Appropriate Utilization of Advanced Diagnostic Imaging Procedures

Context

The number of advanced diagnostic imaging procedures has considerably increased in Canada and internationally over the last decade. While most of the increased utilization in imaging is appropriate and adds value to patient care, the Canadian Association of Radiology (CAR) suggests that up to 30% of diagnostic imaging procedures are inappropriate or contribute no useful information. Similar findings have been noted in Australia. The United Kingdom (UK) has experienced a 5% to 15% annual increase in the demand for imaging over the last ten years. This paper is intended to address some of the main issues pertaining to the appropriate use of advanced diagnostic imaging.

Advanced diagnostic imaging procedures refer to computed tomography (CT), magnetic resonance imaging (MRI), and positron emission tomography (PET/CT) imaging devices. This report addresses all three imaging modalities; however, because there are proportionately fewer PET/CT devices compared to CT devices and MRI devices in Canada (approximately 40, 419, and 222, respectively), most of the references in this report relate to experiences with the latter two technologies.

In 2010, Canadians underwent 1.4 million MRI tests and 4.2 million CT tests, nearly double the number of each performed in 2003. Between 2003 and 2007, MRI and CT use in the United States (US) Medicare population increased annually at a rate of 10.6% and 12.6%, respectively. During the same period, x-rays of the chest and bones increased annually by 1.3% and 3.4%, respectively. The increased demand for advanced imaging is multi-factorial:

- technological advances that have broadened the range of clinical indications that advanced imaging tools can identify
- an aging population
- patient demand for advanced imaging technologies
- the increased availability of the technology
- a quick way for physicians to obtain information on a patient when physicians have increasing work loads
- a practice of defensive medicine to avoid malpractice suits
- physicians referring patients to imaging equipment that they have a financial stake in
- lack of communication between clinicians, radiologists, and family physicians
- lack of ordering physician knowledge
- excessive wait times for the most appropriate test
- pressure to accelerate a patient’s diagnosis, especially in an emergency setting

Some of these factors have led to the over utilization of imaging services and a perception that diagnostic imaging tests are inappropriately ordered.

It is likely that use of advanced diagnostic imaging will continue to increase over the next decade due to the factors mentioned above. Other factors may also contribute to the continued growth of diagnostic imaging utilization. For example, expansion in CT use may be partially attributed to interest in it as a screening tool—specifically for lung cancer in smoking and ex-smoker populations, cardiac disease, and colon cancer populations. Similarly, the role of PET/CT will likely expand as new radiotracers become available that will broaden the range of clinical indications that can be diagnosed with imaging equipment.
Objectives

The purpose of this report is to provide information regarding appropriate utilization of advanced diagnostic imaging. The following questions will be addressed:

1. What issues arise most frequently with respect to the utilization of diagnostic imaging services?
2. What therapeutic areas/conditions are of most concern regarding utilization of appropriate diagnostic imaging?
3. What is the role of the ordering physician, and is there a gatekeeper role or function identified in the literature for ordering physician/specialist or for organizations that act to influence ordering practices both positively and negatively?
4. What is the role, if any, for legislation in driving appropriate utilization?
5. What is the role for payment schemes in driving appropriate utilization?
6. What is the role for quality assurance and accreditation in driving appropriate utilization?

Findings

It is not intended that the findings of this Environmental Scan provide a comprehensive review of the topic. Results are based on a limited literature search that was conducted using the Ovid Medline bibliographic database. Grey literature was identified by searching relevant provincial and association websites. The search was limited to English language documents published between January 1, 2009 and December 9, 2011.

1. What issues arise most frequently with respect to the utilization of diagnostic imaging services?

The most commonly reported issue relating to the utilization of diagnostic imaging services pertains to patient safety. The increased volume of diagnostic imaging tests and the impact on health care finances and wait times are other notable concerns.

**Patient Safety**

There is increasing national and international concern regarding the harmful effects of radiation doses from CT tests, particularly in the pediatric population—who are the most vulnerable to its effects. While there is no direct evidence that ionised radiation from CT causes cancer, it has been reported that CT imaging accounts for 1.5% to 2% of all cancers in the US. The potential of developing cancer is believed to depend on the dosage used—with the risk increasing as the dose increases. In some instances, patients are accidentally over-exposed to excessive amounts of radiation that further increase their lifetime risk of developing cancer.

In Canada, CT is used three times more frequently than MRI. This is likely because there are twice as many CT devices compared to MRI devices. As well, CT is less expensive than MRI and takes less time to perform. While conventional x-ray also uses radiation, the doses associated with CT are generally higher.

