

MRI and CT Scanning Services

1.0 Summary

Diagnostic medical imaging includes the use of magnetic resonance imaging (MRI) and computed tomography (CT) scans to provide physicians with important information for diagnosing and monitoring patients' conditions. Timely, quality, medically necessary scans can help doctors to accurately diagnose and treat many diseases earlier in their course, positively contributing to patients' health outcomes.

As technological advances continue to broaden the range of their medical uses and the diseases that can be diagnosed, MRI scans performed have increased by 17% and CT scans by more than 30% over the five years up to 2017/18, excluding emergency cases (as emergency data was not required to be collected before 2015).

The Ministry of Health and Long-Term Care (Ministry) is responsible for overseeing, through the 14 Local Health Integration Networks (LHINs), the funding and performance of MRI and CT services in Ontario. Of the 137 public hospitals in Ontario as of April 2018, 78 had at least one MRI or CT machine.

Timely access to MRI and CT scanning services is a fundamental part of Ontario's Wait Time Strategy. The Ministry has set four priority levels for radiologists to use to triage patients and has set a wait-time target for each level: emergency (within 24 hours),

urgent (within two days), semi-urgent (within 10 days) and non-urgent (within 28 days). These targets are set at the 90th percentile, which represents the time within which 90% of patients in each category should receive their scan from the date of referral for the scan. This means that no more than 10% should wait any longer than that.

Our audit found that, overall, Ontario's wait times for patients requiring MRI and CT scans were the lowest when compared to five provinces where the 90th percentile wait-time data was available (public information is not available from British Columbia and Quebec). However, many Ontarians who needed scans have had significantly long waits in comparison to Ministry targets. We also found that if existing MRI and CT scan machines had been operated more hours, more patients could have been scanned, thereby reducing wait times. Our audit also identified opportunities where increased efficiency and better use of resources could help to reduce wait times for MRI and CT scans. While some of our specific findings are common to both MRIs and CTs, others are unique to either MRIs or CTs, as follows:

MRI Scanning Services

For MRIs, in 2017/18, a total of 108 MRI machines in 52 hospitals performed over 835,600 examinations. During the same fiscal year, the Ministry provided funding of \$157 million, plus a one-time additional payment of \$7.3 million, to these

hospitals, to be used specifically for providing MRI services. Hospitals also have the discretion to use funds from their global budgets (annual lump-sum funding from the Ministry) or other sources to provide additional MRI services.

- **65% of semi-urgent and non-urgent patients waited longer than the Ministry's targeted waiting period to receive their MRIs.** Ontario hospitals were mostly able to provide timely services to patients who required either emergency or urgent MRI scans, but were unable to do so for semi-urgent and non-urgent patients. It is still important for semi-urgent and non-urgent patients to receive timely services. Long wait times delay their diagnosis and treatment, and can impact their quality of life, such as their ability to return to employment, school or everyday life. In some cases, the long wait can result in deterioration of the patient's condition.

For emergency patients, only 5% waited longer than the 24-hour target. For urgent patients, 17% waited longer than the two-day target (up to five days). Semi-urgent and non-urgent patients accounted for 91% of the total MRI scans in 2017/18. Overall, only 35% (not the intended 90%) of semi-urgent and non-urgent patients received MRI scans within the Ministry's wait-time targets of 10 days and 28 days, respectively. The remaining 65% (not the intended 10%) waited longer than these wait-time targets (see **Figure 7**).

- **Wait times for MRI scans vary depending on where the patient lives in Ontario.** The wait-time disparity for non-urgent patients was the most significant. Depending on where a patient lives and the demand for MRI scanning services in that LHIN, patients have a shorter or longer wait than in other LHINs. The Ministry has not analyzed why wait times vary significantly among LHINs.

In 2017/18, 90% of non-urgent patients waited up to 203 days in the LHIN with the

longest wait times, as compared to 63 days in the LHIN with the shortest wait times.

- **Patients wait unnecessarily long times for MRI scans, while machines are not operating for sufficient hours, despite available capacity.** We found that MRI machines could have been operating more hours, thereby reducing wait times, but the hospitals were financially unable to increase their operating hours for these machines. If all 108 MRI machines in Ontario's hospitals had operated for 16 hours, seven days a week, hospitals would have been able to outperform the Ministry's wait-time targets.

On average, all 108 MRI machines were used at only 56% of maximum capacity (which is running 24 hours a day, seven days a week) in 2017/18. We estimated the additional cost to meet the Ministry targets by the end of 2018/19 would be about \$34 million, assuming hospitals operated machines 132,197 more hours than they operated them in 2017/18, at a rate of \$260 per hour.

- **Patient no-shows (missed appointments) are costly, but the Ministry and hospitals do not understand why they occur.** When patients do not show up for an appointment or cancel it the same day, scanning machines can sit idle if hospitals are unable to fill the time slot quickly. Lack of user-friendly communication systems at the hospitals to allow patients to confirm receipt of their appointment, including emails and text-messaging, contributed to patient no-shows. We also noted that none of the four hospitals where we conducted audit work routinely tracks reasons for no-shows.

MRI patient no-show rates across Ontario hospitals ranged between 0.1% and 13.4% of scheduled appointments. In 2017/18, hospitals reported a total of 48,320 MRI appointments where patients did not show up, which we estimated cost hospitals about \$6.2 million, mainly to pay for staffing.

CT Scanning Services

In 2017/18, a total of 165 CT machines in 78 hospitals performed almost 1.8 million scans. In the same year, the Ministry gave \$9 million to these hospitals to be used specifically for providing CT services. Hospitals rely more heavily on their global budgets to provide CT services—the \$9 million is intended to be supplementary funding.

- **33% of semi-urgent and non-urgent patients waited longer than the Ministry’s targeted waiting period to receive their CT scans.** Ontario hospitals were mostly able to provide timely services to patients who required either emergency or urgent CT scans, but were unable to do so for semi-urgent and non-urgent patients.

For emergency patients, less than 1% waited longer than the 24-hour target. For urgent patients, 4% waited longer than the two-day target (up to four days). Semi-urgent and non-urgent patients accounted for 49% of the total CT scans in 2017/18. Only 67% (not the intended 90%) of semi-urgent and non-urgent patients received CT scans within the Ministry’s wait-time targets of 10 days and 28 days for these two groups. The remaining 33% (not the intended 10%) waited longer (see **Figure 9**).

- **Wait times for CT scans vary depending on where the patient lives in Ontario.** The wait-time disparity for non-urgent patients was the most significant. Depending on where a patient lives and the demand for CT scanning services in that LHIN, patients have a shorter or longer wait than in other LHINs. The Ministry has not analyzed why wait times vary significantly among LHINs.

In 2017/18, 90% of non-urgent patients waited up to 127 days within the LHIN with the longest wait times, as compared to 27 days in the LHIN with the shortest wait times.

- **Patients wait unnecessarily long times for CT scans, while machines are not operating for sufficient hours, despite**

available capacity. We found that CT machines could have been operating more hours, thereby reducing wait times, but the hospitals were financially unable to increase their operating hours for these machines.

On average, all 165 CT machines were used at approximately 37% of maximum capacity in 2017/18, despite long wait times. Cancer Care Ontario does not have a predictive model to determine the number of hours needed to achieve the Ministry’s wait-time targets for CT scans.

- **Patient no-shows (missed appointments) are costly, but the Ministry and hospitals do not understand why they occur.** Lack of user-friendly communication systems at the hospitals to allow patients to confirm receipt of their appointment, including emails and text-messaging, contributed to patient no-shows. We noted that none of the four hospitals where we conducted audit work routinely tracks reasons for no-shows.

CT patient no-show rates across Ontario hospitals ranged between 0.6% and 13% of scheduled appointments. In 2017/18, hospitals reported a total of 57,916 missed CT appointments, but they were able to fill these slots with little difficulty.

MRI and CT Scanning Services

- **The Ministry is unable to justify the funding methods for MRI and CT scans, which have remained unchanged for over 10 years.** The Ministry has not reviewed its funding method for either MRI or CT services, and it has not incorporated into its funding method the actual cost-per-scan information self-reported by hospitals, individual hospitals’ demand and capacity, and the complexity of scans needed by patients.
- **Province-wide peer review of MRI and CT scan results is not mandatory across Ontario hospitals.** Lack of a peer review

program exposes patients and hospitals to the risk of misinterpretation of MRI and CT images and/or misdiagnosis of a patient's condition. A 2013 review of a radiologist's work at Trillium Health Partners uncovered issues related to over 640 CT scans, some of which involved undiagnosed cancers. The Ministry requested that Health Quality Ontario (HQO) lead the implementation of a province-wide physician peer review program in all facilities where diagnostic imaging services are provided, but progress has been slow.

- **Hospitals did not consistently assess or track whether all referrals for MRI and CT scans were clinically necessary.** Monitoring the number of unnecessary or inappropriate scans is essential because these scans do not improve the patient's health and use resources that can otherwise be used to help patients who need the scans. At the four hospitals where we conducted audit work, the hospitals' radiologists are responsible for deciding the level of priority for each incoming referral and rejecting those that are deemed inappropriate. However, none of the hospitals keep track of the number of inappropriate referrals the hospitals rejected.

Independent Health Facilities

Since 2003, the Ministry has contracted with seven independent health facilities (IHF) to provide MRI and/or CT scanning services at no charge to patients insured under the Ontario Health Insurance Plan—mostly semi-urgent and non-urgent scans. In 2017/18, the IHFs, with a total of six MRI and two CT machines, performed about 48,000 MRI and 11,320 CT scans outside of hospitals.

- **Standardized hourly rates and wait-time performance measures are lacking in Ministry agreements with independent health facilities (IHF).** The Ministry is responsible, under the *Independent Health*

Facilities Act, 1990, for licensing, funding and co-ordinating quality assurance assessments of IHFs. We found that achieving performance measures such as wait-time targets is not expected. Also, hourly rates vary: the rate paid for an MRI scan at one IHF can be as high as 175% the rate paid for a similar scan at another IHF, and the rate paid for a CT scan at one IHF can be as high as 280% of the rate paid for a similar scan at another IHF. The Ministry does not know the actual cost of a scan performed outside of a hospital, so it cannot assess whether the rates it currently pays the IHFs are reasonable.

Overall Conclusion

Our audit concluded that not all patients who needed an MRI and/or CT scan received timely and equitable service. This was particularly the case for patients who were assessed in the semi-urgent and non-urgent priority levels. Although Ontario's wait times were the lowest for patients requiring MRI and/or CT scans compared to five other provinces where similar data was available, hospitals in Ontario did not meet the Ministry's wait-time targets. Wait times for MRI and CT scans varied depending on where patients live.

We also concluded that MRI and CT services were not being delivered in a cost-effective manner. The Ministry had not reviewed the MRI hourly rates it pays to hospitals and its funding method for either MRI or CT services for more than a decade, and it did not incorporate into its funding method cost-per-scan information, individual hospitals' demand and capacity, and the complexity of scans needed by patients. In addition, the hourly rates paid by the Ministry to the seven independent health facilities for scans vary significantly for similar services.

The hospitals we visited had policies and screening procedures in place to ensure patient safety while receiving MRI scans. Radiologists at the hospitals also ensure patients were exposed to a

minimal level of radiation dosage for CT scans that produced clear images that were in compliance with applicable standards. However, the hospitals did not consistently assess or track whether all referrals for these scans were appropriate and clinically necessary.

Our audit also concluded that although wait times are measured, validated and publicly reported periodically, more useful and complete wait-time information could be made available to patients and their physicians to assist them in making informed decisions about where patients should be referred to receive the most timely scan.

This report contains 13 recommendations, consisting of 33 actions, to address our audit findings.

OVERALL MINISTRY RESPONSE

Recognizing the importance that MRI and CT imaging play in the diagnosis and treatment of diseases, the Ministry of Health and Long-Term Care (Ministry) is committed to working with Local Health Integration Networks (LHINs), hospitals and Cancer Care Ontario (CCO) toward the continuous quality improvement of cost-effectiveness, safety, appropriateness, efficiency, equitable distribution, and building capacity of high-quality, timely MRI and CT services for all Ontarians. We welcome the insights and recommendations provided by the Auditor General.

The audit identifies several areas of consideration where the Ministry will build on existing efforts and initiatives to evaluate, address and improve. This includes improving scheduling, appropriateness of referrals, and how the Ministry funds MRI and CT operations. The Ministry will continue to work closely with CCO, LHINs, hospitals and other system partners to ensure that Ontarians continue to have access to high-quality MRI and CT diagnostic imaging services.

2.0 Background

2.1 Overview of MRI and CT Scanning Services

Diagnostic medical imaging includes the use of magnetic resonance imaging (MRI) and computed tomography (CT) to provide physicians with important information in diagnosing and monitoring patients' conditions. Medical imaging may be done for many reasons: screening patients at risk for a disease, reducing uncertainty about a diagnosis, assisting with decisions about care choices, assessing treatments and/or guiding surgery or other interventions. Timely MRI and CT scans can improve the ability of doctors to accurately diagnose and treat many diseases earlier in their course, contributing greatly to positive outcomes.

MRI and CT scanning services are offered to patients who have been referred for a scan by a physician. Before a referral is made, patients can consult with their physician to select a hospital or independent health facility (IHF) based on various factors such as the closest location, wait times, distance the patient is willing to travel, and co-ordination of the scan with other tests or consultations. The referring physician completes a requisition and submits it to a hospital diagnostic imaging department or IHF. Before a booking is made, the requisition is assessed by radiologists, who determine the type of scan and assign the patient a priority level—emergency, urgent, semi-urgent and non-urgent. An appointment scheduler then books the patient into a predefined slot in the MRI or CT schedule based on the type of exam required (the part of the body scanned and other requirements to get a clear and usable image).

When patients arrive at the hospital or IHF, they must go through safety procedures with staff before a scan can proceed. The rest of the process includes every step required to examine the patient, study the images, and produce a report of clinical findings based on the images. The report

is sent to the referring physician. **Appendix 1** shows the major steps that a patient typically goes through from consulting his or her physician to receiving the result of a scan. **Appendix 2** lists some of the key similarities and differences in MRI imaging and CT imaging.

2.2 MRI Services

Magnetic resonance imaging (MRI) is a medical imaging technique used to visualize detailed internal structures using magnetic fields. MRI provides three-dimensional views of body organs, and is best used for producing images of soft tissues such as ligaments, tendons, organs and tumours. It also gives excellent visualization of heads, spines, muscles and joints.

