

Diagnostic Accreditation Program

ACCREDITATION STANDARDS

Magnetic Resonance
Imaging

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 standards for magnetic resonance imaging provides additional mandatory requirements and best practices.

Examination requests

No.	Description	Risk	Reference	Change
MR1.0	MRI EXAMINATION REQUESTS <i>Guidance: See also global modality GM1.0 for additional requirements.</i>			Revised
MR1.1	Examination requisitions are processed. <i>Guidance: See also global modality GM1.1.</i>			Revised
MR1.1.1	M Processing of the examination requests ensures there is a review by a radiologist for appropriateness, priority and protocol assignment prior to booking examination.	M		
MR1.1.2	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		New
MR1.2	Examination requests contain accurate information that is received prior to an examination being undertaken. <i>Guidance: See also global modality GM1.2.</i>			
MR1.2.1	B Outpatient requisitions for IV contrast enhanced examinations indicate significant renal disease or risk factors. <i>Guidance: For inpatients, information on renal disease or risk factors is available in the medical record.</i>			

Imaging procedures

No.	Description	Risk	Reference	Change
MR3.0	MRI STANDARD OPERATING PROCEDURES/PROTOCOLS			Revised
MR3.1	There is a comprehensive process in place for protocol adoption and development. <i>Guidance: See also global modality GM3.1.</i>			
MR3.1.1	M Protocols are reviewed at least annually by qualified individual(s) with appropriate technical or medical expertise and revised as required.	M		
MR3.2	Protocols contain all the information necessary to perform the examination.			
MR3.2.1	M Protocol information includes a description of the MRI coil and supplies needed.	M		
MR3.2.2	M Protocol information includes a description of patient positioning.	M		
MR3.2.3	M Protocol information includes the technical parameters such as TR, TE, and slice thickness.	M		
MR3.2.5	M Protocol information includes when guidance or review by a radiologist is required prior to patient discharge (e.g. acute pathology identified or additional sequences required).	M		
MR3.3	Examinations are performed following established protocols.			
MR3.3.1	M Protocols are readily available to staff performing the examination.	H		
MR3.3.2	M Source images, from which 3D processing is performed, are archived.	H		
MR3.3.3	M Protocols are equipment specific.	M		
MR3.4	Images are reviewed for diagnostic quality before the patient is released.			
MR3.4.1	M Image review ensures that the area of interest is captured in its entirety using appropriate imaging planes with adequate SNR.	H		
MR3.4.2	M Image review ensures that the presence of artifacts and motion does not impact the image quality.	H		
MR3.4.3	M Image review ensures that appropriate pulse sequences, molecular suppression and image weighting are achieved.	H		
MR3.4.4	M Image review ensures the use of appropriate coils and techniques for optimal SNR as well as spatial and temporal resolution for the area of interest.	H		

Medical record

No.	Description	Risk	Reference	Change
MR7.0	MRI MEDICAL RECORD DOCUMENTATION <i>Guidance: See also global modality GM7.0 for additional requirements.</i>			Revised
MR7.1	Images are labeled in a standardized way that allows for proper patient identification and annotation that includes: <i>Guidance: See also global modality GM7.1.</i>			
MR7.1.1	M Images are labeled with the slice location and appropriate markings for anatomic orientation and position.	M		
MR7.1.2	M 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. <i>Guidance: Cross-reference and displayed transverse images can be valuable for spine imaging interpretation (also labeling of vertebrae as reference). The facility may also define other protocols that should include capture of cross-referenced images.</i>	M		

Acceptance testing

No.	Description	Risk	Reference	Change
MR12.0	ACCEPTANCE TESTING OF MRI SYSTEMS <i>Guidance: See also equipment and supplies DES2.0 for additional requirements.</i>			Revised
MR12.1	Acceptance testing is performed by a medical physicist after purchase and prior to clinical use of the MRI system.			
MR12.1.1	M Acceptance testing of MRI systems includes evaluation and visual identification of the magnet fringe fields at the five-gauss line and any additional fringe fields which define the limits of MRI conditional equipment.	H		Revised
MR12.1.2	M Acceptance testing of MRI systems includes evaluation of magnetic field homogeneity.	H		Revised
MR12.1.3	M Acceptance testing of MRI systems includes evaluation of RF shield integrity and ambient RF noise.	H		Revised
MR12.1.4	M Acceptance testing of MRI systems includes evaluation of MR spectroscopy using a Braino phantom or equivalent.	H		Revised
MR12.1.5	M Acceptance testing of MRI systems includes evaluation of the system signal to noise ratio using the manufacturer's recommended settings.	H		Revised
MR12.1.6	M Acceptance testing of MRI systems includes evaluation of signal uniformity of the body coil.	H		Revised
MR12.1.7	M Acceptance testing of MRI systems includes evaluation of geometrical distortion.	H		Revised
MR12.1.8	M Acceptance testing of MRI systems includes evaluation of geometric accuracy and gradient performance in all dimensions.	H		Revised
MR12.1.9	B Acceptance testing of MRI systems includes measurement of high-contrast spatial resolution. <i>Guidance: An ACR phantom is required to perform this measurement.</i>			Revised
MR12.1.10	M Acceptance testing of MRI systems includes evaluation of image quality and image artifacts.	H		Revised
MR12.1.11	M Acceptance testing of MRI systems includes a check of table positioning accuracy.	H		Revised

