the patient chart in order to be immediately replaced on the wrist at the end of the procedure, or a new wristband is obtained and placed with the patient chart for immediate placement on the wrist.

Standard of Practice III

All patients undergoing a surgical procedure must be properly identified by the surgical team members prior to transporting the patient to the surgery department.

1. All surgical team members should recognize that performing an invasive procedure on the wrong patient is a possibility that always exists. No healthcare facility, small or large, is immune from human errors, poor communication, and lack of teamwork. To reduce patient identification errors is not accomplished by trying to perfect human performance, but rather by improving the system where healthcare providers work. The human condition can't be changed, but the conditions under which people work can be changed. The following recommendations are intended to reduce the risk of performing an invasive procedure or surgery on the wrong patient.

A. The following are recommended times for verification of patient identity and surgical procedures:

(1) When the surgery is scheduled

(2) When the patient is admitted to the healthcare facility

(3) Anytime the patient is transferred to another caregiver

(4) Prior to sedation

(5) Prior to the patients entry into the operating room

B. The following are recommendations for the identification of the conscious, competent patient prior to the start of the surgical procedure:

(1) The surgical technologist should address the patient using his/her full name and introduce himself/herself, including job title or position. This will aid in lessening the anxiety of the patient.

(2) Patient should be asked to say his/her name, the surgical procedure to be performed, and location of the operation.

(3) The patient's name and hospital-assigned identification number on the surgery schedule and transfer slip should correspond with the information on the patient's wristband.

(4) The information on the patient's wristband should correspond with the information in the patient's chart.

(5) Verify that the procedure listed and described on the informed consent in the patient's chart is the same procedure that the patient verbally stated.

(6) Confirm that the correct procedure is on the operating room schedule.

C. The following are recommendations for the identification of the mentally incapacitated patient:

(1) Verify that the correct patient is being taken to the operating room by asking a family member or designated representative the patient's name.

(2) Verify the information on the patient's wristband is the same as the information in the patient's chart.

(3) The patient's name and hospital-assigned identification number on the surgery schedule and transfer slip should correspond with the information on the patient's wrist band.

(4) Verify that the procedure listed and described on the informed consent in the patient's chart is the same procedure listed on the surgery schedule.

(5) Confirm with the family member or designated representative the procedure that is expected to be performed, as well as location of the operation and verify this matches up with the informed consent.

D. The following are recommendations for the identification of a minor patient:

(1) Complete the recommendations for an alert, oriented patient.

(2) Confirm the minor patient's name with the parent or legal guardian, the procedure to be performed and location of the operation.

E. If, at any point, the verification process fails to confirm the correct patient, correct procedure and/or correct site, the surgeon should be notified and no action taken in transporting the patient into the operating room until the verification is accurate.

Standard of Practice IV

Verifying the correct surgical procedure and site is the responsibility of the surgical team members.

1. Methods of proper confirmation of the surgical procedure and surgical site identification should include, but are not limited to, the following:
A. Oral confirmation
B. Patient identification marker
C. Surgery schedule
D. Patient chart (ie signed consent for surgery, history and physical)
2. The physician should initial the correct surgical site on the patient, if applicable.
3. It is recommended that the surgical site be "marked" to identify the intended site of skin incision or insertion, ie trocars. Marking the site unambiguously contributes to the safety of the patient by avoiding wrong site surgery.
4. Recommendations for marking the surgical site include:
A. No marks of any type should be made on the nonoperative site.
B. Use clear unambiguous marks, such as "Yes" or a line marking the proposed skin incision.
C. The healthcare facility should establish a policy for indicating the type of mark and method of marking to promote continuity among the various departments of the facility.
D. Site marking must take place with the patient conscious, alert and oriented, and the patient indicating the surgery site.
E. Use a permanent marker in which the mark will remain visible after the skin prep is performed.
F. The mark must be visible after the sterile surgical drapes have been placed.

Standard of Practice V

Prior to the start of any surgical procedure, a "time out" should be completed to verify the correct patient, correct surgical procedure, and correct surgical site.

1. In the preoperative holding area, the surgical team members should ask the patient to state (not confirm) the following (Veterans Administration National
Center for Patient Safety).
A. Name
B. Social Security number or date of birth
C. Correct procedure
D. Site of surgical procedure
E. Patient's responses should be reconciled against the marked site, patient's hospital identification wristband, and informed consent.
2. A time-out should serve as a final verification of correct patient, correct procedure, and correct site.
3. A time-out should be performed according to hospital policy.
4. If verification does not occur, the procedure should not occur.

5. With the patient positioned, draped and anesthetized on the OR table, and just before the skin incision is made, “time out” is conducted as a final verbal confirmation of the correct patient, surgical procedure, surgical site, and when applicable, implants (The Joint Commission, 2003).
A. The surgical technologist can request a time out if none of the other surgical team members requested it to be completed

Guidelines for Best Practices for Creating the Sterile Field

Rationale

The following are Standards of Practice related to creating the sterile field in the perioperative setting. Surgical team members must rigorously adhere to the principles of aseptic technique and implement those principles for every surgical procedure in order to reduce the risk of the patient acquiring a surgical site infection (SSI). During all phases of surgical case management, the surgical team members must exhibit a high level of surgical conscience that demands when creating the sterile field, if an individual breaks aseptic technique, he/she will immediately communicate this to the other team members, or if another team member points out a break in aseptic technique, the individual who broke technique will take corrective action.4 Additionally, the surgical personnel will work together as a team to problem solve the break in technique and arrive at the optimal decision applying the principles of aseptic technique. By following these Recommended Standards of Practice, another goal is to contribute to reducing waste and additional costs to the surgical patient. All surgery department personnel should be involved in the process of developing and implementing healthcare facility policies and procedures for creating the sterile field.

Standard of Practice I

To provide for a safe and uneventful surgical procedure, the Certified Surgical Technologist (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.

Standard of Practice 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, eg IV stands, sitting stools, anesthesia provider's cart, and equipment, eg electrosurgical unit, suction system, are in the OR.

2. Furniture should be grouped and positioned.

A. Furniture that will eventually be sterilely draped including the backtable, 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 in which 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. Furniture that will be set up and included in the sterile field should be positioned 12-18 inches away from the wall and other non-sterile furniture and equipment.

3. All other furniture that will not be included in the sterile field, eg linen and trash hampers, sponge/kick buckets, sitting stools, should be positioned away from the furniture to be used in the sterile field and away from traffic patterns.

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. Safety strap should be correctly positioned on the OR table.

Standard of Practice III

Aseptic 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, eg back table pack placed on back table, basin placed in ring stand, instrument sets placed on flat surfaces, 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 by the circulator.

2. Prior to opening a sterile item, the following should be verified:

A. The external 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, eg no perforations, tears or evidence of strike-through.

C. Confirm expiration date, 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, eg sterile towel pack

(4) Peel pack items, including suture

B. The CST's gown and gloves should be opened on a separate flat surface, such as the Mayo stand.

C. Small wrapped items, peel packs and suture packets should be opened and "flipped" onto the sterile field using aseptic technique. The glued area of peel packs and suture packets is considered the boundary between nonsterile and sterile. Items should be opened in such manner that the nonsterile person is not extending over the sterile field.

D. Peel packs that contain a heavy or difficult item(s), eg pliers, 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 aseptic 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 logical, sequential, and efficient routine for creating 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 (e.g. all of the drapes are opened in the same area of the back table.

(3) Sharps should be grouped on one corner of the back table and other items should not be opened near the sharps. This aids in minimizing the risk of an accidental sharps injury during the set up.

(4) Items such as drapes should be opened in reverse order of use (eg, the last drape to be used will be opened first so it will be on the bottom and the first drape will on top). This minimizes movement and contributes to efficiency.

4. Rigid instrument containers should be inspected prior to opening.

A. The filter and/or valve system should be inspected to confirm they are intact.

B. The tray locking mechanisms should be checked for integrity, and if the chemical indicator on the seal lock changed color to confirm that the container was exposed to a sterilization process.

C. If the container does not meet these inspection criteria, it must be considered contaminated and not used.

D. The lid should be lifted upward, take a step back and away from the container to prevent contamination.

E. Containers that have a gasket should be checked to make sure the gasket is intact. If the gasket is not intact, the set should be considered contaminated.

5. If a sterile package is dropped, the package may be considered safe for immediate use if wrapped in impervious packaging, the area of contact is dry, and the integrity of the packaging is maintained. The package should not be placed back in sterile storage and must be immediately opened and placed on the sterile field. Sterile packages wrapped in reusable woven fabric packaging that have been dropped should not be opened, and the items should not be transferred to the sterile field; reusable fabric packaging allows air to implode into the package when it lands on the area of contact. Refer to the AST Recommended Standard of Practice for Sterile Wrapped Items Dropped on Floor for additional details.

Standard of Practice IV

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

Standard of Practice V

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

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. The sterile field should be broken down, and the OR cleaned.

Standard of Practice VI

To contribute to the efficiency of surgical patient care the CST in the first scrub role should implement the principles of economy of motion when completing the setup of the sterile field.

3. The eight principles of economy of motion when setting up the backtable and Mayo stand should be followed by the CST.

A. Motions should be simple, productive, minimal and non-repetitive.

B. Move about as little as possible.

C. Visualize and keep the body centered in a "box" or one area and move just the shoulders and hands. This may not always be possible when preparing for large procedures, but movement should be minimized as much as possible.

D. Divide the backtable into sections and work in sections at the table.

E. Handle each item once; avoid rearranging items. Once an item has been placed, leave it.

F. Establish a logical, sequential, and efficient pattern for backtable and

Mayo stand set up.

G. Be aware of the total OR environment in order to develop "sixth sense awareness" related to movement of others in the OR, who are non-sterile and areas that are sterile and non-sterile.

H. Think fast, but move carefully.

Standard of Practice VII

To contribute to the efficiency of surgical patient care the CST in the first scrub role should establish a routine for setting up the backtable 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 backtable and Mayo stand set ups.

1. Establishing a logical, sequential, and efficient routine for prioritizing setting up the backtable involves the CST being knowledgeable of the contents of the backtable pack, supplies that were opened and basin set contents.

A. Items should be arranged in a manner that allows the CST to limit movement as he/she retrieve instruments and supplies intraoperatively.

B. Items that are used first should be organized first including the gowns and gloves of the other sterile team members followed by draping items followed by corded items such as the bovie and suction tubing. The order of use may change depending on procedure, surgeon preference, and facility policy.

C. As drapes and accessory items are organized and space becomes available, lay opened towels on the backtable, edge-to-edge, side-by-side to cover the backtable cover for reinforcement.

(1) The use of towels for reinforcement purposes is determined

by the backtable cover's ply and surgical procedure.
Reinforced backtable covers are commercially available.
D. Small basins are removed from the basin set and placed close to the edge of the backtable that allows the circulator to pour solutions and medications in an aseptic manner.
E. A skin marker and labels (blank or preprinted) should be available on cases where solutions, dye, and medications will be used.
(1) The containers or syringes should be labeled as outlined in ASTs Guideline Statement for Safe Medication Practices in the Perioperative Area.
F. Drapes and supplies, such as gowns, towels, ESU pencil, handle, light handle covers and suction tip with tubing need to be rearranged. These items may be placed in an area of the backtable that is unused such as a corner on the backtable or on an empty basin Drapes should not be placed on/over irrigation solutions to avoid strikethrough.
G. Sharps, including suture packets, should be arranged in a manner to facilitate completing the counts in an efficient manner. Refer to the AST
Recommended Standards of Practice for Completing Counts.
(1) Sharps should be placed together near the needle mat, in a common location. Suture is arranged in sequence of use.
H. Sponges should be arranged to facilitate the completion of counts in an efficient manner. The band around the sponges should be left in place and not broken/removed until ready to count the sponges. Refer to the AST
Recommended Standards of Practice for Completing Counts.
(1) Depending on the preference of the CST, the 4 x 4 radiopaque sponges can be arranged in a cascading fashion while performing the count.
I. Space is created on the backtable for the instrument set(s), which must be removed from its container.
(1) The internal indicator or integrator is checked prior to moving the set to the backtable to verify exposure to the sterilization process. Each level of the tray should have an internal indicator or integrator, or the entire set is considered contaminated.
(2) The basket or tray is removed from the pan by lifting it vertically without the gloves touching the container and stepping away. Avoid the instrument basket or tray touching the front of the gown and do not place on the backtable until indicator/integrator and bottom of container have been checked.
(3) The bottom of the container should be checked for residual condensate; if present the instrument tray/basket should be considered non-sterile.
J. As instruments are removed from the instrument set they should be organized by category.
(1) Instruments on a stringer should be placed on a roll towel and the stringer removed.
(2) Heavy instruments should be kept in the instrument tray or placed flat on a reinforced surface (eg towel).6
(3) If instruments are placed in an instrument tray, they should be arranged to facilitate counting and access during the procedure.
(4) Forceps should never be placed on the edge of the instrument tray as this damages the instrument. They should be laid flat on the backtable.
(5) Tip protectors, covers and sleeves should be removed from all instruments and removed from the sterile field. These covers are not radiopaque and have the potential to become a foreign body in the surgical wound.

