

Diagnostic Accreditation Program

ACCREDITATION STANDARDS

Computed
Tomography

Copyright © 2024 by the Diagnostic Accreditation Program and the College of Physicians and Surgeons of British Columbia.

All rights reserved. No part of this publication may be used, reproduced or transmitted, in any form or by any means electronic, mechanical, photocopying, recording or otherwise, or stored in any retrieval system or any nature, without the prior written permission of the copyright holder, application for which shall be made to:

Diagnostic Accreditation Program
College of Physicians and Surgeons of British Columbia
300-669 Howe Street
Vancouver BC V6C 0B4

The Diagnostic Accreditation Program and the College of Physicians and Surgeons of BC has used their best efforts in preparing this publication. As websites are constantly changing, some of the website addresses in this publication may have moved or no longer exist.

Introduction

In addition to the general standards, the discipline-specific accreditation standards for computed tomography provides additional mandatory requirements and best practices.

Examination requests

No.	Description	Risk	Reference	Change
CT1.0	COMPUTED TOMOGRAPHY EXAMINATION REQUESTS <i>Guidance: See also global modality GM1.0 for additional requirements.</i>			Revised
CT1.1	Examination requisitions are processed.			Revised
CT1.1.1	M Processing of the examination requests ensures there is a review by a radiologist for appropriateness, priority and protocol assignment prior to booking examination. <i>Guidance: See also global modality GM1.1.</i>	M		
CT1.1.2	M Processing of the examination requests ensures there is a policy that defines those requests that do not need to be reviewed by the radiologist prior to booking the examination.	M		

Patient preparation

No.	Description	Risk	Reference	Change
CT2.0	COMPUTED TOMOGRAPHY PATIENT PREPARATION <i>Guidance: See also global modality GM2.0 for additional requirements.</i>			Revised
CT2.1	Pre-examination information is collected and assessed prior to performing CT colonography.			
CT2.1.1	M All patients are screened for contraindications (e.g. medical conditions, allergies).	H		
CT2.1.2	M Prior to having the procedure, the patient or patient's guardian is informed of the nature of the examination (e.g. description of the rectal catheter insertion and insufflation, administration of medication, etc.).	H		

Imaging procedures

No.	Description	Risk	Reference	Change
CT3.0	COMPUTED TOMOGRAPHY STANDARD OPERATING PROCEDURES/PROTOCOLS <i>Guidance: See also global modality GM3.0 for additional requirements.</i>			Revised
CT3.1	There is a comprehensive process in place for protocol adoption and development.			
CT3.1.1	M Protocols are reviewed at least annually by individual(s) with technical and medical subject matter expertise and revised as required.	M		
CT3.2	Protocols contain all the information necessary to perform the examination.			
CT3.2.1	M Protocol information includes the equipment/supplies needed.	M		
CT3.2.2	M Protocol information includes a description of patient positioning.	M		
CT3.2.3	M Protocol information includes the technical parameters such as mAs, kVp, pitch, and slice thickness.	M		Revised
CT3.2.4	M Protocol information includes the type and dose of contrast agents administered.	M		
CT3.2.5	M Protocol information includes when guidance or review by a radiologist is required prior to patient discharge, and when additional sequences or contrast administration is needed.	M		
CT3.3	Examinations are performed following established protocols.			
CT3.3.1	M Protocols are readily available to staff performing the examination.	H		
CT3.3.2	M Protocols are equipment specific.	M		
CT3.3.3	M Scanning protocols are created with the lowest clinically acceptable patient dose and with consideration for diagnostic reference levels.	H		
CT3.3.4	M There are pediatric protocols where scanning techniques and imaging factors are modified for patient size and age.	H	SC-35	
CT3.4	Images are reviewed for diagnostic quality before the patient is released.			
CT3.4.1	M Image review ensures the anatomic area of interest is well positioned.	H		
CT3.4.2	M Image review ensures the presence of artifacts and motion does not impact the diagnostic image quality.	H		

No.	Description	Risk	Reference	Change
CT3.4.3	M Image review ensures appropriate window levels are applied.	H		
CT3.4.4	M Image review ensures the use of the appropriate field of view (FOV).	H		
CT3.4.5	M Image review ensures adequate intravenous contrast enhancement of required structures.	H		
CT3.4.6	M Image review ensures the appropriate post-processing algorithms are applied.	H		
CT3.4.7	M Image review ensures the use of appropriate reformats for the structures to be optimally demonstrated.	H		
CT3.4.8	M Image review includes the appropriate 3D reconstruction of structures when required.	H		
CT3.5	Patient safety is monitored before, during and after a CT examination.			
CT3.5.2	M When seated at the CT console, the technologist can directly view the patient within the gantry or via a monitor system.	M		
CT3.7	CT colonography procedures are performed following established protocols.			
CT3.7.2	M Colonic distension is performed using carbon dioxide and an automated insufflator.	H		
CT3.7.3	M An initial review of the images is undertaken to ensure sufficient insufflation. <i>Guidance: Review is performed by a radiologist or technologist, deemed adequately trained by the medical leader.</i>	H		
CT3.7.4	M Insufflators are equipped with a filter and reservoir to prevent the reflux of colonic effluent into the insufflation device.	H		New

