

Routine CT Procedures and Related Anatomy

Visual Study Reviewer Matrix • Exact wording from source • Grouped to avoid repetition

1. What a CT Examination Requires of the Technologist

A CT examination involves more than acquiring images. It requires the technologist to:

- Understand the clinical question.
- Verify the correct patient and examination.
- Prepare and position the patient.
- Select the appropriate approved scanning protocol.
- Plan the scan range using the scout image and anatomical landmarks.
- Perform the acquisition safely.
- Review coverage and technical image quality.
- Reconstruct and organize images for diagnostic interpretation.

2. Before Beginning the Examination – Verify

Term	Definition / Description (exact from source)
Patient identity	Use the required identifiers and confirm the request.
Examination	Confirm the body region, requested procedure, laterality where relevant, and clinical indication.
Previous imaging	Review available examinations when appropriate to the task.
Patient-specific factors	Consider mobility, pain, ability to follow instructions, body size, and need for assistance.
Pregnancy screening	Follow departmental policy and applicable requirements.
Contrast requirements	Confirm whether oral, intravenous, rectal, or no contrast is requested.
Safety screening	Review prior contrast reactions, relevant renal history, and other risk factors according to current policy.
Equipment readiness	Check the scanner, accessories, immobilization aids, injector when applicable, and emergency resources.

3. Patient Preparation (depends on the procedure)

- Explain the examination and the importance of remaining still.
- Provide breathing instructions when required.
- Remove external objects that may create artifacts or obscure the region.
- Use immobilization aids when appropriate.
- Position and center the patient according to the examination and scanner instructions.
- Check comfort, support, and the patient's ability to maintain the required position.
- For contrast examinations, verify the order, required screening, and suitable vascular access before administration by authorized personnel.

4. Scout / Topogram / Scanogram

Definition: The scout, also called a topogram or scanogram, is a preliminary projection image used to plan the diagnostic CT acquisition.

It helps the technologist:

- Identify the patient's longitudinal position.
- Locate recognizable anatomical landmarks.
- Set the superior and inferior scan boundaries.
- Confirm that the required anatomy can be covered.
- Assess gross positioning, rotation, and centering.
- Plan the acquisition according to the selected protocol.

How to Decide Where the Scan Starts and Ends

The scan range should be determined by the clinical indication, approved protocol, and required anatomical coverage.

Use this process:

1. Read the examination request.
2. Identify the region and structures relevant to the clinical question.
3. Find the corresponding landmarks on the scout.
4. Confirm the protocol's prescribed superior and inferior boundaries.
5. Check that the planned range includes the complete requested anatomy.
6. Avoid unnecessary coverage beyond the clinical requirement.

Examples of Landmarks (grouped)

Body Region	Landmarks
Head	skull base and vertex
Neck	skull base and the prescribed inferior neck boundary
Chest	lung apices and lung bases
Abdomen	diaphragm and the prescribed abdominal inferior boundary
Abdomen and pelvis	diaphragm through the required pelvic coverage
Spine	the requested vertebral levels, including the required adjacent anatomy
Extremities	the requested joint, bone, or soft-tissue region and required margins

5. Acquisition Collimation, Slice Thickness & Reconstruction Interval

These three terms are related, but they are not interchangeable.

Term	Definition / Description (exact from source)
Acquisition collimation	Describes the detector configuration and the width of acquired data sections.
Reconstruction thickness	Describes the thickness of the images reconstructed from the acquired data.
Reconstruction interval	Describes the distance between successive reconstructed image positions.

6. Selecting the Appropriate Protocol

The clinical indication determines which protocol should be considered.

Clinical question	Example of an appropriate examination approach
Suspected acute intracranial hemorrhage	Noncontrast head CT
Suspected pulmonary embolism	CT pulmonary angiography (CTPA), when indicated
Evaluation of abdominal pain	Protocol selected according to the suspected cause and clinical question
Characterization of a focal liver lesion	A liver protocol that may require multiple contrast phases
Suspected urinary tract calculus	Noncontrast CT using an appropriate stone protocol
Suspected aortic pathology	A suitable CT angiography protocol when indicated
Bone fracture assessment	CT acquisition and bone-focused reconstructions suited to the region

7. Non-contrast / Plain CT vs Contrast-enhanced CT

Non-contrast / Plain CT

No contrast agent is administered for the intended CT acquisition.