(6) Instruments should be briefly inspected for function.
(7) Instruments that require assembly should be assembled.3
K. in some instances it may be necessary to create another sterile field using a second backtable.
(1) The backtable cover should be opened when all other sterile supplies are opened.
(2) If necessary the CST in the first scrub role can drape the backtable. When draping the second backtable the CST will unfold the cover toward himself/herself to cover the front area of the table to reduce the chance of contamination. The CST will unfold the other portion of the table cover away from self.
(3) The second backtable should be organized with minimal movement just as the primary backtable set up was accomplished.
2. 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 CST should select the instruments and supplies that will be used most frequently during the surgical procedure for placement on the Mayo stand.
B. Instruments should be briefly inspected for functionality and damage.3
C. Instruments should be handled carefully, either individually or in small lots, to avoid possible damage.12
D. The CST should place instruments on the Mayo stand in even numbers.
E. The instruments should be grouped with similar instruments as they are on the backtable.
F. The instrument should only be closed to the first ratchet to facilitate the surgeon's ability to quickly open the instrument for use.
G. Sharps placement should allow the CST to safely pick up the sharp and place in the neutral zone or pass to the surgeon.10
H. 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.
I. Curved instruments should be placed together with the curves facing in one direction.
J. Curved instruments that are not placed on a roll towel should be positioned on the Mayo stand according to healthcare facility policy, eg sharp vs. blunt pointed scissors.
K. The skin marker, needle on syringe (local anesthetic) and skin knife should be included on the initial Mayo stand set up, but moved to the backtable after initial use.
L. If a sterile bag is used it should be placed on the Mayo stand in accordance with the AST Guideline Statement for Placement of Sterile Bag in the
Sterile Field.
M. 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.
3. At the appropriate time, per facility policy, the initial count is performed with the circulator. Refer to the AST Standard of Practice for Completing Counts.

Standard of Practice VIII

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

Basic Case Preparation and Perioperative Routines

OR preparation prior to procedure:

- Case Selection
- Surgery Schedule – This is the document from which tells the CST what the procedure is to be performed.
- Surgeon's Preference Card – This may be a hand written document or computer generated.
  Instrumentation – Lists of instrument sets and their locations should be available in the department. Ensure that you retrieve those sets as indicated on the preference card. Other single wrapped instruments may be required as well.
  Supplies, sterile and unsterile – The preference card will list those supplies and packs usually used by the particular surgeon for each procedure. If you cannot locate the card, try to retrieve a comparable one and discuss preferences with the surgeon prior to the procedure.
  Equipment, sterile and unsterile – The equipment will include positioning equipment, special cautery, microscopes, drills etc.

- Preparation of the Environment – Furniture should be arranged for ease of use, efficiency and the best possible sterile technique.
- Establish the sterile field furthest from the door and out of the main traffic lane within a room. This may be difficult but assuring sterile technique is the responsibility of the CST. This will decrease air movement and contaminants. Tables that will be part of the sterile field should be 18 inches from the wall during preparation.
- The OR table should be positioned under the OR light in whatever orientation is required for the procedure with the anesthesia machine at the head of the table. The lights should be checked for proper functioning and positioned for the procedure.
- Bags for laundry, clean and biohazardous waste should be available.
- Kick buckets should be lined with impervious materials and suction canisters should have new liners and the tubing should be in place and attached to the vacuum. Ensure that this is functioning prior to admitting the patient to the suite.
- Sterile packs should be placed on back tables.
- Basins sets are placed in ring stands.
- Instruments are opened on clean, flat surfaces.
- Electronic equipment should be positioned and checked for functioning.
- Some furniture and equipment may not be able to be placed until the patient in on the OR bed and the transporting stretcher removed from the room. However, everything should be available and planned prior to the beginning of the procedure.

Packs are opened, covering the back table, creating a sterile field. Open packs and basins according to aseptic principles. Small items may be flipped into the basin or on the back table according to hospital policy. It may be necessary for the circulator to open each package directly for removal by the scrubbed CST. Each package is checked for integrity and signs of contamination. Chemical indicators are assessed, dates checked if applicable. DO NOT remove the tape from a wrapped package. Rather, snap the seal. Peeling tape increases the risk of tearing the wrapper and contamination.

- Furniture
    - Furniture Mayo stand
    - Back table
    - Ring stand, single, double
    - Prep table
    - OR table and accessories
    - Kick buckets
    - Sitting stools
    - Step stool
    - Linen hamper
    - Trash hamper
    - Biohazardous receptacle
  - Other
    - Blanket warmer
    - Fluid warmer
    - Clock with second hand
    - X-Ray view box
    - Documentation space

Initial steps for starting a procedure:
- Preparation of surgeon and surgical team
- Placing and securing surgical drapes
- Positioning of surgical tables
- Anchoring accessories.

Instrumentation: Tools of the Trade. OR personnel are responsible for the use, handling and care of hundreds of instruments each day. This activity requires knowledge of how they are maintained and properly used in order to prolong their usefulness.

A CST handles hundreds of instruments each day. The number and variety seem overwhelming. When you think about it, almost all operations follow a few basic steps. First, an incision is made, using a cutting instrument such as a knife blade or scalpel; or as in laparoscopy, cutting trocars.
Then the site is exposed, using clamps to control bleedings, graspers to pick up and hold tissue and retractors to hold back tissue layers. The operation is completed using these same basic maneuvers: cutting and dissection, clamping, grasping and retracting. Finally, the incision or cavity is closed, layer by layer, typically with the aid of needle holders, needles and sutures.

With this in mind, most surgical instruments fall into one of four basic categories:

-cutting instruments

- clamps, hemostats and occluding clamps
- graspers, forceps, tenacula and needle holder
- retractors; hand hand and self-retaining types
- probing/Dilating/Cannulating/Draining – They include suction tips, syringes, gall duct probes, trocars, cannulas for drainage of fluid, catheters etc.

Each instrument is used to do a particular job and to function in a particular manner. It should only be used for that function to preserve its longevity. Differences in lengths, weights and shapes of instruments; differences in size, curves or angulations of jaws, blades and handles are specific to adapt

the instrument to perform its specific function

Anatomy of an Instrument:

The clamp is the most common type of instrument. It has identifiable parts. The *point* is its tip. It should fit tightly. The *jaws* hold the tissue securely. They are either smooth or serrated. The serrations allow greater gripping strength and prevent slippage. The *box lock* is the hinge point of the instrument and the pin within it should be flush with the instrument. The *shank* is the area between the box lock and the *finger rings.* The *ratchets* interlock to keep the instrument locked shut and they should mesh together smoothly.

Finishes:

- Bright, mirror
- Satin, dulled
- Ebonized

Cutting instruments are used to incise, cut, dissect or separate tissue. The largest category of cutting instruments are scalpels and scissors. Other specialized instruments are chisels, curettes, rongeurs, osteotomes, power instruments.

Scalpels: Referred to as "knife" Incorrect. Scalpels are the handles with disposable blades.

- Handles - #3, #4, #7, #9, #3L, #4L. Each holds certain blades. 3 and 4 are 5 inches long, 7 is longer. 3L and 4L are 9 inches long and may be angled to reach difficult locations. Beaver handles are made for fine blades for eye and plastic surgeries.
- Blade sizes and uses – Blades are made of carbon steel. There are sliding groove loads and locking loads.
- #10, #11, #12 and #15 fit on 3, 7, and 9 handles
- #20-25 fit on 4 handles
- #10 is considered the "skin" blade in many institutions
- #11 is a bayonet style and is used to open vessels, ducts etc
- #12 is a hockey stick and is the "tonsil" blade
- #15 is also frequently used for finer work but may be used for skin especially for plastic and pediatric surgery.
- Changing blades – Blades are changed using a needle holder or clamp. There are also mechanical devices being developed. DO NOT use fingers for changing blades.
- Passing scalpels – Scalpels are passed with the CST's fingers ABOVE the blade. It is never passed with the hand under the blade as this may result in t accidental injury.

Scissors: a cutting instrument with two shearing blades. Different types of scissors have different tips, blades, curves and angles and levels of delicacy. Each scissor has a specific function. A conventional scissors requires one movement to open the jaws and other to close the, Some scissors, eye, micro, have a spring that holds the jaws open. With these instruments, a single movement presses the spring together and closes the jaws.

There are 2 types of scissors: tissue and suture scissors.

- Tissue scissors are used for tissue dissection. Most have curved tapered points, but some are straight. Curved scissors are preferred because they allow the surgeon to see the tips of the scissors keeping the hand out of the line of sight. Stevens and Castro scissors are used for delicate eye and plastic surgery.

- Suture scissors are usually straight with blunt points. They are used in preparing strands of suture during setup and cutting sutures in the field. They are also used to cut dressings. Wire scissors are needed to cut wire suture.

-Using curved tissue scissors to cut suture will dull the blades.

Other cutting Instruments:
- chisels: sculpt bone; one beveled edge: use with mallet
- osetotomes: shaping bone; double beveled edge; remove periosteum from bone
- rasps: smooth rough bone surfaces
- rongeurs: biting instruments; various sizes and angles;
- saw – cutting bone
- trephine: cut bone from the skull : circular shape
-

Powered Instruments:

Used for sculpting, cutting, shaving, and drilling. Many interchangeable parts. Powered by electricity, air, nitrogen. Pneumatic instruments, a pressure gauge controls the flow at a specified pressure in pounds per square inch. (PSI). Compressed gas may be piped directly into the OR. Development of battery powered instruments.

Cutting/Dissecting Instruments

Scissors: may be short, long, blunt or sharp, curved or straight

Straight Mayo	Suture scissors
Curved Mayo	Heavy/tough tissue
Metzenbaum, short	Superficial, delicate tissue
Metzenbaum, long	deep, delicate tissue
Stevens	Fine, plastic surgery

Scalpels/blades: the oldest of all instruments

CLAMPS: Used to hold, join or compress parts together. Hemostats are used to grasp bleeding vessels and occluding clamps that are used to clamp bowel, ducts, vessels and other tissues. The type of clamp needed for a procedure will depend on the type of tissue to be held and the depth of the surgical procedure.

Hemostats: used to prevent excessice loss of fluid, usually blood, by closing the severed ends of vessels with a minimum of tissue damage. Range in size. Straight or curved. Serrations allow bleeding vessels to be compressed with sufficient force to stop bleeding. The serrations must mesh perfectly to prevent tissue from slipping free from the ends of the clamp. DO NOT used clamps to attach items to the surgical drape. This may bend the ends of the clamp and make them functionless on tissue or cracking a box lock.
- Crile clamps – subcutaneous bleeders.
- Kelly (pean) – muscle bleeders, hold peanuts, pass drains.
- Mosquitoes – superficial bleeders.

Occluding clamps – special jaws with finely meshed teeth. Designed to prevent leakage and to minimize trauma,
- babcock - no teeth – used to grip delicate structures: fallopian tube, vas, bowel

- allis – multiple fine teeth – hold tissue gently but firmly. Used to retract tissue and to grasp fascia, cysts and cartilage.
- Kocher – large tooth to grasp heavy tough tissue like bone, fascia and cartilage.

GRASPING INSTRUMENTS:

Non clamping instruments that allow the surgeon to pick up and hold tissue. Forceps and needle holders are common examples.

- Smooth forceps: simple serrations and smooth tapered points. Adsons, Bayonet.
- Tissue forceps: with teeth, skin, cartilage, fascia. They can tear or puncture delicate tissue.
- Atraumatic forceps: grasp fine tissue; vascular; minimal trauma; debakey forceps

Other graspers:

- sponge forceps -
- towel clips
- tenacula

Needle holders: designed to grasp and firmly hold surutre needles. Shorter, stubbier jays. Most have many serrations that hold the needle in place.

- Mayo-Hegar ; hold medium to heavy needles widely used.
- Webster: plastic surgery: no serrations
- Castroveijo needle holder:

Category 2: Holding/Grasping Instruments - may be long or short, delicate or heavy, straight or curved

Holding clamp – serrated jaw

Grasping clamp – projected tooth or teeth

Mosquito	Smallest, superficial, plastic or pediatric
Crile	First 2 layers of the abdomen
Kelly	Holding clamp, heavy tissue
Pean/Carmalt	Large Kelly, holding clamp
Babcock	delicate structures, intestines, noncrushing
Allis	intestinal structures, delicate
Kocher	Tooth, tough fibrous structures
Adson/tonsil	Long fine
Mixters	long heavy
Tissue forceps	short, regular or long
	Hold or grasp tissue

RETRACTORS hand held ro self retaining. Generally used in pairs. Hold back the edges of surgical wound to provide exposure of the operative site. Retractor tips vary according to the delicacy of the tissue. Tough tissue may get points (rakes) Holding back bowel or liver requires smooth edges.

Hand held

- malleable
- senn
- richardsons
- army-navy
- rakes
- parker
- skin hooks

Self retaining:
- weitlaner
- balfour
- o'connor-o'sullivan
- bookwalter.

Retracting Instruments. These are wither self-retaining or handheld. Variety of sizes and shapes. Hand held retractors are usually used in pairs.

Army-Navy, Parker	Superficial, first 2 layers of the abdomen
Richardson	Inside abdomen to retract organs
Deavers	Curved blades, in the abdomen to get under organs
Malleable	Flexible, can be shaped to order
Skin hooks	superficial
Senn	superficial, sharp or dull
Balfour	Abdominal
O'Connor-O'Sullivan	Pelvic
Weitlaner, Gelpi	Small to medium, sharp or dull

Suturing instruments

Needles holders may be long to short, heavy or delicate. Needles holders must retain a firm grip on the needle. The diamond jaw needles holder has a tungsten carbide insert designed to prevent rotation of the needles. They may have ratchets or may be spring action and lock type.