Numerous strategies to reduce ionised radiation dosage in CT have been documented. In 2007, the Ontario Imaging Safety Committee for CT published a report that recommended the province put in place various regulations to reduce CT related radiation doses. The strategies suggested by the Committee included: shared responsibility between the referring clinician and radiologist on the use of CT; the review of all requests for pediatric CT by a radiologist; the recording and retention of doses for each CT test for audit; and that manufacturers ensure that the control console of CT scanners displays the dose of each CT exam. As well, the Committee recommended the need for revisions to existing provincial legislation that included ensuring only individuals with appropriate clinical knowledge and training in radiation safety are permitted to prescribe or request CT tests.
The implementation of dose registries is another strategy that can be used to improve patient safety. Dose registries can ensure that safe doses of radiation are administered during tests. In 2010, a pilot dose registry and radiation exposure monitoring project was established in Canada. The project, a collaboration between the National Research Council, Agfa HealthCare, Hamilton Health Sciences, and McMaster University, captures data on radiation exposure in patients undergoing diagnostic imaging tests such as CT, PET/CT, and x-ray. The data is used to measure the impact of repeated radiation on patients. Health care professionals and patients can use this information to make decisions about future diagnostic imaging tests and the medical need and associated risks of each procedure.\textsuperscript{30}

In the US, the American College of Radiology piloted a Dose Registry Index (DRI) in May 2011. The pilot project tracks medical imaging doses for CT studies that are submitted anonymously by medical imaging facilities and allows radiologists to track and compare dose indices of other facilities of similar size or geographic area. The radiologist receives feedback that compares their dose levels to national benchmarks, enabling them to make adjustments if necessary.\textsuperscript{31}

The implementation of Picture Archiving and Communication Systems (PACS) can also be used to monitor CT radiation doses. The main purpose of PACS is to facilitate the electronic storage, retrieval, distribution, and presentation of images (including ultrasound, x-rays, CT, MRI, nuclear medicine, and mammography) in different locations and settings. Approximately 90% of radiologists use PACS in Canada. Once these systems are fully implemented across the country, it is believed that they will generate between $850 million and $1 billion annually in health system efficiencies.\textsuperscript{20} According to staff at the University of California radiology department, these saving are expected to be found through the improved productivity of technologists and radiologists, reduced patient transfer, reduced repeat imaging and limited film purchasing and record transfer costs.\textsuperscript{32}

Other strategies to reduce ionised radiation dosage in CT include the use of: decision support software, bismuth shields to partially block radiation, automatic tube current modulation, better reconstruction algorithms, calculation of radiation doses for possible reporting, the provision of patient information material, review of CT protocols, the empowerment of technologists to adjust protocols, and the promotion of alternative non-ionising studies.\textsuperscript{33}

Because MRI does not use iodizing radiation to produce images, safety issues are mostly limited to thermal burns, projectiles, and hearing loss.\textsuperscript{34}

**Increased Volume of Requests for Diagnostic Imaging Tests**

There have been numerous reports of increased use of advanced diagnostic imaging tests both nationally and internationally.\textsuperscript{3,28} According to a 2005 Statistics Canada survey, approximately 4.3% of all Canadians aged 15 and older had a non-emergency CT scan in the past 12 months and approximately 3.9% Canadians had a non-emergency MRI scan during the same period.\textsuperscript{28} In Ontario alone, the number of CT and MRI tests increased by 300% and 600% respectively between 1993 and 2003.\textsuperscript{35}

While there is a general increase in the number of requests for diagnostic imaging tests across Canada, in some provinces there is a higher demand for particular kinds of tests. In 2009-2010, MRI exams were two times more frequent in Ontario and Alberta per 1,000 people, than in Prince Edward Island and Newfoundland and Labrador. Requests for CT exams varied too, with approximately twice the demand per 1,000 people in New Brunswick compared with British Columbia and Ontario.\textsuperscript{10}

There are anecdotal reports that family physicians ordering MRIs may placate patients by also ordering CT or other diagnostic imaging tests, in addition to an MRI, because these tests are associated with significantly shorter wait times. Conversely, as a result of the long wait times associated with MRI, some physicians may avoid the test altogether and order alternative diagnostic tests that are less appropriate but more accessible. It is also reported that physicians trained in health centers where there is high use of diagnostic imaging tend to order more diagnostic imaging tests compared to
physicians trained in low-use centers. As well, more experienced physicians tend to order fewer tests than newer physicians.  

In the UK, patient demand for diagnostic imaging tests, specifically CT and MRI, has increased significantly over the past decade. However, the National Health Service (NHS) does not currently have sufficient information to assess the appropriate use, cost, performance, and capacity of diagnostic imaging services. To help identify this information, the NHS and the Department of Health implemented a Diagnostic Imaging Dataset (DID) that was launched in April 2012. The DID captures detailed information about all diagnostic imaging tests carried out on NHS patients. It is estimated that this national repository will help compare unit costs and benchmark performances. It will enable the identification of the reasons for large variations in utilisation across NHS trusts and overutilization practices. The information captured in the dataset will hold health trusts accountable for their performance and may encourage efficiency.

