



Cardiac CT
Chapter 6

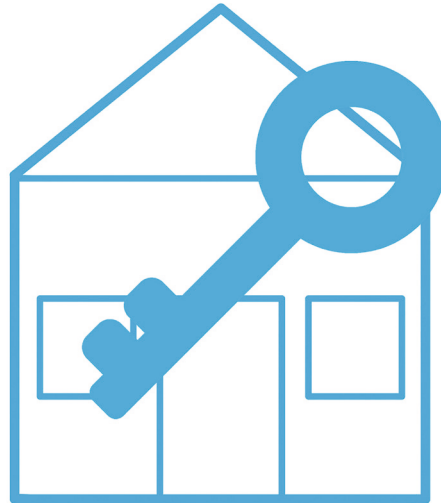
OPERATING A CT CLINIC



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WRITING AN EXEMPLARY REPORT



When writing a CT report it is important to include all of the following aspects:

- The scan indications
- The clinical data of the patient (e.g., gender, age, and body mass index)
- The patient's symptoms, cardiovascular risk factors, and prior test results
- The CT scanner details, the scan protocol, and any medications administered to the patient
- The scan quality (were there any image artifacts that affected the interpretation?)
- Documentation of all of the coronary segments
- The coronary plaque (stenosis severity, plaque type, and any high-risk plaque features)
- The additional cardiac findings (pericardium, aorta, pulmonary artery, left atrial appendage, cardiac chambers, myocardium, heart valves, implanted devices)
- The additional extracardiac findings (lung parenchyma, pleura, liver, mediastinum, ribs, spine, lymph nodes, thyroid gland, esophagus, and breast tissue)

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KNOWING WHEN CARDIAC CT IS NOT THE BEST OPTION

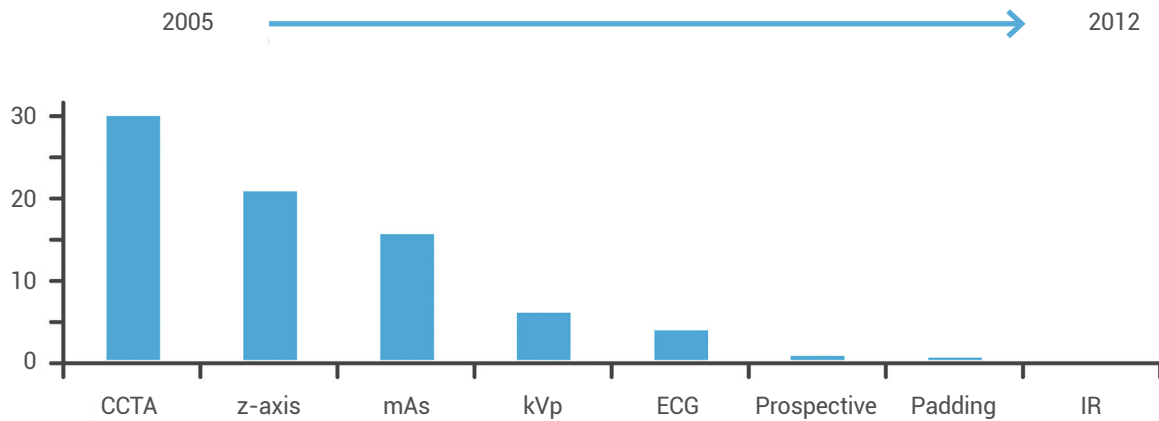


It is important to understand the strengths and limitations of cardiac CT and when other tests may be more suitable. Cardiac CT is considered to be an anatomical test. It is ideally suited for the detection of atherosclerosis or for indications that require high anatomical detail. It is, however, largely unable to provide a functional assessment

of coronary disease and once plaque is identified, often additional testing is required. As responsible clinicians, it is important to vet the CT requests and question the referral if a request seems inappropriate. When in doubt, the appropriate use criteria (AUC) for cardiac CT should be consulted.