Mayo-Hegar	Standard, general surgery
Webster	Plastic/pediatric
Castroviejo	Spring lock, vascular, eye, microsurgery
Heany	Curved, heavy, GYN
Needle nose	heavy, blunt, used for wires

Category 5: Miscellaneous Instruments.

Suction tips	
Yankauer	standards
Pool	thick, heavy fluids
Frazier	small, delicate
Probe/groove director	dilates and probes lumens
Towel clamps	Holds towels or tubing in place
Ring forceps	straight or curved, for prepping or Mopping up blood can be used to retract.

Endoscopic instruments must function through the diameter of the scopes. Typically they have long shafts with distal handles. Must function at the tissue level as any other instruments.
Care and handling: Instruments must be handled gently. Heavy instruments should never be placed or packaged on top of delicate instruments. At the end of the procedure they should be piled up on top of each other. Sharps and delicate instruments should be set aside and individually cleaned and the tips protected.

Check function and integrity – Each should be inspected to spot chips, breaks, or cracks. Forceps,

clamps and other hinged instruments should be checked for jaw alignment. Edges of scissor tested for sharpness. Ratchets must hold and the clamp must open and close easily and smoothly.

Cleaning methods
Instruments contaminated with blood or tissue should be rinsed during the procedure and cleaned immediately after. When blood is allowed to dry on the instrument, it can harden its joints, become trapped in the serrations and cause corrosion and malfunction.
Initial cleaning is manual for gross debris

Processing through a washer-sterilizer is recommended. All instruments opened for a procedure are considered contaminated and should be processed. If cleaning cannot be accomplished immediately, they should soak in warm, soapy water until cleaning is possible.

Instruments that are cleaned may be placed in an ultrasonic cleaner. This is NOT microbicidal and is only used after decontamination.

During cleaning, all hinges and joints are opened to expose box locks and serrations where blood and debris may be concealed

All instruments with removable parts are disassembled for cleaning. Instruments with lumens are flushed.
A noncorrosive, low sudsing free rinsing detergent with as neutral a pH as possible is used for washing instruments.

A high sudsing detergent may not be completely removed during rinsing and cause spotting and staining. A neutral pH is recommended because alkaline detergents can stain instruments and acids can cause pitting.

Only soft brushes are used to clean serrations and joints. Steel wool, scouring powder and abrasives can cause scratches and removal of protective finish

Stiff joints are lubricated with a water-soluble lubricant. Oil-based lubricants leave a residue preventing steam contact and sterilization.

Specialty instruments require special care. Power instruments operated by nitrogen or electricity require special care and maintenance. Guidelines regarding the care of these are available from the manufacturer.

Preparation for sterilization
As instrument sets are assembled, instrument lists are used to ensure the proper packaging. The assembler signs this. This ensures that errors can be traced back and corrected through education. The instruments are wrapped/packaged according to the appropriate sterilization method for those items using the correct wrapping materials, chemical indicators and identifiers.

Intraoperative – Passing techniques
Safety precautions

Drapes were previously addressed.
Packs are opened first and help create the sterile field on the back table. Basic disposable packs are available with a Mayo cover, at least one gown, a hand towel for drying, a suture bag and 4 sticky paper towels. There are many different types of packs made for specific procedures. Some facilities use a custom pack, designed specifically for that institutional preference. Common packs used are

- Laparotomy Pack – may include a drape sheet with abdominal fenestration and sponges, suction tubing, cautery and blades.
- Basic Pack - minus the drape sheet and multiple gowns. Can be adapted for multiple procedures.
- GYN Pack – can accommodate the lithotomy position
- Laparoscopy Pack – may include those items necessary for the use of endoscopic equipment
- Cysto pack – closed urologic procedures in lithotomy position
- Extremity pack – for limbs
- Head and Neck Pack – head/face drapes
- Cardiovascular Pack - vascular specific items
- Arthroscopy Pack
- Hip pack
- C-Section Pack – with items necessary for delivery

- Basin sets – may be disposable or nondisposable
  - Large round basins
  - Small round irrigation basins
  - Kidney/emesis basins
  - Prep cups

- Sponges are manufactured in a variety of shapes and sizes to accomplish absorption of fluid and blood, blunt dissection of delicate tissue and protection of tissue from injury. Only x-ray detectable sponges should be used on the sterile field and all must be counted at prescribed intervals throughout the procedure.
  - Ray-Tex (4x4) – 10 per box. Used in almost all procedures. Removed once the peritoneum is opened. May be folded on sponge sticks for blunt dissection purposes.
  - Laparotomy Sponges – lap pads, tapes. Packaged as 5 with or without rings. Used in major surgery to absorb fluid or to pack organs during procedures.
  - Cottonoids – neuro patties, lentines. Packaged as 210 and are available in sizes ranging from 1/4x1/4 to 3x3 inches. Each has a string that is left outside the wound for easy retrieval. They are made of soft lint free material so they will not injure the delicate brain/spinal tissue.
  - Peanuts/Cherries/Kittners/Rondics – used as dissecting sponges. Come in a variety of sizes for particular procedures. Used to absorb blood in very small areas or the push away tissue. Packaged as 5 and should always be mounted on a clamp. May be used wet or dry.
  - Tonsil sponges – round gauze sponges with a thread attached that is kept outside the mouth during surgery. Packaged as 5
  - Dental Sponges – tubular rolls and non x-ray detectable – Used during extractions.
  - Weckcels – eye surgery

Dressings applied to the wound after the procedure. Protects the wound from trauma, conceals the wound cosmetically, and provides support and protection from infection. Absorb any fluid leaking from

the wound and allow for a moist environment that encourages epithelial tissue formation.

- Gauze dressings
- Non adherent dressings – telfa
- Transparent film – tegaderm, op-site, bioclusive – can be visualized
- Steri-strips
- Pressure dressings- fluffs
- Xeroform, adaptic, Vaseline gauze
- Combines, ABD Pads
- Packing, nasal, vaginal, plain gauze, iodoform
- Gauze roll: kling, kerlix, webril, coban, ace
- Drain sponges
- Liquid collodion forms a seal over a small incision. Used for small incisions. Flammable and is not permitted in some facilities.
- Stent dressings are pressure dressings that are tied in place by sutures.
- Use of Montgomery straps to keep large dressings/incisions protected.

Irrigators and syringes made of glass or plastic are used to irrigate wounds, aspirate fluids, and deliver medication. Syringes are calibrated in millimeters or cubic centimeters.

- Luer lok
- 3-60 cc sizes
- Insulin/Tb syringes
- Control syringes
- Bulb syringes/Asepto

- **Needles**
    - Diameter indicated by gauge number – size of the lumen (12-30)
    - Lengths range from ½" to 2" for subcutaneous and IM injections and 3-7" for spinal needles
    - Parts of the needle:
        - Point
        - Bevel
        - Lumen
        - Cannula
        - Hub
        - Flange
- **Surgical fabrics** – Used for tissues that cannot be brought together without placing a great deal of strain on the tissues. They may also be used as reinforcement of fascia defects. Frequently used to shore up fascia during hernia repair.
    - Types
        - Mersilene mesh – polyester – least inert. It is multifilament that can harbor bacteria.
        - Vicryl mesh – polyglactin – absorbable material that provides temporary support
        - Prolene/marlex mesh – inert and can be used in the presence of infection. Excellent elasticity and high tensile strength
        - Goretex soft tissue patch – PTFE – non absorbable and must not be used in the presence of infection.
        - Stainless steel mesh – rigid and hard to apply. Can cause discomfort for the patient. Inert and can be used in the presence of infection

- Advantages
  - Easy to cut
  - Pliable
  - Porous and allows for drainage
  - Easily sutured
  - Fibrous tissue grows easily through openings.
- Biological materials used include fascia lata from the muscle of cattle or from the patient's own thigh.

Medications:

- Packaged
  - Ampoule
  - Vial
  - Preloaded syringe
  - Tube

- Temperature – care to ensure that refrigerated medications are properly stored.
- Identification
  - Preference card
  - Prior to opening/dispensing by the circulator onto the field
  - Each time the sterile container is breeched

- Labeling – Each facility has policies that address the labeling of medications on the sterile field. Essentially each fluid on every location on the sterile field must be labeled. This can be accomplished with preprinted labels, writing with a sterile marker on blank labels, or steristrips can be used as an alternative. Both cup and syringe are labeled for each medication.
- Transfer – Unless the vial is manufacturer to be totally removed, the fluid is aspirated from the container with a needle and syringe and transferred to the sterile cup presented by the CST. The containers are NEVER discarded throughout the procedure to facilitate verification when necessary. Every time the syringe is passed to the surgeon, it is verbally identified with the appropriate strength. It is particularly important that the anesthesiologist be aware of those injections given to the patient.
- Recording – The CST and the Circulator must keep a running record of medications delivered intraoperatively and the final tally be entered on the Nursing Record of the Procedure.

Anatomy of the abdominal wall

Skin: The surgeon often scratches the exact position and limits of the incision with a scalpel. A marker may be used to draw on the skin as well. The skin is then incised. It is tough and requires the use of pressure. In making this primary incision the surgeon may apply tension to the skin in one of 3 ways:

- By pulling the skin upward at the upper end of the wound cutting through the taut skin and shifting his tension as he progresses downward
- By effecting pressure laterally to make the skin taut from side to side
- By exerting pressure in a downward direction, using a gentle outward pull to keep the skin taut.

Skin may be closed with interrupted or continuous monofilament, nonabsorbable sutures on cutting needles or with stainless steel staples. Prolene or nylon are the preferred suture materials; stainless steel causes the least tissue reaction. The drawback to skin closure is that the wound scars more than

with a subcuticular closure and the sutures must eventually be removed.

Subcuticular Layer: This is an area of tough connective tissue just beneath the layer of skin and above the subcutaneous fat. A subcuticular closure is often used to minimize scarring. Short lateral stitches are placed in a continuous fashion just under the epithelial layer of the skin in a line parallel to the wound. Monocryl or Vicryl are preferred because they are absorbable and need not be removed. Small-gauged sutures are used because the fascia takes the brunt of healing the wound. Skin tapes are often used in conjunction with a subcuticular closure.

Subcutaneous Tissue: The skin incision is carried down to the underlying fascia through the subcutaneous tissue, the layer of fat beneath the skin. Blood vessels in the subcutaneous tissue are ligated with free ties or ligating reels. They may also be cauterized. Absorbable suture is preferred. The subcutaneous fat is spread apart to expose the underlying fascia. The subcutaneous layer does not tolerate sutures well. This layer is usually closed with very few sutures to prevent dead space and the accumulation of fluid that may lead to infection. Vicry or plain are generally used.

Muscle: Abdominal muscles may either be cut or split, depending on the area and the type of incision chosen. Where possible, the surgeon prefers to avoid interfering with muscular blood supply and nerve function by making a muscle-splitting incision or retracting the entire muscle. With retraction of muscle fibers, the posterior fascia layer is exposed. Blood vessels are more frequently encountered at the tendinous insertions of the rectus muscles. These must be ligated. Muscles are not typically closed with suture because they do not tolerate it well. If they are incised they should be loosely approximated with interrupted absorbable sutures.

Fascia: A layer of firm, connective tissue covers the muscles. The anterior layer of fascia may be cut, either in the midline or overlying the rectus or oblique muscles according to the location of the skin incision. Fascia is the primary supportive soft tissue structure of the body and great care must be taken to close it properly. This layer heals slowly and must endure the bunt of wound stress. Heavy, interrupted nonabsorbable sutures with multifilament strands are preferred for added strength. If an absorbable is used, it should be a slow-absorbing, high tensile PDS. If the fascia layer is weak, mesh may be sutured in with prolene sutures for structural support.

Peritoneum: The peritoneum is the thin, membranous lining of the abdominal cavity beneath the posterior fascia. With a tissue forceps, the surgeon picks up the posterior fascia and peritoneum and incises them together, using the point of the scalpel or cautery to make an incision through both layers. It is fast healing and may not require suturing if the posterior fascia is closed properly. If the surgeon chooses to close the peritoneum, an absorbable suture is frequently used.

Abdominal incisions: A variety of incisions are used to gain access to abdominal contents. The type depends on the access desired, the procedure being performed, and the surgeon's preference and wound security. The patient's condition, speed of entry required and sites of previous surgery are also factors.

Vertical Midline – simplest, excellent primary incision and offers good exposure to any part of the abdominal cavity. The incision can be extended from the sternal notch around the umbilicus and down to the symphysis pubis. Provides rapid entry into the abdomen and results in the least blood loss. Does

encourage scar formation and wound disruption.

- Lower median – uterus, bladder
- Upper median – stomach, duodenum, pancreas

Paramedian – slightly off center. Provides better wound strength than midline. Not used for trauma. Better cosmetic healing. Lower incidence of herniation.

Can result in increased bleeding and infection and greater postoperative pain.

- Lower left - excellent for sigmoid surgery
- Upper right - stomach, duodenum and pancreas

Oblique Incisions – McBurney and Subcostal incisions – provides access to specific structures.

McBurney – muscle splitting – used for appendix surgery and drainage of the abdomen. Provides a strong closure but may endanger nerves.

Subcostal (Kocher) – gives only limited exposure. It does provide good cosmetic results and nerve damage is minimal. It results in less tension of the incisional edge.

- Right subcostal – Gallbladder surgery
- Left subcostal – Splenic surgery

Transverse incisions – access to specific organs. Strong closure. May endanger nerves.