While no health technology assessments, systematic reviews, or meta-analyses have been found that assess the impact of overutilization of diagnostic imaging services, overutilization is known to put unnecessary strains on finite health care finances and, in the case of CT procedures, exposes patients to unnecessary radiation doses.

Overutilization has been defined as the use of diagnostic imaging procedures where circumstances indicate that they are unlikely to improve patient outcome. While overutilization of diagnostic imaging services has been reported in Canada, according to the Health Council of Canada, it is difficult to ascertain the reasons why and to what extent it actually occurs. A US study on the overuse of routine imaging for staging low risk prostate cancer, involving 6,444 men, found a widespread overuse of the practice even though it is not recommended in current guidelines.

Repeat imaging is another source of overutilization. There are estimates that between 7% and 15% of all diagnostic imaging tests are unnecessary duplications because pre-existing images are available. A 2007 study by the Commonwealth Fund reported that 20% of all patients surveyed claimed they had undergone repeat imaging. The number of Canadian patients who reported repeat imaging was 8%. In the United Kingdom, 9% of participants reported repeat imaging, in New Zealand it was 10%, in Australia it was 15%, and in Germany it was 16.

Often, repeat imaging occurs in a trauma setting. Trauma patients in emergency departments at local hospitals are usually transferred to larger regional trauma centres, once their condition has stabilized. At the local hospital they are frequently imaged with CT to diagnose injuries and justify transfer. CT scans are often repeated after these patients have been transferred to the larger trauma centres. Factors commonly associated with repeated CT imaging in a trauma setting include increased age, higher injury severity score, and longer delays before transfer.

The escalated use of imaging has also been associated with the potential for “treatment cascades.” Treatment cascades refer to the use of diagnostic imaging that subsequently leads to procedures that may be of low value to patients. A study published in 2011 examined the relationship between the use of MRI and the increased number of unnecessary mastectomies in breast cancer patients. The study results were based on the review of medical records of patients with breast cancer who underwent both MRI and mammography exams. The study found more patients who had both imaging tests underwent mastectomies compared to those who had mammography alone; suggesting that the addition of MRI in patients with breast cancer is associated with an increase in unnecessary mastectomies.

Similar results have been noted with MRI for lower back pain and subsequent surgery. Researchers at Stanford Medical Center found that locations in the US with high concentrations of MRI devices have a higher number of patients receiving MRI tests for lower back pain, and consequently a higher number of people undergoing back surgeries. The study found that each additional MRI device in a given location
leads to 40 additional MRI tests, and that 3,500 needless back surgeries could have been avoided if the MRI devices were not available.\textsuperscript{44}

Overutilization also puts an unnecessary strain on already overburdened wait lists. Reducing wait times for diagnostic imaging services is considered a priority in most provinces.\textsuperscript{45} A 2011 Canadian Institute for Health Information report on Canadian wait times ranked CT and MRI imaging tests as one of five priority areas. Wait times for MRI were regarded as being longer than those for CT, with half of all MRI patients waiting between 31 and 77 days. CT patients waited between 7 and 22 days for a scan. The increased wait time for MRI is likely related to the fact that there are approximately half as many MRI devices as CT devices in Canada (222 compared to 419, respectively).\textsuperscript{9}

According to the Canadian Wait Time Alliance, the benchmark wait time for emergency, CT and MRI cases is 1 to 24 hours. For urgent cases the benchmark wait time for CT and MRI is 1 to 7 days, and for scheduled cases both occur within a 30-day time frame.\textsuperscript{46}

A 2009 Canadian survey of wait times in publicly funded MRI facilities found that while 96\% had some method for triaging MRI requests, only 42\% had documented guidelines for prioritization and none used quality assurance practices to ensure guidelines were followed. Strategies for managing wait times did not address inappropriate requests and were largely centred on attempts to build capacity.\textsuperscript{47}

The recent growth in utilization of advanced imaging services has raised national expenditures on imaging in most countries.\textsuperscript{48} Spending for diagnostic imaging in Canada has increased and now exceeds an estimated $2.2 billion in operational costs. The elimination of 10\% of unnecessary tests is estimated to potentially create savings of $220 million each year.\textsuperscript{49}

2. What therapeutic areas/conditions are of most concern for the utilization of appropriate diagnostic imaging?

The areas of greatest concern in advanced diagnostic imaging relate largely to the use of ionised radiation. Children and pregnant women are the most vulnerable to the effects of ionised radiation which is delivered through CT and PET/CT exams.