2.2.1 Key Statistics Relating to MRI Scans Performed

The total number of MRI scans performed in Ontario hospitals increased by 17% over five years from 702,047 in 2013/14 to 824,805 in 2017/18. (This trend excludes emergency scans, because provincial data for these scans was not required to be collected in 2013/14 and 2014/15. In 2017/18, emergency scans represented only 1% of total MRI scans.) Advances in imaging technology have led physicians to increasingly rely on MRIs to diagnose

patients' conditions—for example, to diagnose cardiac events, screen for cancer, and examine high-risk individuals for breast cancer. The demand for follow-up scans to monitor patients for progression or remission of disease has also increased.

Figure 1 shows the number of MRI scans performed from 2013/14 to 2017/18. For the 2017/18 fiscal year, we also noted the following:

- 69% of MRI scans were performed for adult patients between 18 and 65 years of age, mainly under non-urgent conditions.
- The majority of MRI scans were performed on the head (31% of the total), the spine (25%) and the extremities—that is, the limbs (24%). The remaining 20% of MRI scans were performed in areas such as the abdomen, pelvis, breast, and the neck area.

2.2.2 Funding for MRI Scans

Each year, the Ministry provides a lump-sum payment (the “global budget”) to each hospital based on historical spending and inflation. It also provides additional funding for various programs, including MRI operations. As of March 2018, 52 of Ontario's 137 hospitals had a total of 108 MRI machines. The Ministry gave these hospitals \$157 million in 2017/18 to operate these machines, unchanged from the two previous years. This represents a 3% increase over 2013/14, when the hospitals received

Figure 1: Number of MRI Scans Performed in Hospitals, 2013/14–2017/18

Source of data: Cancer Care Ontario

Priority Level	2013/14	2014/15	2015/16	2016/17	2017/18	2013/14–	2017/18
						% Change	% of Total
Urgent	46,109	50,333	55,951	59,976	63,741	38	8
Semi-urgent	93,190	97,330	104,966	110,861	116,706	25	14
Non-urgent	562,748	587,752	606,468	637,127	644,358	15	77
Total Non-emergency	702,047	735,415	767,385	807,964	824,805	17	99
Emergency*	n/a	n/a	10,267	11,298	10,843	n/a	1
Total	n/a	n/a	777,652	819,262	835,648	n/a	100

* Wait-time data for emergency scans was not required to be collected for the years 2013/14 and 2014/15. Cancer Care Ontario does not have a mandate to validate wait times or volumes for emergency scans collected since 2015/16, because wait times for these scans are not publicly reported.

\$152 million. The Ministry provided one-time funding of \$7.3 million in 2017/18 and \$6.9 million in 2018/19 to hospitals specifically for urgent, semi-urgent, cancer screening and/or diagnosis, and high-risk breast cancer patients.

The Ministry does not provide capital funding for MRI machines. Instead, it funds hospitals' use of the machines mainly on the basis of predetermined hourly rates, as discussed in **Section 4.5**. To buy new machines or replace existing ones, hospitals use part of their internal capital budget and/or money from local fundraising. We discuss capital funding for MRI machines in **Section 4.7.2**. **Appendix 3** shows how these 108 MRI machines are allocated among the 52 hospitals that have them as well as the wait times at each hospital in 2017/18.

2.3 CT Scanning Services

Computed tomography (CT) uses x-ray photons to produce multiple images that are then digitally reconstructed. A CT scanner consists of an x-ray tube and detectors. The tube produces an x-ray beam that passes through the patient's body. The scan combines a series of x-ray images taken from different angles and uses a computer to create cross-sectional images (slices) of a patient's body. CT imaging is best used for the head, bones and areas where there is a lot of movement such as the chest and abdomen. As noted in **Section 2.2**, CT

scans are commonly used for the same body parts as MRI scans.

2.3.1 Key Statistics Relating to CT Scans Performed

The total number of CT scans performed in Ontario hospitals has increased by 31% over five years from 939,258 in 2013/14 to 1,234,131 in 2017/18, primarily resulting from advances in technology. (This trend excludes emergency scans, because provincial data for these scans was not required to be collected in 2013/14 and 2014/15. In 2017/18, emergency scans represented 31% of total CT scans.) For example, the Province has noted an increasing demand by specialists for CT scans to determine the initial state of suspected cancer cells in patients, and the stage of the disease, as well as an increasing number of follow-up scans for patients who need continuous monitoring for progression or remission of a disease.

Figure 2 shows the number of CT scans performed. For the 2017/18 fiscal year, we also noted the following:

- CT scans were performed almost equally for adult patients between 18 and 65 years of age and adults over 65 for all priority levels.
- 81% of CT scans were performed on the abdomen (30% of the total); brain (28%); and thorax (23%); the remaining 19% of CT

Figure 2: Number of CT Scans Performed in Hospitals, 2013/14–2017/18

Source of data: Cancer Care Ontario

Priority Level	2013/14	2014/15	2015/16	2016/17	2017/18	2013/14–	2017/18
						% Change	% of Total
Urgent	228,786	256,316	283,810	343,888	365,120	60	20
Semi-urgent	254,033	266,425	267,192	289,990	313,604	23	18
Non-urgent	456,439	473,133	507,562	544,465	555,407	22	31
Total Non-emergency	939,258	995,874	1,058,564	1,178,343	1,234,131	31	69
Emergency*	n/a	n/a	341,496	495,604	556,131	n/a	31
Total	n/a	n/a	1,400,060	1,673,947	1,790,262	n/a	100

* Wait-time data for emergency scans was not required to be collected for the years 2013/14 and 2014/15. Cancer Care Ontario does not have a mandate to validate wait times or volumes for emergency scans collected since 2015/16, because wait times for these scans are not publicly reported.

scans were performed in areas such as the head and neck, the spine and the pelvis.

2.3.2 Funding for CT Scans

In addition to the lump-sum payment (the “global budget”) the Ministry provides to each hospital, based on historical spending and inflation, it also provides additional funding for CT operations and other programs. As of March 2018, 78 Ontario hospitals had a total of 165 CT machines; historically, each year the Ministry has been giving these hospitals a total of about \$9 million supplementary funding to operate the machines. The Ministry considers the \$9 million to be supplementary funding because it expects hospitals to operate their CT machines out of their global budgets. **Appendix 4** shows how these 165 CT machines are allocated among the 78 hospitals in Ontario and the wait times at each hospital for 2017/18.

2.4 Wait-Time Targets

The Ministry defines wait time as the time “from when a hospital receives the request from the patient’s doctor to book an MRI or a CT scan to the patient having the scan.” We illustrate the patient’s journey, including wait time, in **Appendix 1**.

To prioritize access to MRI and CT scanning services, based on advice from clinical experts, the Ministry has categorized patients into four levels: emergency (Priority 1), urgent (Priority 2), semi-urgent (Priority 3), and non-urgent (Priority 4). Radiologists in hospitals use these categories to triage and classify patients based on the urgency of their need to receive a scan.

In 2005/06, as part of Ontario’s Wait Time Strategy, based on advice from clinical experts, the Ministry established wait-time targets for each of the priority levels for both MRI and CT scanning services, as shown in **Figure 3**. The Ministry target is set for the 90th percentile. This means that 90% of patients should receive their scans within the targets set by the Ministry, and no more than 10% should wait any longer.

Hospitals are required to capture and submit MRI and CT data for both adult and pediatric patients to Cancer Care Ontario (CCO) regularly. Hospital-level MRI and CT wait-time data had been publicly reported on the Ministry’s website until December 2017. Since then, the wait-time data has been published on the Health Quality Ontario website.

The wait times reported publicly on Health Quality Ontario’s website are based on the average (mean) of the wait times measured as well as the percentage scanned within the Ministry target for

Figure 3: Priority Level Definitions* and Provincial Wait-Time Targets for MRI and CT Scan Services in Ontario

Source: Ministry of Health and Long-Term Care

Patient Category	Clinical Description	Type of Patient	Provincial Wait-Time Target
	<i>Any condition in which failure to diagnose and initiate treatment would result in:</i>		
Emergency (Priority 1)	serious morbidity or mortality e.g., spinal cord compression	ER patients, in-patients	within 24 hours
Urgent (Priority 2)	significant deterioration e.g., suspected epidural abscess	ER patients, in-patients, very urgent out-patients	within 2 days
Semi-urgent (Priority 3)	moderate deterioration e.g., cancer staging	urgent outpatients	within 10 days
Non-urgent (Priority 4)	minimal deterioration e.g., chronic dizziness/hearing loss	outpatients	within 28 days

* Priority levels and target times for waiting for diagnostic imaging services in Ontario are developed by clinical experts across the province to guide treatment decisions and manage patient access and outcomes.

each individual priority level and for all priorities combined. **Appendix 5** explains the various methods used by Cancer Care Ontario to measure wait times and describes the advantages and disadvantages of these methods; it also explains the method of measuring real-time wait times, which we discuss in **Section 4.6**. As the Ministry targets are set at the 90th percentile, we have selected this measure to report wait times in our audit report.

2.5 Key Players in the Diagnostic Imaging Sector

The following are the key players in diagnostic imaging sector in Ontario:

Ministry of Health and Long-Term Care (Ministry)

The Ministry is responsible for capacity planning, policy development, and overseeing operating funding and performance of MRI and CT scanning services in Ontario. It provides leadership and management direction in operational and policy initiatives, and through its responsibility for Ontario's hospitals. The Ministry and Local Health Integration Networks (LHINs) sign the Ministry–LHIN Accountability Agreement, which outlines their mutual responsibilities. The Ministry has legislative oversight over hospitals' compliance with the *Healing Arts Radiation Protection Act, 1990* and other laws. This act oversees the use of certain diagnostic imaging equipment, including x-ray and CT machines, but not MRI machines because MRI machines do not expose people to radiation. As of August 2018, the *Oversight of Health Facilities and Devices Act, 2017*, which expanded the Ministry's oversight for MRIs, had passed. This act was not yet in force when we completed our audit. The Ministry has also licensed seven independent health facilities to provide MRI and CT scanning services under the *Independent Health Facilities Act, 1990*, further discussed in **Section 4.12**.

Local Health Integration Networks (LHINs)

LHINs are responsible for transferring global funding as well as specific operating funding for MRI and CT scans from the Ministry to hospitals within their regions. They review and submit business cases to the Ministry for its approval for operating funding in relation to new machines in hospitals. The LHINs monitor hospital wait-time and efficiency data. LHINs sign Hospital Service Accountability Agreements with their hospitals, which outline their mutual responsibilities.

Cancer Care Ontario (CCO)

CCO is a provincial agency with a mandate, among others, to collect and report wait-time and efficiency data relevant to MRI and CT scanning services. Its Diagnostic Imaging Advisory Committee suggests ways to address wait-time issues and guide program strategy and priorities. CCO validates the data submitted by hospitals before it provides the information to Health Quality Ontario for public reporting.

Ontario Hospitals

Hospitals are responsible for procuring and managing MRI and CT machines as well as scheduling, managing and providing safe scanning services within their operations. Radiologists who work in hospitals assign priority levels to incoming referrals, and interpret and share imaging results with the physicians who refer their patients for imaging. Hospitals are required to report relevant wait-time and other efficiency data, such as the patient no-show rates we discuss in **Section 4.9**, to Cancer Care Ontario regularly.

3.0 Audit Objective and Scope

Our audit objective was to assess whether Ontario hospitals, working with the Ministry of Health and Long-Term Care (Ministry), Cancer Care Ontario

(CCO) and their respective Local Health Integration Networks (LHINs), have effective policies and procedures in place to:

- ensure that magnetic resonance imaging (MRI) and computed tomography (CT) scanning services are provided in a timely, safe, equitable, appropriate and cost-effective manner to meet Ontarians' needs in accordance with applicable standards, clinical guidelines and legislation; and
- measure and publicly report periodically on the results and effectiveness of MRI and CT scanning services in meeting patients' clinical needs.

Before starting our work, we identified the audit criteria we would use to address our audit objective. These criteria were established based on a review of applicable legislation, policies and procedures, and internal and external studies. Senior management at the Ministry, CCO, the four hospitals where we did detailed audit work (the Ottawa Hospital, Health Sciences North, St. Joseph's Healthcare Hamilton and Mackenzie Health) and their respective LHINs (Champlain, North East, Hamilton Niagara Haldimand Brant, and Central) reviewed and agreed with our objective and associated criteria as listed in **Appendix 6**.

Our audit work was conducted primarily at CCO and the four hospitals where we conducted audit work from January to July 2018. We obtained written representation from the Ministry, CCO, the four hospitals and their respective LHINs that, effective November 9, 2018, they have provided us with all the information they are aware of that could significantly affect the findings of this report. We interviewed senior management and appropriate staff, and examined related data and documentation at the Ministry, CCO, the four hospitals and their respective LHINs.

To obtain a better understanding of the unique challenges faced by other hospitals in delivering MRI and CT services, we also visited five other hospitals (see **Appendices 3** and **4**), interviewed their

senior management and obtained relevant information. We based our selection of these hospitals on factors including wait times, number and age of machines, number of scans performed, geographical location, hospital type and other observations we made throughout our audit that prompted further examination.

The majority of our file review went back three to five years, with some funding trend analysis going back 10 years. We reviewed relevant research from Ontario and other Canadian provinces, as well as foreign jurisdictions.

We also obtained and reviewed relevant information from the Ministry on the seven independent health facilities (discussed in **Section 4.9**) that are funded by the Province to operate MRI and/or CT scanning services in Ontario.

We talked to representatives from stakeholder groups, including Health Quality Ontario, the Ontario Association of Radiologists and the Canadian Association of Radiologists, to gain their perspectives on diagnostic imaging with regard to MRI and CT scanning services in particular.

We engaged an expert advisor with medical background and expertise in assessing the efficiency of government-funded services such as MRI and CT scanning services.

We did not rely on the work of internal audit, as it has not conducted any recent work related to MRI and CT scanning services.

Finally, we considered the relevant issues reported in our 2006 audits "Hospitals—Management and Use of Diagnostic Imaging Equipment" and "Hospitals—Administration of Medical Equipment"; our 2012 audit "Independent Health Facilities" and our 2017 audit "Cancer Treatment Services."

