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Magnetic Resonance Imaging / Formation image de résonance magnétique

Finding the Truth in Medical Imaging: Painting the Picture of Appropriateness for Magnetic Resonance Imaging in Canada

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Abstract

Background: Questions about the appropriateness of medical imaging exams, particularly related to magnetic resonance exams, have arisen in recent years. However, the prevalence of inappropriate imaging in Canada is unclear as inappropriate exam proportion estimates are often based on studies from other countries. Hence, we sought to compare and summarize Canadian studies related to magnetic resonance imaging appropriateness.

Methods: We completed a systematic literature search identifying studies related to magnetic resonance appropriateness in Canada published between 2003 and 2013. Two researchers independently searched and evaluated the literature available. Articles that studied or discussed magnetic resonance appropriateness in Canada were selected based on titles, abstracts, and, where necessary, full article review. Articles relating solely to other modalities or countries were excluded, as were imaging appropriateness guidelines and reviews.

Results: Fourteen articles were included: 8 quantitative studies and 6 editorials/commentaries. The quantitative studies reported inappropriate proportions of magnetic resonance exams ranging from 2%-28.5%. Our review also revealed substantial variations among study methods and analyses. Common topics identified among editorials/commentaries included reasons for obtaining imaging in general and for selecting a specific modality, consequences of inappropriate imaging, factors contributing to demand, and suggested means of mitigating inappropriate medical imaging use.

Conclusions: The available studies do not support the common claim that 30% of medical imaging exams in Canada are inappropriate. The actual proportion of inappropriate magnetic resonance exams has not yet been established conclusively in Canada. Further research, particularly on a widespread national scale, is needed to guide healthcare policies.

Résumé

Contexte : La pertinence des examens d'imagerie médicale, en particulier ceux d'imagerie par résonance magnétique, a été remise en question au cours des dernières années. Le taux de prévalence des examens non pertinents n'est pas clairement défini au Canada, puisque les estimations en la matière sont souvent fondées sur des études réalisées à l'étranger. Nous avons donc entrepris de comparer et de résumer les études canadiennes traitant de la pertinence des examens d'imagerie par résonance magnétique.

Méthodes : Nous avons effectué une revue systématique de la documentation publiée de 2003 à 2013 afin de relever les études sur le sujet. Les recherches ainsi que l'évaluation de la documentation ont été effectuées de façon indépendante par deux chercheurs. En examinant les titres, les résumés d'articles et, au besoin, les textes complets, nous avons repéré les articles qui étudiaient ou analysaient la pertinence de l'imagerie par résonance magnétique au Canada. Les articles consacrés exclusivement à d'autres modalités ou visant uniquement des pays autres que le Canada ont été exclus, de même que les lignes directrices et les examens portant sur la pertinence de l'imagerie médicale.

Résultats : Quatorze articles ont été pris en compte, soit huit études quantitatives et six éditoriaux ou commentaires. Les études quantitatives ont révélé des taux d'examens non pertinents allant de 2 à 28,5 % en imagerie par résonance magnétique. Nous avons également observé des écarts considérables au chapitre des méthodes d'étude et des analyses. Les éditoriaux et les commentaires ont abordé des thèmes communs, tels que les raisons qui motivent le recours à l'imagerie médicale en général et le choix d'une modalité précise, les répercussions des examens

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d'imagerie non pertinents, les facteurs qui contribuent à la demande d'examens et les éventuels moyens de réduire l'utilisation non pertinente de l'imagerie médicale.

Conclusions : Les études disponibles n'appuient aucunement l'assertion selon laquelle 30 % des examens d'imagerie médicale réalisés au Canada ne sont pas pertinents. Le taux réel d'examens non pertinents en imagerie par résonance magnétique n'a pas encore été établi de façon probante au Canada. Il convient donc de mener d'autres travaux de recherche, en particulier à une échelle nationale généralisée, pour aiguiller les politiques en matière de soins de santé.

