

# **Appropriate use of Medical Imaging in Canada**

## **Medical Imaging Team Day**

### **May 17, 2012**

Join in the celebration of the contribution of the physicians, physicists, sonographers and technologists who make up the imaging team to the Canadian healthcare system.



#### **Medical Imaging Team Day is sponsored by:**

- The Canadian Association of Medical Radiation Technologists (CAMRT)
- The Canadian Association of Nuclear Medicine (CANM)
- The Canadian Association of Radiologists (CAR)
- The Canadian Interventional Radiology Association (CIRA)
- The Canadian Society of Diagnostic Medical Sonographers (CSDMS)
- The Canadian Organization of Medical Physicists (COMP)

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# Appropriate use of Medical Imaging in Canada

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Appropriate access to medical care is something about which Canadians feel strongly. In his 2002 report on the future of health care in Canada, Commissioner Roy Romanow, Q.C., found that Canadians consider equal and timely access to medically necessary health care services as a right of citizenship. That same year, a report on *The Health of Canadians and the Federal Role* by the Standing Senate Committee on Social Affairs, Science and Technology noted that the greatest concern Canadians had about the existing publicly funded health care system was timely access to health care, specifically having to do with the perceived length of waiting times for diagnostic services, as well as hospital care and access to specialists. The report's authors noted, however, that *timely* access to needed care does not necessarily mean immediate access. Nor is the issue of timely access limited to life-threatening situations. Rather, the authors suggest, timely access means that service is being provided in a way that is consistent with clinical practice guidelines to ensure that a patient's health is not negatively affected while waiting for medical care - in other words, that services are being provided appropriately. More recently, *Time for Transformative Change*, a review of the 2004 Health Accord by the Standing Senate Committee on Social Affairs, Science and Technology, reported on the progress of the 10-year plan to strengthen health care launched in 2004. The committee found that while witnesses applauded the recent and measurable improvements in access to and quality of care, they continue to look for innovation-based transformation of the health care system that includes increased efficiencies, integration of services and collaboration of different health care providers. The medical imaging team stands ready to contribute to this transformation.

Medical imaging is an important component of medical care, as it provides the critical information that physicians need to diagnose, treat and monitor injuries and disease. Medical imaging is also an element of medical care that involves many healthcare professionals *and* many patients; for example, the Canadian Institute of Health Information (CIHI) reports that between 2010 and 2011, 1.6 million MRI exams and 4.3 million CT exams were performed on Canadian patients.<sup>1</sup> Understandably then, medical imaging is an aspect of the healthcare system that regularly falls under scrutiny, and for good reason. It can involve lengthy wait times, and is costly, with annual operation costs alone estimated to exceed \$2.2 billion<sup>2</sup>. It is also an aspect of the healthcare system that presents a hazard that Canadians have concerns about, given their increasing awareness of the risks of exposure to potentially unnecessary radiation.

On the occasion of the first Medical Imaging Team Day, this paper has been commissioned to define medical imaging and the concept of appropriateness, and elaborate on what constitutes appropriate utilization of medical imaging services. It also provides an introduction to the medical imaging team, the group of professionals that are working together to ensure that Canadians receive the medical imaging that best meets their healthcare needs.

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<sup>1</sup> Canadian Institute for Health Information (CIHI). *Executive Summary, Medical Imaging in Canada: 2011 Summary*

<sup>2</sup> Canadian Institutes for Health Information (CIHI). *Medical Imaging in Canada, 2007*. Ottawa: Canadian Institutes for Health Information: 2008.

## **What is medical imaging?**

Medical imaging refers to processes and technologies that are used to visualize the anatomy and physiology within the human body. That ‘look inside’ provides information that significantly contributes to a diagnosis of a variety of medical conditions. The technology used, or the combination of technologies used, will depend on a person’s symptoms and the body area that is being examined. Conventional X-rays, interventional radiology, computed tomography (CT), nuclear medicine (e.g. PET, that is, positron emission tomography), magnetic resonance imaging (MRI), and ultrasound are all types of medical imaging that may be requested by an ordering physician, or other qualified healthcare providers where permitted under provincial or territorial law.