Common examples include:

- Routine acute head CT for selected indications.
- CT for suspected urinary calculi.
- Selected bone and trauma examinations.
- Certain follow-up or screening protocols.

Contrast-enhanced CT

Contrast is administered by an approved route to improve visualization of selected vessels, organs, tissues, or abnormalities.

Common examples include:

- Many routine abdominal examinations.
- Many neck soft-tissue examinations.
- Selected chest examinations.
- CT angiography.
- Multiphasic liver studies.

8. Power Injector and Contrast Timing

A power injector delivers contrast according to a prescribed injection protocol.

Important variables include:

- Contrast agent and concentration.
- Prescribed volume.
- Injection rate.
- Injection duration.
- Saline flush, if prescribed.
- IV access type and suitability for the planned flow rate.
- Scan delay or bolus-triggering method.
- Patient and examination-specific requirements.

9. Understanding Contrast Phases

The contrast phase describes the distribution of contrast at the time of image acquisition.

Phase	General purpose
Non-contrast	Establishes baseline attenuation without administered contrast
Arterial phase	Emphasizes arterial enhancement and selected arterial-phase abnormalities
Portal venous phase	Often provides useful enhancement of abdominal organs and the portal venous system
Delayed phase	Evaluates later contrast distribution or washout when required by the clinical question

What Does Correct Contrast Enhancement Look Like?

Contrast-enhanced images should be assessed in the context of the requested examination and phase. We should ask:

- Are the expected vessels or organs enhanced?
- Does the enhancement pattern fit the selected phase?
- Is the enhancement sufficient for the intended clinical question?
- Is the scan coverage complete?
- Is there evidence of motion or a technical problem that affects evaluation?
- Is there a possible complication, such as contrast extravasation, that needs attention?

10. CT Head – Scout, Protocol, Resulting Images & Landmarks

Scout and localization

- Identify the skull base and vertex on the scout.
- Confirm head alignment and the intended scan boundaries.
- Follow the approved protocol for coverage and gantry or acquisition orientation.
- Check that the prescribed intracranial anatomy will be included.

Protocol considerations

- Use the approved routine head protocol for the indication.
- Confirm acquisition and reconstruction settings, including appropriate brain and bone reconstructions when prescribed.
- Avoid assuming that one slice thickness or reconstruction series is suitable for all head CT indications.

Resulting images: key landmarks

- Skull base and posterior fossa.
- Orbits and surrounding structures, when included.
- Lateral ventricles and third ventricle.
- Basal ganglia region.
- Cerebral hemispheres.
- Vertex.

Post-processing and quality check

- Review the appropriate brain and bone windows.
- Use coronal and sagittal MPR when appropriate to the examination.
- Check the full prescribed coverage and assess motion, artifacts, and completeness.

11. CT Neck – Clinical Purpose, Prep, Scout, Protocol, Landmarks

Common indications

- Evaluation of a neck mass.
- Suspected deep neck infection.
- Assessment of cervical lymphadenopathy.
- Selected head and neck cancer staging.
- Evaluation of selected traumatic or inflammatory conditions.

Preparation and positioning

- Confirm the indication and whether contrast is required.
- Review the appropriate contrast safety screening when indicated.
- Position the patient supine, generally with the head and neck aligned.
- Ask the patient to remain still and follow breathing or swallowing instructions when needed.
- Remove objects that may cause artifacts.

Scout and localization

- Identify the skull base and prescribed inferior boundary.
- Confirm the intended coverage for the clinical indication.
- Check patient alignment and whether the full required region fits within the scan range.