No.	Description	Risk	Reference	Change
MR12.1.12	M Acceptance testing of MRI systems includes evaluation of each coil and establishment of baseline performance. <i>Guidance: The five-gauss line is used to define the pacemaker safety margins.</i>	H		Revised
MR12.1.13	M Acceptance testing of MRI systems includes evaluation of acoustic noise in and outside the magnet room.	H		Revised
MR12.1.14	M Acceptance testing of MRI systems includes evaluation of MRI signal stability.	H		Revised
MR12.1.15	M Acceptance testing of MRI systems includes a measurement of image uniformity.	H		Revised

Quality assurance

No.	Description	Risk	Reference	Change
MR13.0	QUALITY CONTROL TESTING OF MRI SYSTEMS <i>Guidance: See also equipment and supplies DES3.0 for additional requirements.</i>			
MR13.1	Daily quality control procedures are established and used to monitor performance of MRI systems.			Revised
MR13.1.1	M Daily quality control testing of MRI systems includes a restart of the scanner, which is conducted according to manufacturer's recommendation.	M		Revised
MR13.1.2	M Daily quality control testing of MRI systems includes a performance assessment, which is conducted according to manufacturer's recommendation. <i>Guidance: Consult manufacturer's system manuals for recommendations which may include phantom scanning or daily system start-ups and self-diagnostic tests.</i>	M		Revised
MR13.2	Weekly quality control procedures are established and used to monitor performance of MRI systems. <i>Guidance: A phantom will be required to perform these procedures.</i>			Revised
MR13.2.1	B Weekly quality control testing of MRI systems includes a measurement of central MRI frequency.	M		Revised
MR13.2.2	M Weekly quality control testing of MRI systems includes evaluation of at least three of the most commonly used MRI coils according to manufacturer's recommended procedures. <i>Guidance: Weekly quality control assessments could include SNR ratio of extremity coils or centre frequency assessment for the body coil.</i>	M		Revised
MR13.2.3	M Weekly quality control testing of MRI systems includes an image artifact assessment, which is conducted by visually assessing image slices of a phantom scan.	M		Revised
MR13.3	Monthly quality control procedures are established and used to monitor performance of MRI systems. <i>Guidance: A phantom will be required to perform these procedures.</i>			Revised

No.	Description	Risk	Reference	Change
MR13.3.1	M Monthly quality control testing of MRI systems includes evaluation of all MRI coils according to manufacturer's recommended procedures. <i>Guidance: Monthly quality control assessments could include SNR ratio or extremity coils or centre frequency assessment for the body coil.</i>	M		Revised
MR13.4	Annual quality control procedures are established and used to monitor performance of MRI systems. <i>Guidance: An annual medical physicist or MR scientist assessment of MRI systems ensures equipment performance, image quality, and an established and effective quality assurance program.</i>			Revised
MR13.4.1	B Annual quality control testing of MRI systems includes a measurement of image uniformity.	M		Revised
MR13.4.3	B Annual quality control testing of MRI systems includes a measurement of high contrast spatial resolution.	M		Revised
MR13.4.4	M Annual quality control testing of MRI systems includes evaluation of image quality and image artifacts.	M		Revised
MR13.4.5	M Annual quality control testing of MRI systems includes evaluation of magnet homogeneity and system shim.	M		Revised
MR13.4.6	M Annual quality control testing of MRI systems includes evaluation a review of the weekly and monthly quality control testing records.	M		Revised
MR13.4.7	M Annual quality control testing of MRI systems includes a check of table positioning accuracy.	M		Revised
MR13.4.8	M Annual quality control testing of MRI systems includes evaluation of geometric accuracy at isocenter and at the periphery of the field of view.	M		Revised
MR13.4.9	M Annual quality control testing of MRI systems includes evaluation of any non-permanent visual demarcations of the magnet fringe field at the five-gauss line and any other visually identified fringe fields (i.e. when tape is used to identify fringe fields).	M		Revised

Bibliography

American College of Radiology, Committee on MR Safety. ACR guidance document on MR safe practices: Updates and critical information 2019. Journal of Magnetic Resonance Imaging. 2020 Feb;51(2):331-338. Available from:

<https://onlinelibrary.wiley.com/doi/10.1002/jmri.26880>

American College of Radiology, Committee on MR Safety. ACR Manual on MR Safety Version 1.0. [Internet]. [Virginia]: American College of Radiology; 2020. Available from: <https://www.acr.org/-/media/ACR/Files/Radiology-Safety/MR-Safety/Manual-on-MR-Safety.pdf>

American College of Radiology, Expert Panel on MR Safety. ACR guidance document on MR safe practices: 2013. Journal of Magnetic Resonance Imaging. 2013 Mar;37(3):501-30. Available from: <https://onlinelibrary.wiley.com/doi/10.1002/jmri.24011>

American College of Radiology. ACR-AAPM Technical Standard For Diagnostic Medical Physics Performance Monitoring Of Magnetic Resonance (MR) Imaging Equipment [Internet],[Virginia]: American College of Radiology; 1999 [rev 2019, amend 2022]. Available from: <https://www.acr.org/-/media/ACR/Files/Practice-Parameters/mr-equip.pdf?la=en>

Canadian Association of Radiologists, committee of Magnetic Resonance Imaging. CAR Standard for Magnetic Resonance Imaging [Internet]. Ontario: Canadian Association of Radiologist; 2011 Apr. Available from: <https://car.ca/wp-content/uploads/Magnetic-Resonance-Imaging-2011.pdf>

The Royal Australian and New Zealand College of Radiologists, MRI Reference Group. MRI Safety Guidelines, Version 3.0 [Internet]. New Zealand: The Royal Australian and New Zealand College of Radiologists; 2007 [rev 2021] Available from: <file:///C:/Users/echarles/Downloads/MRI%20Safety%20Guidelines%20V3.pdf>