We conducted our work and reported on the results of our examination in accordance with the applicable Canadian Standards on Assurance Engagements—Direct Engagements issued by the Auditing and Assurance Standards Board of the Chartered Professional Accountants of Canada. This included obtaining a reasonable level of assurance.

The Office of the Auditor General of Ontario applies the Canadian Standards of Quality Control and, as a result, maintains a comprehensive quality control system that includes documented policies and procedures with respect to compliance with rules of professional conduct, professional standards and applicable legal and regulatory requirements.

We have complied with the independence and other ethical requirements of the Code of Professional Conduct of the Canadian Professional Accountants of Ontario, which are founded on fundamental principles of integrity, objectivity, professional competence and due care, confidentiality and professional behaviour.

4.0 Detailed Audit Observations

4.1 65% of MRI Patients and 33% of CT Patients Had Long Waits for Their Scans, in Excess of the Ministry's Targets for Semi-urgent and Non-urgent Priority Patients

Our audit found that while Ontario hospitals were mostly able to provide timely services to patients who required either an emergency or urgent MRI or CT scan, they were unable to do so for semi-urgent and non-urgent patients. The Ministry's target for providing emergency scans is 24 hours, and its target for urgent scans is two days. The targets for semi-urgent and non-urgent scans are 10 days and 28 days, respectively.

The Ministry has set its target for the 90th percentile. This means that 90% of patients should receive their scans within target, and no more than 10% should wait longer than that. For semi-urgent and non-urgent patients, however, far greater percentages than 10% waited longer than 10 and 28 days, according to statistics compiled by Cancer Care Ontario.

- **MRI scans:** For emergency patients, only 5% waited longer than 24 hours. For urgent patients, 17% waited longer than two days (up to five days). Semi-urgent and non-urgent patients accounted for 91% of the total MRI scans in 2017/18. Overall, only 35%, not 90%, of semi-urgent and non-urgent patients received MRI scans within the Ministry's targets of 10 days and 28 days, respectively. The remaining 65%, not 10%, waited longer than these targets (see **Figure 7**).
- **CT scans:** For emergency patients, less than 1% waited longer than 24 hours. For urgent patients, 4% waited longer than two days (up to four days). Semi-urgent and non-urgent patients accounted for about 49% of the total CT scans in 2017/18. Only 67%, not 90%, of semi-urgent and non-urgent patients received CT scans within the Ministry's 10-day and 28-day targets for these two groups. The remaining 33% of patients, not 10%, waited longer (see **Figure 9**).

In our hospital visits, we noted that the percentage of patients scanned within target (especially patients requiring non-urgent scans) was strongly influenced by anomalies in the wait-list system. For example, when patients cancelled a confirmed scheduled appointment, other patients who were still waiting for a scan were often able to jump the queue and have their scan performed sooner—even though many were not the highest priority patients on the wait list.

Hospital staff we spoke to about this specific issue at three of the four hospitals that otherwise reported high wait times informed us that these patients formed a large percentage of the patients scanned within target. As a result, the percentage of patients scanned within target (28 days for non-urgent patients) as disclosed by these hospitals often skewed both the average and 90th percentile calculations reported by the Ministry. We discuss more appropriate and useful reporting methods in **Section 4.6**.

Even though these patients have been classified below the urgent level by radiologists, long wait times delay the diagnosis and treatment of their conditions and can affect their quality of life (for example, delaying their return to work or school); in some cases, the delay can result in deterioration of a patient's condition and extra cost to the health-care system. During our audit, we noted the following:

- A patient wrote to the then Minister of Health and Long-Term Care in early 2018 about his own case and the consequences of the delay in scheduling an appointment. The patient was assessed as non-urgent and put into a long wait list for seven months. However, during the long wait, the patient was hospitalized for a surgery that in the patient's opinion "[was] for a condition that might have been caught by that CT scan." The patient further stated that "I was in hospital care for two months with at least three medical teams attending to me (I am still not recovered). We can imagine the cost to the taxpayer let alone the damage perpetrated against the patient. According to my surgeon, I came within a half-inch ... of losing my leg. All of this might have been obviated by a correctly scheduled medical image..."
- We noted another example where a neurologist who has extensive experience with the health sector expressed concerns about wait-time problems in general:
 - "For routine studies [meaning non-urgent scans], we have seen considerable wait times.... For some MRI requests we have been given wait times of over 6 months for routine studies. Although these studies may not be urgent, this delay creates anxiety for our patients over protracted periods of time. Even if the neurologist doesn't think there is a tumor or multiple sclerosis, the patient may—and will agonize over this daily for 6+ months."
 - "Another issue is that some eventually diagnosed pathologies may have been better addressed months earlier. For example, an imaging scan for dementia may seem routine but if prominent vascular pathology is identified, more urgent stroke prevention may be warranted. If a tumor is identified, it would likely have been better addressed 6 months earlier."
 - "I am also concerned that the wait time creates waste. For example, if there is a prolonged wait for MRI, an interim CT scan may be ordered to ensure there isn't gross pathology but the MRI will still be needed so extra resources are consumed."

Many of the physicians and hospital staff we interviewed echoed these viewpoints.

Long wait times also introduce an unnecessary element of uncertainty into Ontario's health-care system. The wait for a scan is a bottleneck in the patient's progress through the system: decisions on further treatment often have to wait until the scan is completed and interpreted. As a complex system that consists of many interacting parts, Ontario's health-care system requires predictability to plan its actions and direct its resources most efficiently.

4.1.1 Ontarians Experienced the Lowest Wait Time among Five Other Provinces

Although patients in Ontario waited longer than the provincial targets for both MRI and CT scans, Ontario's wait times for both scans were among the lowest compared to five other provinces where the 90th percentile data was most recently available. We show the data compiled by the Canadian Institute for Health Information (CIHI) for the period between April and September 2016, and for the same period in 2017, in **Figures 4** and **5**. (CIHI's reports do not include data from British Columbia and Quebec, which was not publicly available.)

In addition, the Canadian Agency for Drugs and Technologies in Health reported that in 2017, Ontario performed a relatively high number of

Figure 4: Comparison of Selected Provincial Wait Times for MRI Scans, April–September, 2016, and April–September, 2017

Source: Canadian Institute for Health Information

Province	Wait Time (Days)	
	April–September, 2016	April–September, 2017
Ontario	99	96
Saskatchewan	208	174
Manitoba	176	205
PEI	181	231
Nova Scotia	203	241
Alberta	242	277

Notes:

- Wait times are measured as the maximum amount of time in which 90% of patients have received their MRI scans.
- Provinces shown are those for which comparable data was available.

MRI and CT examinations per 1,000 population compared to other provinces in Canada, as shown in **Appendix 7**. We also noted that Ontario has set more ambitious and potentially harder to attain wait-time targets than other provinces and the Canadian Association of Radiologists have set; these are shown in **Appendix 8**.

4.1.2 MRIs: Many Patients Had Long Waits for Semi-urgent and Non-urgent Scans

Semi-urgent and non-urgent scans made up 91% of the total MRI volume in 2017/18. That same year, 61% of semi-urgent patients received their scans within target (10 days); 29% waited between 11 and 34 days; and 10% waited more than 34 days.

As non-urgent patients waited the longest to receive their MRI scans, in **Figure 6** we have shown wait times for these patients for 2017/18, with the number and percentage of patients and their wait times stated in day ranges.

As the Ministry sets its target at the 90th percentile, we have assessed the Ministry's progress toward this target. **Figure 7** shows the 90th percentile wait-time trend over the last five years for semi-urgent and non-urgent MRI requests,

Figure 5: Comparison of Selected Provincial Wait Times for CT Scans, April–September, 2016, and April–September, 2017

Source: Canadian Institute for Health Information

Province	Wait Time (Days)	
	April–September, 2016	April–September, 2017
Ontario	41	35
Manitoba	46	49
Saskatchewan	61	55
Nova Scotia	77	92
Alberta	92	110
PEI	71	113

Notes:

- Wait times are measured as the maximum amount of time in which 90% of patients have received their CT scans.
- Provinces shown are those for which comparable data was available.

and compares it to the wait-time targets set by the Province as well as the targets recommended by the Canadian Association of Radiologists.

We noted that, on an annual basis, hospitals consistently performed a lower number of scans than the number of incoming requisitions during a year. As a result, an increasing backlog of outstanding scan requests increased by 63% from 85,021 as of April 1, 2014, to 138,197 as of April 1, 2018, which led to the long waits. Many factors contributed to the increasing backlog:

- Technological advances in imaging equipment have contributed to increased demand. Physicians are increasingly relying on MRI imaging for purposes such as diagnosing cardiac events, providing care for cancer patients, and screening high-risk individuals for breast cancer.
- Increasing numbers of follow-up scans for patients who need continuous monitoring for progression or remission of disease (such as cancer) drive up the demand year after year. From 2013/14 to 2017/18, the demand for follow-up scans increased by 46%, compared to only 14% for initial or one-time scans and other types of scans.

Figure 6: MRI Wait Times for Non-urgent Patients, 2017/18

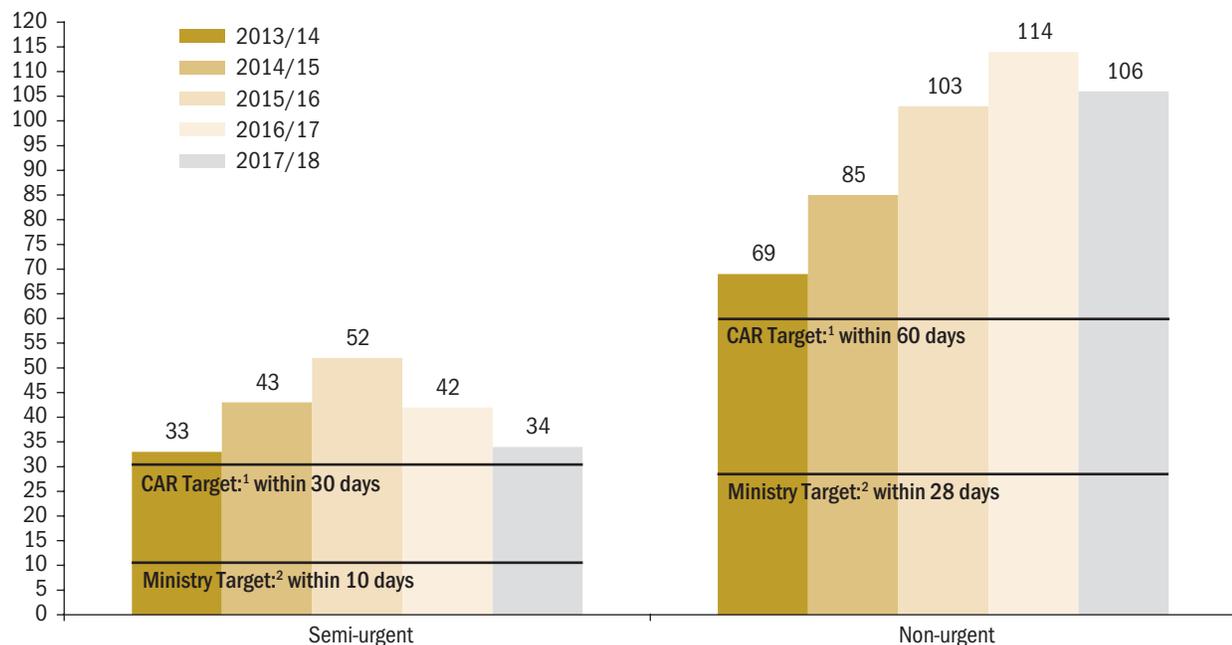
Source of data: Cancer Care Ontario

	Wait Time within Target (Days)	Wait Time in Excess of Target (Days)				Total
	0-28	29-60	61-90	91-150	151-240+	
# of Scans Performed*	171,099	203,044	108,733	60,775	18,790	562,441
(%)	30	36	19	11	4	100

* Number of scans performed excludes patients who received follow-up scans.

Figure 7: Wait Times for MRI Scan for Semi-urgent and Non-urgent Patients, 2013/14–2017/18 (Days)

Source of data: Cancer Care Ontario



1. Target recommended by the Canadian Association of Radiologists (CAR).

2. Ministry's wait times measured as the maximum amount of time in which nine of 10 patients have received their MRI scans.

- Imaging equipment is not operating sufficient hours to meet patient demand (discussed in **Section 4.4**).

In 2017/18, the Ministry funded the hospitals with an additional one-time funding of \$7.3 million. This additional funding contributed to shorter wait times of MRI scans for urgent, semi-urgent, cancer, and high-risk Ontario Breast Screening Program patients by 20% to 32% (or between one and 42 days).

4.1.3 CTs: Some Patients Had Long Waits for Semi-urgent and Non-urgent Scans

As with MRI scans, the Ministry sets its target for CT scans at the 90th percentile. This means that 90% of patients should receive their CT scans within 10 days for semi-urgent patients and within 28 days for non-urgent patients, and no more than 10% should wait any longer.