## **Who is the medical imaging team?**

It takes many healthcare professionals working as a team to provide medical imaging care. This group of healthcare professions make up what we refer to as the *Medical Imaging Team*. Members of these professions, consisting of physicians, sonographers, technologists and medical physicists, work together to assist the referring healthcare providers in requesting the most appropriate medical imaging for their patients’ needs. Members of the medical imaging team direct and perform different aspects of the medical imaging examination, including interpretation of examination results, and reports on the findings. Specifically, the medical imaging team consists of the following medical imaging experts:

- ◆ medical physicists
- ◆ medical radiation technologists
- ◆ nuclear medicine physicians
- ◆ radiologists (physicians, including specialists such as interventional radiologists)
- ◆ sonographers

The medical imaging team is supported in their commitment to timely, appropriate care by an array of administrative staff and nursing personnel.

## **How does the medical imaging team determine what is appropriate?**

Evidence indicates that between 10 and 20 per cent of medical imaging studies are unnecessary or inappropriate.<sup>3</sup> All medical imaging procedures involve some risk and therefore, it is important that the patient receive the most appropriate medical imaging examination the first time and every time.

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<sup>3</sup> Picano E. Sustainability of medical imaging. *British Med J.* 2004; 328:578-580.

<sup>3</sup> Lehnert BE, Bree RL. Analysis of Appropriateness of Outpatient CT and MRI Referred from Primary Care Clinics at an Academic Medical Centre: how critical is the need for improved decision support? *J Am Coll Radiol* 2010; 7 (3): 192-197.

<sup>3</sup> Curry L and Reed M. Electronic decision support for diagnostic imaging in a primary care setting. *J. Am Med Informatics Association*. 2011 **18**:267-270

<sup>3</sup> Bowen S, Johnson K, Reed M, Zhang L and Curry L. The effect of incorporating guidelines into a computerized order entry system for diagnostic imaging. (with). *J Am Coll Radiol*. 2011 Apr ;8 (4):251-8

Determining the appropriateness of every individual medical imaging procedure is complex. Appropriateness may vary with the age, sex, size, and physical limitations of the patient. It also depends on the condition and symptoms with which the patient presents, along with availability of a piece of desired technology.

Every request for medical imaging that a clinic or hospital receives is generally subject to a three stage process that is completed by one or several members of the medical imaging team before an appointment is booked or the examination is performed: the **review stage**, the **protocol stage** and the **prioritization stage**. This process helps to ensure that the medical imaging examination requested is the best option available for the particular patient. The potential benefits of that examination must outweigh the potential risks in order for any medical imaging to be prescribed.

### **Review Stage**

Appropriate medical imaging is not a *one size fits all* concept. The review stage allows one or several members of the medical imaging team to properly assess each request, thereby ensuring that the medical imaging requested is suitably aligned with the patient's clinical history. The member or members of the medical imaging team also must consider other factors, including:

- ♦ Is the medical imaging requested consistent with available medical imaging guidelines related to the patient's clinical condition and history?
- ♦ Which medical imaging modalities are available and accessible within an acceptable time frame?
- ♦ Which medical imaging modality will allow the medical imaging team to acquire the information needed by the ordering healthcare provider while using the least amount of radiation?
- ♦ Which medical imaging modality will be the most cost-effective for the healthcare system?

In cases where the medical imaging request does not align with the most appropriate course of action, a physician member of the medical imaging team may wish to consult with the healthcare provider who made the original request, and recommend a more appropriate medical imaging procedure.

It is important to note that requests for medical imaging that do not include an adequate clinical history for the patient should be returned to the healthcare provider that requested the medical imaging procedure to obtain further detailed information. This helps ensure that the patient will receive the most appropriate medical imaging. The more comprehensive the information provided in an initial request, the greater the likelihood is that a medical imaging examination can be undertaken in the most appropriate and timely manner possible.

### **Protocol Stage**

After the review phase has been completed, the medical imaging team then proceeds with the protocol stage. It is at this point that a plan is laid out for each medical imaging request. The medical imaging request then becomes the prescription that indicates how the medical imaging procedure will be performed. It ensures the medical imaging procedure is best optimized to answer the ordering healthcare provider's question

## **Prioritization Stage**

To complete the process, each prescription for medical imaging is then prioritized. Most medical imaging facilities will use a grading or triage system to indicate the time-sensitivity of the medical imaging that is prescribed. This prioritization ensures that patients requiring the most urgent medical imaging services receive priority appointments. It is important to note that medical imaging departments receive a large number of requests from many different healthcare providers on a daily basis and must maintain a balance of all the patients requiring medical imaging services at any given time. The medical imaging team also modifies a patient's priority status in cases where the patient's medical status improves or deteriorates, in consultation with their primary healthcare provider.