Medical record

No.	Description	Risk	Reference	Change
CT7.0	COMPUTED TOMOGRAPHY MEDICAL RECORD DOCUMENTATION <i>Guidance: See also global modality GM7.0 for additional requirements.</i>			Revised
CT7.1	Images are labeled in a standardized way that allows for proper patient identification and annotation. <i>Guidance: See also global modality GM7.1.</i>			
CT7.1.1	M Images are labeled with slice location and include appropriate markings for anatomic orientation and position.			M
CT7.1.2	B Images are labeled in a standardized way that allows for proper patient identification and annotation that includes a cross-reference image with the corresponding location of slices displayed.			
CT7.2	Comprehensive examination details are recorded in the medical record. <i>Guidance: See also global modality GM7.2.</i>			
CT7.2.2	M Comprehensive examination details recorded in the medical record include an indicator of CT examination radiation dose such as DLP.			M
CT7.2.3	M CT patient dose information such as the DLP value or dose report is appended to the acquired images as a separate series.			M

Acceptance testing

No.	Description	Risk	Reference	Change
CT12.0	ACCEPTANCE TESTING OF COMPUTED TOMOGRAPHY SYSTEMS <i>Guidance: See also equipment and supplies DES2.0 for additional requirements.</i>			Revised
CT12.1	Acceptance testing is performed after purchase and prior to clinical use of CT systems.			Revised
CT12.1.1	M Acceptance testing of CT systems includes visual and functional testing of the mechanical properties, as well as any other mechanical checks as recommended by the manufacturer. <i>Guidance: Unit appears electro-mechanically sound, and all moving parts move smoothly, without obstruction. All patient and operator contact surfaces are safe and free from hazards.</i>	H	SC-35	Revised
CT12.1.2	M Acceptance testing of CT systems includes visual and functional evaluations of the safety systems for damage, as well as any other safety checks as recommended by the manufacturer.	H	SC-35	Revised
CT12.1.3	M Acceptance testing of CT systems includes evaluation of the accuracy of image acquisition factors such as kVP, current time product (mAs), and pitch.	H	SC-35	Revised
CT12.1.4	M Acceptance testing of CT systems includes evaluation of CT number accuracy.	H	SC-35	Revised
CT12.1.5	M Acceptance testing of CT systems includes evaluation of CT image noise.	H	SC-35	Revised
CT12.1.6	M Acceptance testing of CT systems includes evaluation of CT image uniformity.	H	SC-35	Revised
CT12.1.7	M Acceptance testing of CT systems includes evaluation of CT number calibration.	H	SC-35	Revised
CT12.1.8	M Acceptance testing of CT systems includes evaluation of CT number linearity.	H	SC-35	Revised
CT12.1.9	M Acceptance testing of CT systems includes evaluation of the tomographic section thickness.	H	SC-35	Revised
CT12.1.10	M Acceptance testing of CT systems includes evaluation of patient support movement.	H	SC-35	Revised
CT12.1.11	M Acceptance testing of CT systems includes evaluation of laser light accuracy.	H		Revised

No.	Description	Risk	Reference	Change
CT12.1.12	M Acceptance testing of CT systems includes evaluation of automatic positioning of tomographic plane accuracy.	H		Revised
CT12.1.13	M Acceptance testing of CT systems includes evaluation of gantry tilt accuracy.	H		Revised
CT12.1.14	M Acceptance testing of CT systems includes evaluation of spatial resolution.	H	SC-35	Revised
CT12.1.15	M Acceptance testing of CT systems includes evaluation of low contrast detectability.	H	SC-35	Revised
CT12.1.16	M Acceptance testing of CT systems includes evaluation of the number dependence on phantom position.	H		Revised
CT12.1.17	M Acceptance testing of CT systems includes evaluation of the radiation dose profile.	H		Revised
CT12.1.18	M Acceptance testing of CT systems includes evaluation of the radiation dose delivered from a scout localization image.	H		Revised
CT12.1.19	M Acceptance testing of CT systems includes evaluation of the CT dose index to establish a baseline computed tomography dose index (CTDI).	H		Revised