We noted that wait times for patients requiring CT scans are shorter than for MRI scans. The main reason for this is that the time needed to perform a

Figure 8: CT Wait Times for Non-urgent Patients, 2017/18

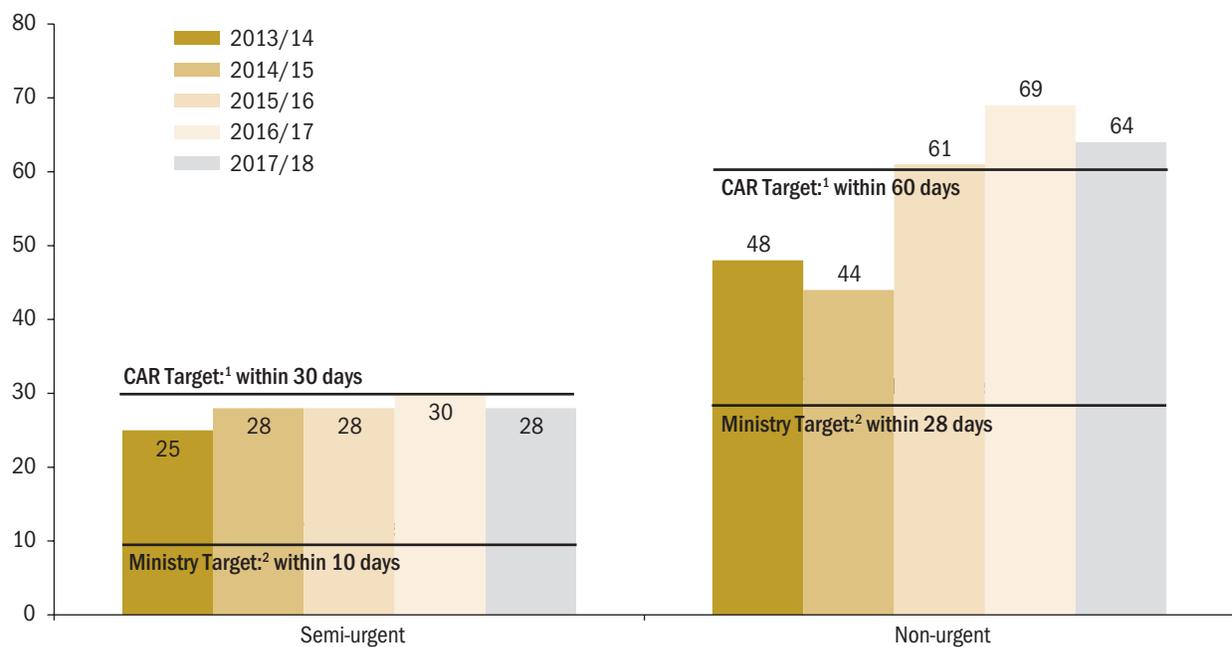
Source of data: Cancer Care Ontario

	Wait Time within Target (Days)	Wait Time in Excess of Target (Days)				Total
	0-28	29-60	61-90	91-150	151-240+	
# of Scans Performed*	259,099	76,308	23,540	12,488	6,139	377,574
%	69	20	6	3	2	100

* Number of scans performed excludes patients who received follow-up scans.

Figure 9: Wait Times for CT Scans for Semi-urgent and Non-urgent Patients, 2013/14–2017/18 (Days)

Source of data: Cancer Care Ontario



1. Target recommended by the Canadian Association of Radiologists (CAR).

2. Ministry's wait times measured as the maximum amount of time in which nine of 10 patients have received their CT scans.

CT scan is much less; CT scans take a few minutes, while MRI scans can take from 20 minutes to more than an hour.

Also, CT scans are often used in emergency cases to quickly examine patients who may have internal injuries or other types of trauma. These rapid examinations often reveal internal injuries and/or bleeding quickly enough to help save lives. These patients are at the highest priority level and are scanned within the Ministry target of 24 hours. This partly explains why semi-urgent and non-urgent

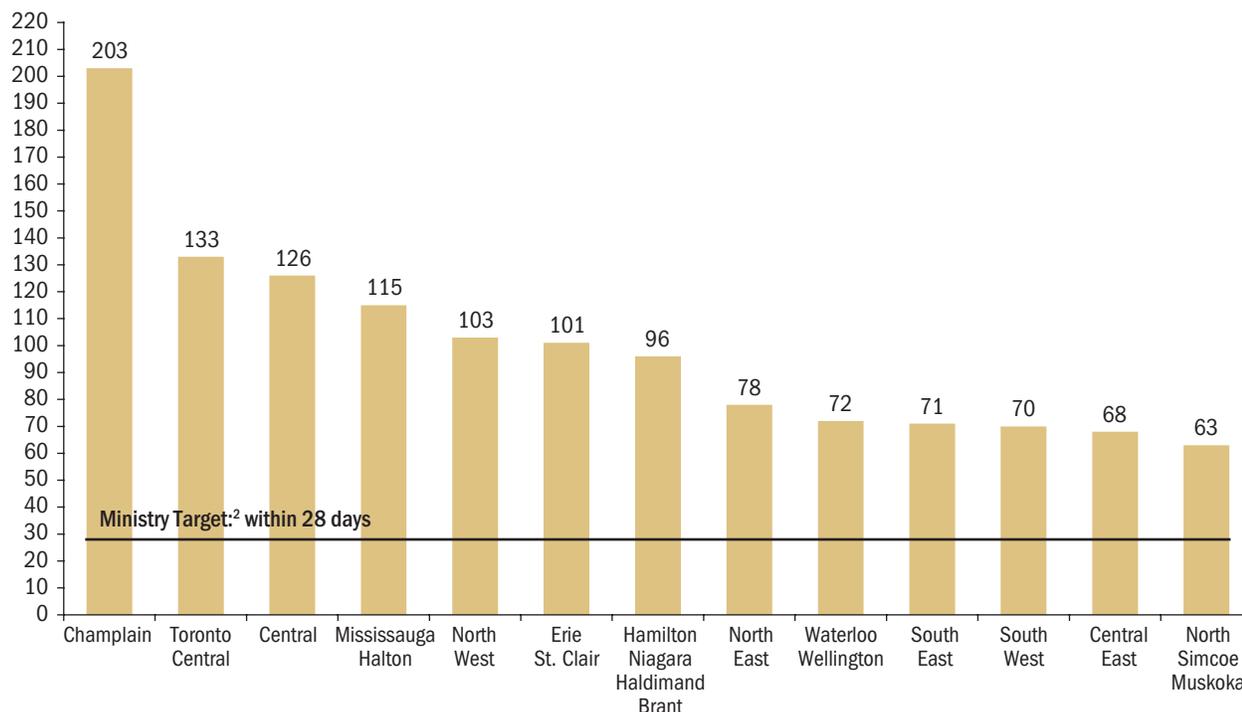
patients made up only 49% of total CT requests in 2017/18, compared to 91% for MRI requests.

As non-urgent patients waited the longest to receive their CT scans, in **Figure 8** we have shown the number and percentage of scans performed on these patients in 2017/18, with wait times stated in day ranges.

Since the Ministry sets its target at the 90th percentile, once again we have assessed its progress by showing the 90th percentile wait-time trend for semi-urgent and non-urgent patients. **Figure 9**

Figure 10: MRI Wait Times for Non-urgent Patients, by Local Health Integration Network (LHIN),¹ 2017/18 (Days)

Source of data: Cancer Care Ontario



1. Central West LHIN has one hospital which operates four MRI machines. This hospital's data contained significant inaccuracies due to a system implementation issue, and therefore the information has not been published by the Ministry of Health and Long-Term Care on the Health Quality Ontario website and is not included in this figure.

2. Wait times are measured as the maximum amount of time in which 90% of patients have received their MRI scans.

shows the wait-time trend for CT scans for these patients over the last five years and compares it to the targets set by the Ministry as well as the targets recommended by the Canadian Association of Radiologists.

The reasons for the long waits for CT scans are similar to what we see with MRI scans. The main reasons are the backlog of patients waiting to be scanned, the constantly rising demand resulting from advances in the technology and the machines' capabilities, and the increase in the number of follow-up scans for patients who need continuous monitoring.

We discuss wait-time issues from different perspectives in the sections that follow.

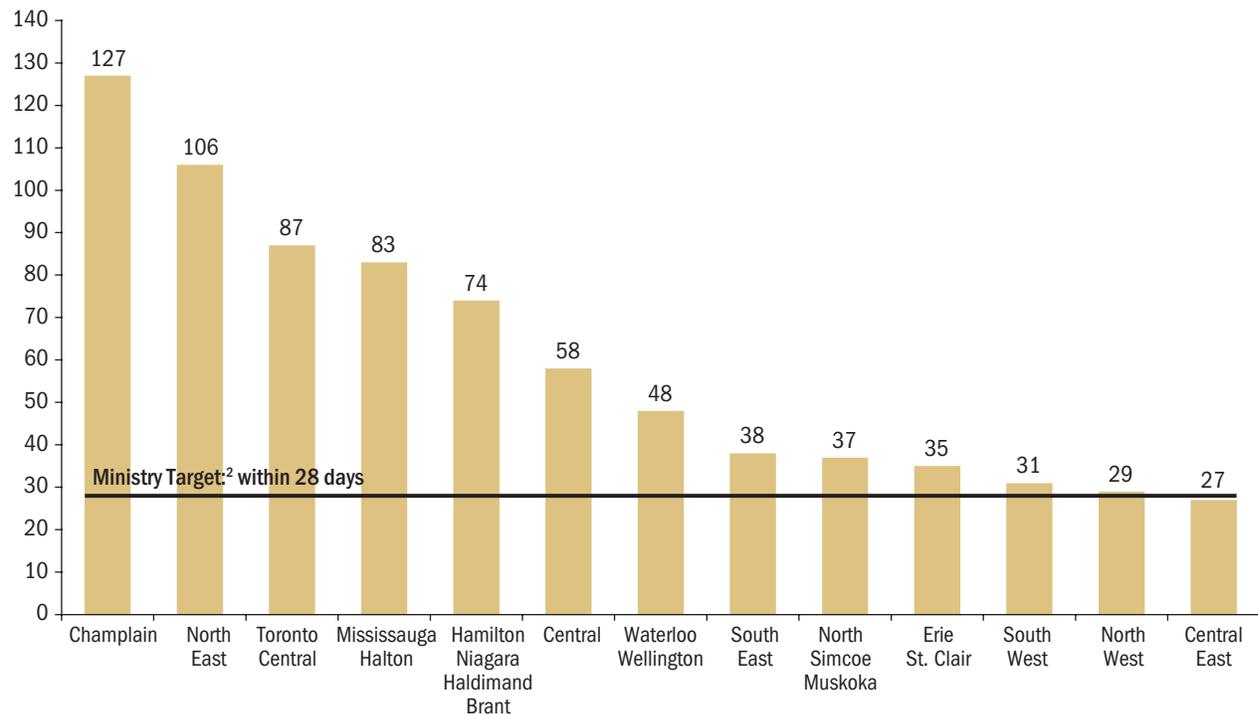
4.2 Wait Times for Scans Vary Depending on Where Patients Live

Our audit found that wait times for MRI and CT scans varied significantly depending on where patients live. The disparity for non-urgent patients was the most significant. **Figure 10** shows the MRI wait times for non-urgent patients by LHIN in 2017/18; **Figure 11** shows the corresponding CT wait times.

Cancer Care Ontario collects information on wait times at the LHIN level, including total number and type of scans performed, type of hospital, use by patients from outside the LHIN, number of MRI and/or CT machines, and length of time machines are run. The Ministry has not used this data, however, to analyze the reasons for the significant differences in wait times among LHINs that may result in inequitable experiences in the health-care system for patients living in different regions.

Figure 11: CT Wait Times for Non-urgent Patients, by Local Health Integration Network (LHIN),¹ 2017/18 (Days)

Source of data: Cancer Care Ontario



1. Central West LHIN has two hospitals of which one operates six CT machines. This hospital's data had significant inaccuracies due to a system implementation issue, and therefore the information has not been published by the Ministry of Health and Long-Term Care on the Health Quality Ontario website and is not included in this figure.

2. Wait times are measured as the maximum amount of time in which 90% of patients have received their CT scans.

4.2.1 MRI Scans

We noted that the Champlain, Toronto Central and Central LHINs have relatively higher MRI wait times for non-urgent patients than other LHINs. These three LHINs had unique challenges that drove up their wait times:

- Champlain LHIN serves the fourth highest population in Ontario (approximately 1.3 million as of July 2017). Outside of the University Health Network, Ottawa Hospital in Champlain LHIN is Ontario's largest teaching or academic hospital and provides the highest number of MRI scans (approximately 36,000 in 2017/18); it is also the only teaching hospital performing complex scans within this LHIN. The other two teaching hospitals in Champlain LHIN serve specific populations: pediatric patients at the Children's Hospital

of Eastern Ontario, and francophone patients at l'Hôpital Montfort. With the exception of these two, the nearest teaching hospital in Ontario is Kingston Health Sciences Centre in South East LHIN, 195 kilometres away. Hence, the wait times at Ottawa Hospital have driven up the overall wait times for its LHIN. **Section 4.3** further discusses wait times in teaching hospitals.

- In Toronto Central LHIN, 58% of the patients its hospitals served were from outside the LHIN. In particular, Sunnybrook Hospital and the University Health Network offer specialized MRI services to patients across the province: Sunnybrook is the largest single-site critical care resource in Ontario and one of the largest regional trauma and oncology centres. University Health Network is a well-known research centre, attracting physician

referrals for MRI scans in complex and specialized cases.

- Central LHIN serves the highest population in the province (approximately 1.9 million as of July 2017); in addition, 28% of the patients it served were from outside this LHIN.

North Simcoe Muskoka LHIN, with the second lowest population density in the province, had the shortest wait times for MRI scans.

4.2.2 CT Scans

We noted that, for CT scans, Champlain, North East and Toronto Central LHINs have relatively higher wait times for non-urgent patients than other LHINs. The reasons are similar to those explained for MRI scans in the previous section. In addition, North East LHIN has only one teaching hospital performing 35% of all emergency and urgent scans, therefore driving up the wait times overall for this LHIN. In 2017, as requested by the Ministry, CCO analyzed whether additional CT machines are required in the North East and North West LHINs and recommended three potential areas where patients who were travelling over 100 kilometres could benefit from a mobile CT machine. As of August 2018, the Ministry had not made a decision whether to install a new machine in these areas.

RECOMMENDATION 1

To help ensure patients have equitable access to MRI and CT services across the province, we recommend that the Ministry of Health and Long-Term Care work with Local Health Integration Networks (LHINs) and hospitals to:

- analyze and identify the reasons why wait times vary significantly between LHINs:
 - for MRI services; and
 - for CT services; and
- take necessary actions to reduce the wait-time inequities across the province:
 - for MRI services; and
 - for CT services.

MINISTRY RESPONSE

The Ministry of Health and Long-Term Care supports this recommendation and will work with LHINs, hospitals and clinical experts to determine the causes of local and regional variations in wait times for MRI and CT services and take necessary action to address any inequities.