- Upper transverse – bilateral subcostal incision joined at the midline
- Lower transverse – *Pfannensteil* – pelvic surgery. Strong closure with minimal stress on the suture line.

Thorocoabdominal Incision – used for operations on the distal esophagus. Converts the pleural and peritoneal cavity into one space. Also used for emergency hepatic surgery. Access to specific organ and multiple spaces. Difficult positioning, hemorrhagic and difficult postoperative recovery.

Instrumentation and suture sequence.

The intraoperative activity is the classic role of the CST.

- Observes anatomy, pathology and procedure
  - Observation will enable the CST to request unanticipated needs of the surgical team
- Handles the specific skills of instrument care and passing proficiently
- Works to predict actions and needs in advance
- Pays attention to the entire OR environment
- Communicates with the surgeon and circulator

Case Management – Managing the Mayo

- Setup
  - Prepare tables/sterile field neatly and consistently
  - Checks function of instruments
  - Place instruments in logical sequence

- During the procedure
  - Secure all tubes/cords
  - Pass instruments efficiently and safely

    - Pick up loose instruments immediately and return to proper location
    - Clean instruments between use
    - Predict needs and stay ahead
    - Always observe the procedure
- After the procedure
    - Maintain the field until patient leaves the room
    - Replace instruments for processing
    - Follow policy for post operative procedures
    - Protect against cross-contamination
- Counts are important and they must be done meticulously and according to prescribed policy.
- Medications and solutions are properly labeled and passed
- Dressings application – The last stitch is not the end. The patient must be cleaned prior to placement of the dressing. The grounding pad removed. And the patient given a clean gown and a warm blanket.
- Communication – technical skills are important but communication is imperative. Surgery is dangerous and the surgeon relies on the team to hare important facts and observations.
    - Amount of irrigation used
    - Amount of local anesthetic used
    - Count results
    - Contents of syringes and catheters
    - Type of suture being passed.

- Postoperative Routines
    - The room must be returned to the original state to prepare for the next procedure.
    - Disrobe and remove gloves
    - Replace gloves with nonsterile gloves to complete tasks
    - Place instruments in the pan and prepare for transfer to processing as per hospital policy
    - Place all sharps in box for disposal
    - Check the floor and drapes for instruments that may have fallen.
    - Place all contaminated drapes and supplies in appropriate containers
    - Perform terminal sterilization of instruments or remove to decontamination area
    - Clean all contaminated furniture and floor of the OR
    - Restock the room as necessary.

Guidelines for Best Practices for Monitoring Sterility

Rationale

The following are Standards of Practice related to monitoring sterility in the perioperative setting. One of several safe patient outcomes related to surgery is all items that are handled and used by the sterile team members, as well as those items that come into contact with the patient's tissues are sterile. In other words, to prevent surgical site infections (SSI), only sterile items may be placed within and come into contact with a sterile field and only sterile members of the surgical team should touch and handle the sterile items.4 Guaranteeing the use of sterile items requires a quality control system that involves chemical and biological indicators that the CST and CSFA rely upon to ensure that proper sterilization parameters have been met.

Additionally, the use of indicators serves as an aid in pinpointing and resolving processing failures. The delivery of safe, quality patient care demands a team effort in establishing a sterile field to prevent SSIs. All surgical team members should be involved in the process of developing and implementing healthcare facility policies and procedures for monitoring sterility.

Standard of Practice I

All packaged sterile items should have some type of external indicator that can be visualized by the surgical team members to ensure the parameters for sterilization have been met.

1. As recommended by the Association for the Advancement of Medical Instrumentation (AAMI), a class I process indicator, also referred to as an external chemical indicator (CI), should be used on the outside of every sterile package or container.

A. An external CI should be attached to every healthcare facility package or rigid sterilization container that is intended to be processed through some type of sterilization system.

(1) Except for those packages, such as paper-plastic peel packs that allow visualization of the internal CI, AAMI recommends an external CI be used on all packages.

(2) Commercial packages typically include a printed color-changing external CI that the surgical team members can visualize.

B. Types of class I external CIs include sterilizer indicator tape, indicating label and indicator strips that are chemically impregnated. Upon exposure to the sterilization process, the chemical should change color and the color should be even.

C. External CIs are used to demonstrate that the pack or container has been exposed to a sterilization process in order to distinguish between processed and unprocessed packs and containers. They do not prove that the enclosed items are sterile. In other words, CIs demonstrate that a package or container has been subjected to specific sterilization processing conditions.

D. CIs assist in detecting potential sterilization failures. The use of CIs should be part of an overall quality assurance program that includes the use of biological indicators (BI) and sterilization machine monitors.

E. The surgical team members should visualize and examine the external CI prior to opening a package or container in the OR to confirm that the item has been exposed to the sterilization process, and the color change is even.

F. All types of CIs should be used according to the manufacturer's instructions.

Standard of Practice II

All individual units (peel packs, package, tray, rigid container system) processed by a healthcare facility should contain an internal CI.

1. It is recommended that the type of internal CI to be utilized by the healthcare facility be class 3, 4, or

5.

A. Internal CIs are used to demonstrate that the pack or container has been exposed to a sterilization process in order to distinguish between processed and unprocessed packs and containers. They do not prove that the enclosed items are sterile. In other words, CIs demonstrate that a package or container has been subjected to specific sterilization processing conditions.

B. Internal CIs assist in detecting potential sterilization failures. Specific types of internal CIs may aid in the detection of specific sterilization machine malfunctions, eg, air leaks, improper temperature, poor quality steam. The use of internal CIs should be part of an overall quality assurance program that includes the use of external CIs, biological indicators (BI) and sterilization machine monitors.

C. Internal CIs must be retrieved, visualized and examined by the CST during the time of preoperative case management to confirm that it has been exposed to the sterilization process, and the color change is even. If the CST's interpretation determines that the sterilization process has been inadequate, the contents of the individual unit should be considered non-sterile, and the unit immediately removed from the sterile field. The CST will need to make a determination of how much of the sterile field was possibly contaminated by the unit. For example, if the unit was a rigid container system in which the enclosed contents had not yet been placed on the sterile back table, the table will not require to be "broken" down.

Second example, a pack of sterile linen towels are tossed onto the back table and may have touched other sterile items; therefore, the towels and other items are considered non-sterile. In this instance, the CST will have to use his/her judgment, as well as knowledge of the principles of asepsis in determining the course of action. In all instances, the CST will need to change gloves since they are considered contaminated from handling non-sterile items.

D. The CST should hand the non-sterile unit to the circulator who should return it with the internal CI and load identification information to the sterile processing department.

E. All types of internal CIs should be used according to the manufacturer's instructions.

Guidelines for Best Practices for Wearing Jewelry

Rationale: The following are Recommended Standards of Practice related to wearing jewelry in the perioperative setting. Overall, the transfer of microorganisms has long been a recognized source of nosocomial infection and therefore, the skin is a major potential source of cross-contamination in the perioperative environment. Hand hygiene is the number one, least expensive, most effective factor in preventing infections and should be diligently practiced by all. This includes awareness of the consequences of wearing jewelry in the healthcare facility. Jewelry is a source for harboring organisms and has been found to be a reservoir for the fast colonization of microorganisms. Additionally jewelry presents challenges in wearing of non-sterile or sterile gloves. All members of the surgical team should be involved in the process of developing and implementing healthcare facility policies and procedures for wearing jewelry.

Standard of Practice I

It is the responsibility of each surgical department to follow recommended CDC standards for recommended OR attire.

1. Every surgical department should develop policies and procedures regarding personal hygiene and proper OR attire.

2. Following CDC established guidelines and the healthcare facility's policies and procedures will aid in environmental control of the restricted and semi-restricted areas of the surgery department.

Standard of Practice II

Hand hygiene, including hand washing and surgical scrub, are vital in the prevention and transmission of harmful microorganisms.

1. The surgical scrub renders the skin surgically clean by reducing pathogenic colonization, decreasing the density of transient flora and providing a continuous antimicrobial action.
2. Wearing rings, watches, bracelets and similar hand and forearm jewelry reduces the efficacy of washing, scrubbing and disinfecting the hands and forearms.

Standard of Practice III

Jewelry may be a source of contamination and pose a risk of injury to the patient and surgical personnel.

1. Surgical team members must remove all rings, bracelets, watches, earrings and similar jewelry, prior to entering the restricted areas. Necklaces, chains or other jewelry, including earrings, may increase skin desquamation and shedding. Additionally, exposed jewelry may become contaminated during a surgical procedure with aerosolized particles, blood, or other body fluids and be a source of nosocomial infection.

A. Removal of all jewelry from the hands and forearms allows the CST in the first scrub role and other surgical team members, who must perform the surgical scrub, to make contact with all surfaces of the skin with the surgical scrub brush and antimicrobial scrubbing agent.

B. Studies have demonstrated that the skin underneath rings has an increased colonization of microorganisms as compared to other areas of the skin on fingers where rings are not worn.

Guidelines for Best Practices for Skin Prep of the Surgical Patient

Rationale Dexon

The following are Standards of Practice related to skin prep in the perioperative setting. The skin prep is part of the daily patient care routine of the Certified Surgical Technologist (CST) and Certified Surgical First Assistant (CSFA) in the OR. The majority of surgical site infections (SSIs) are caused by the entry of the patient's own microbial flora into the surgical wound. Since the patient's skin cannot be sterilized, skin prep is performed. Skin prep aids in preventing SSIs by removing debris from, and cleansing, the skin, bringing the resident and transient microbes to an irreducible minimum, and hindering the growth of microbes during the surgical procedure. All surgical team members should be involved in the process of developing and implementing healthcare facility policies and procedures for the patient skin prep.

Standard of Practice I

The patient and surgical team members should follow the surgeon's preoperative orders. Additionally, preoperative preparations by the surgical team should be completed.

The surgeon's orders may include the patient taking a bath or showering with an antiseptic agent the night before surgery and/or the morning of surgery.

The CDC recommends requiring patients to bathe or shower with an antiseptic agent the night before surgery.

If Clorhexidine gluconate (CHG) is to be used, the following instructions should be provided to the patient: CHG is inactivated by soaps and shampoos. The patient must make sure the soap and shampoo is thoroughly rinsed off prior to using CHG. CHG is an eye irritant and can burn the corneas as well as being ototoxic. The patient should be instructed to be very careful and to keep CHG from entering eyes and ears. The patient should be instructed not to use a body lotion after bathing or showering with CHG. The body lotion will inactivate the residual bacteriostatic effects of CHG.

The preoperative patient interview should include asking the patient if she/he has any known allergies, as well as a review of the patient's history and physical. If the information gathered from the interview, history and physical indicate the patient is allergic to shellfish, may which contain iodine, a non-iodine prep solution should be used. The information already indicates the patient being allergic to iodine due to prior exposure. If the information indicates the patient has allergies to strawberries, bananas, kiwis, or poinsettias, which contain elements of latex, it should be documented that the patient is latex allergic. The information may already indicate the patient being latex allergic due to prior exposure. The shave and skin prep will need to be performed in a latex-free OR environment. If the patient indicates an allergy or allergies to particular antimicrobial solution(s), this should be indicated in the patient chart, on the cover of the patient chart, and on the patient allergy wrist band to be worn on the day of surgery. Latex allergy should be indicated in the same way.

The patient care plan should be revised to reflect the allergy and ensure the correct antimicrobial agent is used or latex-free environment is established. The surgical team should refer to the surgeon's orders pertaining to hair removal (also referred to as "shave prep" in this document) should or should not be performed prior to skin prep. However, it is recommended that hair removal

not be performed.

The shave prep continues to be a controversial topic. Several studies, both low quality and higer quality, have been conducted with varying conclusions. If the shave prep is ordered, it should be performed as close to the time of surgery as possible in order to reduce the risk for microbial growth in breaks in the skin.

The shave prep should not be performed in the OR The shave prep should be performed in the preoperative holding area where the privacy of the patient can be maintained. It is recommended that an electric clipper be used. The second choice for hair removal is a depilatory cream; however, a small amount of the cream should be applied to a small patch of the patient's skin to determine if the patient has a reaction prior to use on a large area of the skin.

Manufacturer's instructions should be followed for the cleaning and disinfection of reusable electric clippers and shaving head. Single-use shaving heads should be disposed of in a sharps container.

It is recommended that the skin and hair be wetted in order to perform a wet shave prep. Water makes the hair softer and provides a smoother skin surface as compared to dry hair and skin, therefore reducing the risk for skin irritation and cuts. The hair that is removed in preparation for a craniotomy must be placed in a secure container or bag, preferably zip lock-type bag that is labeled with the patient's name and healthcare facility identification number. The container or bag is removed from the OR, but transported with the patient postoperatively, since the hair is the property of the patient. Loose hair on the field and patient's skin should be collected for disposal to prevent hair from entering the surgical wound. It is recommended to use hypoallergenic tape or latex-free peel-and-stick mitt (two commercial products include the Medicus Health Pre-OP Glove® and Covidien PreopMitt.

Patient education must include informing the patient to not perform a self-shave prep or use a depilatory the night before, or morning of, surgery.

If hair removal is not performed, an alternative for keeping the hair out of the surgical wound for cranial procedures is to apply a non-flammable gel to the hair.

Eyebrows should never be shaved. If thick, they should be carefully trimmed using small scissors. Long eyelashes should be carefully trimmed using small scissors.