Patients who receive medical imaging appointments that require special preparation are contacted to ensure that they are properly prepared for their upcoming medical imaging procedure.

## **Medical imaging: step-by-step**

Before the patient receives the prescribed medical imaging, the member of the medical imaging team who will be carrying out the imaging procedure or procedures goes through the patient's clinical history once again in order to confirm that the medical imaging that will be administered remains, in fact, the most appropriate. If the clinical history matches the medical imaging prescribed, the medical imaging team member proceeds with the procedure. If, however, there is any discrepancy between the patient's clinical history and the medical imaging procedure prescribed, the medical imaging team and, when warranted, the healthcare provider that originally requested the procedure will modify the examination as required. After the reassessment has been completed, the patient receives the appropriate medical imaging deemed necessary.

As the prescribed medical imaging examination is being performed, the technologist, sonographer or physician members of the medical imaging team look closely at every image that is produced. Each image or imaging sequence is assessed to ensure that the images produced are of diagnostic quality. To meet the requirements for diagnostic quality, the image must clearly define the desired anatomical and pathological structures required and be free of preventable imaging distortions. The medical imaging team members also look for unexpected findings and modify the examination during the procedure as required.

After all the images are obtained, a specialized physician, such as a radiologist, looks at each image carefully to identify any abnormalities. He or she then makes a final report and sends it directly to the healthcare provider who originally requested the medical imaging. Generally, the report includes the physician's findings, one or several possible diagnoses and when appropriate, recommendations for further imaging or other investigations. A final report is generally provided within a few days of having completed the medical imaging exam. However, newer technology, such as voice recognition reporting, where available, can facilitate reports being available within hours of the exam completion. If critical findings are present, the reporting physician attempts to discuss the results directly with the ordering physician.

## **Behind the images**

In addition to the work involved with managing the millions of patient referrals for medical imaging and producing and interpreting the images, there are a number of areas in which members of the medical imaging team work behind the scenes. They play a critical role in quality assurance by contributing their expertise as members of their respective national professional association. These, in turn, work to ensure the highest standards for appropriate medical imaging care are promoted throughout the country.

### **Quality Assurance**

The maintenance of medical imaging equipment is paramount to patient safety and is something the general public may take for granted. Medical physicists, technologists and sonographers all work together with service personnel to ensure medical imaging equipment is operating within its functional norms.

Even before any medical imaging equipment is utilized in practice, medical physicist members of the medical imaging team will perform acceptance testing on the equipment to ensure it is performing within very specific standards. Equipment is not used on patients until acceptance testing has been passed and certified by a medical physicist.

Once the equipment is in clinical use, the medical imaging team will commence a quality assurance program which may include a facility accreditation process. Within the program, there will be a preventive maintenance schedule. Participating in preventative maintenance helps to ensure that medical imaging equipment will remain consistently safe over time. The quality assurance program is also to ensure that the image quality is maintained and the requested test is effective. Without high standards of image quality, the 'right test' will not be effective.

There are also accreditation processes that address particular modalities. For example, the Canadian Association of Radiologists Mammography Accreditation Program (MAP) is an initiative instituted almost twenty years ago to ensure that the quality of mammography images meets the highest standards. This voluntary program offers radiologists the opportunity for independent evaluation of their facility's staff qualifications, equipment performance, quality control, image quality, and radiation exposure to the breast.

### **Harnessing technology to achieve efficiencies**

There have been, and continue to be, many technological advances that increase efficiencies in the management of our medical imaging care. These include the use of digital imaging archiving systems to easily store, retrieve and transmit previous medical imaging examinations, the continuing development of electronic health records for all Canadians, and the development of electronic systems for ordering medical imaging examinations. In some cases, the latter can also provide feedback on the appropriateness of the examinations requested.

