



Canadian Association of Radiologists Spine Imaging Referral Guideline

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Canadian Association of
Radiologists Journal
1–6

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DOI: 10.1177/08465371241290762

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Abstract

The Canadian Association of Radiologists (CAR) Spine Expert Panel is made up of physicians from the disciplines of radiology, emergency medicine, neurology, neurosurgery, physiatry, a patient advisor, and an epidemiologist/guideline methodologist. After developing a list of 10 clinical/diagnostic scenarios, a rapid scoping review was undertaken to identify systematically produced referral guidelines that provide recommendations for one or more of these clinical/diagnostic scenarios. Recommendations from 23 guidelines and contextualization criteria in the Grading of Recommendations, Assessment, Development, and Evaluations (GRADE) for guidelines framework were used to develop 22 recommendation statements across the 8 scenarios (one scenario points to the CAR Trauma Referral Guideline and one scenario points to the CAR Musculoskeletal Guideline). This guideline presents the methods of development and the referral recommendations for myelopathy, suspected spinal infection, possible atlanto-axial instability (non-traumatic), axial pain (non-traumatic), radicular pain (non-traumatic), cauda equina syndrome, suspected spinal tumour, and suspected compression fracture. Spondyloarthropathies and spine trauma point to other CAR Diagnostic Imaging Referral Guidelines, Musculoskeletal and Trauma, respectively.

Résumé

Le groupe d'experts de la colonne vertébrale de l'Association canadienne des radiologistes (CAR) regroupe des médecins spécialisés en radiologie, urgentologie, neurologie, neurochirurgie et physiatry, ainsi qu'un représentant des patients et un épidémiologiste spécialisé en méthodologie de l'élaboration de lignes directrices. Après avoir élaboré une liste de 10 scénarios cliniques/diagnostiques, le groupe d'experts a entrepris une revue rapide des publications en vue de repérer les lignes directrices relatives aux demandes d'examen élaborées de façon systématique qui fournissent des recommandations pour un ou plusieurs de ces scénarios. Des recommandations provenant de 23 lignes directrices et des critères de contextualisation dans le cadre GRADE (notation des recommandations, analyses, développements et évaluations) ont été utilisés pour élaborer 22 énoncés de recommandations couvrant les 8 scénarios (un scénario renvoie aux lignes directrices de la CAR relatives aux demandes d'examen en traumatologie, et un autre renvoi aux lignes directrices de la CAR en matière de système musculo-squelettique). Ces lignes directrices présentent les étapes à suivre et les recommandations d'orientation dans les cas de myélopathie, de suspicion d'infection de la colonne vertébrale, d'instabilité atlanto-axiale possible (non traumatique), de douleur axiale (non traumatique), de douleur radiculaire (non traumatique), de syndrome de la queue de cheval, de suspicion de tumeur de la colonne vertébrale. Les spondylarthropathies et les traumatismes de la colonne vertébrale renvoient à d'autres lignes directrices relatives aux demandes d'examen en imagerie diagnostique, soit celles portant sur le système musculo-squelettique et celles en matière de traumatologie, respectivement.

Keywords

spine, diagnostic imaging, referrals, guideline, recommendations

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Table 1. Recommendation Text, Symbol, and Interpretation.

Recommendation	AGAINST	FOR
STRONG	<p>Strong, against “we recommend against” (↓↓)</p> <ul style="list-style-type: none"> All or almost all informed people would not recommend/choose the course of action and only a small proportion would. 	<p>Strong, for “we recommend” (↑↑)</p> <ul style="list-style-type: none"> All or almost all informed people would recommend/choose the course of action and only a small proportion would not. Request discussion if the intervention is not offered.
CONDITIONAL	<p>Conditional, against “we suggest against” (↓)</p> <ul style="list-style-type: none"> Most informed people would not recommend/choose the course of action, but a substantial number would. This may be conditional upon patient values and preferences, the resources available or the setting in which the intervention will be implemented. 	<p>Conditional, for “we suggest” (↑)</p> <ul style="list-style-type: none"> Most informed people would recommend/choose the course of action, but a substantial number would not. This may be conditional upon patient values and preferences, the resources available or the setting in which the intervention will be implemented.