Protocol considerations

- Select the approved soft-tissue neck protocol or CTA protocol as appropriate.
- Confirm whether IV contrast is indicated.
- Use the prescribed reconstruction thickness, interval, and soft-tissue reconstruction algorithm.
- Include additional reconstructions if required by the protocol.

Resulting images: key landmarks

- Nasopharyngeal, oropharyngeal, and laryngeal levels.
- Airway and surrounding soft tissues.

- Major cervical vessels.
- Cervical vertebral bodies.
- Relevant lymph node chains and salivary glands, depending on the level.

Post-processing and quality check

- Review axial images and coronal/sagittal MPR.
- Confirm that the entire prescribed neck region is included.
- Assess for swallowing motion, streak artifacts, and unexpected enhancement.

12. CT Chest – Clinical Purpose, Prep, Scout, Protocol, Landmarks

Part being imaged: Lungs, pleura, mediastinum, chest wall, and selected thoracic structures.

Common indications

- Evaluation of pulmonary nodules or masses.
- Suspected infection or other lung disease.
- Assessment of selected thoracic injuries.
- Evaluation of mediastinal abnormalities.
- Selected cancer staging and follow-up.
- Suspected pulmonary embolism when CTPA is indicated.

Preparation and positioning

- Confirm the clinical indication and requested chest protocol.
- Determine whether IV contrast is required.
- Position the patient supine, with arms raised when appropriate and tolerated.
- Explain the breathing instructions before entering the scan.
- Check that the patient's position allows the intended thoracic coverage.

Scout and localization

- Confirm the prescribed coverage from the lung apices through the lung bases.
- Check patient centering and arm position.
- Ensure the planned range includes the required thoracic anatomy.

Protocol considerations

- Select the protocol according to the clinical indication: routine chest, high-resolution lung imaging, CTPA, or another approved examination.
- Review the prescribed acquisition settings and dose-optimization methods.
- Thin-section reconstruction is useful for evaluating lung parenchyma and small airways.
- A thicker series may be provided for routine review where the protocol specifies it.
- For CTPA, confirm the authorized contrast timing and injection settings.

Resulting images: key landmarks

- Lung apices.
- Trachea and main bronchi.
- Carina.
- Aortic arch and mediastinum.
- Pulmonary arteries when the protocol is designed to evaluate them.
- Diaphragms and lung bases.

Post-processing and quality check

- Review lung and mediastinal windows as appropriate.
- Use coronal and sagittal MPR where useful.
- Check for motion, incomplete inspiration, artifacts, and incomplete coverage.

13. CT Abdomen – Clinical Purpose, Prep, Scout, Protocol, Landmarks

Part being imaged: Abdominal organs, vessels, bowel, retroperitoneum, and surrounding soft tissues, depending on the protocol.

Common indications

- Evaluation of abdominal pain.
- Suspected abdominal infection or inflammation.
- Assessment of abdominal masses.
- Selected cancer staging and follow-up.
- Evaluation of suspected bowel or organ abnormalities.
- Assessment of selected abdominal trauma.

Preparation and positioning

- Confirm whether the request is for abdomen alone or abdomen and pelvis.
- Verify whether IV contrast, oral contrast, or no contrast is appropriate for the approved protocol.
- Review relevant safety screening and required preparation.
- Position the patient supine unless the protocol specifies otherwise.
- Explain breath-holding instructions where applicable.

Scout and localization

- Identify the diaphragm and the prescribed inferior abdominal boundary.
- Confirm whether the pelvis must also be included.
- Check that the intended anatomy fits within the planned range.

Protocol considerations

- Choose the approved protocol based on the indication.
- Confirm whether IV contrast and/or enteric contrast is prescribed.
- Review the specified phase, acquisition parameters, and reconstruction settings.
- Select thin or thicker reconstructions according to the clinical task and approved protocol.

Resulting images: key landmarks

- Liver and spleen.
- Pancreas and surrounding structures.
- Kidneys and collecting systems, as visible at the relevant level.
- Abdominal aorta and major vessels.
- Bowel loops.
- Vertebral bodies and posterior abdominal structures.