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Key Words: Appropriateness; Canada; Literature review; Magnetic resonance imaging; Quality assurance

The quality and appropriateness surrounding medical imaging (MI), particularly in relation to magnetic resonance (MR) exams, have become prevalent topics and a mounting concern in Canada. The volume of MR exams has been rapidly escalating in North America over the past decade [1–3]. The number of MR exams performed in Canada doubled from 0.69 million in 2003/04 to 1.7 million in 2011/12 [1]. Similarly in the United States, MR imaging increased from an average of 35 to 94 exams per 1000 patients between 1992–2001 [3]. There is a legitimate demand growth from technological advances and a wider range of clinical indications for MR exams [4–6]. Hence, the number of operational MR scanners has increased in many countries, including Canada and the United States, in an attempt to meet the rising exam demand. For example, the total number of scanners increased from 2,990 to 10,815 in the United States and from 30 to 308 in Canada between 1993–2012 [1]. However, it is not clear whether the MR exams being completed are indeed all necessary or appropriate.

In this context, appropriateness refers to the “difference in outcomes between empiric treatment and treatment informed by the results of an imaging test” [7]. Hence, MI exams are deemed appropriate when health benefits exceed any potential negative consequences or adverse effects [7,8]. Mayo and Munk [8] argued that appropriate MI exams are those deemed “acceptable, suitable, or correct for a given clinical scenario or circumstance.” In other words, appropriate MI helps to improve both patient care and patient safety by enabling prompt diagnosis, and proper medical management. On the other hand, inappropriate MI does not contribute to correct patient management and can include “duplicate ordering, incorrect modality usage, absent or poor supportive clinical information, unneeded repeated examinations, and examinations ordered before patient examination” [8]. It can also include the failure to obtain proper imaging when clinically indicated [9]. Numerous factors may affect the appropriateness of imaging; clinical context is one of the biggest keys in determining whether or not imaging exams are deemed appropriate and should be determined on individual basis. As long as clinical indications are met according to clinical scenarios, MI exams that are normal and hence may not alter clinical management are still very valuable and cannot be considered inappropriate [8]. Thus, an inappropriate MI exam request can also be defined as one that does not meet the clinical indication criteria, or one that

is duplicated/repeated in an unjustified short period of time. Both overuse and underuse of MI can be defined as an inappropriate MI exam.

Understanding the volume of inappropriate MI exams being conducted is an issue of interest as these exams not only increase health care costs, but also may delay access for patients for whom an exam is appropriate, particularly where there are already long waiting lists for certain modalities (such as MR). Furthermore, for irradiating modalities, inappropriate exams expose patients to radiation unnecessarily and hence may harm rather than help patients. Estimates of the proportion of inappropriate MI exams being performed in Canada are often based on studies from other countries with different health care systems (eg, United States, Italy, and Iran). Quantitative studies from some of these countries suggest that >25% of MI exams may be inappropriate and not clinically indicated [10–12]. The proportion of inappropriate MI exams in Canada has commonly been quoted at approximately 30% [8,9,13]. The validity of this statistic has been questioned [13], yet the true proportion is unknown. As little is known regarding current MI practices, appropriateness or utilization on a national level, our objective was to summarize and compare Canadian MR appropriateness studies. We opted to focus on MR due to the lengthy wait times and high costs associated with this modality. We included both quantitative studies as well as qualitative reports, as the latter provide insight into the complexities and contributing factors surrounding inappropriate imaging.

Methods

We searched the literature for studies related to MR appropriateness in Canada published between January 1, 2003 and December 21, 2013. Two researchers independently searched and evaluated the literature available in the following databases: EMBASE, PubMed, Medline, and Google Scholar. Based on the titles and abstracts, articles that studied or discussed MR appropriateness in Canada were selected. The main search terms were: *appropriateness, Canada, diagnostic imaging, guidelines criteria, inappropriate, medical audit, medical imaging, and MRI*. Non-MR-related articles and articles from other countries were excluded. Reviews and MR appropriateness guidelines were also excluded.

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