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OPTIMIZING SCAN PROTOCOLS TO REDUCE RADIATION DOSE



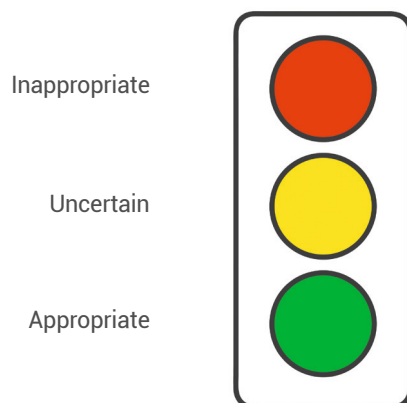
Cardiac CT involves the administration of ionizing radiation. It is therefore important to employ strategies to keep this “As Low As Reasonably Achievable” (ALARA).

When planning coronary or cardiac CT, scan techniques that can reduce the radiation dose, include the following:

- Limiting the z-axis length
- Using lower mAs
- Using lower kVp
- Obtaining prospective ECG-gated acquisitions
- Limiting padding
- Using more advanced reconstruction techniques (iterative reconstruction, model based iterative reconstruction)

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USING APPROPRIATE CRITERIA IN CARDIAC CT

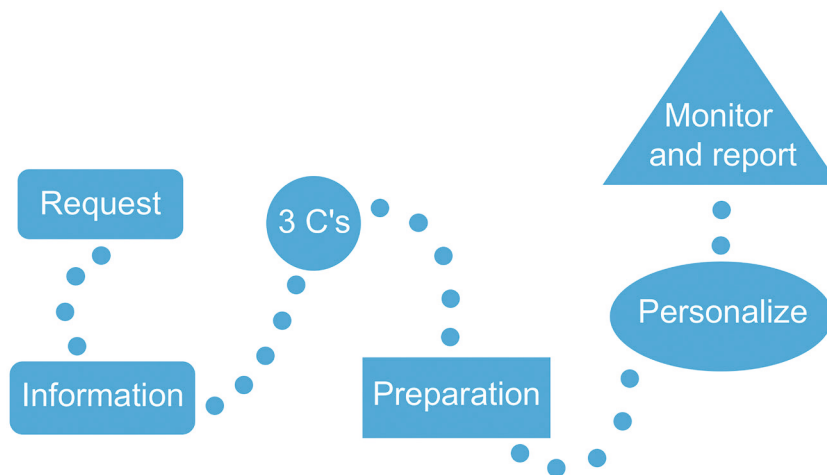


Cardiac CT has acquired a large evidence base, which enables clinicians to know which indications it has been of value to. Current appropriate use criteria (AUC) are graded into inappropriate, uncertain, and appropriate indications.

Knowledge of these criteria are imperative for referrer confidence. It is recommended that every practitioner of cardiac CT read the AUC and refer to it as a guide to determine when cardiac CT is considered an appropriate test.

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SETTING UP AND DELIVERING A HIGH-QUALITY SERVICE IN CT



The delivery of a high-quality cardiac CT service requires a certain infrastructure to be in place.

Competencies

The technologist / radiographer and clinician should be competent to perform cardiac CT. Competence should be defined as having received appropriate training, certification, experience, and an ongoing commitment to continuing medical education.

Equipment

High-quality cardiac CT services can only exist where the appropriate equipment is in place. This includes a cardiac capable scanner and an appropriate contrast injector pump.

Radiation monitoring

Robust governance should be in place to monitor the radiation doses administered to patients on a regular basis and for this to be benchmarked against other centers nationally and internationally.

Screening

With any investigation, patient safety is of the utmost importance. Ensure patients are checked for safety before a scan is performed. This starts from the moment the request is received by checking the appropriateness of the referral, to after the scan has been performed. Check for contrast allergies, renal function, asthma, and medication safety. Last but not least, ensure you are scanning the right patient by verifying the patient's identity.

Pre-test

Advise your patients to abstain from caffeine and nephrotoxic medications on the morning of their examinations. Be sure to advise patients; for example, to stop taking metformin 48 hours prior to their test. Adhere to local policies about preventing the onset of contrast-induced nephropathy.

Pre-procedure

Use the right medications to achieve the best scan quality. Aim to scan patients with heart rates < 65 bpm and make the use of GTN routine in your department. Practice breath-holding with your patients before the test commences.