CT

Guidelines recommend that experienced radiologists provide sound clinical justification before imaging children or pregnant women in the pelvic/abdominal regions with CT. As well, alternative imaging technologies such as MRI and ultrasound should be considered where appropriate.\textsuperscript{50}

According to the latest CAR guidelines, CT is a “well accepted and established” imaging procedure for head and neck diagnosis, spinal, thoracic, abdominal, pelvic, and musculoskeletal investigations.\textsuperscript{51} However, patients are referred to CT scanning from virtually every medical speciality. Other common uses of CT included neurology, cardiology, oncology, angiography, virtual endoscopy, orthopaedics, and trauma.\textsuperscript{52} Approximately 90\% of all Canadian CT scans for outpatients are for head, abdomen, chest, and spine tests.\textsuperscript{53}

CT is believed to play an important role in the diagnosis of trauma.\textsuperscript{50} This is largely because of its clinical usefulness in situations where time restrictions do not allow for a delay in imaging, when anesthesia restrictions limit access to MRI, or when large body parts need to be imaged quickly.\textsuperscript{54} In fact, significant increases in CT use in trauma patients have been reported.\textsuperscript{55}

The Ontario Diagnostic Imaging Safety Committee for CT has recommended that Diagnostic Reference Levels for head, chest, and abdominal/pelvic CT should be established by members of professional medical bodies. Once established, the Diagnostic Reference Levels should be disseminated and reviewed periodically.\textsuperscript{29}
MRI

Because MRI does not use ionising radiation, it should be considered first in situations where both CT and MRI provide similar information and where both modalities are available. According to the latest CAR guidelines, the most suitable clinical applications of MRI include: adult and pediatric brain, head and neck, adult and pediatric spine, abdomen and pelvis, musculoskeletal system, cardiovascular, chest, breast imaging, and fetal imaging. Over 80% of all Canadian MRI tests for outpatients are of the head, spine, and extremities.

There are some contraindications to the use of MRI: metallic foreign bodies in the orbits, aneurysm clips, pacemakers, cochlear implants, etc. As well, MRI will give reduced image quality close to prostheses.

PET/CT

In Canada, the main application of PET/CT scanning is in oncology, where it is used for the diagnosis, staging, and/or detection of recurrent disease. Across Canada, the most popular uses of PET in oncology are for lung, esophageal, breast, colorectal, and thyroid cancers. PET is used less widely for cardiology and neurology disorders. Outside of Canada PET/CT is also commonly used to diagnose neurological, infection/inflammation and cardiology-associated conditions.

3. What is the role of the ordering physician, and is there a gatekeeper role or function identified in the literature for ordering physician/specialist or for organizations that act to influence ordering practices both positively and negatively?

Ordering Physician

According to the Health Council of Canada, family physicians are regarded as the gatekeepers to Canada’s entire health care system, including diagnostic imaging services. In fact, the increase in the overall use of advanced diagnostic imaging has, in part, been attributed to growth in referrals from family physicians, since some jurisdictions now permit orders from them. Previously, only specialists were allowed to order these procedures.

The gatekeeper function for diagnostic imaging is different across Canada and depends on a variety of factors. A referral for an advanced imaging test may be made by either a family physician or specialist, depending on the policies of regional health authorities, the geographic location of an ordering physician, the availability of radiologists, and the clinical reason for ordering the test. Some specialists will also supervise, perform, and interpret test results.

Medical students, chiropractors, and nurse practitioners can order diagnostic imaging tests in some jurisdictions. There is anecdotal evidence that in jurisdictions where family physicians are not authorized to refer patients to diagnostic imaging services, they are still routinely requesting these procedures.

A 2003 report by the Ontario Institute for Clinical Evaluative Sciences on access to MRI found that neurologists ordered the greatest proportion of all MRI tests – constituting 24%, followed by family physicians who ordered 20%, orthopedic surgeons 17%, and neurosurgeons 8%.

The expanded role of family practitioners as ordering physicians is cause for concern in Canada because radiology courses are not a compulsory component of medical school training for general practitioners. A lack of ordering physician knowledge is a factor that can contribute to overutilization.

In the UK, there are restrictions on who can refer patients for different types of diagnostic imaging services. Neither general practitioners or junior hospital doctors have the authority to order diagnostic imaging tests. Currently, general practitioners refer patients to hospital consultants. Following an
outpatient appointment with a patient, the hospital consultant requests a diagnostic imaging procedure. After the test, the patient returns to the consultant who plans the treatment program.59

However, as part of the UK Department of Health’s new “Modernisation of Health and Care” program, patients will be allowed to access diagnostic imaging services directly through their general practitioners. It is estimated that this new approach will reduce wait times for diagnostic imaging tests from up to 18 weeks down to 3 weeks. As well, it is anticipated that the adoption of this new program will free up hospital consultants time for patients with serious conditions and allow patients to be managed within a primary health care setting which is believed to provide more convenience and is less expensive than alternatives.59 It remains to be seen if this new program will impact the appropriateness of advanced diagnostic imaging practices, or if it will help reduce wait times for diagnostic imaging services.