Quality assurance

No.	Description	Risk	Reference	Change
CT13.0	QUALITY CONTROL TESTING OF COMPUTED TOMOGRAPHY SYSTEMS <i>Guidance: See also equipment and supplies DES3.0 for additional requirements.</i>			Revised
CT13.1	Daily quality control procedures are established and used to monitor performance of CT systems.			Revised
CT13.1.1	M Daily quality control testing of CT systems includes a system start-up or reboot according to the manufacturer's recommendations.	M	SC-35	Revised
CT13.1.2	B Daily quality control testing of CT systems includes evaluation of all meters and visual/audible indicators.		SC-35	Revised
CT13.1.3	B Daily quality control testing of CT systems includes evaluation of all moving parts to ensure smooth operation without obstruction. All patient and operator contact surfaces are clean, safe and free from hazards.			Revised
CT13.1.4	M Daily quality control testing of CT systems includes calibration, or at the testing frequency recommended by the manufacturer.	M		Revised
CT13.1.5	M Daily quality control testing of CT systems includes CT number accuracy, or at the frequency recommended by the manufacturer, using a uniform water phantom to ensure the CT number for water is within the manufacturer's specifications.	M		Revised
CT13.1.6	M Daily quality control testing of CT systems includes image artifact assessment, or at the frequency recommended by the manufacturer, by visually assessing image slices of a phantom scan.	M		Revised
CT13.2	Weekly quality control procedures are established and used to monitor performance of CT systems.			Revised
CT13.2.1	M Weekly quality control testing of CT systems includes evaluation of the gantry and table cleanliness to remove contrast media and debris build up from producing artifacts. <i>Guidance: The table cleanliness includes checking underneath the mattress for debris.</i>	M		Revised
CT13.2.3	M Weekly quality control testing of CT systems includes evaluation of noise, to ensure that the noise does not vary from the baseline value by more than 0.2 HU.	M	SC-35	Revised

No.	Description	Risk	Reference	Change
CT13.2.4	M Weekly quality control testing of CT systems includes evaluation of image uniformity, to ensure uniformity does not exceed 2 HU from the baseline at acceptance testing.	M	SC-35	Revised
CT13.5	Annual quality control procedures are established and used to monitor performance of CT systems.			Revised
CT13.5.1	M Annual quality control testing of CT systems includes evaluation of the CT number dependence on phantom position. The resultant CT number for water does not differ by more than 5 HU at various phantom positions.	M	SC-35	Revised
CT13.5.2	M Annual quality control testing of CT systems includes evaluation of the scout localization image radiation dose, to ensure it remains within 20% of the nominal value.	M		Revised
CT13.5.3	M Annual quality control testing of CT systems includes evaluation of the radiation dose profile, to ensure the collimation of the radiation beam does not exceed the prescribed scan width.	M	SC-35	Revised
CT13.5.4	M Annual quality control testing of CT systems includes evaluation of CT number linearity, over the CT number range of -1000 to +1000.	M	SC-35	Revised
CT13.5.5	M Annual quality control testing of CT systems includes evaluation of CT system laser light accuracy.	M		Revised
CT13.5.6	M Annual quality control testing of CT systems includes evaluation of automatic positioning of tomographic plane accuracy, to ensure that the location of the localization scan corresponds to within 1 mm of actual scan plane.	M		Revised
CT13.5.7	M Annual quality control testing of CT systems includes evaluation of CT dose index (CTDI), to ensure that the CTDI is within 20% of the established baseline values.	M		Revised
CT13.5.8	M Annual quality control testing of CT systems includes evaluation of gantry tilt accuracy.	M		Revised
CT13.5.9	M Annual quality control testing of CT systems includes evaluation of interlocks, if present.	M		Revised
CT13.5.10	M Annual quality control testing of CT systems includes evaluation of patient support movement accuracy, to ensure the measured movement is within 1 mm of the intended movement.	M	SC-35	Revised
CT13.5.11	M Annual quality control testing of CT systems includes evaluation of spatial resolution.	M	SC-35	Revised

No.	Description	Risk	Reference	Change
CT13.5.12	M Annual quality control testing of CT systems includes evaluation of low contrast detectability.	M	SC-35	Revised
CT13.5.13	M Annual quality control testing of CT systems includes evaluation of beam width. <i>Guidance: The test may be conducted more frequently, as recommended by the manufacturer.</i>	M		Revised
CT13.5.14	M Annual quality control testing of CT systems includes evaluation of the reconstructed slice thickness. <i>Guidance: The test may be conducted more frequently, as recommended by the manufacturer.</i>	M		Revised

