Digital Radiography of the Abdomen

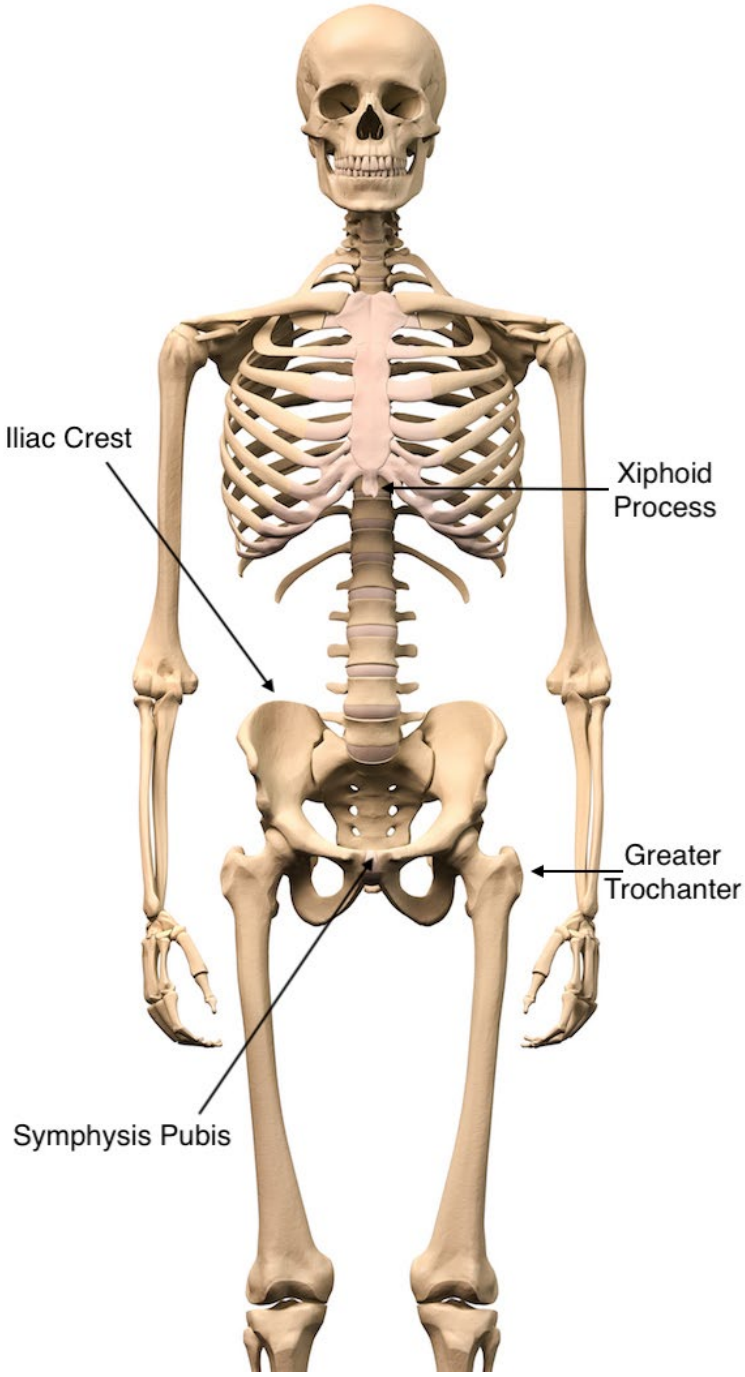
By Lindsay McCorkle, M.S.Ed., R.T.® (R)(CT)(MR)(M)(ARRT)

SECTION 2: Bony Landmarks, Body Planes, Body Habitus, and Abdominal Quadrants for Abdominal Radiography

Bony Landmarks

During abdominal radiographic studies, RTs depend on bony landmarks as reference points to confirm accurate positioning since organs in the abdomen aren't visible from the outside of the body. These landmarks assist in making sure the IR and central ray are positioned correctly, which ensures that all required anatomy is included on the final radiographic image. The following bony landmarks can be used to aid with positioning during a radiographic examination of the abdomen: the iliac crest, the xiphoid process, the symphysis pubis, and the greater trochanter (Figure 10).

Figure 10. Bony Landmarks



An enhanced image that depicts bony landmarks used by RTs during positioning for radiographic imaging studies of the abdomen. The black arrows identify the iliac crest, xiphoid process, greater trochanter, and symphysis pubis.

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Iliac Crest

The iliac crest is the superior most part of the ilium (pelvis) and is the most frequently utilized bony landmark in abdominal radiographs. It's characterized by a curved border and is located at the level of the L4 to L5 interspace. It's easily palpated on most patients. To do so, palpate in and down on the mid-lateral aspect of the abdomen or slightly above the umbilicus. When the center of the IR is placed at approximately the level of the iliac crest, the lower abdominal area is usually included on the final abdominal radiograph.