In Australia, over 65% of requests for diagnostic imaging are made by general practitioners.60 In recognition of the significant increase in the use of diagnostic imaging by general practitioners, the Western Australia Cancer Council developed a four-page resource card to educate and assist them when discussing diagnostic imaging with patients. In 2011, the resource card was distributed to 1,700 general practitioners within the region. A follow-up questionnaire was distributed three months later and showed that 86% of the polled general practitioners found the resource card to be useful. As well, 90% of the general practitioners discussed the risks and benefits of imaging with their patients, an increase of 20% since the time of initially sending out the resource card.61

In 2010, a Norwegian survey of 93 family practitioners was conducted to determine their knowledge of radiation doses and the associated risks to patients for commonly requested diagnostic tests. The survey found that family practitioners who underwent radiation safety training at medical school were significantly more knowledgeable about the subject than those who received no training. Overall, family practitioners reported a low level of awareness of radiation doses, and generally underestimated them and their associated risks. More than 40% of the responders were not aware that MRI and ultrasound do not use ionised radiation.62

Radiologists

The traditional role of Canadian radiologists is to supervise medical imaging practices and interpret test results for the diagnoses and treatment of patients.9 They may also play a role in determining the appropriate use of imaging services. It has been argued that their superior clinical and technological expertise in radiation exposure, puts them in a position where they should be playing a much greater role in the decision-making process for safe imaging, especially in the areas of appropriateness and patient safety issues.63,64

It is claimed that some radiologists actually contribute to overutilization because they do not routinely review orders for appropriateness before they are conducted.17,54 In the absence of reviewing all requests for diagnostic images, it has been suggested that the burden of overutilization might be better contained if radiologists were to review some requests more routinely, particularly those that are costly or expose patients to high levels of radiation. There is support for radiologists taking on the role of child advocates in setting the standard for safe and effective pediatric imaging.54 There is also support for radiologists to communicate directly with patients about the benefits and risks of radiation exposure.65

It has been implied that overutilization might be reduced if communication between radiologists and ordering physicians occurred more frequently and effectively. A survey of family physicians, specialists, and radiologists from Ontario, on diagnostic imaging practices, found that there was a lack of communication between ordering clinicians and radiologists, both at the time of initially ordering the test and also at the time the test results are reported back to the ordering physician. Radiologists claimed that it was difficult to provide definitive interpretations of test results in the absence of background information on patients. Similarly, ordering physicians stated that it was difficult to open
lines of communication with radiologists due to busy schedules, the relocation of radiologists, and administration changes within imaging departments.14

The Australian government is currently assessing the role of radiologists in appropriate imaging with the aim of expanding their involvement with patient management. A review will be undertaken that will involve working with imaging requesters and providers to improve communication flow and give radiologists more clinical information on patients. Regulations that limit imaging substitutions will also be reviewed with the aim of removing barriers to clinically appropriate imaging.60

In the UK, the Royal College of Radiologists provides good practice guidance to help reduce the overutilization of diagnostic imaging services. The College recommends that clinical radiology departments undertake frequent audits of practices that are associated with significant risk. The audit helps to identify significant deviations from accepted standards and can be used to develop a plan for remedial action. Audits should include an assessment of appropriateness or indication, safety or complication rates and minimum efficacy rates.66

Other Organizations

Public and private health insurers may also play a gatekeeping role in diagnostic imaging ordering practices, because they make decisions regarding which tests to fund.

Similarly, provincial physician associations may influence imaging ordering, since they negotiate fee schedules, set provincial standards and provide guidance.

Improved communication and cooperation between all the stakeholders involved in diagnostic imaging, including radiologists, ordering physicians, insurers, policy makers, patients and industry will likely be key to controlling overutilization and patient safety issues.