Note. Down arrows are red and Up arrows are green when available in colour.
Created using the guidance provided in Andrews et al.⁶

Introduction

Beginning in January 2024, an Expert Panel (EP) made up of physicians from the disciplines of radiology, emergency medicine, neurology, neurosurgery, physiatry, a patient advisor, and an epidemiologist/guideline methodologist met to develop a new set of recommendations specific to referral pathways for spine conditions. Through discussion (via a virtual meeting) followed by offline communication, the EP developed a list of 10 clinical/diagnostic scenarios to be covered by this guideline. These recommendations are intended primarily for referring clinicians (eg, family physicians, specialty physicians, nurse practitioners); however, they may also be used by radiologists, individuals/patients, and patient representatives.

Our methods describing the guideline development process, including the rapid scoping review to identify the evidence base, has been published in *CMAJ Open*¹ and an editorial to this series of guideline publications is available in *CARJ*.² The application of well-established scoping review and rapid review guidance (JBI,³ Cochrane Handbook,⁴ Cochrane Rapid Review Methods Group⁵) and guideline methodology (ie, Grading of Recommendations Assessment, Development, and Evaluation or GRADE^{6,7}) were used to identify the evidence-base and to guide the Expert Panel in determining the strength and direction of the recommendations for each clinical scenario (Table 1). The quality of conduct and reporting of the included guidelines identified in the scoping review were evaluated with the AGREE-II checklist,⁸ using a modified scoring system. In instances where guidelines were lacking, expert consensus was used to develop the recommendation. Contextualization to the Canadian health care system was considered for each recommendation, with discussion around the factors found in the Evidence to Decision framework in GRADE for guidelines (eg, balance of desirable and undesirable outcomes, values and preferences, resources implications).⁷

A systematic search for guidelines (with an a priori defined inclusion criteria) was run in Medline and Embase on February 20, 2024. The search was limited to publications from 2019 onward (Supplemental Appendix 1). Supplemental searching included the following national radiology and/or guideline groups: the American College of Radiology and the National Institute for Health and Care Excellence. Recommendations for each clinical scenario were formulated over one virtual meeting on May 31st, 2024. External review and feedback were obtained from radiologists and emergency physicians. The full guideline can be found on the CAR website (www.car.ca).

Results

Systematic Scoping Review

A total of 2654 records were identified through the electronic database and 5 additional records were added from the supplemental search. Twenty-three guidelines were included (Figure 1). Potentially relevant guidelines published in languages other than English can be found in Supplemental Appendix 2. A list of excluded records with justifications for exclusion is available upon request. Most guidelines were rated as moderate or high quality, using the modified AGREE-II checklist⁸ (Supplemental Appendix 3). The number of guidelines included per clinical/diagnostic scenario ranged from 1 to 12, with a median of 3 guidelines per clinical scenario.

Recommendations

Additional details of the included guidelines, including which imaging modalities (eg, computed tomography [CT], magnetic resonance imaging [MRI], radiograph [XR], ultrasound [US]) that were discussed can be found in Supplemental Appendix 4.

A guideline is intended to guide and not be an absolute rule. Medical care is complex and should be based on evidence, a clinician's expert judgment, the patient's circumstances, values, preferences, and resource availability. Not all

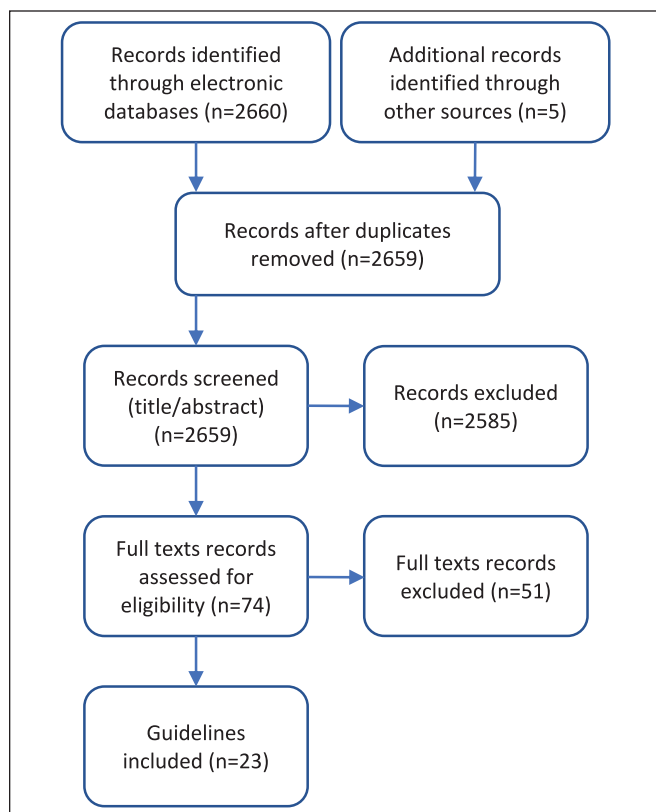


Figure 1. PRISMA flow diagram.