Reporting

Issue standardized reports that contain all of the recommended elements so reports can be easily understood by your referrers.

READING LIST

- Abbara, S, Arbab-Zadeh, A, Callister, TQ, et al. 2009. SCCT guidelines for performance of coronary computed tomographic angiography: A report of the Society of Cardiovascular Computed Tomography Guidelines Committee. *J Cardiovasc Comput Tomogr.* **3**: 190–204.
- Chandrashekhar, Y, Shaw, LJ, and Narula, J. 2015. Diagnostic Imaging, Radiation Exposure, and Carcinogenic Risk: Let's Be Realistic, Reasonable, and Rational. *JACC Cardiovasc Imaging.* **8**: 885–887.
- Douglas, PS, Hoffmann, U, Patel, MR, et al. 2015. Outcomes of anatomical versus functional testing for coronary artery disease. *N Engl J Med.* **372**: 1291–1300.
- Halliburton, SS, Abbara, S, Chen, MY, et al. 2011. SCCT guidelines on radiation dose and dose-optimization strategies in cardiovascular CT. *J Cardiovasc Comput Tomogr.* **5**: 198–224.
- Hausleiter, J, Meyer, T, Hermann, F, et al. 2009. Estimated radiation dose associated with cardiac CT angiography. *JAMA.* **301**: 500–507.
- Leipsic, J, Abbara, S, Achenbach, S, et al. 2014. SCCT guidelines for the interpretation and reporting of coronary CT angiography: a report of the Society of Cardiovascular Computed Tomography Guidelines Committee. *J Cardiovasc Comput Tomogr.* **8**: 342–358.
- Nguyen, PK, Lee WH, Li, YF, et al. 2015. Assessment of the Radiation Effects of Cardiac CT Angiography Using Protein and Genetic Biomarkers. *JACC Cardiovasc Imaging.* **8**: 873–884.
- Raff, GL, Chinnaiyan, KM, Cury, RC, et al. 2014. SCCT guidelines on the use of coronary computed tomographic angiography for patients presenting with acute chest pain to the emergency department: a report of the Society of Cardiovascular Computed Tomography Guidelines Committee. *J Cardiovasc Comput Tomogr.* **8**: 254–271.
- SCOT-HEART investigators. 2015. CT coronary angiography in patients with suspected angina due to coronary heart disease (SCOT-HEART): an open-label, parallel-group, multicentre trial. *Lancet.* **385**: 2383–2391.
- Shaw, LJ, Hausleiter, J, Achenbach, S, et al. 2012. Coronary computed tomographic angiography as a gatekeeper to invasive diagnostic and surgical procedures: results from the multicenter CONFIRM (Coronary CT Angiography Evaluation for Clinical Outcomes: an International Multicenter) registry. *J Am Coll Cardiol.* **60**: 2103–2114.
- Taylor AJ, Cerqueira, M, Hodgson, JM, et al. 2010. ACCF/SCCT/ACR/AHA/ASE/ASNC/NASCI/SCAI/SCMR 2010 appropriate use criteria for cardiac computed tomography. A report of the American College of Cardiology Foundation Appropriate Use Criteria Task Force, the Society of Cardiovascular Computed Tomography, the American College of Radiology, the American Heart Association, the American Society of Echocardiography, the American Society of Nuclear Cardiology, the North American Society for Cardiovascular Imaging, the Society for Cardiovascular Angiography and Interventions, and the Society for Cardiovascular Magnetic Resonance. *J Am Coll Cardiol.* **56**: 1864–1894.
- Teague, SD, Rissing, S, Mahenthiran, J, et al. 2012. Learning to interpret the extracardiac findings on coronary CT angiography examinations. *J Cardiovasc Comput Tomogr.* **6**: 232–245.
- Weigold, WG, Abbara, S, Achenbach, S, et al. 2011. Standardized medical terminology for cardiac computed tomography: A report of the Society of Cardiovascular Computed Tomography. *J Cardiovasc Comput Tomogr.* **5**: 136–144.