4. What is the Role of Legislation in Driving Appropriate Utilization?

Currently there is no specific Canadian federal legislation that addresses appropriateness in medical imaging. However, Health Canada has developed a series of Safety Codes to set out requirements for the safe use of radiation-emitting equipment for large radiological facilities.67

Some provincial legislation also pertains to safety issues, and some provincial chapters of professional colleges, societies, and associations provide recommendations, guidance and/or standards. For those provinces that haven’t created documentation that addresses appropriate imaging practices, there is general agreement that this issue needs to be addressed—if not at the jurisdictional level, then at a national one. The CAR provides criteria on appropriate imaging practices that is aimed at clinical specialists.49

A 2007 report by the Ontario Diagnostic Imaging Safety Committee for CT recommended that the province adopt dose management and optimization strategies. The committee also suggested revisions to the existing Ontario HARP Act. Chief amongst these revisions would be the stipulation that only health practitioners with appropriate clinical knowledge and training in radiation safety should be permitted to prescribe or request CT tests. As well, it was recommended that routine testing and inspection of CT scanners should be incorporated into the Act.68

In the US, federal legislation has played a significant role in reducing inappropriate ordering. The 2005 Deficit Reduction Act’s imaging related clauses were implemented as a result of escalating costs attributed to imaging. These clauses required outpatient imaging operators to adopt lower payments for the technical components of imaging exams.69 In the first full year the Act took effect, Medicare’s imaging spending was reduced by 12.7%.70 The Act is also believed to have impacted sales of CT and MRI scanners which declined by 36%.71
A provision of the Medicare Improvements for Patients and Providers Act, passed in 2008, required the accreditation of all imaging facilities by 2012 as a condition for reimbursement. Conditions for accreditation are currently being developed.\textsuperscript{17}

The US 2010 Patient Protection and Affordable Care Act further reduced physician fees for imaging by 25% and required physicians who have a financial interest in an imaging technology to inform their patients of this interest and provide a list of alternative facilities.\textsuperscript{71}

The UK has radiation protection legislation in the form of the \textit{Ionising Radiation (Medical Exposure) Regulations 2000 (IR(ME)R)} ACT. The main legal requirements are enforced through the UK Health and Safety Executive and are framed to protect patients from unintended or unjustified radiation exposure. The legislation requires that clinical radiology departments must record the professionals from whom they will accept referrals and produce appropriate referral criteria. Sufficient medical data is required before a practitioner can assess the justification for a procedure. This process allows radiologists to restrict referrals for certain types of tests to specific individuals or grades of health care professionals. It is believed that this legislation improves the quality of clinical information provided for requests for imaging procedures involving ionising radiation and in so doing helps reduce unnecessary investigations.\textsuperscript{72}

5. What is the Role of Payment Schemes in Driving Appropriate Utilization?

Funding methods for diagnostic imaging depend on the technology being used and the jurisdiction where the procedure is taking place.\textsuperscript{9} There are usually variations between how physicians’ professional fees are funded and how hospital or other facility operational fees are funded. For example, many physicians are reimbursed for services using the fee-for-service payment method while hospitals are reimbursed mostly through global budgets.

Hospital and physician funding mechanisms are believed to influence the delivery and quality of patient care. Fee-for-service hospital funding is not considered to be a promising option in Canada, because it rewards volume.\textsuperscript{73} Similarly, fee-for-service physician funding is associated with overutilization of diagnostic imaging services.\textsuperscript{74} In May 2012, the Government of Ontario implemented physician fee reductions. While this decision was made primarily to save money across all provincial physician services, an 11% fee reduction for 250 diagnostic radiology tests over four years, as well as a 50% reduction in “self-referral fees,” a practice that involves physicians referring patients back to their own practices for diagnostic testing, may also impact appropriate utilization practices.

In 2009, participants of a summit hosted by the American Board of Radiology Foundation discussed the causes and effects of overutilization. They identified a variety of payment systems, including fee-for-service, that contribute to diagnostic imaging overuse.\textsuperscript{17} Physician self-referring was also recognized as a practice that contributes to the increased volume of diagnostic imaging. A meta-analysis published in 2011, found that in the US, non-radiologist self-referring clinicians are 2.48 times more likely to order diagnostic imaging tests than clinicians with no financial incentive in imaging. The cost of this imaging to Medicare was estimated to be billions of dollars annually.\textsuperscript{70} Summit participants discussed an alternative payment approach that involved realigning economic incentives to an approach that rewards evidence-based practice and preferred outcomes.\textsuperscript{17}

The US Medicare Payment Advisory Commission (MEDPAC) recommended to Congress that a bundled payment mechanism should replace the existing fee-for-service system. A bundled payment is a predetermined fixed amount for each patient hospitalization episode. It is believed that this payment model will give physicians and hospitals increased incentive to prevent overutilization of diagnostic imaging services.\textsuperscript{75} Opponents of this payment system claim that it could potentially lead to hospitals cutting services to the bare minimum and cherry picking the healthiest and thereby the cheapest patients.\textsuperscript{76} As well, this method does not account for regional and diagnostic differences in costs, a factor that could potentially leave some doctors out-of-pocket.\textsuperscript{77}
Prior authorization is another payment scheme that can influence appropriate utilization. This payment mechanism requires ordering physicians to receive authorization from insurance companies and/or their agents before a patient’s diagnostic imaging test can be performed. Physicians cannot be reimbursed for the procedure without this prior approval. Supporters of this process claim that it improves the quality of patient care and creates health care savings because there are checks and balances in place. Critics believe that the process lacks transparency, is disruptive to the clinical work flow and is administratively and financially burdensome. There is also the belief that physicians, with an understanding of patient medical histories, and not health insurers, should be responsible for decisions relating to patient care. One of MEDPAC’s recommendations to Congress was that practitioners who order substantially more advanced imaging services than their peers should be required to partake in a prior authorization program.