Xiphoid Process

The xiphoid process is the small tip located at the inferior most part of the sternum. It corresponds to the superior anterior part of the diaphragm at the level of T9 or T10, and it also corresponds to the superior part of the abdomen. The xiphoid process isn't often used during abdominal imaging of a patient in the supine position, but it can be a useful landmark when performing an upright abdominal radiograph, as the xiphoid process landmark can help ensure the entire diaphragm is included on an upright radiograph. To locate the xiphoid process, simply press on the soft abdomen area at midline and move superiorly, palpating along this superior movement until the firm bony distal portion of the sternum is felt. This is the xiphoid process. The kidneys usually reside halfway between the xiphoid process and the iliac crest.

Symphysis Pubis

The symphysis pubis is the point at which the 2 pelvic bones join anteriorly. The symphysis pubis marks the inferior portion of the abdomen and can only be palpated when the patient is in a supine position. Due to its lower position in the abdomen, the palpation of this landmark can be uncomfortable or embarrassing for some patients, especially if they aren't warned of the palpation ahead of time. To palpate, lie your hand flat on the patient's mid-abdomen and slowly and gently press downward on the abdomen, moving slightly inferiorly with each palpation. When a horizontal bony area is felt, this is the symphysis pubis. The symphysis pubis also aligns with the level of the greater trochanter. So, if the patient or the RT is uncomfortable with the palpation of the symphysis pubis, palpating the greater trochanter is an alternative option.

Greater Trochanter

The greater trochanter is a large prominence located on the superior lateral aspect of the femur adjacent to the femoral neck. It is more easily palpated on thinner patients, but it isn't impossible to

palpate on average-weight patients. It will be difficult to palpate on obese patients. To locate it, place one hand flat on the lateral side of the patient's hip/femur while using the other hand to externally and internally rotate the leg at the level of the knee. The patient should be in a supine position for this palpation. As you rotate the leg, the hand lying flat on the lateral side of the hip should feel the prominence of the trochanter moving medially upon internal leg rotation and laterally on external leg rotation. The greater trochanter corresponds to the level of the symphysis pubis, which marks the inferior most part of the abdomen. This landmark is not as accurate as others, but it can be used effectively once the palpation technique is mastered.

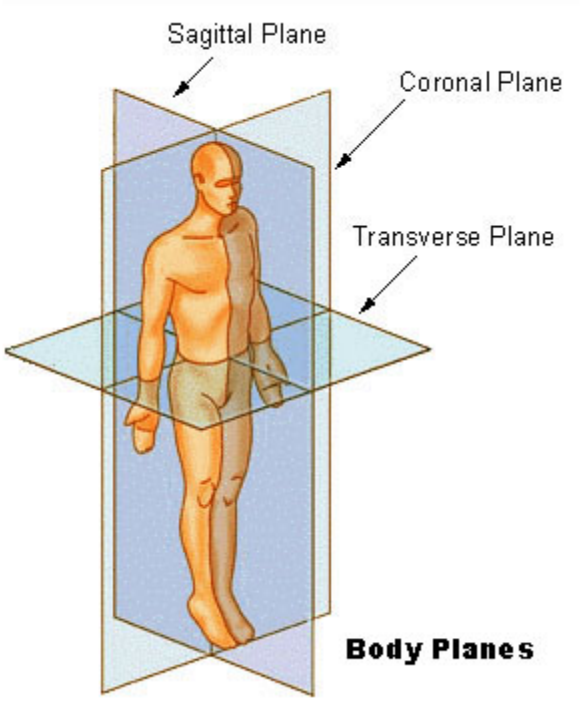
Body Planes

During radiographic positioning, imaginary body planes such as the midcoronal plane and midsagittal plane are often referenced. RTs should be familiar with how these specific planes correlate to the IR, central ray angle, and body part during patient positioning for an abdominal radiograph.

Midcoronal Plane

The midcoronal plane is a longitudinal plane that divides the body into equal anterior and posterior parts (Figure 11).[7] During either a posteroanterior (PA) or AP projection of the abdomen, the midcoronal plane should be parallel to the IR.

Figure 11. Body Planes



An illustration of the sagittal, coronal, and transverse planes of the body. The midcoronal (or coronal) plane is a longitudinal plane that divides the body into equal anterior and posterior parts. The midsagittal (or sagittal) plane is a longitudinal plane that divides the body into equal right and left parts. The midcoronal and midsagittal planes are helpful during patient positioning for abdominal radiographs. Ensuring the midcoronal plane is parallel to the IR and the midsagittal plane is perpendicular to the IR will ensure there is no body rotation when performing an AP or PA abdominal X-ray.

