



Specimen Collection in the OR

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Surgical technologists utilize their management skills when handling and maintaining tissue specimens. Consistent practice in mastering the handling and collection of tissue specimens is beneficial to new, as well as seasoned, surgical technologists. The patient's diagnosis depends heavily on proper labeling, handling, and safe collection of the specimen. It's estimated that 17% of specimen labeling defects in the operating room environment resulted in incorrect therapies, and approximately 6% of those defects resulted in adverse events.⁴ Though the frequency of defects is not ordinarily high, a single fault can be catastrophic and should not be considered insignificant.

Surgical steps to acquire the specimen play a critical role for the peri-operative team to determine the physician's plan to proceed with treatment.

The collection of tissue specimens is separated into three specific categories - non-invasive, invasive, and interventional. The non-invasive collection is a technique that uses medical devices near the skin but does not invade body tissue to acquire a tissue sample. The invasive procedure uses a medical device to obtain tissue by entering a body cavity or vessel and may inject a substance into the body. The interventional technique is an invasive method that also includes the use of equipment in a specialty department, for example, fluoroscopy in radiology.

THREE PHASES OF SPECIMEN COLLECTION TESTING

There are three testing phases in the specimen collection process. Each phase takes the specimen through the necessary stages of obtaining,

LEARNING OBJECTIVES

- ▲ Learn the three phases of specimen collection testing
- ▲ Identify the different types of specimens obtained during surgery
- ▲ Evaluate how discrepancies in tissue specimens can lead to devastating consequences
- ▲ Review the standards of practice for CSTs when handling specimens
- ▲ Determine what steps are needed to ensure proper specimens are collected during surgery

diagnosing, and treatment of the patient. Handling the tissue specimen is critical in adequately assessing the patient. The three phases of specimen testing are the pre-analytical, analytical, and post-analytical phase. Pre-analytical testing usually happens first but doesn't always take place in the laboratory. In this phase, errors can occur, especially in handling and identification. Rigorous control measures will need to be in place to avoid problems or errors further in the process. The CST should verify specimen with the surgeon prior to labeling and delivering. When presenting the specimen to pathology it is important to identify the specimen's orientation to the patient by verifying, for example, the long stitch representing the lateral specimen edge and the short stitch representing the superior specimen edge. The next phase in the collection process is the analytical phase. This phase includes laboratory testing or the diagnostic procedures that ultimately provide the results to the physician or surgeon. The post-analytical phase is the final phase of the specimen testing function. This phase culminates in the production of a final result, value, or, in histology, a diagnostic pathology report.

WHAT ARE THE DIFFERENT TYPES OF SPECIMENS OBTAINED DURING SURGERY?

Cultures

A culture is a collection of body tissue or fluid by use of a prepackaged swab in a sterile peel pouch, dispensed onto the sterile field that is then spread in a growth medium. The microorganisms that replicate is tested to identify the bacteria present. The culture should be sent to the lab immediately or refrigerated. Cultures are labeled with the patient identification, date, and site of culture. Cultures are collected in a plastic tube and the fluid or tissue should be the only thing that touches the swab. The swab is placed in culture media at the bottom of the tube and, dependent upon the brand, may need to be crushed immersing the specimen with growth medium. The CST will drop the closed culture into the small pouch, using sterile technique, that is held by the gloved circulator. The circulator will affix a patient identification and biohazard sticker to the specimen pouch before sending it to the lab. Anaerobic cultures, used to discern bacteria that do not need oxygen to replicate, require immediate attention. Since anaerobic cultures exposed to oxygen can kill the organism in minutes, the CST has the specimen aspirated into a syringe expelling any air, then removing the needle and capping off the syringe.

Smears and Biopsies

Smears are made by swiping the patient's cells into a liquid suspension or fixating it to a glass slide and observed under a microscope. The sample is "fixed" with a sealant or preservative. The glass slide is then stained and examined by a pathologist, who provides a possible diagnosis. Smears are studied within minutes after being obtained in hopes of providing a quick diagnosis to the surgeon.

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A biopsy is the removal of tissue or fluid for diagnosis and analysis. Surgeons can collect several multiple biopsies in tissue to obtain a significant specimen. Many invasive methods are possible including aspiration, percutaneous needle, trocar or punch biopsy, brush cytology, and excisional or incisional biopsy.