Prior notification is another payment scheme that can influence appropriate utilization. Like prior authorization, prior notification requires ordering physicians to contact insurers to determine if an imaging test will be covered by a patient’s health insurance plan, prior to a test. Physicians may still order the test if it’s not covered, but health insurers using this approach believe it encourages physicians to select the most appropriate tests based on individual patient’s clinical circumstances. Australia is currently revising its funding methods for diagnostic imaging. In 2012, the Australian government published a report entitled Review of Funding for Diagnostic Imaging Services. The purpose of the report was to establish appropriate fees for Medical Benefits Schedules and review current funding arrangements for different diagnostic imaging modalities, as well as develop alternatives to fee-for-service funding mechanisms.

In 2002, England’s Department of Health introduced a form of activity-based funding, known as payment by results (PbR). This new funding model marked a fundamental change in the way in which certain hospital activities, including diagnostic testing, are reimbursed. PbR is believed to reward efficiencies, support patient choice and reduce wait times. Critics of this funding model claim that, like the bundled payment mechanism, PbR achieves efficiencies by hospitals cherry picking healthy patients, or by reducing the level of resources in the provision of care, which subsequently lowers the quality of the patient care. Some high cost drugs, devices and procedures are excluded from PbR. For example, PET/CT and SPECT/CT are not funded through PbR, whereas PET remains within the scope of PbR.

6. What is the Role of Quality Assurance and Accreditation in Driving Appropriate Utilization?

There is a general acceleration of efforts by governments and professional colleges to promote appropriate utilization of medical imaging through credentialing and quality assurance practices. This is mostly due to reporting of medical imaging errors across Canada.

Alberta is currently reviewing medical quality assurance processes for diagnostic imaging testing after interpretation errors were discovered in three facilities across the province in less than two months. A similar investigation took place in British Columbia in 2011 when its Ministry of Health Services requested an independent investigation into the quality of diagnostic imaging after errors in four health authorities came to light. Two reports by the British Columbia Patient Safety & Quality Council were the outcome of this investigation. One of these reports included recommendation for the minimization of errors which included a provision of a peer-review process for CT scans, the development of health authority Diagnostic Imaging Quality Assurance Committees to provide oversight for DI services and the creation of a standardized process across all health authorities for medical staff appointment, credential review and privileging, and physician review.

In Saskatchewan, the College of Physicians and Surgeons (CPSS) provides leadership in the areas of quality standards in diagnostic imaging specifically in relation to the professional practice of radiologists and nuclear medicine physicians. The Quality Assurance Program aims to review the
performance of every physician engaged in diagnostic imaging at three year intervals. The review involves the random selection of DI tests done by the physician that will be reviewed by a number of peers. The peer reviewers submit a report of their observations to the Advisory Committee on Medical Imaging (ACMI) of the CPSS. After a review of the report, the ACMI shares the report with the physician under review and, if necessary, provides recommendations for improvement. If the ACMI identifies specific areas of concern, it may review the physician’s practice more quickly to ensure that the recommendations have been implemented.

Most provinces have experienced problems with diagnostic imaging errors. However, because the majority of jurisdictional quality assurance programs are facility based and are specific to the size of the facility, the make of the imaging equipment, and the scope of the facilities practice, it is difficult to standardize diagnostic imaging practices, even at a local level.

The Australian government is working on improving the appropriate use of diagnostic imaging services by strengthening the power of the Diagnostic Imaging Accreditation Scheme (DIAS). The DIAS will be introducing stricter quality and safety standards for practitioner credentialing, practice and patient safety, professional supervision requirements, management of patient radiation dose, and other areas that affect the appropriate use of diagnostic imaging services.

In the UK, an Imaging Services Accreditation Scheme (ISAS) was developed in 2009 to create an accreditation process to support radiology services in delivering higher quality patient-focused services. It was jointly established with the Society and College of Radiographers and is being run for the two colleges by the United Kingdom Accreditation Service (UKAS). The ISAS is intended to promote best practice by comprehensively addressing patient experience, clinical effectiveness, patient and staff safety, and efficient use of resources.