Jewelry and make-up

The patient's body jewelry should be removed from the area of the skin prep. The skin under jewelry has been identified as a source of high microbial counts. Removal of jewelry allows for proper cleansing and prepping of the area. Jewelry should be removed to avoid patient injury during movement of the patient between the stretcher and OR bed and during positioning; avoid pooling of prep solutions; avoid electrosurgical burns.

Prior to performing the skin prep, the pierced area should be cleaned. Patient education should include informing the patient to not wear any cosmetics the day of surgery. Cosmetics can inhibit the effectiveness of the antiseptic solution. For surgery that involves the fingers, hand or wrist, the patient should be instructed to cut the nails short, thoroughly clean the subungual areas during the preoperative bath or shower, remove artificial nails and nail polish.

Standard of Practice II

The healthcare facility should use FDA-approved agents that have immediate, cumulative, and persistent antimicrobial action.

1. The skin prep agents should have the following properties: fast-acting, persistent and cumulative actions, and non-irritating.

2. The surgical team members and infection control officer should be involved in the process of evaluating and selecting the skin prep agents. In the US, antiseptic agents are regulated by the FDA's Division of Over- the-Counter Drug Products.5

The evaluation should involve the review of the manufacturer's information to confirm that the antiseptic agents were tested according to FDA requirements and to review the results of the testing to confirm efficacy.

A. The involvement of the surgical personnel allows the ability to evaluate the properties of the antiseptic agents, including effects on the skin and to contribute to the final decision regarding the antiseptic agents that are the most effective antimicrobial solutions as well as least harmful to the skin.

The cost of the antiseptic agents should not be a factor that influences the decision-making process.

B. When evaluating antiseptic agents, the following FDA standards should be taken into consideration. The agents should: substantially reduce transient microorganisms, possess a broad-spectrum of antimicrobial properties, be fast-acting, have persistent, cumulative activity and be nonirritating to the skin.

Standard of Practice III

Alcohol is an accepted antiseptic agent; however, it should not be used as the single agent but as part of the skin prep regimen.

1. The antimicrobial action of alcohols is the denaturing of proteins. 60%-95% alcohol is the most effective. Additionally, antiseptic solutions that contain alcohol, such as Clorhexidine with 70% alcohol, are less effective at higher alcohol concentrations since the denaturing of proteins does not easily occur in the absence of water.

2. Alcohol has broad-spectrum antimicrobial properties, including the ability to destroy Gram-positive and Gram-negative bacteria as well as multidrug-resistant pathogens including MRSA and VRE, Mycobacterium tuberculosis and fungi.

3. Alcohols have rapid activity when applied to the skin, but alone do not have a persistent, cumulative activity; however, when combined with another antiseptic agent persistent, cumulative activity results. Therefore, if the healthcare facility adopts the use of alcohol, it is recommended that the agent be a combination of alcohol and other antiseptic agent (alcohol-based solution).

A. Alcohol-based solutions have a greater antimicrobial activity as compared to other solutions. Studies have shown that alcohol-based solutions immediately lower the microbial count on the skin more effectively than other solutions.

B. Alcohol-based solutions that contain 0.5% to 1% Clorhexidine gluconate have been found to have a persistent antimicrobial activity that is equal to, or greater, than that of CHG alone. The next most effective scrubbing agents are Clorhexidine gluconate, iodophors, and Triclosan. Studies of parachlorometaxylenol (PCMX) have produced contradictory results and therefore, further studies are required in order to determine the efficacy of the agent with other agents.

C. A surgeon may include in his/her orders the use of alcohol as a wipe (referred to as an alcohol wipe) once the paint solution has been applied. This is an acceptable practice since the alcohol is being used as part of the overall skin prep regimen.

4. When using an alcohol-based solution, the healthcare facility procedure for performing skin prep should follow the manufacturer's instructions since the instructions can vary according to the solution that is being used.

A. It is recommended that alcohol and alcohol-based solutions not be used on mucous membranes.

5. The alcohol-based solution should not be used when the patient's skin is visibly dirty or contaminated with proteinaceous materials since that decreases the antimicrobial action of the alcohol.9

The skin should be prewashed with a non-antimicrobial soap and thoroughly dried prior to using the alcohol-based solution.

6. Alcohols are flammable and therefore, must be properly stored according to

National Fire Protection Association recommendations, as well as local and state regulations.

A. Alcohol containers should be stored in a dry, cool area that is approved by the healthcare facility for the storage of flammables that is away from sources of flames, heating vents, and high temperatures.

B. The alcohol or alcohol-based solution must be allowed to thoroughly dry prior to the placement of the drapes in order to avoid the fumes building up under the drapes and being ignited, particularly if electrosurgery or a laser will be used.

Standard of Practice IV

Surgical team members should perform a standardized patient skin prep procedure based upon manufacturer's written instructions that are specific to the antimicrobial agent to be used and according to healthcare facility policy and procedures.

1. The surgical team member(s) who will be performing the skin prep should first perform a hand wash.

2. Gross soil, grease, skin oil, blood and other debris should be removed from the skin prior to performing the skin prep.

A. A non-aseptic, non-irritating, non-flammable and non-toxic fat solvent or degreaser should be used to cleanse the skin.

3. Just as with the surgical scrub, the ideal duration of the skin prep has not been established. However, it is recommended that the skin prep last a minimum of five, and until all sponges have been used.

4. Sterile gloves should be worn. The skin prep is performed using sterile technique. Care should be exercised to avoid touching non-sterile items such as the OR bed sheets and blanket(s) with sterile gloves, prep solution sponges and paint solution sponge sticks. Controversy exists in using a "clean" versus "sterile" skin preparation kit. The use of a sterile-skin preparation kit has not been proven to represent an advantage in the reduction of SSI; and vice-versa, the use of the clean kit has also not been proven to be advantageous. As always, healthcare facility policy should be followed.

5. The boundaries of the skin prep should be much wider than the planned incision site in order to reduce the risk of SSI, allow for lengthening of the incision, placement of trocars for endoscopic procedures, possible conversion from an endoscopic to open procedure and placement of wound drains.

6. The prep solution and paint should not be allowed to pool or accumulate under, or adjacent to, the patient in order to prevent chemical burns and decrease the risk of electrosurgical or laser burn.

A. Sterile towels should be placed at the periphery of the skin prep boundaries to aid in preventing the accumulation of the agents.

B. ECG leads, electrosurgery dispersive electrode (grounding pad), and tourniquet, if in the vicinity of the skin prep region, should be covered by an adhesive clear plastic drape to prevent accumulation of prep fluids and prevent chemical burns. If the antiseptic solution makes contact with any of the above listed items, they should be removed and replaced. At the end of the procedure, the towels should be carefully removed to avoid dragging across the prep area and prevent contamination.

7. The skin prep is begun at the planned incision site and carried to the periphery, using an ever-widening circular motion. Once the boundaries/periphery of the skin prep have been reached, the sponge should be discarded and not brought back over the clean area. The most important principle of skin prep is prepping always progresses from the clean to the dirty area.

8. The paint solution should be applied with prep stick sponges, using the no-touch technique in order to avoid contamination from the gloves that came into contact with the prep-solution soaked sponges.6

9. CHG, alcohol and alcohol-based agents should not be used on mucous membranes.

10. Gentle pressure should be used when applying the prep agents on patients with friable skin.

Standard of Practice V

Contaminated areas require special attention and generally should be prepped last or separately.

1. Areas of high microbial counts, including the axilla, groin, perineal region, anus and vagina are prepped last. Each sponge is used and discarded; it should not be reused.

A. The exception is the umbilicus. The umbilicus is considered contaminated, but any time it is a part of the skin prep, it is prepped first, most often with the use of prep-solution soaked cotton-tipped applicators. This prevents debris from the umbilicus from splashing onto the prepped abdomen.

B. Stomas, skin ulcers, sinuses and open wounds are considered contaminated and should be prepped last.

(1) It is recommended that the stoma be isolated with a sterile clear plastic adhesive drape. If the stoma is to be a part of the skin prep, it should be cleansed first prior to the start of the skin prep. The mucin and organic matter can inhibit the effectiveness of antiseptic agents; removal is necessary. A betadine-soaked sponge should be placed over the stoma after the cleansing. The skin prep of the surrounding area is completed, the sponge removed, and the stoma prepped last following the same principle of clean-to-dirty. The prep solution should not be allowed to contaminate the previously prepped area.

(2) Traumatic open wounds may require extensive irrigation with warm sterile normal saline. For small open wounds, the surgeon may use a bulb syringe; for larger wounds, the pulse lavage may be used. A moisture- proof pad should be placed under the patient prior to the irrigation. After the irrigation has been completed, it may still be necessary to place dry towels or sheets under the patient. Additionally, the surgeon may debride the open wound after irrigation.

The surrounding area should be prepped first. The open wound should be packed with sterile gauze, while the surrounding skin is being prepped. The sterile gauze will be removed, and the open wound prepped last.

Standard of Practice VI

Surgical procedures, such as grafts, abdominal-perineal and abdominal-vaginal require two separate skin preps to be performed.

1. Separate skin prep set-ups are required for prepping the donor and recipient sites for skin, bone or vascular graft procedures.

A. The donor site is prepped first with a colorless solution, most often CHG, to allow the surgeon the ability to properly visualize the skin, while taking the graft.

B. The recipient site is often an open wound, such as a burn, and therefore is considered contaminated. Open wounds should not be prepped with alcohol, alcohol-based agents or povidone-iodine solution, since those can cause chemical burns of the tissues.

2. Abdominal-perineal and abdominal-vaginal procedures require separate skin preps since the perineal and vaginal areas are considered contaminated.

A. The perineal or vaginal prep should be performed first in order to avoid splashing and contaminating the abdomen if it were to be prepped first.

(1) If using povidone-iodine solution, the mucous membranes of the vagina should only be prepped with the paint solution.

B. Once the perineum or vagina is prepped, the area should be covered with sterile towels during the abdominal prep.

Standard of Practice VII

Eye and facial preps may require the use of alternative prep solutions or diluted regular solutions in order to avoid injury to the patient.

1. CHG and iodophors are contraindicated for use in eye and facial preps. Both agents can severely injure the cornea if they accidentally enter the eye. Additionally both agents are ototoxic and can cause sensorineural deafness if they enter the inner ear.

2. Triclosan and PCMX are considered non-toxic and should be considered for use in facial preps. However, it is still advised to ensure that the agents do not enter the eyes. Warm sterile water should be used as the rinse.

3. If the patient is awake during the prep, he/she should be advised to keep eyes closed. If the patient is under anesthesia, the eyes should be protected by placing a small sterile plastic adhesive drape.

4. Cotton balls should be placed in the ears to prevent the prep agent from entering.

Guidelines for Best Practices for the Decontamination of Surgical Instruments

Rationale

The following are Standards of Practice related to the proper decontamination of surgical instruments (henceforth, simply referred to as instruments) in the perioperative setting. Instruments that are opened on the sterile field, whether used or not used, during the surgical procedure must be thoroughly decontaminated prior to disinfection and/or sterilization. The terms cleaning and decontamination are often used synonymously to indicate a physical and chemical process of removal of organic material, soil and debris, and microorganisms from inanimate objects, such as instruments. The term cleaning frequently, as indicated in the prior sentence, refers to the removal of microorganisms as opposed to killing. However, the Occupational Safety and Health Administration defines decontamination as, "the use of physical or chemical means to remove, inactivate, or destroy blood-borne pathogens on a surface or item to the point where they are no longer capable of transmitting infectious particles and the surface or item is rendered safe for handling, use, or disposal."[27] For the remainder of this document, the terms cleaning and decontamination will be used synonymously, and the OSHA definition will apply to both terms, meaning the process removes, inactivates or destroys microorganisms.

When performed properly, cleaning effectively reduces the bioburden in order to prepare the instruments for disinfection and sterilization. The importance of this step cannot be overemphasized since organic material, soil, and debris can block the disinfectant or sterilizing agent from making complete contact with the surface of the instruments. Additionally, cleaning allows for the safe handling of the instruments by healthcare workers (HCWs).

Standard of Practice I

The cleaning of instruments should begin during the surgical procedure to prevent drying of blood, soil and debris on the surface and within lumens.

A. The CST in the first scrub role should keep the instruments free of debris and blood during the surgical procedure.
   The instruments should be wiped clean using a sterile, water-moistened sponge. Care must be taken that the sponge is not used on the tissues of the patient.
   Instruments with lumens should be flushed with a sterile, water-filled syringe to remove blood and debris and prevent drying of the gross soil.
   Instruments that may not be used for the remainder of procedure, eg, acetabular reamers used during a total hip arthroplasty, may be placed into a basin containing sterile water to soak.
   Saline must not be used, since the chloride ions can cause pitting and deterioration of the finish on the surface of the instruments.

Standard of Practice II

The cleaning of instruments should continue at the point of use post-procedure, including sorting and disassembly of instruments, containment and transportation to the decontamination room.

1. Post-procedure, after removal of the sterile gown and gloves, the CST should wear personal protective equipment (PPE) when breaking down the sterile back table.
2. Instruments should never be soaked in saline or sodium hypochlorite (bleach) solution. The chloride ions in both solutions are highly corrosive, causing the breakdown of the finish on instruments, as well as the metal.

It is recommended that soaking soiled instruments begin in the OR at the completion of the procedure. The instruments can be placed in a basin containing a mixture of sterile water and enzymatic detergent. Refer to the manufacturer's instructions for the correct amounts of sterile water and enzymatic detergent to be mixed.

3. All instruments that were on the sterile field, whether used or not used, are considered contaminated, and a possible source of microorganisms that could cause an infection in HCWs and patients.