CT lung cancer screening

No.	Description	Risk	Reference	Change
CT13.6	An annual medical physicist assessment of CT systems used for lung cancer screening ensures radiation safety, equipment performance, image quality, and an established and effective quality assurance program.			Revised
CT13.6.1	M Annual quality control testing of CT systems used for lung cancer screening includes a review of patient size-specific protocols, to ensure that the (computed tomography dose index) CTDI for a standard sized patient is equal to or less than 3.0 mGy, on CT systems used for lung cancer screening. <i>Guidance: The medical physicist performs a survey of patient doses and is available to assist in protocol optimization initiatives.</i>	M	BC-Lung	Revised
CT13.6.2	M Annual quality control testing of CT systems used for lung cancer screening includes evaluation of 3D spatial resolution, 3D reconstruction slice thickness, and spatial warping for the lung cancer screening protocols, using the CT scanner's median dose for a standard sized patient. <i>Guidance: Scan protocol needs QIBA Conformance Certification Mark by using the CTLX1 phantom. BC Cancer Lung Cancer Screening Program facilitates analysis through Accumetra.</i>	M	BC-Lung	Revised
CT13.7	A lung cancer screening protocol optimization committee is established to oversee the implementation of quality assurance recommendations.			Revised
CT13.7.1	M Annually a lung cancer screening protocol optimization committee reviews the medical physicist patient dose report along with each CT scanner's protocol acquisition and reconstruction parameters.	M	BC-Lung	Revised
CT13.7.2	M Annually a lung cancer screening protocol optimization committee reviews CT scanning practices such as limits of anatomic region length exposed, number of series, patient centering, noise on the image, etc.	M	BC-Lung	Revised
CT13.7.3	M Annually a lung cancer screening protocol optimization committee reviews the standardization of lung cancer screening CT scanning protocol nomenclature to simplify PACS and RIS management.	M	BC-Lung	Revised
CT13.7.4	B A lung cancer screening protocol optimization committee is comprised of radiologists, technologists, and medical physicists.		BC-Lung	New

No.	Description	Risk	Reference	Change
CT13.8	CT systems used for lung cancer screening require full patient demographics in order to create clinically useful dose reports.			Revised
CT13.8.1	M Patient height and weight are recorded for all lung cancer screening CT scanning. <i>Guidance: For a screening program, patients are ambulatory. If patient height and weight information are not easily available on incoming paperwork, they can be requested from the patient as opposed to measured.</i>	M	BC-Lung	Revised

References

Abbreviation	Reference
BC-Lung	BC Cancer Lung Cancer Screening Program Recommendation
SC-35	Health Canada. Safety Code 35. Radiation protection in radiology–large facilities [internet]. Ontario: Health Canada; 2024. Available from: https://www.canada.ca/content/dam/hc-sc/documents/services/environmental-workplace-health/reports-publications/radiation/safety-code-35-safety-procedures-installation-use-control-equipment-large-medical-radiological-facilities-safety-code/safety-code-35-safety-procedures-installation-use-control-equipment-large-medical-radiological-facilities-safety-code.pdf

Bibliography

- Aldrich JE, Bilawich AM, Mayo JR. Radiation doses to patients receiving computed tomography examinations in British Columbia. Can Assoc Radiol J. 2006 Apr;57(2):79-85. Available from: <https://pubmed.ncbi.nlm.nih.gov/16944681/>
- Aldrich JE, Duran E, Dunlop P, Mayo JR. Optimization of dose and image quality for computed radiography and digital radiography. J Digit Imaging. 2006 Jun;19(2):126-31. Available from: <https://link.springer.com/article/10.1007/s10278-006-9944-9>
- American College of Radiology. ACR Computed Tomography Quality Control Manual [Internet]. [Virginia]: American College of Radiology; 2017. Available from: https://www.acr.org/-/media/ACR/Files/Clinical-Resources/QC-Manuals/CT_QCManual.pdf
- American College of Radiology. ACR-AAPM Technical Standard for Diagnostic Medical Physics Performance Monitoring Of Computed Tomography (CT) Equipment [Internet]. [Virginia]: American College of Radiology; 1998 [rev 2022]. Available from: <https://www.acr.org/-/media/ACR/Files/Practice-Parameters/CT-Equip.pdf?la=en>
- Hammerstrom K, Aldrich J, Alves L, Ho A. Recognition and prevention of computed radiography image artifacts. J Digit Imaging. 2006 Sep;19(3):226-39. Available from: <https://link.springer.com/article/10.1007/s10278-006-0590-z>