Post-processing and quality check

- Review the appropriate soft-tissue window.
- Use coronal and sagittal MPR when appropriate.
- Confirm complete prescribed coverage.
- Assess motion, artifacts, and expected contrast enhancement for the selected phase.

14. Multiphasic Liver CT – Understanding Triphasic Scanning

Clinical purpose

Multiphasic liver CT may be requested to characterize a liver lesion, evaluate selected liver tumors, or investigate specific vascular and parenchymal abnormalities.

Protocol planning

- Verify that a multiphasic liver examination is actually requested.
- Confirm the prescribed contrast agent, volume, injection rate, and timing method.
- Check that the IV access and injector are appropriate for the protocol.
- Confirm that the planned coverage includes the required liver anatomy.
- Verify the required phases before acquisition.

The three commonly described phases

Phase	Description
Arterial phase	Highlights arterial enhancement and selected lesions that enhance prominently in this phase.
Portal venous phase	Demonstrates enhancement of the liver parenchyma and portal venous system.
Delayed phase	Evaluates later enhancement or washout when required by the clinical question.

Post-processing and quality check

- Ensure that the intended phases have been acquired and labeled correctly.
- Compare the liver across the phases.
- Review appropriate soft-tissue images and MPR.
- Check that the liver is fully covered in every required phase.

15. CT Spine – Clinical Purpose, Prep, Scout, Protocol, Landmarks

Part being imaged: The specified spinal region—cervical, thoracic, or lumbar spine—and associated structures required by the examination.

Common indications

- Suspected spinal fracture.
- Evaluation of selected degenerative bony changes.
- Assessment of selected postoperative or hardware-related concerns.
- Evaluation of complex osseous anatomy.
- Selected cases in which CT is needed for detailed bone assessment.

Preparation and positioning

- Verify the requested spinal region and vertebral levels.
- Review trauma precautions and the patient's ability to move safely.
- Maintain immobilization and spinal precautions where indicated.
- Position according to the approved examination and clinical circumstances.
- Confirm the scan range from the request and protocol.

Scout and localization

- Identify the requested vertebral levels.
- Confirm the superior and inferior coverage.
- Ensure that the prescribed region and any required adjacent anatomy are included.

Protocol considerations

- Select the appropriate spinal CT protocol.
- Use acquisition and reconstruction settings suited to the requested region and clinical question.
- Thin source or reconstructed images may support high-detail bone assessment and multiplanar reformats.
- Confirm whether dedicated bone and soft-tissue reconstructions are required.

Resulting images: key landmarks

- Vertebral bodies.
- Pedicles and posterior elements.
- Spinal canal.
- Intervertebral spaces.
- Facet joints.

Post-processing and quality check

- Review bone-focused images.
- Create sagittal and coronal MPR as prescribed.
- Use 3D reconstruction when it adds value, such as for selected complex fractures or surgical planning.
- Check alignment, coverage, and motion artifacts.

16. CT Pelvis – Clinical Purpose, Prep, Scout, Protocol, Landmarks

Part being imaged: Pelvic bones and selected pelvic organs, vessels, and soft tissues depending on the examination.

Common indications

- Evaluation of pelvic trauma and fractures.
- Investigation of selected pelvic masses.
- Assessment of selected inflammatory or infectious conditions.
- Evaluation of selected urinary, bowel, or pelvic soft-tissue abnormalities.
- Selected cancer staging and follow-up.

Preparation and positioning

- Verify whether the request is for pelvis alone or abdomen and pelvis.
- Determine the appropriate protocol and contrast requirements.
- Review relevant contrast screening if contrast is prescribed.

- Position the patient according to the examination and trauma precautions.
- Confirm that the planned coverage includes the required pelvic anatomy.

Scout and localization

- Identify the prescribed superior and inferior pelvic boundaries.
- Check coverage of the required bones and soft tissues.
- Confirm whether the pelvis is included as part of a larger abdomen-and-pelvis examination.