## **Contributing to national medical association-led initiatives**

The national professional associations which represent the members of the medical imaging team work on their behalf on several fronts. For example, they undertake a number of activities that promote approaches to quality assurance of the equipment that produces medical images, and oversee the creation of guidelines, advisories, position statements and best practices for medical imaging. These organizations also play a key role in advocacy, monitoring political, socio-economic and technological issues that may have an impact on the delivery of appropriate medical imaging.

Members of the medical imaging team are guided in safe, ethical and expert practice by libraries of professional resources developed by their professional associations. These include codes of ethics, competency profiles, guidelines and standards. For example, to assist healthcare providers to make appropriate choices related to medical imaging, the Canadian Association of Radiologists (CAR) has created a number of referral guidelines. The guidelines are informed by evidence and created by an expert panel of radiologists and other relevant stakeholders. The CAR also works with the International Radiology Quality Network and the World Health Organization to assist in creating guidelines for medical imaging in variable global conditions, including those in developing countries.

## **Advocacy**

The medical imaging team works together to advocate for the highest standard of appropriate medical imaging for Canadian patients. Its members also collaborate to ensure their collective expertise on the topic of appropriate medical imaging is considered by policymakers as they address important issues that have an impact on the healthcare of Canadians.

One of the most recent examples of the medical imaging team's effective advocacy was its response to the shortage of medical isotopes<sup>4</sup> that occurred as a result of the 17-month shutdown of the National Research Universal (NRU) reactor at Chalk River. The consistent supply of medical isotopes has been a significant concern within the Canadian healthcare system and the nuclear medicine community internationally since the NRU reactor initially went down in December 2007. The nuclear medicine physicians, radiologists, technologists and physicist members of the medical imaging team worked closely with Natural Resources Canada and Health Canada to address the short-term needs of the nuclear medicine community throughout the disruption as well as participated in consultations on measures to secure a stable supply of medical isotopes for Canada and the world over the longer term.

During times of shortage the medical imaging team worked tirelessly to ensure Canadian patients received the medical imaging required. It also reassessed the appropriateness of all the examinations scheduled in nuclear medicine to ensure that the patients' needs were met. Some patients were moved to other imaging modalities, while others received modified nuclear medicine examinations to maximize

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<sup>4</sup> A medical isotope is a very small quantity of radioactive substance used in safe, cost-effective imaging and treatment of disease. New technologies enable medical isotopes to be delivered directly to the site of diseased cells. This is different from external beam radiation treatment where radiation is directed from outside of the body

isotope supply for others. Members of the medical imaging team worked additional hours and double shifts when isotopes were finally made available to maximize efficiency.

Members of the medical imaging team are also involved in international efforts to promote minimization of radiation exposure for patients through use of minimal dose or alternative medical imaging technologies such as ultrasound and MRI which use no radiation. Canadian medical imaging team members are engaged in initiatives such as Image Wisely<sup>5</sup> and Image Gently<sup>6</sup>, campaigns that are dedicated to raising awareness of opportunities for eliminating unnecessary medical imaging examinations and lowering the amount of radiation in necessary medical imaging examinations to only that needed to obtain optimal medical images. Several of the associations representing the medical imaging team professions provide valuable information resources to assist members of the general public to have intelligent and informed discussions with their primary healthcare providers, and help Canadians make healthy choices.<sup>7</sup>

## Conclusion

Medical Imaging Team Day was established as a time to recognize the work of the team of healthcare professionals who collaborate to improve the health of Canadians, ensuring that the appropriate diagnostic imaging tests are performed and interpreted expertly, with the highest standard of patient safety, comfort and care. It is also a time for the team to commit to leading the evolution of imaging care, and to collaborating with Canadian decision makers and with other healthcare professions to determine how the already high quality of diagnosis and treatment of disease and injury can be continuously improved. Exploring the potential for policies and programs that promote an even better standard of appropriateness of care, minimized radiation dose, and training to ensure that new technology is used optimally is an excellent place to begin the discussion.

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<sup>5</sup> Image Gently: an initiative of the Alliance for Radiation Safety in Pediatric Imaging  
<http://www.pedrad.org/associations/5364/ig/>

<sup>6</sup> Radiation Safety in Adult Medical Imaging <http://www.imagewisely.org/>

<sup>7</sup> Imaging Team Resource Centre <http://www.imagingteam.ca/resources.html>

<http://www.imagingteam.ca/>