imaging modalities are available in all clinical environments, particularly in rural or remote areas of Canada. Decisions about patient transfer, use of alternative imaging or serial clinical examination and observation can be complex and difficult. Therefore, the expected benefits of recommended imaging, risks of travel, patient preference, and other factors must be considered. The guideline recommendations are designed to assist the choice of imaging modality in situations where it is deemed clinically necessary to obtain imaging.

Unless the panel agreed a specific protocol is required to optimize patient care/diagnosis, the recommendations do not specify when contrast should or should not be used, as this decision may vary based on clinical presentation, regional practice preferences, preference of the referring clinician, radiologist and/or the patient, and resource availability.

We reviewed relevant recommendations related to the 8 clinical/diagnostic scenarios previously published by radiology and specialty societies, including: the Canadian Association of Radiologists,⁹ the American College of Radiology,¹⁰⁻¹⁵ the American Society of Interventional Pain Physicians,¹⁶ the Australian clinical guideline,¹⁷ the Cervical Joint Working Group,¹⁸ the European Academy of Neurology/Peripheral Nerve Society,^{19,20} the European Association of Nuclear Medicine/European Society of Neuroradiology and the European Society of Clinical Microbiology and Infectious Diseases,²¹ the ESMO-EURACAN-GENTURIS-ERN PaedCan,²² the Japanese Orthopaedic Association,²³⁻²⁵ the Lumbar Facet Intervention Guidelines Committee,²⁶ the National Institute for Health and Care Excellence,^{27,28} the North American Spine Society,²⁹ the Polish Society of Spine Surgery, the Polish Society of Oncology, the Polish Society of Neurosurgeons, the Polish Society of Oncologic Surgery, the Polish Society

Table 2. Spine Recommendations.

Clinical/diagnostic scenario and recommendations

SP01. MYELOPATHY^{9,10,19,20,27}

1. In patients with non-traumatic acute onset myelopathy, we recommend **MRI** (↑↑).
 - ↳ 1.1 If MRI is unavailable or contraindicated, we suggest **CT** as an interim investigation until MRI is available (↑).
2. In patients with chronic or progressive myelopathy, we recommend **MRI** (↑↑).
 - ↳ 2.1 If MRI is unavailable or contraindicated, we suggest **CT** as an interim investigation until MRI is available (↑).
3. In patients with known malignancy or suspected secondary malignancy, refer to SP07. Suspected spinal tumour.

For patients with traumatic injury, see T05. Suspected cervical spine trauma in adults and T08. Suspected thoracolumbar fracture.³³

SP02. SUSPECTED SPINAL INFECTION^{9,11,12,17,21}

1. In patients with suspected spinal infection, we recommend **MRI** (↑↑).
 - ↳ 1.1 If MRI is unavailable or contraindicated, we suggest **CT with contrast** as an interim investigation until MRI is available (↑).

SP03. POSSIBLE ATLANTO-AXIAL INSTABILITY (NON-TRAUMATIC)⁹

1. In patients with non-traumatic possible atlanto-axial instability, we recommend **XR (flexion, extension)** as the initial imaging modality (↑↑).

For patients with traumatic injury, see T05. Suspected cervical spine trauma in adults.³³

(continued)

Table 2. (continued)

 Clinical/diagnostic scenario and recommendations

SP04. AXIAL PAIN (NON-TRAUMATIC)^{9,11,13,16,18,23–26,28,29,31}

1. In patients with non-traumatic axial spine pain with no red flags[◇], we suggest **no routine imaging** (↓).
2. In patients with non-traumatic axial spine pain with no red flags[◇] when pain has not resolved after conservative treatment, we recommend **XR** as the initial imaging modality (↑↑).
3. In patients with non-traumatic axial spine with red flags[◇], refer to SP01 for Myelopathy, SP02 for Suspected spinal infection, SP05 for Radicular pain, or SP07 for Suspected spinal tumour (in patients with known malignancy or suspected secondary malignancy).
4. If concern for occult metastatic lesions, we recommend **MRI or NM** (bone scan)[†] (↑↑).