4. Contaminated instruments should be contained during transport from the point of use to the decontamination area.

(1) Contaminated instruments should be handled as little as possible at the point of use and should be immediately contained and transported to the decontamination area. Immediate containment and transport reduces the risk of surgical personnel's contact with the contaminated instruments.

(2) Containment should be achieved through the use of some type of container that has been identified to prevent surgical personnel and other HCWs from contact with the contaminated instruments and prevention of airborne microorganisms during transport. The type of container to be used depends on the items to be transported. Types of recommended containers include closed carts, bins with lids, rigid sterilization container systems, and impermeable bags that can be used alone or in combination.

(3) Rigid sterilization container systems with intact, dry filters and closed valves are an accepted method for the transportation of contaminated instruments. However, the use of the container for transportation purposes should be confirmed by consulting the manufacturer's instructions. Some manufacturers recommend not using the same container for transporting contaminated instruments that is also used for the sterilization of the instruments.

(4) The rigid sterilization container system requires no additional covering, unless the external surfaces have been contaminated with blood and/or body fluids. If the container has been handled and touched by a person who has had contact with blood or body fluids, such as the CST, it should be assumed it is contaminated. In this instance, the container should be enclosed in a red biohazard bag, bin with a lid or closed cart. When purchasing a rigid sterilization container system, the healthcare facility should consult the manufacturer's information to confirm if the container can be easily and effectively decontaminated.

(5) The external surfaces of bins with lids, closed carts and other containers should be decontaminated after each use with an Environmental Protection Agency (EPA) - registered, intermediate-level disinfectant. The containers should be thoroughly wiped down externally and internally. The use of a cart wash system is recommended for decontaminating closed carts. Additionally, routine cleaning of the case cart wheels should be performed to remove string and other debris to maintain the easy movement of the wheels.

Standard of Practice III

Cleaning/detergent agents should be selected that will not damage the cleaning equipment and effectively clean instruments.

1. The chemicals in the cleaning agent(s) should not be corrosive to the cleaning equipment including the ultrasonic cleaner, washer-decontaminator, or washer-sterilizer.

2. The chemicals in the cleaning agent(s) should not cause electrolytic action between the

instruments and cleaning equipment.

3. The cleaning agent(s) should not be corrosive and damaging to the instruments.

4. Cleaning agent(s) should be easily removed from the instruments by rinsing with water in order to avoid residual chemicals that could corrode and damage the instruments as well as present a danger to the patient.

5. It is recommended to select a detergent with a pH between 7-10 to use in the cleaning of instruments.[16] Detergents that have a pH of higher than 7 are more effective in the removal of organic

6. debris such as blood, fat and feces.[16]

7. Antimicrobial solutions, such as iodophors that are used for skin antisepsis, should never be used for cleaning instruments.

8. Manufacturer's instructions for the use of detergents should always be followed.

The instructions should be kept on file and accessible at all times by HCWs.

Standard of Practice IV

Cleaning may be performed manually, mechanically or a combination of both. The selection of the cleaning method should be based upon the type of device and manufacturer's recommendations. However, cleaning alone may not be sufficient to decontaminate items that present a high risk of disease transmission such as surgical instruments and therefore, should undergo a microbicidal process.

1. The manufacturer should provide written instructions for the reprocessing of the instrument(s) or device(s) that include recommendations for the type of cleaning method to be used, type of cleaning equipment and cleaning agent(s).

A. The cleaning method should not affect the function of the instruments or devices and should be safe to use by HCWs.

B. The manufacturer's instructions should be kept on file and accessible at all times by HCWs.

C. Prior to HCWs using cleaning equipment and/or cleaning agents that are not recommended by the manufacturer for particular instruments or devices, the HCW should contact the manufacturer for recommendations, as well as contact the manufacturers of the cleaning equipment and
cleaning agent(s).

2. Manual cleaning is recommended for delicate instruments and devices, such as microsurgical instruments, lensed instruments, power equipment, and other instruments that cannot tolerate an automated cleaning process.

A. Immersible instruments and devices should be kept submerged in the water to prevent aerosolization. Non-immersible instruments and devices should be cleaned according to the manufacturer's instructions.

B. The water with detergent should be kept at a temperature in a range of 27º
C to 44º C (80º F – 110º F). Temperatures over 110º F cause coagulation and thus prevent removal of protein substances. Water temperatures that are too cold may not activate the detergent.

C. After cleaning, instruments and devices should be thoroughly rinsed to remove detergent residue and debris.

(1) Rinsing is extremely important, because residuals can reduce the efficacy of the disinfection and sterilization processes and possibly cause damage to the tissues of the surgical patient.

D. Scouring pads and abrasive cleaning agents should not be used for cleaning instruments and devices in order to prevent damage to the items.

E. Only brushes designated for use in cleaning instruments and devices should be purchased by the healthcare facility.

(1) Reusable brushes create a risk for cross-contamination. Reusable brushes should be cleaned and decontaminated at least daily or when heavily soiled. Brushes that show wear should be
discarded.

(2) Brushes used to clean instruments and devices with lumens must be the correct size. If the brush is too large, it will not properly fit into the lumen; if shoved into the lumen it could damage the instrument or device and possibly become stuck within. If too small, the brush will not make complete contact with the lumen's surface and prevent thorough cleaning.

F. A three-sink method should be used for manual cleaning: A sink with tap water and detergent; second sink with tap water for rinsing; third sink with distilled/de-ionized water as a second rinse to aid in preventing staining.

3. The use of mechanical cleaning equipment is recommended as the primary method for decontamination of instruments and devices that can withstand the process. Mechanical cleaning equipment provides the advantage of exposing the instruments and devices to a microbicidal process.

A. The use of mechanical cleaning equipment significantly reduces the amount of contact time between the HCW and contaminated items.

B. Thermal disinfection can be accomplished with the use of washer sanitizers, washer-decontaminators, washer-disinfectors, and washer sterilizers. Washer sanitizers provide the lowest level of disinfection, and washer-sterilizers offer the highest level of disinfection.

(1) Thermal disinfection should only be used to render items safe to handle by HCWs not wearing PPE and not as a process in which they are ready for reuse in surgery. Critical items should always be put through a sterilization process as well as semi-critical items should be either sterilized or high level disinfected.

(2) To ensure proper functioning of the equipment, routine maintenance should be performed according to the manufacturer's instructions, the strainer should be cleaned on a daily basis, and the operating instructions provided by the manufacturer should be followed.

(3) Time and temperature should be monitored and documented.

(4) HCWs must be careful when removing hot items from the equipment in order to avoid burns. The items may be wet with hot water. Additionally, water that drips on the floor may make it slippery; the water should be wiped from the floor.

Standard of Practice V

The issue of when to use the ultrasonic cleaner (UC) in the cleaning of instruments and devices should be determined by the healthcare facility.

1. The issue of when to use the UC is controversial and should be determined by the facility. Suggestions for timing of use include after the initial rinse and prior to mechanical cleaning, or after mechanical cleaning, which may include a sterilization cycle.

A. Instruments and devices are not considered safe for handling by HCWs, if the UC is used prior to mechanical cleaning since the UC cleans, but does not disinfect or sterilize the items.

2. To ensure proper functioning of the UC, routine maintenance should be performed according to the manufacturer's instructions and the operating instructions provided by the manufacturer should be followed.

3. Instruments and devices must be initially rinsed to remove gross debris prior to being placed in the UC.

4. Water in the UC should be changed every eight hours or when visibly dirty.

5. It is recommended that a detergent be added to the water to increase the efficacy of the cleaning process. The detergent must be low foaming in order to prevent interference with the cavitation process of the UC.

6. The UC should be run on an empty cycle each time water is changed in order to degass.

7. Instruments and devices should be placed in trays designed for use in the UC.

A. Ratcheted instruments should be in the open position.

B. Instruments should not be densely packed in the tray or stacked.

C. Instruments of unlike metals should not be placed together in the same tray, eg, stainless steel instruments should not be placed with aluminum, copper or brass instruments.

D. Instruments or items that are chrome plated or ebonized, or contain plastic, cork, wood, glass, chrome or rubber should not be placed in the UC.

8. Instruments and devices should be rinsed and dried.

A. There are several models of UCs. A common model consists of three tanks: the first tank contains the water and detergent; second tank is used for rinsing; and the third tank is used for drying.

Standard of Practice VI

Instruments delivered to the decontamination area/room should be cleaned either manually, with use of automated washers or a combination of both.

1. The manufacturer's written instructions and recommendations for cleaning of instruments should be followed.

A. Manufacturers are responsible for providing the written instructions for the decontamination of instruments as well as the test results verifying the instruments can be effectively decontaminated without posing any harm to HCWs.

B. The instructions should be kept on file and accessible at all times by HCWs.

C. The written policies and procedures for the decontamination area should be based upon the manufacturer's written instructions. The policies and procedures should be kept on file and accessible at all times by HCWs.

Standard of Practice VII

New and repaired instruments should be inspected, decontaminated, and sterilized according to the manufacturer's written instructions prior to being placed in the surgery department's normal circulation of instrumentation.

1. New and repaired instruments should be inspected to assure all moving parts are in

good working order including: the box lock, tips align as well as teeth if present; cutting edges of scissors are sharp and free of burs or other damage; screws are in place and not loose or stripped; and ratchets hold the instrument closed without springing open. If defects are found, the instrument(s) should be immediately shipped back to the manufacturer or instrument repair business to be repaired or replaced.

2. Manufacturer's written instructions should be followed if pretreating new instruments is required. Manufacturers may require pretreating in steam sterilization in order to harden the coating on the instruments prior to routine cleaning and sterilization.

3. New and repaired instruments should be decontaminated according to the manufacturer's written instructions prior to sterilization to remove soil and debris related to the manufacturing, repair and shipping of the instruments.

Standard of Practice VIII

Loaner instruments should be inspected, decontaminated, and sterilized according to the manufacturer's written instructions prior to being used. Loaner instrumentation is defined as instruments or instrument sets borrowed from a vendor for surgical procedures that are returned to the vendor after use.

1. Prior to receiving the loaner instruments, the healthcare facility should request a copy of the manufacturer's written instructions for decontaminating and sterilizing the instruments. This will allow the facility to identify instrumentation that requires special handling and determine if the facility decontamination equipment and machines will meet the recommendations of the manufacturer. Additionally this avoids delays in processing the instruments and therefore, avoids delaying the scheduled surgical procedure(s).

2. Loaner instruments should be considered contaminated upon receipt.

Standard of Practice IX

The decontamination room should be a room that is physically separate from areas where clean instruments, supplies and equipment are undergoing preparation for sterilization to prevent the risk of cross-contamination.

1. Scrub sinks and hand washing stations should not be used for cleaning instruments.[9] Cleaning dirty instruments in the scrub or hand washing sink will contaminate the faucet, sides and bottom of the sink thus contributing to cross contamination when HCWs use the sinks for hand washing or performing the surgical hand and arm scrub.

2. The design and location of the decontamination room should take into consideration the need to centralize the process in one area, allow for efficient transportation of contaminated devices to and from the points of use, prevent cross contamination with clean areas, safety of HCWs, and meet OSHA requirements.

Standard of Practice X

HCWs that handle contaminated instruments and devices are required to wear PPE to protect from soil and debris, blood and body fluids, and splashes from liquid chemical cleaning agents.

1. PPE should include Hair cover
   - Eye protection
   - Fluid-resistant facemask
   - Fluid-resistant gown

- Gloves
- Shoe covers may be optional according to healthcare facility policy; however, they are recommended in the case of liquid chemical splashes

2. It is recommended that disposable hair cover, facemask, gown, gloves and shoe covers be worn.

3. A hand wash must be performed when the PPE is removed to prevent cross contamination and nosocomial infections.[27]

Standard of Practice XI

HCWs involved in the handling and reprocessing of contaminated instruments and devices should complete initial education and training and competency validation on the use of decontamination processes and procedures, use of machines, chemicals used and PPE. Education and training should be an ongoing process in order to promote a safe environment for patients and HCWs.

1. Initial education and training should include, but not be limited to, the following:
   - PPE
   - Receiving of contaminated instruments and devices
   - Methods of decontamination
   - Chemical agents used at the healthcare facility to include location of Material Safety

     Data Sheets, location of manufacturer's written instructions, selection of cleaning agent according to instruments or devices to be cleaned, proper use and mixing/dilution of agents, safety precautions.
   - Specific instructions for the decontamination of instrumentation and devices used at the healthcare facility
   - Procedures for decontaminating instruments contaminated by high-risk tissue (see Standard XII)
   - Procedures for decontaminating eye instrumentation

Standard of Practice XII

Prior to assembly and packaging for sterilization, the instruments should be visually inspected for damage, debris, detergent residue, and all parts are present if the instrument was disassembled.

1. The following recommendations are general guidelines to follow for testing the functionality of instruments[15]:

   A. Burs or cracks should not be present on the cutting edges of scissors. The scissor should close smoothly, and the blades be aligned. Scissors, excluding microscissors, should be sharp enough to cut two 4 x 4 sponges with little effort.

   B. Ratcheted instruments should smoothly close and lock and not spring open when the ring handles are lightly tapped in the palm of the hand.

   C. The jaws of hinged instruments should close evenly with no gaps, and the tips evenly lined.

   D. Forceps should not be bent and easily close with the tips evenly lined. The teeth of tissue forceps should fit smoothly in the groove of the opposite side.