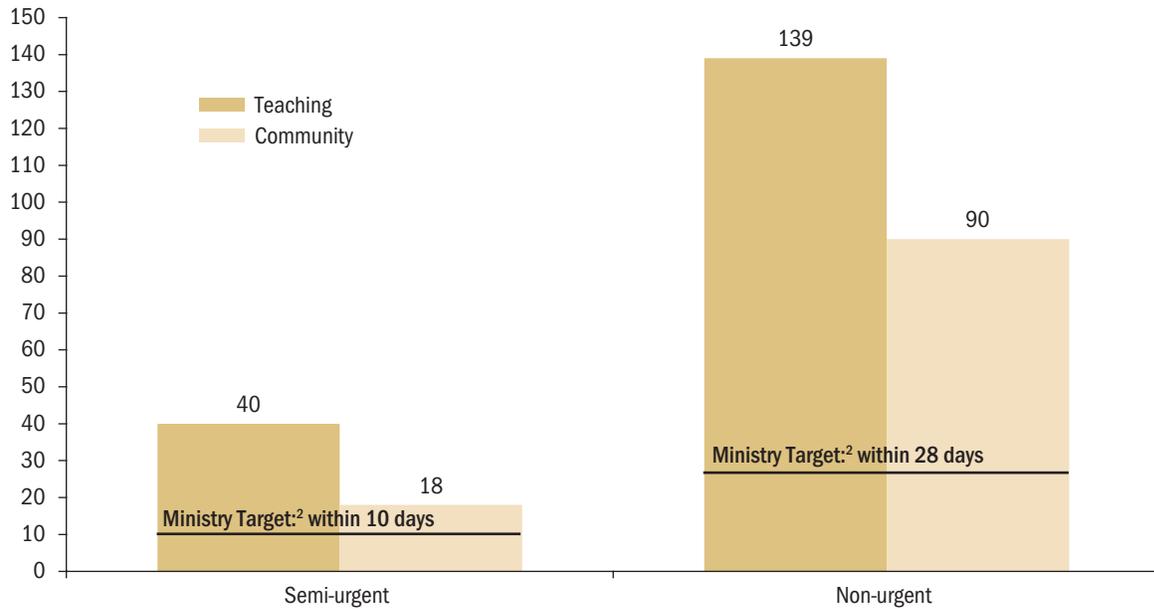
4.3 Patients in Teaching Hospitals Wait Significantly Longer for Scans than Those in Community Hospitals

Patients classified as semi-urgent or non-urgent had to wait significantly longer for their scans in teaching hospitals than those waiting in community hospitals. **Figure 12** shows the MRI wait times for semi-urgent and non-urgent patients at teaching versus community hospitals; **Figure 13** shows the corresponding CT wait times. The reasons for the long waits in teaching hospitals include the following:

- Referring physicians or the patients themselves may prefer to have a scan done and interpreted at a teaching hospital because of a perception that teaching hospitals have better quality of care even for semi-urgent or non-urgent cases. Radiologists at the four hospitals where we conducted audit work primarily read and interpret scans performed in their own hospital. However, we did not note any significant issues among radiologists at teaching hospitals associated with reading and interpreting scans performed at other hospitals, if that creates efficiencies.
- Teaching hospitals have the expertise to scan, interpret and diagnose complex and specialized patient cases, and therefore they receive a high number of referrals. Particularly for MRI scans, the complex scans (specialized by body part) that teaching hospitals specialize in generally require more time for each scan, leaving less time

Figure 12: MRI Wait Times for Semi-urgent and Non-urgent Patients, Teaching vs Community Hospitals,¹ 2017/18 (Days)

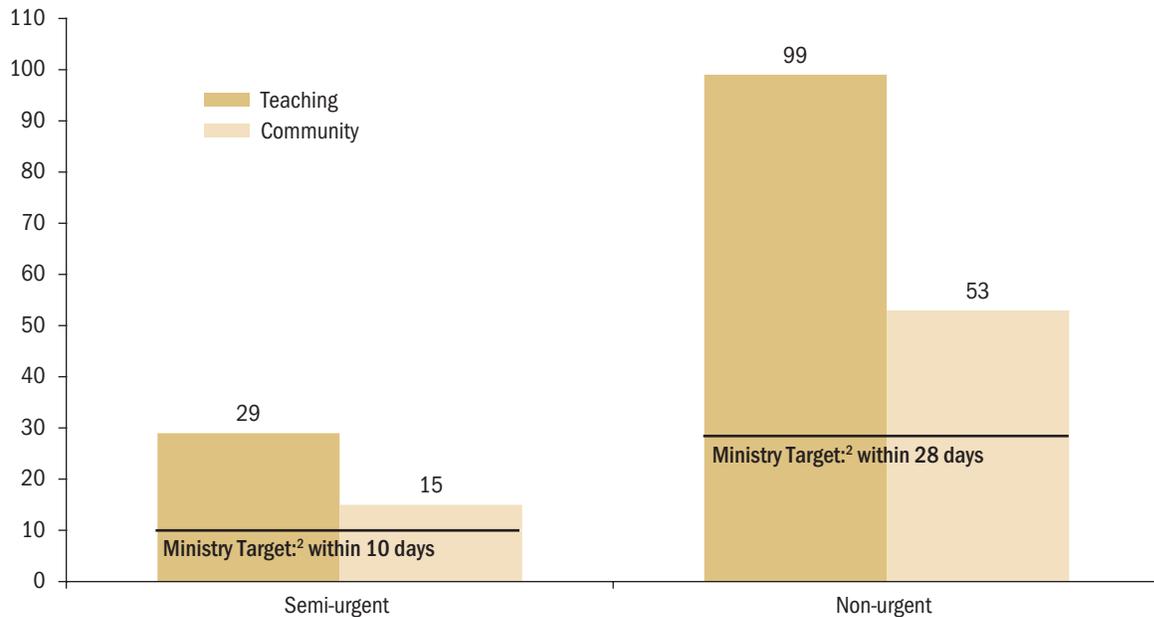
Source of data: Cancer Care Ontario



1. Of the hospitals with MRI machines, 18 were teaching hospitals and 34 community hospitals.
2. Wait times are measured as the maximum amount of time in which 90% of patients have received their MRI scans.

Figure 13: CT Wait Times for Semi-urgent and Non-urgent Patients, Teaching vs Community Hospitals,¹ 2017/18 (Days)

Source of data: Cancer Care Ontario



1. Of the hospitals with CT machines, 18 were teaching hospitals and 60 community hospitals.
2. Wait times are measured as the maximum amount of time in which 90% of patients have received their CT scans.

and fewer resources for less complex scans. (Complex scans are defined as scans that are performed on emergency, urgent and/or in-patients, patients requiring general anaesthesia before the scan can be performed or patients whose scans are expected to take longer than 60 minutes.) As a result, other patients scheduled for scans may find themselves on a long wait list. We compared the percentages of complex scans performed in teaching and community hospitals and noted that teaching hospitals performed more than double those performed by community hospitals.

- For CT scans, teaching hospitals performed on average about double the number of emergency scans performed by community hospitals (11,000 scans compared to 6,000 scans). The higher number of emergency scans may leave less machine time for other priority levels, resulting in high wait times for these other patients. Emergency scans comprised more than 30% of total CT scans performed in 2017/18.

Ontario places no restriction on where a patient can obtain a scan. It also has no standard or set of consistent practices in place to process and distribute physician referrals for MRI or CT scans among hospitals, especially for semi-urgent and non-urgent cases. As a result, semi-urgent and non-urgent cases are frequently referred to teaching hospitals, where these patients are assigned low priority and have significantly long wait times. Conversely, some physicians refer their patients to community hospitals with lower wait times so their scans can be performed earlier than in a teaching hospital. However, one specialist cautioned that this may pose a risk if complex scans are not interpreted by specialized physicians with the required expertise, most often found in teaching hospitals.

We noted that hospitals in Champlain LHIN were working with the LHIN to establish a centralized intake system for scans to allocate demand equitably among the hospitals, with a tentative

implementation date by fall 2019. The intent of this system would be to distribute non-urgent cases among hospitals within the same LHIN, reducing the long waits in some of the LHIN's hospitals.

Waterloo Wellington LHIN was also working on an e-referral system.

RECOMMENDATION 2

To help ensure timely and equitable access for semi-urgent and non-urgent MRI and CT services, we recommend that Local Health Integration Networks (LHINs) continue to work with hospitals to:

- offer referring physicians and patients the option of having scans performed in hospitals with lower wait times, and having the results interpreted with guidance from specialized radiologists and physicians in teaching hospitals, where needed:
 - for MRI services; and
 - for CT services; and
- where applicable, redistribute the incoming referrals between teaching and community hospitals within a LHIN by using an effective tool such as a centralized intake or referral process:
 - for MRI services; and
 - for CT services.

RESPONSE FROM LHINS

The LHINs acknowledge the benefit of streamlining referral processes and commit to work with hospitals and physicians to explore solutions such as centralized intake, offering alternative referral options, and/or developing common tools. The LHINs recognize such strategies should be co-ordinated with other initiatives to more effectively improve wait times. The specific strategies explored may vary across the province to reflect differences in populations, geographies, and clinical and financial resources that exist within LHINs.

4.4 Patients Wait Unnecessarily Long for Scans Because Machines Are Not Operating Sufficient Hours despite Available Capacity

We found that existing MRI and CT machines could be used for more hours per week, thereby reducing wait times, but the hospitals were financially unable to increase their operating hours for these machines to meet patient demand.

The Ministry's MRI and CT Expert Panel (Panel) stated in 2005 that these machines should meet efficiency standards and operate extended hours to minimize the fixed cost per exam. The Panel recommended a minimum standard for MRI and CT operations at 16 hours a day, seven days a week. We noted that if all 108 MRI and 165 CT machines in the province followed the Panel's recommendation, hospitals would have been able to outperform the Ministry's wait-time targets, as explained in **Sections 4.4.1 and 4.4.2.**

4.4.1 MRI Scans

Between 2013/14 and 2017/18, the Ministry's annual funding for MRI operations increased by about 3%, from \$152 million to \$157 million. Staff at two of the four hospitals where we conducted audit work informed us that they used part of their global budgets to run their MRI machines for additional hours, but not all hospitals we spoke to could find the funds they needed to do this.

In 2017/18, the Ministry funded Ontario hospitals for a total of 473,000 MRI hours based on a funding model of \$385/hour for the first 2,080 hours and \$260/hour thereafter. The Ministry also provided one-time funding to support an additional 28,000 hours, for a total of 501,000 operating hours. The hospitals, meanwhile, operated a total 523,511 MRI hours, or 22,511 hours beyond the number funded by the Ministry. Even though the hospitals were operating their MRIs for more hours than the Ministry funded, the

machines were still operating at only 56% of their maximum capacity.

We found that while many of the hospitals were not running their MRI machines at the maximum, a few others were running their machines close to the maximum. Overall, we noted that in 2017/18, of the 108 MRI machines, 69% (75 machines) were run below 16 hours a day, seven days a week; 29% (31 machines) were run between 16/7 and 23/7; and the remaining 2% (two machines) were kept running more than 23/7. For example, one of the four hospitals where we conducted audit work had high wait times (134 days for non-urgent patients), but was operating its MRI machines only 11 hours, six days a week—that is, at 39% of maximum capacity.

We also noted that in order to have completed 90% of scans within the Ministry's wait-time target at the end of 2017/18 and to have cleared the backlog from prior years, the hospitals would have had to operate their MRI machines a total of 585,273 hours—514,579 hours for incoming requests received during the year and another 70,694 hours to clear the outstanding requests for MRI scans accumulated prior to 2017/18. However, the hospitals provided 61,762 fewer hours than the number of hours required.

Given that the hospitals were unable to clear the existing backlogs and meet the Ministry's wait-time targets for the 2017/18 fiscal year, CCO projected that, for the following year, hospitals would need to run their MRI machines a total of 655,708 hours—576,288 hours to handle all the incoming requests received during the year and another 79,420 hours to clear the outstanding requests accumulated prior to 2018/19. These 655,708 hours are equivalent to an additional \$34 million in funding (at a rate of \$260/hour) for 132,197 hours (655,708 minus 523,511) assuming, for 2018/19, hospitals operate the same number of MRI hours as in 2017/18. At the time of our audit, the Ministry did not have a plan to increase its annual funding to hospitals.

4.4.2 CT Scans

On average, all 165 CT machines were operated over 530,000 hours in 2017/18, or at approximately 37% of maximum capacity, despite long wait times. CCO does not have a predictive model to estimate the number of hours needed to achieve the Ministry's wait-time target for 90% of patients referred for CT scans, as was done for MRIs, discussed in the previous section.

RECOMMENDATION 3

To better utilize the existing MRI and CT machines and reduce wait times for services, we recommend that the Ministry of Health and Long-Term Care work with Cancer Care Ontario and hospitals to:

- assess whether the existing unused capacity at each hospital can be used to address existing backlogs from prior years and new requests for scans received by the hospital:
 - for MRI machines; and
 - for CT machines; and
- prepare a detailed action plan to better utilize the existing machines to improve wait times:
 - for MRI services; and
 - for CT services.

MINISTRY RESPONSE

The Ministry of Health and Long-Term Care supports this recommendation and will work with Cancer Care Ontario, Local Health Integration Networks and hospitals to assess machine capacity and prepare an action plan to better utilize capacity to address wait times, with consideration given to geographical differences.

4.5 Ministry Unable to Justify Funding Method for Scans That Has Remained Unchanged for Over 10 Years

We noted that the Ministry's funded hourly rates for MRI and CT services have remained unchanged for over a decade. It has not formally reviewed or revised the hourly rates since 2006. We also found that although hospitals self-report costing information that would allow the Ministry to calculate the average cost per scan, the Ministry has not used this information, together with other attributes such as demand, capacity and complexity of scans, to analyze and assess whether the current hourly rate is appropriate.

4.5.1 Ministry Unable to Justify Its Funding per MRI Machine

The Ministry was unable to justify why the allocation of MRI funding for each machine is appropriate. In 2006, the Ministry standardized its funding formula to provide all machines 2,080 hours at the hourly rate of \$385 and thereafter at \$260 per hour. However, we noted that the Ministry funds approximately 20% of MRI machines (22 out of 108 machines) for between 3,120 hours and 4,160 hours operating time per machine at the rate of \$385 per hour. The Ministry did not adjust the funding for these 22 machines, resulting in a higher annual funding of between \$130,000 and \$260,000 per MRI machine since then.

As well, we noted that hospitals self-report costing information, which indicated that the average cost per MRI scan decreased from \$143 in 2013/14 to \$128 in 2017/18. Cost per scan varies by hospital because it depends on factors such as the types of scans and patients, and the time taken for each scan. Because of these factors, the average number of scans performed within an hour also varies between hospitals. For example, if in one hour an average of 1.6 MRI scans are performed (provincial average as reported by CCO), the \$128 cost per

scan is equivalent to \$205 per operating hour. However, the Ministry has not used this information to analyze and assess whether the current hourly rate of \$385 (for the first 2,080 hours) and \$260 (for operating hours over and above 2,080) are appropriate.