There may be a role for the automation of quality assurance in diagnostic imaging. It is believed that objective data can be retrieved through the development of quality assurance algorithms that detect and quantify deficiencies in quality assurance. This data could be used to create universal standards and a structured quality assurance database.

Appropriateness criteria can be used as a quality assurance strategy to help alleviate overutilization. Appropriateness criteria are evidence-based guidelines that assist ordering physicians and other providers in making the most appropriate imaging decision for a specific clinical condition. The use of these guidelines can improve ordering physicians’ quality of care. However, knowledge of appropriateness criteria tools is generally not widespread and their use is voluntary. The American Association of Radiology has developed appropriateness criteria, and CAR has tested the effectiveness of providing its Diagnostic Imaging Referral Guidelines through computerized clinical decision support and computerized provider order entry systems, as part of appropriateness projects.

Evidence-based practice guidelines and recommendations have been developed to help guide appropriate clinical decision making. However, physicians do not always follow guidelines. A 2009 survey of 25 US physicians on the application of practice guidelines found diversity in use. Some physicians found guidelines highly useful and implemented them often while others found them not very useful and rarely, if ever, used them. Some physicians found guidelines to be inaccessible and confusing. Others found guidelines to be too generalized to be applied to atypical patients. There was concern that not all guidelines can be applied to populations who do not commonly take part in clinical trials, such as children, the elderly, and those with multiple co-morbidities. As well, many physicians felt that when dealing with the individual needs of their patients, their own judgement and expertise was better than generic, third party guidelines.

Clinical decision support systems provide immediate guidance to physicians on the appropriateness of diagnostic imaging tests and as such may have a role to play in quality assurance. Clinical decision support tools can be accessed through web portals, computerized order entry systems or via electronic
health records so that they can be used as part of the normal workflow. Clinical decision support systems are not used extensively in Canada. CADTH published a report on this topic in January 2012.89

CAR conducted two studies in Manitoba to test the usability of clinical decision support systems for diagnostic imaging. One study at the Children’s Hospital in Winnipeg reviewed 8,757 orders that were placed through the decision support software in one year. The results showed that the decision support software did not have a big impact on physician’s ordering practices, with advice from the decision support only being followed in 2% of cases. Nineteen per cent of orders had relevant guidelines, 10% of orders were inappropriate, (and less than 1% of all inappropriate orders were avoided). It was also noted that the new process affected the time to order a DI test depending on the setting. Physicians in an outpatient setting noted that results were received more rapidly under the new process, whereas emergency room physicians noted that the new process increased the time it took to receive results. As well, it was noted that while the information received through the new system was more clear and standardized, it lacked the contextual information necessary to complete the most appropriate test.2

The second Manitoba study assessed the acceptance of decision support in a rural community family practice over a 36 week period. The decision support system identified 24% of the orders as inappropriate and physicians followed suggestions from decision support to improve their diagnostic imaging order in 25% of the initially inappropriate orders. It was noted that while physicians supported the concept of clinical decision support, the perceived disruption in workflow created by it affected its implementation.90

Four US studies assessed the impact of integrating clinical decision support systems into computerized order entry. Three of them reported decreases in the volume and rate of inappropriate use of CT and MRI due to decision support system implementation.91-93

In Australia, decision support tools were recommended by the Australian Diagnostic Imaging Association as a means of coping with rapid changes in diagnostic imaging. The association suggests that decision support tools should be made available on the desktops of all referring physicians as a means of assuring that imaging requests are appropriate.94

In 2011, a systematic review on the impact of computerized order systems on imaging services and patient outcome found imaging departments experienced efficiency gains, improved test selection, improved test appropriateness and cost savings with incorporating computerized order systems. Most of these benefits were associated with the integration of decision support tools.95

Credentialing of imaging equipment and physicians who interpret imaging tests is another strategy that can affect utilization. Information sharing on accredited staff between health ministries, health authorities, and professional colleges will help ensure that only trained staff are conducting and reading diagnostic imaging tests. As seen in the US, legislation that requires providers to undergo a privileging process to receive reimbursement has gone some way to reduce inappropriate diagnostic imaging.

Conclusion

Demand for diagnostic imaging services continue to rise globally. Most of the increase in use is appropriate and adds value to patient care. However, numerous independent reports have indicated that some diagnostic imaging procedures are inappropriate or contribute no useful information. The main issues that arise from inappropriate use relate to patient safety, the impact on health care finances, and wait times. Appropriate utilization of diagnostic imaging services is influenced by a number of factors that include, but are not limited to, physician test ordering practice and diagnostic imaging funding mechanisms, as well as quality assurance and accreditation practices.
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