   E. The ratchets on self-retaining retractors should be tested to ensure they remain in the open position and release with little effort.

   F. Trocar points should be inspected for burs, cracks, dullness or bends.

2. Instruments that are not in proper working order should be removed and

replaced in the instrument set.

Standard of Practice XIII

Manufacturer's instructions and healthcare facility policy should be followed for the use of colored tape and plastic dipping materials for the identification of specific surgical instruments.

1. Studies have confirmed that the use of colored tape does not interfere with the sterilizing agent contacting the underlying surface of the surgical instruments.[21]
2. Plastic dipping materials do not interfere with the sterilizing agent with the exception of "flashing instruments." Due to the nylon or plastic material's heat insulating properties, instruments that have plastic material used for identification purposes cannot be flashed sterilized.

Guidelines for Best Practices for Sterile, Wrapped Items Dropped on Floor

Rationale

The following Standards of Practice relate to the proper handling of sterile wrapped item(s) that drop on the floor of the surgery department. The sterility of items is event related, except for commercially packaged items containing chemicals or drugs, or what is commonly referred to as event-related sterility (ERS). The shelf life of a package is determined if an event occurred that compromises the package and the contents. In other words, ERS is based on the fact that the items within a package are sterile until an event causes the items to be considered contaminated.3,4 Events that can cause contamination include moisture penetration, tear(s) or puncture(s) in the wrapper, multiple handling of the package that leads to tearing of the seal and airborne contamination. All members of the surgical team should be involved in the process of developing and implementing healthcare facility policies and procedures related to sterile packages that are dropped on the floor.

Standard of Practice I

A dropped package sterilized in pervious wrapping material must be considered unsterile.

1. The pervious wrapping material allows for the implosion of air and contaminants into the package.
2. The package should be opened and the enclosed item(s) returned for reprocessing and sterilization.

Standard of Practice II

A dropped package sterilized in impervious wrapping material can be considered sterile.

1. The package must be opened for immediate use if the following criteria is met

A. Integrity of the package has not been compromised, examples include tear(s), puncture(s).

B. Floor or area of contact is dry.

2. The package should not be stored for future use.

Guidelines for Best Practices for Surgical

Drapes

Introduction

The Standards of Practice were researched and authored by the AST Education and Professional Standards Committee and have been approved by the AST Board of Directors. They are effective April 13, 2008.

AST developed the Standards of Practice to support healthcare facilities in the reinforcement of best practices related to surgical drapes. The purpose of the recommended standards is to provide an outline that surgical team members can use to develop and implement policies and procedures for surgical drapes. The Standards is presented with the understanding that it is the responsibility of the healthcare facility to develop, approve, and establish policies and procedures for surgical drapes according to established healthcare facility protocols.

Rationale

The following are Standards of Practice related to surgical drapes. The primary purpose of draping the surgical patient is to isolate the surgical site from the other areas of the patient's body and nonsterile areas of the OR table in order to contribute to reducing the risk of surgical site infection (SSI). The drapes serve as a barrier to endogenous and exogenous sources of contamination, in particular endogenous contamination (patient's skin flora as the source), which is identified as a major source of SSI.6 Draping not only contributes to protecting the surgical site, but expands the sterile field allowing the Certified Surgical Technologist (CST) and other members of the sterile surgical team to place sterile instrumentation and supplies on the drapes, eg establishing the neutral zone for passing sharps. Draping is performed on a routine basis in the care of surgical patients and therefore, the Standards of Practice address factors such as, choice of drapes, desired drape characteristics, single-use versus reusable and general draping guidelines. All surgical team members should be involved in the process of developing and implementing healthcare facility policies and procedures as related to drapes.

Standard of Practice I

Only sterile drapes should be used within the sterile field.

1. Drapes create a barrier between the surgical field and possible sources of microbes. Microbial migration and contamination from nonsterile to sterile areas is minimized by isolating the incision site and creating a sterile field with the use of sterile drapes.
2. Drapes protect the patient from their own skin flora (endogenous source of contamination) and surgical team members and environment (exogenous sources of contamination).
3. Drapes must be properly sterilized in accordance with the recommendations of American National Standards Institute (ANSI) and the Association for the Advancement of Medical Instrumentation (AAMI).
    A. Methods of sterilization for drapes include, but are not limited to, radiation, steam, and ethylene oxide.

4. Sterile surgical team members must not come into contact with the contaminated undersurface of the drape that has come into contact with a nonsterile surface.
5. Once a drape has been positioned, it should not be repositioned. The top of furniture, such as the OR table, back table and prep table are considered sterile, and the portion of the drape hanging below the edge is considered nonsterile. Repositioning can bring the nonsterile portion of the drape into the sterile field, causing contamination, as well as possibly transferring microbes onto the field, placing the patient at risk for acquiring an SSI.
6. Drapes should be handled as little as possible by the sterile team members.
7. When handling drapes prior to placement on the patient, they should not be allowed to unfold.
8. The CST, Certified Surgical First Assistant (CSFA) and surgeon should maintain 12" away from the OR table when performing the draping procedure to avoid contamination of the sterile gloves and front of the gown.
9. The CST, CFA and surgeon should not reach across an undraped OR table in order to perform a draping procedure.
A. When handing the four towels to the surgeon or CSFA to initially square off the incision site, the CST should stand on the same side of the OR table.
10. When draping the patient, the CST, CSFA and surgeon should protect the sterile, gloved hands from contamination by "cuffing" the hands.
11. Nonperforating towel clips should be used to keep towels or drapes in place.
12. When reusable woven drapes are used, manufacturer's instructions should be consulted in regard to the care and reprocessing of the drapes.
13. Disposable and nondisposable contaminated drapes should be properly contained at the end of the surgical procedure. The drapes should be placed in impervious bags that are identified by the biohazard symbol.

Standard of Practice II

A compromise in the integrity of the microbial barrier results in contamination.

1. Drapes must be free of holes, punctures, and tears.
    A. Drapes should be resistant to punctures and tears to prevent microbial contamination of the sterile field.

Standard of Practice III

Drapes should be resistant to fluid penetration.

1. Intraoperatively patient body fluids and irrigating solutions come into contact with the drapes.
    A. Draping material should be impervious and fluid-resistant to prevent strike-through contamination from microorganisms.6 Prevention of strikethrough
    contamination reduces the risk of SSI.
    B. Blood, body fluids, and irrigating solutions should be suctioned and/or sponged as soon as possible from the drape in order to aid in preventing strike-through contamination.

C. Impervious barriers incorporated into drapes, in particular around the fenestration, aid in providing additional protection in isolating the surgical site and increase the resistance to strike-through contamination.
D. It is recommended that the CST, when preparing the sterile back table and Mayo stand, not place the drapes underneath the basin. If irrigation solution is poured into the basin by the circulator prior to draping the patient, fluid may spill out onto the drapes, rendering them useless because of strike-through contamination. Increased costs may result due to the need for a replacement with a new sterile drape.

Standard of Practice IV

Drapes should be lint free.

1. Lint is recognized as a vector for causing SSI. Additionally, airborne lint serves as a medium for transport of microbes.
    A. Lint free drapes minimize airborne contamination and spreading of particles into the surgical wound.

Standard of Practice V

Drapes should be flame resistant.

1. Currently, there are no local, state or federal regulations that establish standards of performance for surgical drapes. However, the majority of manufacturers of drapes have adopted the same standards for drapes as surgical gowns.

A. The standards that the surgical team follow for guidance in evaluating drapes, include the following:

National Fire Protection Agency (NFPA): NFPA No. 702-1980

- Standard for Classification of the Flammability of Wearing Apparel. In 1987, the NFPA removed this from their list of current standards, but it is still used as a reference by manufacturers, FDA, and AAMI as one of the standards to be used for evaluating the safety and performance characteristics of drapes and gowns. This standard established four classes for rating gowns by two factors: ignition and flame spread. These four classes are also used for the evaluation of drapes. Class 1, relatively slow burn, is the most relevant for surgical team members.
- Consumer Product Safety Commission (CPSC): 16 CFR Part 1610, Standard for the Flammability of Clothing Textiles.
  Through this standard, the CPSC is responsible for the regulation of drapes and gowns. When evaluating a drape, the surgical team members should confirm that the manufacturer's information includes the statement The Basic Fabric Meets the Class 1 Flammability Requirements for CPSC 16 CFR Part 1610.

2. Drapes should resist ignition from sources such as lasers, fiberoptics, and electrosurgery within the sterile field.
3. Healthcare facilities should establish policies and procedures for fire prevention.

A. Fires involving drapes can cause serious injuries to the patient and surgical team members: therefore, all surgical team members should be properly educated in fire prevention and healthcare facility protocol.
B. All HCWs should complete annual competencies on fire safety.

Standard of Practice VI
The surgical team members should evaluate drapes based upon the following factors and characteristics.

1. The draping material should be easy to handle and flexible in order to conform as much as possible to the contour of the patient and OR table.
2. The drapes, in particular drapes composed of reusable woven material, should be free of toxic substances, such as dyes and laundry detergent residues.
3. The draping material should have limited memory.
4. When evaluating drapes, the surgical team members should evaluate the information provided by the American Society for Testing and Materials (ASTM).

A. ASTM developed the two tests, F1670 and F1671 for assessing the fluid and microbial barriers of surgical nonwoven and woven fabrics.
B. The manufacturer should provide the information, related to the results of these tests when the surgical team members are evaluating drapes.
C. AAMI and the US Food and Drug Administration both confirm that ASTM tests are the definitive tests for assessing the fluid and microbial barriers of surgical fabrics.

Standard of Practice VII
Drapes made of reusable woven fabric should have the same barrier characteristics as single-use nonwoven disposable fabrics.

1. The thread count and chemical treatments establish the barrier properties of the woven fabric.
    A. It is recommended that woven fabrics with a thread count of 270 or 280 be used as sterile drapes.
    B. It is recommended that woven fabrics be treated with chemicals to increase the barrier properties be used as sterile drapes.
2. A system should be established for monitoring the number of times a woven fabric drape undergoes reprocessing.
    A. Repeated laundering and sterilization of woven fabrics decrease the barrier effectiveness.
    B. The number of uses, launderings, and sterilization should be recorded in order to monitor the woven fabric's effectiveness as a barrier. Woven fabrics with a high-thread count should be considered a noneffective barrier after approximately 75 reprocessing.
3. Reusable drapes must be visually inspected prior to sterilization.7

A. For small holes or thin, stretched areas of fabric, a patch of the same type of draping material may be applied. The patches should be heat sealed to the drape; stitching the patch must never be allowed as a method for repairing a drape.

Standard of Practice VIII

The surgical team should take the proper precautions in the application of drapes when the surgical procedure calls for the use of a laser.

1. The surgical team members should consider the use of aluminum-coated drapes.
   A. Currently no draping material is 100% resistant to laser beam impact.
   B. The sterile surgical team members should take proper precautions when draping the patient, including outlining the surgical site with wet towels. Refer to the AST Standards of Practice for the Safe Use of Lasers.

Standard of Practice IX

Surgical team members should be involved in the selection process of drapes to be used in the OR

1. Surgical team members should be involved in the evaluation of drapes that are being considered for use in the OR
   A. It is highly recommended that the team members refer to the AAMI document Technical Information Report TIR No. 11-1994 during the evaluation process.2
   B. It is also recommended that team members refer to the ANSI/AAMI document Liquid Barrier Performance and Classification of Protective Apparel and Drapes Intended for Use in Healthcare Facilities during the evaluation process.1
   C. It is recommended the team members evaluate a variety of manufacturers' drapes, including reviewing the manufacturers' documentation in order to verify they are meeting ANSI/AAMI standards for barrier performance.

Competency Statements

Competency Statements	Measurable Criteria
1. The CST and CSFA are knowledgeable of the importance of reducing microbial contamination by using sterile drapes to reduce the risk of a SSI. 2. The CST and CSFA are knowledgeable of the need to prevent strike-through to protect themselves and the patient from microbial contamination. 3. The CST and CSFA are knowledgeable of draping procedures and have the skills for properly handling drapes in an aseptic	1. Educational standards as established by the Core Curriculum for Surgical Assisting and the Core Curriculum for Surgical Technology.3,4 2. The subject of draping is included in the didactic studies as a student as well as the principles of aseptic technique. 3. Students demonstrate knowledge of draping procedures in the lab/mock OR setting and during clinical rotation. 4. As practitioners, CSTs and CSFAs

manner. 4. The CSFA has the advanced surgical knowledge and skills to serve in the capacity of guiding the sterile surgical team members in the draping of the patient according to the surgeon's preference. 5. The CST and CSFA are knowledgeable of the need to implement cost-effective measures in the use of drapes without compromising the care of the patient. 6. The CST and CSFA are knowledgeable of the fire hazards in the healthcare facility and measures that are implemented to reduce the risks.	perform draping procedures. The CSFA often fulfills the role of guiding the team in the draping procedure according the surgeon's preference. 5. CSTs and CSFAs complete continuing education to remain current in their knowledge of draping procedures including annual review of the policies of the healthcare facility.

STRATEGIES FOR SUCCESS

There are only so many hours in a day, a week, and a term. You cannot change the number of hours, but you can decide how to best use them. To be successful in school, you must carefully manage your study time. Here is a strategy for doing this.

Prepare a Term Calendar

At the beginning of a term, prepare a Term Calendar. Update it as the term goes on. Here is what to do to prepare a Term Calendar.

- Record your school assignments with their due dates and your scheduled tests.
- Record your planned school activities.
- Record your planned school activities.
- Record your known out-of-school activities.