AP = anteroposterior; IR = image receptor; PA = posteroanterior.

National Institutes of Health/National Cancer Institute. SEER Training Modules: Anatomical Terminology – Directional Terms. Training.SEER.cancer.gov. Available at: https://training.seer.cancer.gov/anatomy/body/terminology.html. Accessed 2020.[7] For educational purposes only.

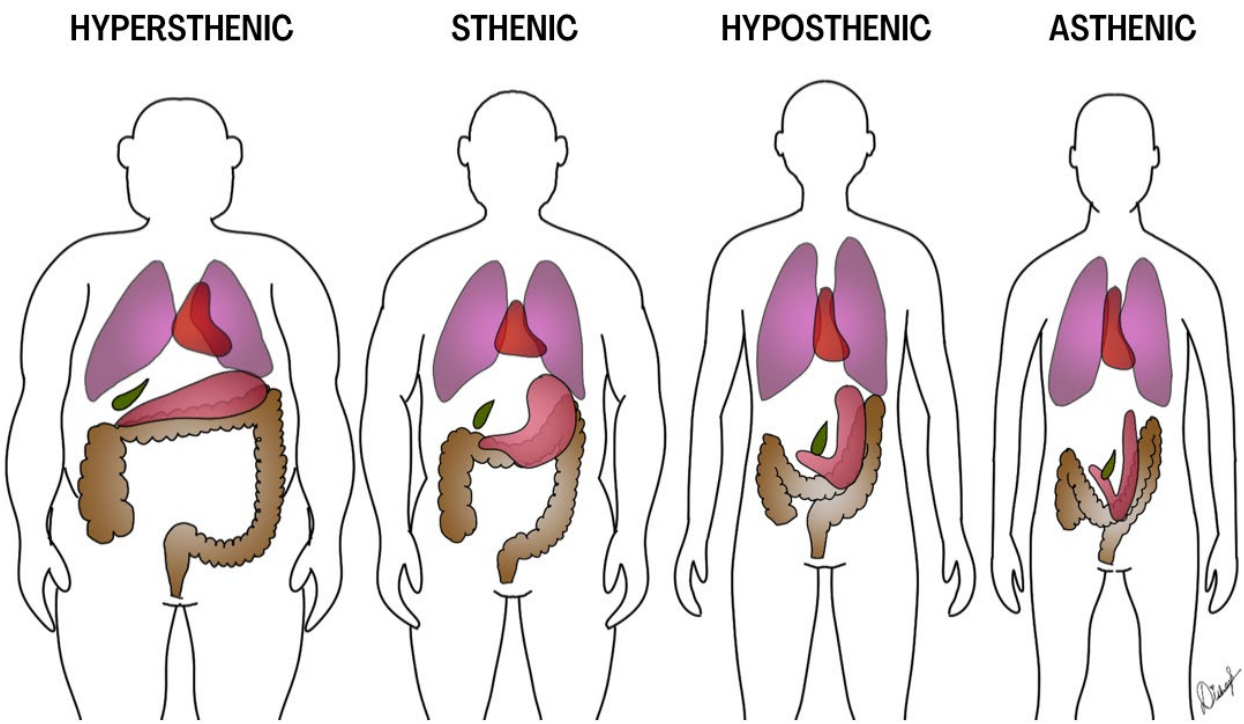
Midsagittal Plane

The midsagittal plane is a longitudinal plane that divides the body into equal right and left parts. The midsagittal plane is also known as the median plane. When performing a PA or AP projection of the abdomen, the midsagittal plane should be perpendicular to the IR (Figure 11).[7]

Body Habitus

Body habitus is the general shape of the human body, which has an impact on the location of organs within the abdominal cavity. It describes a person's physique, otherwise described as body figure and size. Body habitus comes into play when positioning a patient precisely for GI abdominal procedures. There are 4 body habitus types that RTs should be familiar with when performing digital radiographic examinations of the abdomen: hypersthenic, sthenic, hyposthenic, and asthenic (Figure 12).[8]

Figure 12. Body Habitus Types



Lokhandwala D. Body Habitus Types. Radiopaedia.org. Available at: https://radiopaedia.org/cases/160303. Published February 15, 2023. Accessed 2025.[8] For educational purposes only.

Hypersthenic Patients

Hypersthenic patients make up approximately 5% of the patient population. Patients that are hypersthenic have the largest build. Their abdomens tend to be very wide from left to right and very deep in an anterior to posterior perspective. Their diaphragm sits high, and the transverse colon sits high as well. Their stomachs will also sit high in the upper abdomen, in a more transverse

orientation, and extend from T9 to T12. The gallbladder sits high as well, to the right of midline, and is oriented in a transverse position.