Protocol considerations

- Select the approved bone-focused, soft-tissue, trauma, or other protocol as indicated.
- Confirm contrast requirements and phase when applicable.
- Review reconstruction thickness and algorithms appropriate to the clinical question.

Resulting images: key landmarks

- Iliac bones and iliac crests.
- Sacrum and sacroiliac joints.
- Acetabula and hip joints.
- Pubic symphysis.
- Urinary bladder and selected pelvic organs when included.
- Pelvic vessels and soft tissues, depending on the protocol.

Post-processing and quality check

- Review bone and soft-tissue windows as appropriate.
- Use coronal and sagittal MPR.
- Use 3D reconstruction when it is indicated and adds clinical value.
- Check for missing anatomy, motion, and artifacts.

17. CT Extremities – Clinical Purpose, Prep, Scout, Protocol, Landmarks

Part being imaged: The specified limb, joint, bone, or soft-tissue region.

Common indications

- Complex fractures.
- Evaluation of articular surfaces.
- Selected bone lesions.
- Assessment of selected postoperative or hardware-related concerns.
- Selected soft-tissue masses or infection when CT is appropriate.
- CT angiography of an extremity when specifically indicated.

Preparation and positioning

- Verify the exact side and region requested.
- Confirm whether the examination is unilateral or bilateral.
- Review trauma precautions and immobilization requirements.
- Position the limb according to the approved protocol and the patient's condition.
- Remove obstructing objects where safe and appropriate.
- Confirm whether contrast is required.

Scout and localization

- Identify the requested bone or joint.
- Confirm laterality and the planned coverage.
- Ensure the entire requested region and necessary margins are included.

Protocol considerations

- Select the appropriate extremity protocol.
- Use acquisition and reconstruction settings suited to the size and anatomy of the region.
- Thin reconstructions can help demonstrate complex bone anatomy and support MPR or 3D reconstruction.
- Use contrast only when the indication and protocol require it.

Resulting images: key landmarks

- Cortical bone.
- Trabecular bone.
- Joint surfaces and joint spaces.
- Fracture lines or fragments, when present.
- Adjacent soft tissues included in the examination.

Post-processing and quality check

- Review bone-focused images and soft-tissue images when indicated.
- Generate coronal and sagittal MPR.
- Use 3D reconstruction for selected complex fractures or surgical planning.
- Confirm complete coverage and assess for motion or metal artifacts.

18. How to Check Whether the Scan Is Complete

1. Correct examination

- Correct patient and examination.
- Correct body region and laterality.
- Correct protocol and intended contrast status.

2. Anatomical coverage

- Required superior and inferior boundaries included.
- No unintended truncation of the region of interest.
- Required anatomy included in the prescribed phases and series.

3. Image quality

- No excessive motion.
- No avoidable positioning or centering problems.
- No severe artifacts that compromise the intended evaluation.
- Appropriate reconstruction thickness and algorithm.

4. Contrast and series completeness

- Required phases and series acquired.
- Series labeled and organized correctly.
- Expected enhancement assessed when applicable.
- Concerns escalated according to departmental procedure.

19. Final Takeaways: Think Like a CT Technologist

For every CT examination, remember:

Term	Definition / Description (exact from source)
1. Understand the clinical question.	The indication guides the protocol.
2. Prepare the patient safely.	Verify the request, patient factors, and required checks.
3. Read the scout carefully.	Use landmarks and the approved protocol to plan coverage.
4. Understand the parameters.	Acquisition settings and reconstruction settings serve different purposes.
5. Know what the images should show.	Connect the scan range to the anatomy and clinical task.
6. Check the contrast and phases.	Expected enhancement depends on the examination and timing.
7. Use appropriate post-processing.	Select reconstructions that help evaluate the intended anatomy.
8. Confirm technical completeness.	Review coverage, image quality, and required series.
9. Escalate concerns.	Do not independently change protocols or repeat scans outside authorization.

Source: 2026 Routine CT Procedures and Related Anatomy (De La Salle Medical and Health Sciences Institute). All definitions and wording kept exact. Grouped by topic for visual review and to avoid repeated terms.