While the Ministry's one-time funding of \$7.3 million in 2017/18 and \$6.9 million in 2018/19 was allocated based on projected demand by LHINs, its allocation of annual funding of \$157 million among hospitals is primarily based on the number of hours each machine was funded historically. The allocation of annual funding does not incorporate the following key attributes at each hospital:

- Demand for scans at each hospital—the number of MRI orders received and the regional demographic and population needs vary by hospital.
- Complexity and types of scans performed—some scans take longer than others to perform or to interpret. For instance, a scan requiring contrast material takes on average 40 minutes and requires at least two technologists on site, whereas other scans take on average 20 minutes and require only one technologist on site. (The contrast material is a chemical substance called Gadolinium, injected into the patient to obtain enhanced images for certain types of scan.) Cardiac scans are also complex scans that take significantly longer than other scans.
- Unused MRI capacity within the hospital—allocation of the funding across hospitals does not consider the available capacity in operating hours at each hospital based on the number of machines it runs. We noted that throughout the year the Ministry and LHINs do not consistently track available capacity in each hospital to optimally allocate funds across hospitals. For instance, we were informed that one hospital could not utilize additional funds it received from the LHIN since it was already operating its MRI

machine at maximum capacity and could not perform more scans.

Wait times are lengthened when hospitals with high demand for scans are not funded according to the actual cost of meeting the demand, and when hospitals with available capacity lack the funds to put this capacity to use. Hospitals' priorities may also be distorted by these funding inequities, as they may lack the incentive to perform complex scans requiring more resources.

4.5.2 Ministry Has Not Reviewed Appropriateness of Its Funding to Hospitals for CT Scans for More than 10 Years

Hospitals self-report costing information, which indicated that the average cost per CT scan decreased from \$70 in 2013/14 to \$64 in 2017/18. For example, if in one hour an average of 2.87 CT scans are performed (estimate based on data collected by CCO), the \$64 cost per scan is equivalent to \$181 per operating hour. However, the Ministry has not used this information, with other factors such as the increasing demand for CT services, to analyze and assess whether the current hourly rate of \$250, or the total of \$9 million funding to hospitals, is appropriate.

RECOMMENDATION 4

To help ensure the method used to fund hospitals for their MRI and CT machines is appropriate, we recommend that the Ministry of Health and Long-Term Care work with Local Health Integration Networks to:

- collect complete and relevant information on demand, capacity and types of scans and performed by each hospital:
 - for MRI services; and
 - for CT services; and
- use the information collected to regularly assess the reasonableness of the funding rates and allocations to each hospital and make any necessary adjustments:

- for MRI services; and
- for CT services.

MINISTRY RESPONSE

The Ministry of Health and Long-Term Care (Ministry) supports this recommendation and will work with partners to determine and collect relevant information for MRI and CT services, and conduct an initial and regular review of existing funding approaches for MRI and CT services with adjustments made as necessary. In addition, the Ministry will work with Local Health Integration Networks to support the regular monitoring of utilization to make necessary funding adjustments.

4.6 Wait Times for Patients to Receive an MRI or CT Scan Are Higher than Publicly Reported for Selected Hospitals

To understand current real wait times and compare them to the publicly reported average wait times we note in **Section 2.4**, we asked staff at four selected hospitals what appointment dates were currently being provided to non-urgent patients, to obtain an understanding of how long a patient can expect to wait once the hospital has received his or her requisition form. Our analysis shows that wait times are higher than publicly reported for patients who were referred to receive an MRI or CT scan at these hospitals.

We obtained wait lists as of July 12, 2018 (we chose that day to ensure we compared all the wait lists at the same time point) from three of the four hospitals where we performed audit work. The fourth hospital was unable to generate the wait list in a similar report format for the purpose of our analysis, due to data quality issues resulting from a recent system implementation. A wait list contains, among other things, patients' information, the date of their referrals for MRI or CT scans and their appointment dates (when scheduled).

From our analysis of the three hospitals, we found that:

- One hospital was not giving appointment dates to over 90% of the non-urgent patients who were referred to this hospital and waiting for MRI and/or CT scans. At the time of our audit, this hospital did not give appointment dates to these patients when they were first referred by their physicians. The fact that this hospital was not scheduling any appointments for these patients, which is very important for patients and referring doctors to know, was not communicated to the public.
- Another hospital had not given appointment dates to 45% of the non-urgent patients who were waiting for MRI scans. We noted that this hospital was not giving appointments to non-urgent patients who were waiting for scans requiring contrast agent (used for generating clearer images in specific body parts).
- Although the third hospital had given appointments to all non-urgent patients who were waiting for MRI and/or CT scans, more than 85% of these patients were waiting in excess of the average wait time reported to the public.

Refer to **Appendix 9** for our detailed analysis.

As shown in **Appendix 5**, which lists the advantages and disadvantages of five different measures—average (mean), median, 90th percentile, date ranges and real-time wait time—it is important to provide patients with the picture of their potential wait times that they can find most useful. This information is critical in allowing patients and their physicians to make informed decisions on diagnosis and treatment.

Before December 2017, the Ministry used to publicly report on wait times using the 90th percentile, which is the target set by the Ministry, as recommended and advised by clinical experts. Since then, Health Quality Ontario (HQO) started to report through its website on the average (mean) wait time and the percentage of patients scanned within

the Ministry target for each individual priority level and for all priorities combined. The reason stated for the change was that a user survey revealed that patients and caregivers want to know how long they can expect to wait (that is, the typical wait or average for similar patients) and whether patients in Ontario receive timely care. The survey results also revealed that these new measures were easier for the public to understand than the 90th percentile figure.

The 90th percentile is an important measure of the Ministry's progress, but neither it nor the average informs patients how long they are likely to wait for their scans. The usefulness of these measures is further diluted by the percentage of non-urgent patients who have been scanned within 28 days as a result of anomalies in the system (as explained in **Section 4.1**).

As noted in **Section 4.1.2** and **Figure 6**, an alternative reporting method is to state wait times in day ranges by number and percentage of patients on the list. This method has the advantage of representing every patient who has received a scan in a hospital. Therefore, it provides a more complete picture of how many patients waited in the past and for how many days.

These three methods—the average wait times reported to the public, the 90th percentile wait-time targets and wait-time day ranges—are all based on how long patients have waited to have their scans completed. In other words, the data used is a record of past performance. An alternative to methods that involve providing information on past performance is for hospitals to provide real-time information on patients' expected wait times to CCO for public reporting. The real-time wait time reflects the next available appointment date that patients can expect to get, and its calculation changes according to a patient's real position along his or her journey to receive a scan. It can therefore provide specific and useful information to patients and their physicians, and give the health-care system a more reliable picture of expected patient flow.

For patients to use the information provided, they first must be aware that it exists. With assistance from hospital staff, we conducted a survey at the four hospitals we visited by asking patients who came in for MRI/CT scans, over one to two days, if they were aware that hospitals' wait time information is publicly available. We found that very few patients were aware that they could access wait-time information:

- **MRI patients:** Overall, only 5% of the MRI patients surveyed were aware they could view MRI wait-time data by hospital. Of the 5% of the patients who were aware of the HGO website, 10% visited the website and found that the information was useful in planning their treatment.
- **CT patients:** Overall, only 3% of the CT patients surveyed were aware they could view CT wait-time data by hospital. Of the 3% of the patients who were aware of the HGO website, 20% visited the website, none of whom found that the information was useful in planning their treatment.

RECOMMENDATION 5

To better assist patients and physicians in making informed decisions, we recommend that the Ministry of Health and Long-Term Care:

- assess the advantages and disadvantages of various wait-time reporting methods;
- publicly report complete and relevant wait-time information by hospital, such as the percentage of patients scanned within various wait-time ranges and the next available appointment date a patient who is on a hospital's wait list would expect to receive a scan; and
- work with other health providers to increase public awareness of the availability of the wait-time information on Health Quality Ontario's website.

MINISTRY RESPONSE

The Ministry of Health and Long-Term Care (Ministry) supports this recommendation and will assess various wait-time reporting methods, options for expanded data collection and enhancing public reporting. The Ministry also welcomes the opportunity to increase public awareness of wait-time reporting.

4.7 Use of Scanning Machines Past Their Expected Service Life Could Affect Patient Safety as Well as Quality and Efficiency of Scans

To track when MRI and CT machines are due to be replaced, the Canadian Association of Radiologists (Canadian Radiologists) provides guidelines to define these machines' life expectancy. According to the guidelines, life expectancy for an MRI or a CT machine ranges from eight to 12 years, assuming no upgrades are made to the machine, and depends on the number of hours per year it is run and number of scans per year. **Figure 14** shows the number of MRI and CT machines in Ontario by age as well as the number of machines past their expected service life, assuming no upgrades are made, as of March 2018.

4.7.1 Forty-Nine, or 30%, of CT Machines in Ontario Are Past Their Expected Service Life

The radiologists we interviewed in the course of our audit stressed the clinical value of CT scans. Nevertheless, potential impacts on patient safety are a concern with older CT machines. Our audit found that, as of March 2018, of the 165 CT machines in hospitals, 49, or 30% of them, were past their expected service life as determined by the guidelines developed by the Canadian Radiologists. CCO, on behalf of the Ministry, keeps track of the age of each CT machine; however, it does not know how many of these 49 CT machines may have been upgraded and therefore might have had their service life extended or their radiation dosage reduced.

The Ministry does not directly fund the acquisition of CT machines. Instead, hospitals fund their purchase either from their internal capital budget and/or with money raised by the hospital foundation. Therefore, it is the hospitals that are responsible for replacing their CT machines at the end of their service life.

CT machines past their service life are more likely to generate lower quality images than newer technologically advanced machines. Newer machines also scan patients more quickly. Older

Figure 14: Number and Percentage of MRI and CT Machines Past Their Expected Service Life,* as of March 2018

Source of data: Cancer Care Ontario

	Age (Year)				Total
	0-4	5-8	9-12	13-20	
MRI Machines					
# MRI machines by age	20	35	26	27	108
% MRI machines by age	19	32	24	25	100
# MRI machines past their expected service life	0	0	23	27	50
% of total MRI machines past their expected service life					46
CT Machines					
# CT machines by age	66	38	37	24	165
% CT machines by age	40	23	22	15	100
# CT machines past their expected service life	0	2	23	24	49
% of total CT machines past their expected service life					30

* According to the Canadian Association of Radiologists' guidelines, life expectancy for an MRI or a CT machine ranges from eight to 12 years, assuming no upgrades are made to the machine, and depends on the number of hours per year it runs and number of scans performed per year.

machines have more breakdowns and need more maintenance, which extends wait times and forces patients to reschedule their appointments. An important additional problem is that older CT machines, if not upgraded to reduce radiation dosage, can produce higher radiation than new machines for the same scan.

Based on our audit work at the four hospitals, we noted the following:

- One hospital acquired two CT machines in 2009. The hospital spent \$300,000 in late 2012 to upgrade the two machines, and then replaced one with a new machine in 2017. We were informed that for scans of similar body parts for a person of similar size, the radiation dosage from the new machine was 20–30% less than the older machine.
- The other hospital replaced its two CT machines, each approximately 10 years old, in fall 2017. The hospital radiologist informed us that for scans of similar body parts, similar sized patients received a radiation dose that was 30–40% less from the new machines.
- The remaining two hospitals were operating CT machines 10 to 12 years old. One hospital invested approximately \$300,000 to upgrade two machines, to operate them at a lower radiation dosage while still maintaining the quality of the scans. The other hospital did not upgrade its two CT machines to reduce dosage levels, but it has other processes in place to ensure the radiation dosages are kept as low as possible. It also informed us that it plans to replace one of the machines, which could potentially reduce radiation dosage by 20–80% for similar body parts and patient size.

RECOMMENDATION 6

To help ensure that CT machines are safe for producing images of the required quality, we recommend that the Ministry of Health and Long-Term Care work with hospitals to:

- establish provincial guidelines to help hospitals consistently plan in replacing or upgrading CT machines that are approaching the end of, or are past, their expected service life; and
- regularly monitor and analyze the impact on patient safety of using CT machines that are past their expected service life.

MINISTRY RESPONSE

The Ministry of Health and Long-Term Care (Ministry) supports this recommendation and will work in partnership with hospitals to gather the required data and determine the service life span of the CT machines. This would lead to more appropriate and timely flagging of replacements. The Ministry will also work with clinical experts to establish provincial guidelines, including looking to established national guidelines such as those developed by the Canadian Association of Radiologists.

4.7.2 Fifty, or 46%, of MRI Machines in Ontario Are Past Their Expected Service Life

Quality and efficiency of scans are issues with older MRI machines. We found that, as of March 2018, of the 108 MRI machines in hospitals, 46%, or 50 of them, were past their expected service life as determined by the guidelines developed by the Canadian Radiologists. Although CCO, on behalf of the Ministry, captures the number of MRI machines past their service life, it did not know how many of these 50 MRI machines might have been upgraded to extend their service life.

The same efficiency and quality problems that are associated with the use of older CT machines also affect older MRI machines.

Because the Ministry does not provide capital funding separately for MRI machines, it does not have a provincial capital plan in place for MRIs. Instead, the Ministry relies on each hospital to have its own capital planning process to determine when

and how a new MRI machine should be purchased and/or an old machine should be replaced. Based on our hospital visits, we noted that MRI machines can range from \$1.4 million to \$2.7 million, depending on the model and functionality. Hospitals fund their purchase from their internal capital budget and/or with money raised by the hospital's local community.

RECOMMENDATION 7

To help ensure that MRI machines produce quality images and operate efficiently, we recommend that the Ministry of Health and Long-Term Care work with hospitals to:

- establish provincial guidelines to help hospitals consistently plan to replace or upgrade MRI machines that are approaching the end of, or are past, their expected service life; and
- analyze the impact in areas such as quality and efficiency of using MRI machines that are past their expected service life.

MINISTRY RESPONSE

The Ministry of Health and Long-Term Care (Ministry) supports this recommendation and will work in partnership with hospitals to establish provincial guidelines to support enhanced planning for MRI machines' life cycles, including looking to established guidelines such as those from the Canadian Association of Radiologists. The Ministry will also analyze any impacts relating to using machines past their expected service life.

