

Guest Editorial / Éditorial sollicité

Appropriateness of Imaging in Canada

During my fellowship training at a large academic centre in the United States, I (J.F.) remember being amused at a Nike logo sticker that had been placed on the computed tomography (CT) multiviewer that read “Just do it.” When I asked one of the radiology residents about the logo, he informed me that, because the department had purchased 4 new state-of-the-art CT scanners, this had become the department’s unwritten motto. Residents were not to ask too many questions about the indications for studies or give any resistance with the justification that it was better for patients to get the studies performed and interpreted correctly than to go to the competition down the street where the quality of the work was questionable. In case after case, I struggled with the dubious indications for these high-cost CT and magnetic resonance imaging (MRI) examinations, most of which would be laughable in our resource-limited Canadian context. This experience definitely tainted my views regarding the appropriate use of imaging resources in the very competitive environment of the United States, but I often wonder, what do we really know about appropriateness in Canada, and can we be certain of the rate of inappropriate imaging?

In a time when financial pressures on governments are at an all time high, it is not surprising that all aspects of health care spending are under intense scrutiny. The Canadian Institute of Health Information reports that, between 2010 and 2011, 1.6 million MRIs and 4.3 million CTs were performed on Canadian patients [1]. Annual operating costs for imaging alone are estimated to exceed \$2.2 billion [2]. With these large numbers, elimination of even a small percentage of inappropriate examinations could significantly impact the cost-effectiveness of the delivery of imaging services in Canada. In addition, we know that the most appropriate imaging examination provided at the most appropriate time can save costs in unnecessary additional investigations, shorten hospitalizations, and reduce the need for costly invasive procedures. It is no wonder that there is great interest in this topic by governments and health economists. Cost-effectiveness, however, cannot be the only consideration; quality and patient safety are also important factors related to the appropriate use of imaging resources.

An imaging examination can be deemed inappropriate for a number of reasons, including its inability to contribute to patient management, the performance of an examination at the wrong time, or failure to obtain imaging when it is indicated. There are several reasons why referring physicians order inappropriate or unnecessary examinations [3]. Because of the rapid advances in the techniques of diagnostic imaging, it is difficult

for them to keep up with research on the most appropriate use of diagnostic imaging and the most appropriate imaging modality to use in a given clinical situation. In an attempt to bypass wait times, a physician may also order an examination that may not be the most appropriate in a given situation. In some cases, pressure from patients who expect to have imaging may also play a role in physicians’ decision making.

Inappropriate imaging carries many potential risks. In recent years, patient safety related to radiation exposure has gained much publicity with recent evidence of definable mortality risk being ascribed to individual CT studies [4]. Another important potential harm is the “incidentaloma.” Any examination can lead to incidental findings, the vast majority of which are benign but often require further investigation. This potentially exposes patients to further radiation, anxiety, and even invasive procedures, all for little or no benefit [5,6]. This is particularly unfortunate if the imaging examination was not indicated in the first place. Lastly, the prolongation of wait times due to inappropriate examinations booked within an imaging modality queue also negatively impacts on the delivery of timely service to those who really need the examinations.

Determining Inappropriate Imaging Referral Rates in Canada

As Canadian radiologists, we are regularly challenged by imaging requests that may not make sense given the provided clinical picture. But how significant a problem is inappropriate imaging in the Canadian context? Estimated rates of inappropriate imaging in the global literature have ranged as high as 30% [7]. However, we do not know the actual rates of inappropriate imaging in Canada because there have been no large-scale studies carried out here to assess appropriateness of diagnostic imaging [8]. Nevertheless, there have been several studies reported that shed some light on the issue.

- A study carried out prospectively in British Columbia showed that, in a series of 454 thoracic CTs, 48% resulted in a change in diagnosis [9]. Although this study did not specifically look at the issue of appropriateness, it does suggest that most of the scans were likely appropriate.
- A recently published retrospective study evaluated the appropriateness of approximately 2000 CT and MRI requisitions in British Columbia [10]. By using a computer program to categorize the requisitions, only 2% were

deemed inappropriate, whereas 46% were indeterminate because of limitations of the software program, and 25% were “not validated” because the clinical information provided was inadequate. When a small subset of the requisitions (325) was assessed “by hand” and consensus reached by 2 reviewers, only 1.5% were deemed “indeterminate,” and none were deemed “inappropriate.”