Hyposthenic/Asthenic Patients

Hyposthenic patients make up about 35% of the patient population, while asthenic patients encompass about 10% of patients. Hyposthenic/asthenic patients are the opposite of hypersthenic patients in regard to body shape. These individuals are more slender, lean, and tend to have long lungs which causes the diaphragm to sit lower. In turn, this pushes the large intestine into the lower abdominal area. For these patients, the stomach takes on a "J" shape and sits lower in the abdominal cavity compared to a hypersthenic patient. The duodenal bulb sits at the level of L3 or L4 near the midline, and the gallbladder sits more midline as well at the level of the iliac crests.

Sthenic Patients

Sthenic patients comprise about 50% of the patient base and have a close to a normal build. Compared to hypersthenic patients, sthenic patients' stomachs have a more traditional "J" shape and are located lower in the abdominal cavity. Their stomachs tend to extend from T11 through L2; the duodenal bulb sits approximately at the level of L1 to L2 to the right of midline. The gallbladder is not as transverse as a hypersthenic patient's gallbladder and can be located halfway between midline and the lateral abdominal wall at the level of the iliac crests.

Abdominal Quadrants

To assist in locating organs in the abdominal cavity, it can be helpful to divide the abdomen up into 4 quadrants which are: the RUQ, LUQ, RLQ, and LLQ. These quadrants are defined by drawing a line through the abdomen vertically at the midsagittal plane and drawing another line horizontally through the abdomen at the level of the umbilicus (or between L4 and L5). Table 1 lists the organs that are located in each quadrant of an average-sized adult and are depicted in Figure 13.[9]

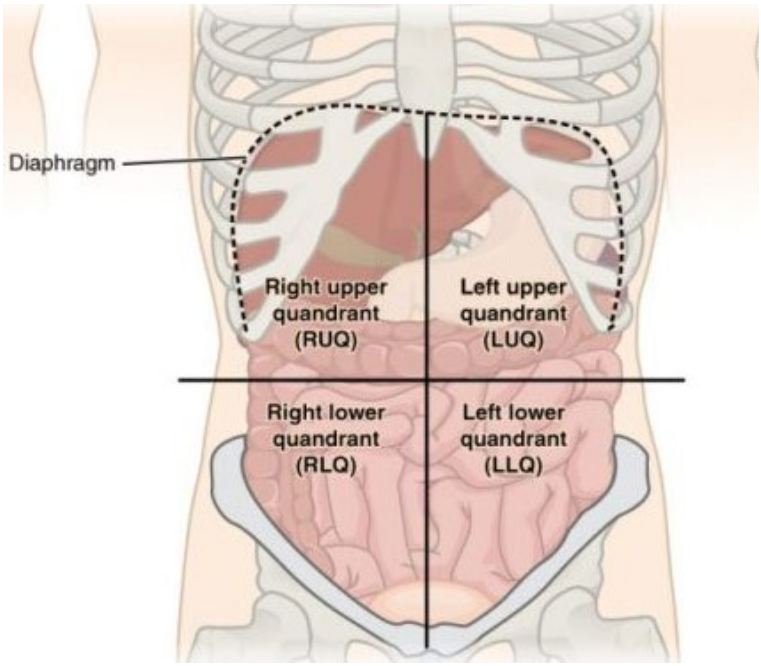
Table 1. Organs and Abdominal Quadrants

RUQ	LUQ	RLQ	LLQ
Gallbladder	Stomach	Cecum	Part of the jejunum
Liver	Spleen	Partial ileum	Descending colon
Duodenum	Pancreatic tail	Ascending colon	Sigmoid colon
Pancreatic head	Left colic flexure of large intestine	Ileocecal valve	
Right kidney		Appendix	
Right adrenal gland	Left kidney		
Right colic flexure of the large intestine	Left adrenal gland		

The location of organs in an average-sized adult based on the 4 quadrants of the abdomen.

LLQ = left lower quadrant; LUQ = left upper quadrant; RLQ = right lower quadrant; RUQ = right upper quadrant.

Figure 13. Abdominal Quadrants



A labelled illustration depicting each abdominal quadrant and the organs located in each quadrant. Review the image in comparison to Table 1 and see if you can locate the organs listed in each quadrant.

Open Resources for Nursing (Open RN); Ernstmeyer et al, eds. *Medical Terminology* [Internet]. 2nd ed. Chippewa Valley Technical College; 2024.[9] For educational purposes only.

It is vital for RTs to be knowledgeable about the bony landmarks that can assist in correctly placing the IR and central ray during abdominal radiographic examinations, whether those examinations include AP projections or PA projections. In addition, RTs ought to be familiar with body habitus and the body planes and should utilize the midcoronal plane and midsagittal plane as references when positioning a patient for an abdominal X-ray.