4.8 Hospitals' Tracking of CT Scans' Frequency of Use and Radiation Dosage per Patient Has Been Insufficient

As noted in **Section 4.7.1**, the radiologists we interviewed stressed the clinical value of CT scans, even when taking into account concerns over the impact

of radiation from the scans. However, the medical profession is aware of these concerns, particularly when it comes to pediatric patients who are the most vulnerable to the long-term effects of radiation. The main risk that is cited is the potential for this type of radiation to cause cancers. The potential risk for a given patient depends on the radiation dosage the patient receives from each scan and the frequency of scans over a specific period. As well, older CT machines, if not upgraded to reduce dosage, may emit higher amounts of radiation than newer machines, as discussed in **Section 4.7.1**.

We noted that the cumulative dosage levels per patient in Ontario are not tracked. Under the *Occupational Health and Safety Act*, occupational dosage limits are set for workers, including hospital staff, from any source of x-rays, including CT machines. However, no similar legislative requirement exist for patients in Ontario. We also noted that although CT machines capture the radiation dosage from each scan, neither the Ministry nor the four hospitals where we conducted audit work track each patient's cumulative dosage.

Outside the four hospitals, we noted that two other hospitals use software to track cumulative radiation levels from scans within their own facilities, but cannot track dosage from scans their patients receive outside their hospitals.

Wide variations in radiation dosage given to patients for similar scans in different hospitals are also a health concern. In 2014, Toronto's St. Michael's Hospital set up a radiation dosage registry to track data collected from each CT scan it did and compare its results with several other hospitals.

Health Quality Ontario's "Report and Recommendations on Modernizing Ontario's Radiation Protection Legislation" (2016) recommended a dosage registry system across hospitals along the lines of systems in use in the United Kingdom, California and elsewhere, to track radiation that patients receive from any type of medical equipment that emits radiation, including x-ray machines, as well as to compare radiation dosage per similar scan between hospitals.

RECOMMENDATION 8

To minimize the overall health effects on patients, and especially pediatric patients, from CT radiation, we recommend that the Ministry of Health and Long-Term Care work with hospitals to:

- evaluate the cost-effectiveness and feasibility of creating a CT dosage registry to track and monitor the radiation dosage patients receive during their lifetime; and
- use the dosage registry information to assess the impact of the variation across hospitals in dosage received from similar body scans.

MINISTRY RESPONSE

The Ministry of Health and Long-Term Care (Ministry) supports this recommendation. The Ministry will work with the appropriate stakeholders, including hospitals, to explore and assess the cost-effectiveness and feasibility for hospitals and facilities to collect and report the necessary data.

4.9 Hospital Booking and Scheduling of Appointments Could Be Improved

Cancer Care Ontario collects various efficiency metrics including booking turnaround time and patient no-show rate. Our audit found that improvement in the following areas could be made by hospitals to maximize the use of resources and improve patient experience.

4.9.1 Hospitals Mail Letters or Phone Patients to Notify Them of Their Appointments

Once hospital staff schedule an appointment for a patient, they inform the physician and/or patient of the appointment date, time and other details. We noted that three of the four hospitals where we

conducted audit work send letters to notify patients when their appointments are first scheduled. The fourth hospital phones patients directly. None of the four hospitals use email or other automatic systems that allow patients to confirm receipt of their appointment details electronically. Thus, the hospitals cannot be sure that all patients are aware of their appointments when they are first scheduled.

Then, to remind patients when their appointments are coming up and confirm with patients, three hospitals phone them (calls are either automated or in-person). The fourth uses an automated phone system or sends text messages when cell phone numbers are detected.

4.9.2 Patient No-Shows Are Costly but the Ministry and Hospitals Do Not Understand Why They Occur

When patients do not show up for an appointment or cancel it the same day, scanning machines can sit idle if hospitals are unable to fill the appointment slot quickly.

MRI Patient No-Shows

MRI no-show rates across hospitals, as reported to CCO, ranged from 0.1% to 13.4% of scheduled appointments for 2017/18. In 2017/18, hospitals reported a total of 48,320 missed MRI appointments—representing the number of additional patients who could have received a scan that year. We estimated that such no-shows cost the hospitals about \$6.2 million (48,320 patients × estimated \$128/scan) to pay mainly for staffing. All four of the hospitals where we conducted audit work agreed on the difficulty they face in scheduling around missed MRI appointments. One hospital's data showed that of the 24 no-shows it had in a sample week, it was only able to fill three slots.

None of the four hospitals where we conducted audit work routinely tracks the appointment confirmation rate. Based on our audit testing of data available at three of the four hospitals, we noted

that only 25–36% of the patients who received phone call reminders confirmed their appointment before the day of their scan. In comparison, 50% of the patients who received text messages confirmed their appointments. The fourth hospital did not have information available for our analysis at the time of our audit.

CT Patient No-Shows

CT no-show rates across hospitals reported to CCO ranged from 0.6% to 13% of scheduled appointments for 2017/18. In 2017/18, hospitals reported 57,916 CT appointment no-shows; however, we noted that they were able to fill these slots with little difficulty.

None of the four hospitals where we conducted audit work routinely tracks the appointment confirmation rate. Based on our audit testing of data available at three of the four hospitals, we noted that only 21–41% of the patients who received phone call reminders from the hospitals confirmed their appointment before the day of their scan, while 54% of the patients who received text messages confirmed their appointment. The fourth hospital did not have information available for our analysis at the time of our audit.

Reporting of No-Shows

Hospitals report their no-show numbers to CCO regularly. However, they are not required to record or report on how many of their no-shows they are able to replace with another patient (such as an in-patient or an emergency department patient), nor do the hospitals actively track and monitor this information to determine the amount of time machines are sitting idle.

CCO reports no-show rates back to the hospitals to monitor as an efficiency metric. We noted that CCO could improve the relevancy of this metric if it were coupled with other patient demographic information (such as age and gender) and scan procedure to provide hospitals with insight on factors affecting the no-show rates in their local

patient populations. Although this information is available at CCO, it is not provided to the hospitals unless requested.

When we asked CCO to compile no-show rates by patient age, we found that patients aged 19–29 had a higher no-show rate in 2017/18 than other age groups, at 12%. This group might be more reachable with alternative communication methods or technology such as email and text messaging.

As well, we noted that all four hospitals where we conducted audit work do not routinely track the reasons for no-shows. Thus, even though the hospitals recognize the problem, they do not fully understand the reasons behind it and can do little to influence the trend. Hospital staff indicated that patients are less likely to remember appointments the more distant in the future the date is. As a result, one hospital schedules patients no earlier than a month before the next available appointment slot. We noted, though, that this has other implications for patients, discussed in **Section 4.9.3**.

RECOMMENDATION 9

To help improve efficiency of booking and scheduling of MRI and CT scanning appointments and minimize patient no-shows, we recommend that hospitals:

- formally track the reasons for patient no-shows and develop strategies to reduce their prevalence; and
- track confirmation rates to assess the effectiveness of the existing notification and reminder systems to determine if a more user-friendly technology, such as automatic confirmation through email or text messaging, should be used.

RESPONSE FROM HOSPITALS

The hospitals agree that there need to be measures in place to establish effective and efficient processes to mitigate no-shows and to determine best practices in resource utilization. Hospitals recognize the importance of

implementing measures or processes to advise patients of their responsibilities and allow hospitals the opportunity to reach successful outcomes in having patients attend their appointments as scheduled.

The hospitals are supportive and will assess the effectiveness of their processes to mitigate no-shows on a regular basis, by tracking reasons for no-shows and patient demographics. These reviews will allow hospitals to strategize best practices that would include new technologies and processes to improve outcomes. Hospitals will work with their Information Technology departments as well as Communications and Privacy Offices on technologies that can improve access to patients through various user-friendly technological means such as emails, texting, automated mail-outs or interactive voice response systems.

The hospitals agree that patient no-shows have negative implications on operations, access and patient management, with a potential for lost revenues and increasing wait times. These challenges require hospitals to continue to find better opportunities to reduce no-show rates. Regular reviews do provide such opportunities, as well as working with their Local Health Integration Networks in seeking best practices from other hospital sites.

4.9.3 Some Hospitals Have a Large Number of Patients Waiting To Receive MRI Appointments

In 2017/18, while schedulers at hospitals were able to schedule urgent and semi-urgent requests within two days, they took an average of 18 calendar days to schedule non-urgent requests and notify the patients of their appointment date and time. The average of 18 calendar days is over twice as long as the seven calendar days recommended by Cancer Care Ontario.

Of the four hospitals where we conducted audit work, three had a significant number of patients

who were waiting to receive MRI appointments; on average, at 15, 28 and 197 days, in scheduling incoming non-urgent scan requests for 2017/18. The hospital with the largest backlog indicated that it schedules patients for their appointments approximately a month before the next available open date, rather than as soon as possible, to minimize the number of appointments being re-scheduled during the long waits. However, this increases patients' anxiety as they are waiting longer to receive their appointment details and times. This also impacts their ability to plan their treatment with their physicians. The same three hospitals indicated that they lack sufficient resources, such as staffing, to schedule appointments on a timely basis.

RECOMMENDATION 10

To help ensure that patients receive the dates of their MRI appointments as soon as possible, we recommend that hospitals establish an effective process to monitor incoming scan requests and schedule appointments on a timely basis.

RESPONSE FROM HOSPITALS

Hospitals acknowledge the importance in notifying patients of appointments in a timely manner and the monitoring of incoming MRI scan requests. Hospitals generally attempt to provide timely notification of appointments. However, there are occasions where capacity to perform the requested examination becomes an issue. One hospital with a high backlog in notifying patients of their appointments in a timely manner is currently working with its new Healthcare Information System vendor to develop notification strategies that would confirm their appointments, or when capacity is an issue, confirm receipt of their referrals along with a current anticipated wait time.

4.10 Province-wide Peer Review Program Not Mandatory across Ontario Hospitals

The Canadian Association of Radiologists (Canadian Radiologists) describes peer review as a process of self-regulation by a profession or of evaluation involving qualified individuals within the field. Peer review is used to maintain standards, improve performance and provide credibility. The Canadian Radiologists recommend that a radiology department's overall quality assurance program should incorporate peer review to enhance the consistency and accuracy of radiology services and thus improve the quality of care for patients.

Nevertheless, not every Ontario hospital that provides MRI and/or CT scanning services has a regular peer review program. In 2013, an external review of a radiologist's work at Trillium Health Partners found errors in his interpretation of 645 CT scans over the course of one year, some of which involved undiagnosed cancers. In December 2013, the Minister of Health and Long-Term Care requested that Health Quality Ontario (HQO) and its health partners “lead the implementation of a province-wide physician peer review program in all facilities where diagnostic imaging services are provided, including mammograms and CT scans.”

The 2016 report “Peer Review: A Diagnostic Imaging Quality Initiative for Ontario” outlined an implementation plan for a province-wide peer review program. The report's recommendations for a mandatory peer review program included that it should be integrated, standards-based, consistent, focused on learning and education, accountable and sustainable. As of June 2018, HQO had developed a toolkit to support implementation of peer review programs in five community hospitals for their staff radiologists, and planned to expand this pilot program to 14 hospitals by the end of 2018/19. HQO indicated to us there has been no expectation set by the Ministry that the program will be mandatory for hospitals, and that it does not have the authority to “require” all hospitals to participate in this program.

The Ministry still does not have a complete list of the hospitals with regular peer review programs among those that provide scanning services. In 2014, when the Ontario Hospital Association surveyed Ontario's 155 hospitals, only 85 responded to the question asking if they had a peer review program; 41 of them had these programs in their diagnostic imaging departments.

Three of the four hospitals where we conducted audit work have peer review programs in place for reviewing both MRI and CT scans and the associated radiologist reports. The fourth had conducted several trial peer reviews but was not doing them on a regular basis.

In conducting a peer review, a colleague reviewer re-examines a sample of a practising radiologist's scans and compares the results with the radiologist's reports on those scans. This has the benefit of evaluating the end product of the radiologist's work—an assessment of performance in practice that is hard to accomplish in many other medical specialties. Peer reviews therefore give radiologists and hospitals the opportunity to improve quality assurance and maintain the value of radiologists' expertise.

RECOMMENDATION 11

To help improve quality of diagnostic results across Ontario hospitals, we recommend that the Ministry of Health and Long-Term Care work with Health Quality Ontario to clarify their expectation and timeline for hospitals to implement a formal and regular peer review program of diagnostic results in hospitals.

MINISTRY RESPONSE

The Ministry of Health and Long-Term Care (Ministry) supports this recommendation and will continue to work with Health Quality Ontario (HQO) to implement a formal and regular peer review program of diagnostic results in hospitals.

To achieve this, and to inform appropriate expectations and implementation timelines, the Ministry and HQO will continue to seek advice from hospitals and clinical expert groups.

4.11 Hospitals Did Not Consistently Assess Whether All Referrals for MRI and CT Scans Were Clinically Necessary

Research organizations and stakeholder groups we interviewed during our audit, including the Ontario Association of Radiologists, estimated that inappropriate scan referrals in Ontario—meaning, those that are not clinically necessary—range from 2% to 12%.

The Canadian Association of Radiologists recognizes that the appropriateness of performing an MRI or CT scan relies on having evidence based on clinical indications to support the request for the scan. A scan that is unlikely to improve patient outcomes is considered inappropriate. Inappropriate use of scans puts unnecessary financial strain on the system and increases wait times for patients who really need the scans. There are also risks for patients who are given scans they may not have needed. Radiologists sometimes make incidental findings (unexpected findings that the referring physician did not refer for). Many of these are benign, but they may still lead to a series of further scans and investigations, and anxiety for the patient. In some cases, investigating these findings may require invasive medical procedures.

Academic research on medical imaging has found that ordering inappropriate scans is a problem for the medical system. A recent Canadian review of studies on this issue with MRI scans found results for inappropriate scans ranging from 2% to as high as 28.5%, depending on the body part, age and location of the patient, and design of the study. A Canadian study released in 2018 examined approximately 1,000 MRI scans for various body parts along with the indications for imaging given on the physicians' requisition forms. The study

assessed each scan according to the Canadian Association of Radiologists' referral guidelines, and found 6% to 12% to be inappropriate.