Prepare a Weekly Schedule

Each Sunday before a school week, prepare a Weekly Schedule. Update it as the week goes on. Here is what to do to prepare a Weekly Schedule.

- Record your daily classes.
- Enter things to be done for the coming week from your Term Calendar.
- Review your class notes from the previous week to see if you need to add any school activities.
- Add any out-of-school activities in which you will be involved during the week.
- Be sure to include times for completing assignments, working on projects, and studying for tests. These times may be during the school day, right after school, evenings, and weekends.

Prepare a Daily Organizer

Each evening before a school day, prepare a Daily Organizer for the next day. Place a √ next to each thing to do as you accomplish it. Here is what to do to prepare a Daily Organizer.

- Enter the things to do for the coming day from your Weekly Schedule.
- Enter the things that still need to be accomplished from your Daily Organizer from the previous day.
- Review your class notes for the day just completed to see if you need to add any school activities.
- Add any out-of-school activities in which you will be involved the next day.

Your Weekly Schedule should have more detail than your Term Calendar. Your Daily Organizer

should have more detail than your Weekly Schedule. **Using a Term Calendar, a Weekly Schedule, and a Daily Organizer will help you make the best use of your time.**

Successful students have good study habits. They apply these habits to all of their classes. Read about each study habit. Work to develop any study habit you do not have.

Successful students:

1. **Try not to do too much studying at one time.**
   If you try to do too much studying at one time, you will tire and your studying will not be very effective. Space the work you have to do over shorter periods of time. Taking short breaks will restore your mental energy.

2. **Plan specific times for studying.**
   Study time is any time you are doing something related to schoolwork. It can be completing assigned reading, working on a paper or project, or studying for a test. Schedule specific times throughout the week for your study time.

3. **Try to study at the same times each day.**
   Studying at the same times each day establishes a routine that becomes a regular part of your life, just like sleeping and eating. When a scheduled study time comes up during the day, you will be mentally prepared to begin studying.

4. **Set specific goals for their study times.**
   Goals will help you stay focused and monitor your progress. Simply sitting down to study has little value. You must be very clear about what you want to accomplish during your study times.

5. **Start studying when planned.**
   You may delay starting your studying because you don't like an assignment or think it is too hard. A delay in studying is called "procrastination." If you procrastinate for any reason, you will find it difficult to get everything done when you need to. You may rush to make up the time you wasted getting started, resulting in careless work and errors.

6. **Work on the assignment they find most difficult first.**
   Your most difficult assignment will require the most effort. Start with your most difficult assignment since this is when you have the most mental energy.

7. **Review their notes before beginning an assignment.**
   Reviewing your notes can help you make sure you are doing an assignment correctly. Also, your notes may include information that will help you complete an assignment.

8. **Tell their friends not to call them during their study times.**
   Two study problems can occur if your friends call you during your study times. First, your work is interrupted. It is not that easy to get back to what you were doing. Second, your

friends may talk about things that will distract you from what you need to do. Here's a simple idea - turn off your cell phone during your study times.

9. **Call another student when they have difficulty with an assignment.**
   This is a case where "two heads may be better than one."

10. **Review their schoolwork over the weekend.**
    Yes, weekends should be fun time. But there is also time to do some review. This will help you be ready to go on Monday morning when another school week begins.

Procrastination is putting off or avoiding doing something that you must do. It is natural to procrastinate occasionally. However, excessive procrastination can result in guilt feelings about not doing a task when it should be done. It can also cause anxiety since the task still needs to be done. Further, excessive procrastination can cause poor performance if you try to complete a task with little time remaining. In short, excessive procrastination can interfere with your school and personal success.

Twenty things you can do to control procrastination.

- Reward yourself when you complete a task on time. You can surf the Internet, have some ice cream, or do anything else that is a positive enforcer for you.
- Prioritize the tasks you have to do. Putting tasks in priority order will avoid the problem of trying to decide where to begin.
- Work on tasks at the times you work best. Some students can get things going in the morning, while other students may be more comfortable working in the evening.
- Don't try to finish everything at once. Break tasks into smaller, more manageable parts.
- Work with a study group. The momentum of the other group members will carry you with them.
- Carefully schedule what you have to do. Stick to your schedule.
- Establish reasonable standards for completing a task. Striving for perfection can stop you from completing the task.
- Set specific goals and track your progress toward their accomplishment. This will help you avoid the feeling that the work before you is endless.
- Establish a comfortable place in which to do your work. You will be more inclined to do your work if your workspace is peaceful and inviting.
- Work for short periods of time. Set a timer for 15 minutes and take a short break when it goes off.
- Create a "to do" list at the start of each day. Keep the list to a reasonable length. Cross off each thing to do as you accomplish it.
- Don't sit around thinking about what you have to do. Stop thinking and start doing.
- If there is a particular task that you dread doing, force yourself to face it. Once you complete this task, your other tasks will seem like "a walk in the park."
- Think about all of the benefits of completing a task. Use these thoughts as motivators.

- Use visual reminders of what you have to do. Post-it notes placed in prominent places (e.g., refrigerator door, computer screen, and mirror) will remind you that something needs to be done.
- Organize your workspace. Spending a lot of time “looking” for what you need to do a task is a classic form of procrastination.
- Use peer pressure. This works for Weight Watchers and can work for you. Identify a friend to whom you are accountable for getting your work done.
- Focus on starting a task rather than finishing it. Bring your focus from the future to the right now.
- Don’t make too much of a task. Overvaluing a task can make you highly anxious. Anxiety can block your performance.
- Identify the ways in which you procrastinate. Take direct steps to eliminate these.

Benjamin Franklin once said, "You may delay, but time will not." Use the suggestions in this article to avoid delaying doing what you have to do and to ensure that time does not work against you.

Improving Concentration

Many students have difficulty concentrating while studying. Being able to concentrate while you are studying is essential to doing well in class and on tests.
Here are 10 suggestions for improving your study concentration:

- Study in a quiet place that is free from distractions and interruptions. Try to create a space designated solely for studying.
- Make a study schedule that shows what tasks you need to accomplish and when you plan to accomplish each task. This will provide you with the structure you need for effective studying.
- Try to study at the time of day you work best. Some people work well early in the morning, others late at night. You know what works best for you.
- Make sure you are not tired and/or hungry when you study. Otherwise, you won't have the energy you need to concentrate. Also, maintain your physical fitness.
- Don't try to do two tasks at the same time. You won't be able to concentrate on either one very well. Concentration means focusing on one thing to the exclusion of all else.
- Break large tasks into a series of smaller tasks that you can complete one at a time. If you try to complete a large task all at once, you may feel overwhelmed and may be unable to maintain your concentration.
- Relax. It's hard to concentrate when you're tense. It's important to relax when working on a task that requires concentration. Meditation is helpful to many students.
- Clear your mind of worrisome thoughts. Mental poise is important for concentration. You can get distracted by your own thoughts. Monitor your thoughts and prevent yourself from following any that take you off track. Don't daydream.
- Develop an interest in what you are studying. Try to relate what you are studying to you own life to make it as meaningful as possible. This can motivate yourself to concentrate.
- Take breaks whenever you feel fatigued. There is no set formula for when to take breaks. You will know when you need to take a break.

Studying without concentration is like trying to fill a bucket with water when the bucket has a hole in its bottom. It doesn't work.

TAKING LECTURE NOTES

I. There are many reasons for taking lecture notes.

A. Making yourself take notes forces you to listen carefully and test your understanding of the material.
B. When you are reviewing, notes provide a gauge to what is important in the text.
C. Personal notes are usually easier to remember than the text.
D. The writing down of important points helps you to remember then even before you have studied the material formally.

II. Instructors usually give clues to what is important to take down. Some of the more common clues are:

A. Material written on the blackboard.
B. Repetition
C. Emphasis
   1. Emphasis can be judged by tone of voice and gesture.
   2. Emphasis can be judged by the amount of time the instructor spends on points and the number of examples he or she uses.
D. Word signals (e.g. "There are **two points of view** on . . . " "The **third** reason is . . . " " In **conclusion** . . . ")
E. Summaries given at the end of class.
F. Reviews given at the beginning of class.

III. Each student should develop his or her own method of taking notes, but most students find the following suggestions helpful:

A. Make your notes brief.
   1. Never use a sentence where you can use a phrase. Never use a phrase where you can use a word.
   2. Use abbreviations and symbols, but be consistent.
B. Put most notes in your own words. However, the following should be noted exactly:
   1. Formulas
   2. Definitions
   3. Specific facts
C. Use outline form and/or a numbering system. Indention helps you distinguish major from minor points.
D. If you miss a statement, write key words, skip a few spaces, and get the information later.

E. Don't try to use every space on the page. Leave room for coordinating your notes with the text after the lecture. (You may want to list key terms in the margin or make a summary of the contents of the page.)
F. Date your notes. Perhaps number the pages.

SAVING TIME ON NOTETAKING

Here are some hints regarding taking notes on classroom lectures that can save time for almost any student. Some students say that they plan to rewrite or type their notes later. To do so is to use a double amount of time; once to take the original notes and a second to rewrite them.

The advice is simple:
DO IT RIGHT THE FIRST TIME!

Second, there are some students who attempt to take notes in shorthand. Though shorthand is a valuable tool for a secretary, it is almost worthless for a student doing academic work. Here's why. Notes in shorthand cannot be studied in that form. They must first be transcribed. The act of transcribing notes takes an inordinate amount of time and energy but does not significantly contribute to their mastery. It is far better to have taken the notes originally in regular writing and then spend the time after that in direct study and **recitation** of the notes.

Third, do not record the lesson on a cassette tape or any other tape. The lecture on tape precludes flexibility. This statement can be better understood when seen in the light of a person who has taken his/her notes in regular writing. Immediately after taking the notes this person can study them in five minutes before the next class as s/he walks toward the next building, as s/he drinks his/her coffee, or whatever. Furthermore, this student, in looking over his/her notes, may decide that the notes contain only four worthwhile ideas which s/he can highlight, relegating the rest of the lecture to obscurity. Whereas the lecture on tape has to be listened to in its entirety including the worthwhile points as well as the "garbage," handwritten notes may be studied selectively. A student who takes the easy way out - recording the lecture on tape as he or she sits back doing nothing - will box him or herself into inflexibility.

NOTE TAKING
Learning to make notes effectively will help you to improve your study and work habits and to remember important information. Often, students are deceived into thinking that because they **understand** everything that is said in class, they will therefore remember it. This is dead wrong! Write it down.
As you make notes, you will develop skill in selecting important material and in discarding unimportant material. The secret to developing this skill is practice. Check your results constantly. Strive to improve. Notes enable you to retain important facts and data and to develop an accurate means of arranging necessary information.

Here are some hints on note making.
1. Don't write down everything that you read or hear. Be alert and attentive to the main

points. Concentrate on the "meat" of the subject and forget the trimmings.

2. Notes should consist of key words or very short sentences. If a speaker gets sidetracked it is often possible to go back and add further information.
3. Take accurate notes. You should usually use your own words, but try not to change the meaning. If you quote **directly** from an author, quote **correctly.**
4. Think a minute about your material before you start making notes. Don't take notes just to be taking notes! Take notes that will be of real value to you when you look over them at a later date.
5. Have a uniform system of punctuation and abbreviation that will make sense to you. Use a skeleton outline and show importance by indenting. Leave lots of white space for later additions.
6. Omit descriptions and full explanations. Keep your notes short and to the point. Condense your material so you can grasp it rapidly.
7. Don't worry about missing a point.
8. Don't keep notes on oddly shaped pieces of paper. Keep notes in order and in one place.
9. Shortly after making your notes, go back and rework (not redo) your notes by adding extra points and spelling out unclear items. Remember, we forget rapidly. Budget time for this vital step just as you do for the class itself.
10. Review your notes regularly. This is the only way to achieve lasting memory.

LEARNING BY LISTENING

You can learn a lot through listening. In college, it will be a prime source of information. Unfortunately, people do not instinctively listen well. Quite the reverse! Listening is a skill which must be developed.
If you apply the following suggestions, you will find yourself listening more effectively, both in class and out.

1. Determine why what the speaker is saying is important to you. If you don't have an immediate, vivid reason for listening to a speaker, you are an unmotivated listener.

2. Remember: the responsibility for interest and understanding lies with you, not with the speaker. Learning is up to the learner. If you simply want to sit passively and blame the speaker for your lack of success, then you're not a serious learner.

3. If you can't hear, arrange things so you can. Move away from sources of noise-human or mechanical. Sit where you can see the speaker easily, and where other distractions are at a minimum.

4. Listen to what the speaker is saying. Don't tune the speaker out because you don't like something about him/her or the message. Be sure you understand something before you reject it.

5. Look for the speaker's pattern of organization. In a lecture, a speaker is generally referring to notes or some other source of information. You can understand much better if you are able to recognize what the speaker's driving at and how the speaker's getting there.

6. Look for the main idea or ideas of the presentation. Facts are important only as they support the speaker's points. If you have trouble distinguishing between the important and the trivial, a friend or a tutor in the Academic Skills Center can help you.

7. Don't let your mind wander. Your thoughts move far more rapidly than the swiftest mouth, and the urge to stray is tempting. Your attention span can be increased, however, through deliberate effort. Continue to practice the habit of attention and don't be discouraged by early failures.

8. Take notes while you listen. Even if you recognize everything being said, jot it down, because you won't remember it later unless you do.