- In a prospective study of 2374 ultrasound, CT, and MRI examinations, it was found that only 2.5% were inappropriate in terms of their indications or their stated urgency [11].
- A recent retrospective study in Ontario showed that only 1 patient among 623 who had CTs for headaches actually had a brain tumour. Of those patients, 28.4% received 2 or more CTs of the head during the decade over which the review took place [12]. There are well-established guidelines that suggest that neuroimaging is only indicated for a minority of patients with headaches [13]. Although the retrospective nature of this study did not permit an accurate assessment of the appropriateness of all these scans, the low yield suggests that the criteria for imaging patients with headaches were not being rigorously followed.
- An analysis of appropriateness of ultrasound examinations ordered by family physicians in Nova Scotia demonstrated variable results, depending on the examination ordered [14]. When using the Canadian Association of Radiologists (CAR) 2005 Diagnostic Imaging Referral Guidelines, the percentage of “not clearly indicated” examinations varied from a low of 1.6% for pelvic examinations and 2.4% for soft-tissue scans to much higher rates, of 18.8%, 12.1%, and 25.2% for requests for thyroid, abdominal, and carotid scans, respectively.
- Two studies have been reported in which CAR guidelines have been incorporated into a computerized physician order entry system (CPOE). In the initial project carried out at a tertiary care children’s hospital, almost 9000 orders were placed through the CPOE, of which 19.2% had relevant guidelines. Of these, 10.9% were considered inappropriate according to the guidelines [15]. In another, smaller study, at a family practice centre, almost a thousand orders were placed through the CPOE, of which 58% were addressed by the CAR guidelines, and 24% were considered inappropriate according to the guidelines [16].
- A group in Ottawa has developed 4 decision rules for the use of imaging in trauma cases: the Ottawa Ankle Rule, the Ottawa Knee Rule, the Canadian C-Spine Rule, and the Canadian CT Head Rule. Application of these decision rules has resulted in a 20%-30% reduction in imaging [17]. However, a recent study has shown that, although almost all physicians surveyed in Canada were aware of the Canadian Cervical Spine Rule, only 73% of them actually used it [18], which suggests that there is still a significant amount of unnecessary imaging for this type of trauma.

These studies indicate that there is inappropriate diagnostic imaging being performed in Canada; however, the question of its overall rate remains. They also point to a number of factors that influence the variability of the rates. One such factor is the

triaging of requisitions, which tends to be more rigorous in provinces with longer wait times for certain modalities due to under-resourcing. Another factor is the clinical context. For example, a patient who presents himself to a busy emergency department with no observational beds available may undergo medical imaging to facilitate the triage process. Although we have a professional responsibility to attempt to control inappropriate imaging, it is not possible for radiologists to triage every imaging request before it is performed to determine its appropriateness because of time constraints and often limited clinical information.

However, we must be careful not to contribute to the problem through indiscriminate recommendations for further imaging [19,20]. A Canadian study found that, in a series of almost 16,000 CT and MRI reports, further testing was recommended in 26.1% of them. Of those, 91% of the suggested further testing was for additional medical imaging [21]. Recommendations for further imaging, although an important part of our professional responsibility, may also be considered a form of self-referral. We should always consider the clinical situation carefully before making recommendations for additional imaging. In particular, it is important that we consider the likelihood or pretest possibility of a disease when we are making such recommendations [22] and follow accepted guidelines when possible.

There is no doubt that appropriateness of diagnostic imaging in Canada is a complex issue with multiple determining factors, many of which are beyond our control as radiologists. Although we do not have any large-scale Canadian studies to determine the extent of inappropriate imaging studies in Canada, there is no evidence to suggest that 30% of diagnostic imaging in Canada is inappropriate. It is clear that the degree varies greatly based on the jurisdiction, modality, and referring group. Regardless of the actual percentage, there is an opportunity for us as Canadian radiologists to be physician leaders and proactively improve the appropriateness of diagnostic imaging in Canada. Unlike that experience with the Nike logo all those years ago, we have a responsibility to continuously question the appropriateness of examinations and actively encourage our referring physicians to use tools created to help them choose the most appropriate tests first, such as the CAR’s Diagnostic Imaging Referral Guidelines, available at www.car.ca/en/standards-guidelines/guidelines.aspx.

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