The choice of MRI or NM may differ based on the primary neoplasm or patient history.

[◇]Severe or progressive neurologic deficits (eg, bowel or bladder function, saddle parasthesia), Fever, Sudden back pain with spinal tenderness (especially with history of osteoporosis, cancer, steroid use), Trauma, Serious underlying medical condition (eg, cancer)³⁴

[†] If vertebral body tumour or occult metastases are suspected, see M04. Bone tumour—Primary and M05. Bone tumour—Metastases.³²

For patients with traumatic injury, see T05. Suspected cervical spine trauma in adults and T09. Suspected thoracolumbar fracture.³³

SP05. RADICULAR PAIN (NON-TRAUMATIC)^{9,11,13}

1. In patients with non-traumatic radicular spine pain with no red flags[◇], we suggest **no routine imaging** (↓).
2. In patients with non-traumatic radicular spine pain with red flags[◇] when pain has not resolved after conservative treatment, we recommend **MRI** as the initial imaging modality (↑↑).
 - ↳ **2.1** If MRI is unavailable or contraindicated, we suggest **CT** as an interim investigation for lumbar radiculopathy until MRI is available (↑).
 - ↳ **2.2** For cervical or thoracic radiculopathy, we do not suggest **CT** (EP consensus).
3. In patients with known malignancy or suspected secondary malignancy, refer to SP07. Suspected spinal tumour.

[◇]Severe or progressive neurologic deficits (eg, bowel or bladder function, saddle parasthesia), Fever, Sudden back pain with spinal tenderness (especially with history of osteoporosis, cancer, steroid use), Trauma, Serious underlying medical condition (eg, cancer)³⁴

For patients with traumatic injury, see T05. Suspected cervical spine trauma in adults, T08. Suspected thoracolumbar fracture.³³

SP06. CAUDA EQUINA SYNDROME^{9,12,13}

1. In patients with cauda equina syndrome, we recommend **MRI** in an urgent/expedited manner (↑↑).
 - ↳ **1.1** If MRI is unavailable or contraindicated, we suggest **CT** as an interim investigation until MRI is available (↑).
CT has a high negative predictive value.
-

SP07. SUSPECTED SPINAL TUMOUR^{14,22,30}

1. In patients with suspected spinal tumour (intradural/extramedullary and intramedullary), we recommend **MRI** as the initial imaging modality (↑↑).
 - ↳ **1.1** If MRI is unavailable or contraindicated, we recommend **CT or CT myelography** as an alternative (↑↑).

For vertebral body tumour, see M04. Bone tumour—Primary and M05. Bone tumour—Metastases.³²

SP08. SUSPECTED COMPRESSION FRACTURE¹⁵

1. In patients with non-traumatic suspected compression fracture, we recommend **XR or CT** as the initial imaging modality (↑↑).
Recommendation for XR or CT may be based on patient presentation (eg, severity, clinical factors such as inability to position patient).

For patients with traumatic injury, see T05. Suspected cervical spine trauma in adults and T08. Suspected thoracolumbar fracture.³³

SP09. SPONDYLOARTHROPATHIES

See 2023 CAR Musculoskeletal guideline³²

SP10. SPINE TRAUMA

See 2023 CAR Trauma guideline³³

of Oncologic Radiotherapy, and the Polish Society of Orthopaedics,³⁰ and the Veterans Affairs and US Department of Defence.³¹ One scenario each refer to the 2023 CAR Musculoskeletal³² and Trauma³³ Diagnostic Imaging Referral Guidelines.

Recommendations are presented in Table 2.

Acknowledgments

We would like to thank: Becky Skidmore for creating the search strategies for the systematic scoping review, and the following individuals on the Diagnostic Imaging Referral Guidelines Working Group for providing feedback on the guideline (listed alphabetically): Paul Pageau (WG co-chair, Emergency medicine physician),

Mary-Lynn Watson (emergency physician), Charlotte Yong-Hing (Radiologist), and Kaitlin Zaki-Metias (Radiologist).

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This work was supported by the Canadian Medical Association.

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Supplemental Material

Supplemental material for this article is available online.

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