Aspiration biopsy is a collection of fluid for a pathological examination that is removed from semisolid tissue. Aspiration is the act of puncturing a body cavity or organ with a hollow needle to draw out the fluid. A percutaneous needle, punch, or trocar biopsy removes the specimen by using an open device inserted into the tissue. A core sample of the tissue is removed in one, or multiple, locations in the targeted body area. The CST sterilely prepares a needle that is inserted percutaneously into the exposed tissue. A trocar or punch is designed to remove a core sample of tissue, such as bone marrow, from the patient. A brush biopsy is completed using a tiny sterile cylindrical brush prepared by the CST that sweeps a hollow lumen or cavity for superficial cells. The brush containing specimen is withdrawn from the patient and is inserted and swished around into a liquid preservative such as sterile saline to create the solution for analysis.

Frozen Section

The frozen section is a pathological procedure done to perform rapid analysis of a specimen. It is used mostly in oncological surgery to provide detailed information on extracted tissue intraoperatively to assist in deciding the next steps of surgical intervention. The tissue sample is placed on a freezing microtome machine causing the specimen to freeze within a second. A razor-thin slice of tissue is cut from the frozen specimen for review under a pathologist's microscope. The technical name for this procedure is called cryosection. When the surgeon removes a piece of tissue and hands it to the CST, the CST will immediately place the specimen on a sterile non-adherent dressing. This specimen is then passed off the field into an empty sterile specimen cup. Once the sample has been transported to pathology, it takes approximately 20-30 minutes for rapid analysis by the pathologist who then reports the findings to the surgeon. The CST will need to prepare for possible further dissection, which may require more frozen sections. Tagging the specimen may be utilized to show where it was positioned on the patient's body. A long stitch is placed on the lateral specimen edge and a short stitch is placed on the superior specimen edge. This procedure is especially important when determining clean margins in procedures where the excision of all malignant tissue is the surgical goal.

Permanent Section

A permanent section provides the best quality for examination by a pathologist and may allow for a more accurate result than frozen sections. A permanent section specimen is inserted into a liquid fixative for several hours depending on the tissue sample size. When the specimen is placed in formalin, proteins are denatured, and the tissue hardens. The most important part of the tissue specimen process is adequate fixation. Often paraffin wax is used to fixate the specimen. When specimen denaturing is complete, the sample is fixated by placing it into molten paraffin, that has solidified through a chilling process. The prepared specimen is then set in a tissue cutting machine, called a microtome, dissecting a thin 5 micron sliced paraffin block of biopsy specimen. The delicate sections are floated in a sterile water bath and placed on a glass slide. The paraffin wax is dissolved using solvents. The histologist stains the specimen with hematoxylin and eosin, a combination that makes distinguishing cellular parts easier for the pathologist.⁵

IDENTIFYING ERRORS IN TISSUE SPECIMEN COLLECTING

The poor management, improper labeling of specimens, or loss of tissue samples can lead to incorrect results, incorrect anatomical margin identifications, or even damage of the specimens themselves. Discrepancies in tissue specimens can result in devastating consequences to the patient such as repeated or unnecessary surgery, incorrect diagnosis, delay in treatment for malignancy, or unnecessary medical treatment. The CST is directly responsible for the proper tissue specimen care and handling on the sterile field. Meier et al. describe four types of errors, which are defective identification, unsatisfactory specimen, a flawed interpretation, and deficient reporting.⁵ Specifically, in the pre-analytic phase, errors occur causing inadequate labelling (patient, tissue, laterality, anatomic location) and defective specimen being obtained (loss of the sample, erroneous in measurement or gross description, floaters, inadequate sampling, and the absence of an indication of ancillary studies when necessary). Approximately 38% of pre-analytic phase errors are due to wrong identification, and 4-10% are specimen related.

Errors within the analytic phase include wrongful classification, and false negatives or false positives. About 23-28% of mistake diagnoses are misinterpretations occurring in the analytic phase. Defective reporting (erroneous or missing non-diagnostic information, error in dictation or typing, report delivery, and errors related to computer or format, transmission and upload error) are areas where mistakes are common during the post-analytic phase. In the post-analytic stage, defective reporting is responsible for 28-40% of the errors.⁴

STANDARD OF PRACTICE FOR CSTS WHEN HANDLING SPECIMENS

Maintaining proper specimen management is essential for the CST to ensure the tissue sample's integrity and accuracy. Specimen management should include correctly identifying the patient, accurately identifying the specimen, appropriately labeling the specimen immediately upon receipt, and communicating information repeatedly for confirmation from the surgical team. The CST must place the sample in an appropriate container, with or without additive, using proper sterile technique, especially when handing it off the sterile field. The surgical technologist must properly label the specimen and verify the pathology requisition slip. If

applicable, they will need to properly transport the specimen to the laboratory. It is crucial to maintain a standard practice when managing tissue samples for pathology. During the preoperative phase of patient care, surgeons should communicate how they would like the specimen prepared. The surgeon should report the type of specimen, confirmation diagnostic studies to be performed, anticipation of the number of samples to be received, as well as the type of container and preservatives needed. The healthcare facilities should have a pre-printed requisition form with pertinent information stamped as required. A healthcare worker will need to complete the following statement on the form:

- Patient's name
- Patient's healthcare facility identification number
- Patient's unit and/or room number
- Clinical diagnosis
- Surgeon's name
- Source of specimen to include anatomical location where the specimen was removed, side, etc.
- Type of tissue
- Date and time of collection in the OR
- Study requested, e.g., culture, Gram stain, frozen section, etc.
- Other pertinent clinical information
- Name of circulator who completed documentation and preparation of the specimen for transport to the pathology or laboratory department.¹

The CST will need to be aware of any cultural preferences of the patient may have as to having a biopsy performed. Specific religions and cultures may request special handling of the specimen, or for the patient to keep the actual sample. The CST will need to follow the hospital policy when it comes to these patient requests. Clear communication with the pathology department is needed to maintain the chain of custody for documents and the specimen.

It is imperative that the CST practice proper aseptic technique when handling the specimen and containers on the sterile field. Samples need to be kept moist and are not allowed to dry, unless otherwise specified. Specimens are to be placed in a sterile container with preservative, if applicable, as soon as possible. If a speedy transfer is not possible, the sample will be placed in a sterile basin and kept moist with saline or placed on a saline-soaked non-adherent dressing until the CST can make the transfer safely to the circulator. The specimen must not be passed off with, or on, a radiopaque counted sponge. All samples will need to be gently handled.

CONCLUSION

Surgical technologists play an important role in the overall process of specimen care and handling crucial to the specimen collection process. "It is a process that involves many Health Care Workers and many steps including communication of information among the surgical team members, labeling, packaging, and transport of the specimen that may contribute to increasing the risk of error."¹ The CST's role in specimen management is of great importance and can help preserve the integrity of a patient's accurate diagnosis.



ABOUT THE AUTHOR

Tyronne Johnson, CST, CRCST, MBA, has been a Certified Surgical Technologist since 1995. His career expanded from being a graduate of the military operation room specialist program in 1990 at Fort Sam Houston, Texas, to

a surgical technologist and sterile processing educator. His passion for teaching has helped many students find long-lasting careers in the healthcare field. Tyronne earned his BA in business administration from Ashford University in 2013 and earned his executive MBA in healthcare administration from Baruch College in 2020. He is currently working as a full-time faculty member at Kingsborough Community College in Brooklyn, New York.

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1. Which stage of specimen testing occurs first, but doesn't always take place in the laboratory?
 - a. Analytical
 - b. Pre-analytical
 - c. Post-analytical
 - d. All of them take place in the laboratory
2. During a(n) _____, the CST sterilely prepares a needle that is inserted percutaneously into the exposed tissue.
 - a. Smear
 - b. Biopsy
 - c. Aspiration biopsy
 - d. Culture
3. Frozen section specimens are used mostly in what type of surgery?
 - a. Oncology
 - b. Orthopedic
 - c. Cardiovascular
 - d. General
4. In the post-analytic stage, what is responsible for up to 40% of errors in specimen collection?
 - a. Wrongful classification
 - b. False negatives
 - c. Mistake diagnoses
 - d. Defective reporting
5. True or False: The analytical phase of specimen testing includes a final result, value or diagnostic pathology report.
 - a. True
 - b. False
6. Specimen management should include which of the following:
 - a. Correctly identifying the patient
 - b. Appropriately labeling the specimen upon receipt of the specimen
 - c. Transfer of the specimen from the CST
 - d. Only a and b
7. Which specimen sample may allow for a more accurate result than frozen sections?
 - a. Smears
 - b. Biopsies
 - c. Cultures
 - d. Permanent Sections
8. Tagging a specimen may be utilized to show:
 - a. It's position on the patient
 - b. When determining clean margins
 - c. Both a and b
 - d. Neither a or b
9. Which sample is fixed with a sealant of preservative?
 - a. Smear
 - b. Biopsy
 - c. Aspiration biopsy
 - d. Frozen section
10. The most important process during the tissue collection of a permanent section is:
 - a. Adequate fixation
 - b. Insertion of liquid
 - c. The placement in a sterile water bath
 - d. The staining of the specimen

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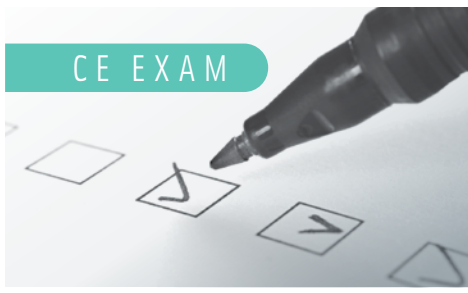
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