Radiologists in the Champlain LHIN estimated the percentage there at 5% to 15%. At the four hospitals where we conducted audit work, the chief radiologist or other radiologists are responsible for deciding the level of priority for each incoming referral, rejecting those they deem inappropriate or obtaining further clarifications from the referring physicians on the need for a scan. However, none of the hospitals kept track of the number of referrals they rejected as inappropriate.

The radiologists we interviewed agreed that the likelihood of an inappropriate referral depends on the body part and age of the patient, particularly in the absence of other clinical indicators, or "red flags." For example, a physician should not routinely refer patients with only lower back pain for imaging, unless there are reasons to suspect serious underlying clinical issues. Chronic knee pain in patients over the age of 55 is another such example where MRI or CT scans may not be clinically necessary.

To support that consensus, the Waterloo Wellington LHIN completed a case study in 2017 that found that of 650 patients older than 55 with knee pain, 221 had completed a pre-consult MRI scan. A review of these cases found that 77% of the 221 scans were considered inappropriate. Building on this work, an electronic referral system incorporating a decision support tool reduced the number of inappropriate MRIs by 12%.

To limit the number of inappropriate scans being requested, the Canadian Association of Radiologists issued its Diagnostic Imaging Referral Guidelines in 2012 as a resource for physicians. It intends these guidelines to assist physicians in making decisions, but not to restrict their role in deciding on the imaging studies they request.

Hospitals that have scanning services have also been studying whether to provide similar clinical decision support to requesting physicians. The Champlain LHIN centralized intake system (as

mentioned in **Section 4.3**) will include decision support tools and clinical pathways to help guide referring physicians in their ordering practices to improve appropriateness of the requests. A clinical support tool is used for this purpose by hospitals in the United States.

RECOMMENDATION 12

To better ensure that referrals for MRI and CT scans are clinically necessary, we recommend that the Ministry of Health and Long-Term Care work with Local Health Integration Networks and hospitals to:

- develop effective tools such as standardized requisition forms with applicable checklists to minimize the number of inappropriate requests for scans; and
- ensure that radiologists at hospitals assess and track MRI and CT requests, and implement practices that improve adherence to the appropriateness guidelines.

MINISTRY RESPONSE

The Ministry of Health and Long-Term Care supports this recommendation and will work with Local Health Integration Networks, hospitals and clinical experts to develop and implement tools and best practices to minimize the number of inappropriate referrals for scans. The Independent Health Facilities Program will consult with key partners and licensees to consider how it might be possible to implement these recommendations.

4.12 Standardized Hourly Rates and Performance Measures Are Lacking in Ministry Agreements with Independent Health Facilities

Our audit found that, for both MRI and CT scans, standardized hourly rates and wait-time performance measures are lacking in Ministry agreements

with independent health facilities (IHF), as detailed in **Sections 4.12.1** and **4.12.2**.

Also, the Ministry has not compared the practices in providing similar scanning services by both the IHF and hospital sectors to identify areas, such as hourly rates and peer review, for further improvement. For example, all IHFs licensed under the *Independent Health Facilities Act* (Act) are required to perform regular peer review, whereas a province-wide formal peer review program still has not been fully implemented in hospitals, as discussed in **Section 4.10**.

IHFs are either for-profit or not-for-profit organizations located in communities throughout Ontario that provide certain health-care services, including MRI and CT services, at no charge to patients insured under the Ontario Health Insurance Plan. Their purpose is to provide Ontarians with increased access to health-care services outside of hospitals. The Ministry is responsible under the Act for licensing, funding and co-ordinating quality assurance assessments of these IHFs.

In order to receive funding under the Act, these licensees sign an agreement with the Ministry to establish the annual budget. The IHFs must submit monthly service reports to the Ministry that detail the number of hours of services delivered. The year-end reconciliation process is based on the actual service hours rendered, the types of services provided and the daily operating hours; the Ministry may recover any overpayments.

Over the three fiscal years ending 2017/18, the Ministry funded seven IHFs a total annual average of \$8.6 million for MRI services and \$2.6 million for CT services. In 2017/18, the IHFs with a total of six MRI and two CT machines performed about 48,000 MRI and 11,320 CT scans, excluding the number of scans performed by another two CT machines where information had not been reported to Cancer Care Ontario at the time of our audit.

4.12.1 MRI Scans

Three licensees with five IHFs operate a total of six MRI machines. A list of these IHFs with their corresponding wait-time information is shown in **Appendix 10**. We found the following issues:

- The Ministry's agreed hourly rates with these IHFs varied significantly: the rate paid for an MRI scan at one IHF can be as high as 175% the rate paid for a similar scan at another IHF. These rates were established in 2003 as a result of successful bids submitted to the Ministry in response to request for proposals for the provision of licenced MRI services, as set out under the Act. The Ministry still pays the same rates in 2018. The Ministry does not know the actual cost per scan performed outside of hospital so it cannot know whether the rates it currently pays the IHFs are reasonable.
- All five IHFs are currently contracted to provide wait-time information to Cancer Care Ontario. However, their contracts with the Ministry do not require them to achieve any of the provincial wait-time targets that are expected from Ontario hospitals. In 2017/18, none of these IHFs met the provincial wait-time target of 28 days.

4.12.2 CT Scans

Three licensees with four IHFs operate four CT machines in various locations across the province (see **Appendix 10**). We found similar issues as discussed previously in **Section 4.12.1** as follows:

- The Ministry's agreed hourly rates with these IHFs varied: the rate paid for a CT scan at one IHF can be as high as 280% the rate paid for similar scan at another IHF. These rates were established in 2003 as a result of a request for proposals process mentioned in **Section 4.12.1**. The Ministry still pays the same rates in 2018. Again, the Ministry does not know the actual cost per scan per-

formed outside of hospital so cannot know whether the rates it currently pays the IHFs are reasonable.

- Only two of the four IHFs are currently contracted to provide wait-time information to Cancer Care Ontario, although they are not contracted to achieve the wait-time targets. In 2018/19, the Ministry began funding the two other IHFs to establish the capability and start reporting their wait times as well.

RECOMMENDATION 13

To help ensure that payments to independent health facilities (IHFs) for MRI and CT services are cost-effective, we recommend that the Ministry of Health and Long-Term Care:

- review the existing hourly rate paid for scanning services delivered by each IHF and determine whether the rates are appropriate based on the types of scans, cost per scan and the service volume each IHF performs; and
- establish performance measures, such as wait-time targets, and incorporate these measures into future contracts with all IHFs.

MINISTRY RESPONSE

The Ministry of Health and Long-Term Care will undertake a review of the hourly rate paid for MRI and CT services and will undertake a review of MRI and CT independent health facilities' transfer payment funding agreements to consider:

- how to implement a consistent, clear and evidence-based approach to setting facility-fee rates for MRI and CT service delivery;
- a potential adjustment to existing MRI and CT facility-fee rates to align with this approach; and
- an analysis and integration of applicable performance measures, including wait-time targets, associated with the provision of services.

Appendix 1: A Patient's Journey in Receiving an MRI or CT Scan and the Wait Time as Defined by the Ministry of Health and Long-Term Care (Ministry)

Prepared by the Office of the Auditor General of Ontario

Activities Performed by Patient and Physician

Patient consults with a physician concerning a health issue

Physician determines whether an MRI or CT scan is appropriate to diagnose patient's health condition

If appropriate, physician completes an MRI or CT scan referral form and sends it to the hospital

Activities Performed by the Hospital or Independent Health Facility

Administrative staff receive the referral and record it

Radiologist assesses the referral and assigns a priority level to triage patients

Booking staff schedule patient for the scan based on the patient's assigned priority level

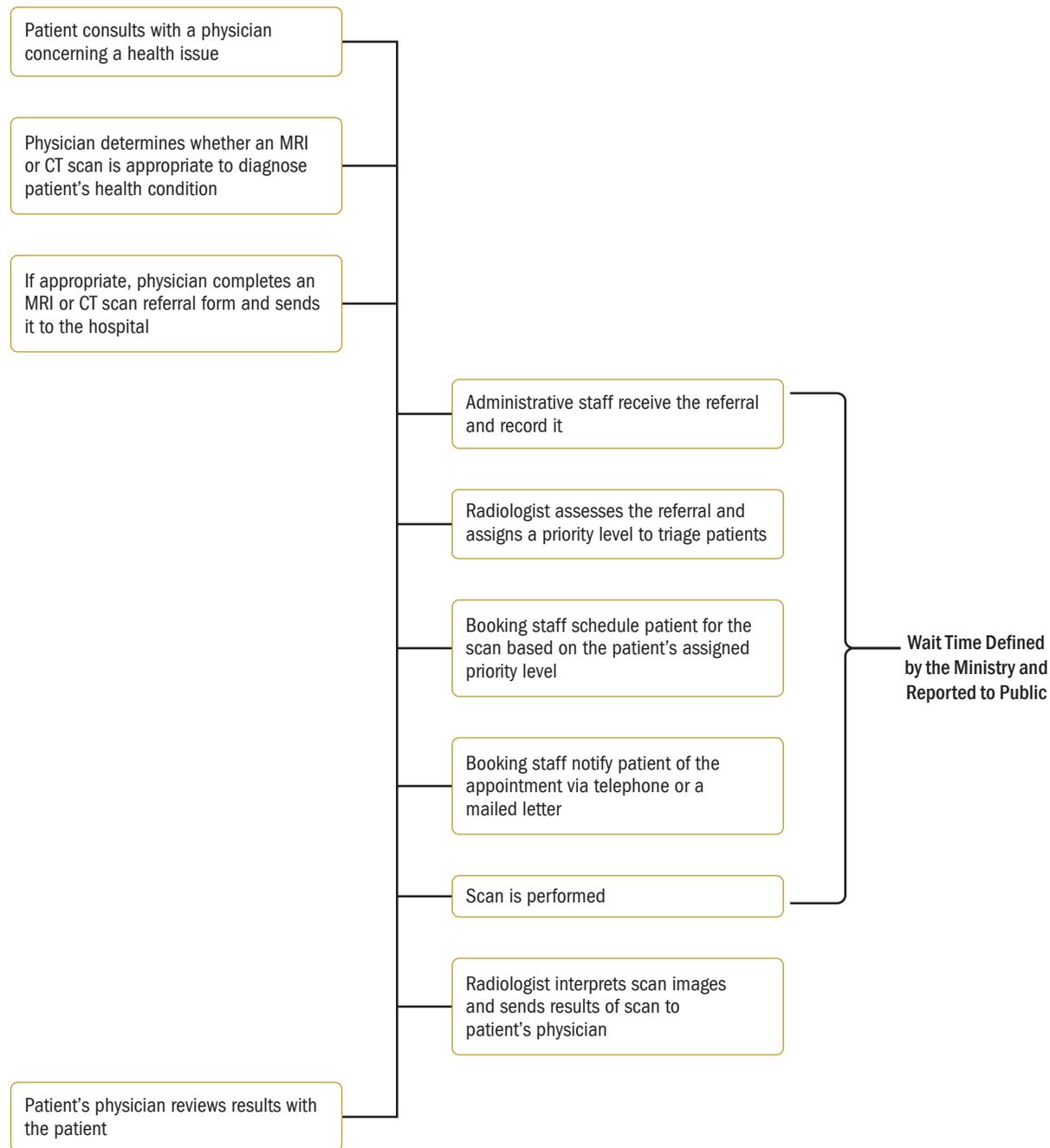
Booking staff notify patient of the appointment via telephone or a mailed letter

Scan is performed

Radiologist interprets scan images and sends results of scan to patient's physician

Patient's physician reviews results with the patient

Wait Time Defined by the Ministry and Reported to Public



Appendix 2: Key Facts Regarding MRI and CT Machines

Source of data: Ministry of Health and Long-Term Care

	MRI Machine	CT Machine
How it works	<ul style="list-style-type: none"> • Uses a magnetic field and pulses of radio waves to produce images of areas inside the body 	<ul style="list-style-type: none"> • Combines a series of x-ray images taken from different angles and uses a computer to create cross-sectional images (slices) of a patient's body
Best use	<ul style="list-style-type: none"> • Soft tissues (e.g., ligaments, tendons, organs, tumours) 	<ul style="list-style-type: none"> • Bones and areas with lots of movement (e.g., chest and abdomen) • Often used to monitor cancer patients
Scanning time	<ul style="list-style-type: none"> • 20 minutes to 60+ minutes 	<ul style="list-style-type: none"> • A few minutes
Patient safety	<ul style="list-style-type: none"> • Does not use any radiation • Due to strong magnetization, MRIs are not safe for patients with metal in their body, such as pacemakers, metal plates or screws • Extra precautions are taken with patients who have medical implants • Patient or delegate must respond to all questions regarding safety protocols before obtaining a scan 	<ul style="list-style-type: none"> • Patients are exposed to radiation emitted from each scan completed • Patients with metal in their body can get CT scans
Patient comfort	<ul style="list-style-type: none"> • Painless; possible discomfort if patient is sensitive to small enclosed spaces • Depending on length of scan, patient may have to stay still for a long time, which can be difficult • Very loud; patients are given earplugs to block the noise as much as possible 	<ul style="list-style-type: none"> • Painless; possible discomfort if patient is sensitive to small enclosed spaces

Appendix 3: Number of MRI Machines¹ and Wait Times, by Ontario Hospital, March 2018

Source of data: Cancer Care Ontario

Hospital	Hospital Type	# of MRIs	Non-urgent Patients' Wait Times, at 90th Percentile, ² 2017/18 (# of Days)
Central LHIN			
Humber River Hospital	Community	2	142
Mackenzie Health ³	Community	2	134
North York General Hospital	Teaching	2	134
Markham Stouffville Hospital Corporation	Community	2	76
Southlake Regional Health Centre	Community	2	62
Central East LHIN			
The Scarborough and Rouge Hospital	Community	3	88
Lakeridge Health Corporation ⁴	Community	3	66
Peterborough Regional Health Centre	Community	1	53
Ross Memorial Hospital	Community	1	50
Northumberland Hills Hospital	Community	1	25
Central West LHIN			
William Osler Health System ⁵	Community	4	Not Reported
Champlain LHIN			
Ottawa Hospital ³	Teaching	4	249
Cornwall Community Hospital	Community	1	122
Hôpital Montfort/Montfort Hospital	Teaching	2	116
University of Ottawa Heart Institute	Teaching	1	88
Queensway Carleton Hospital	Community	2	81
Children's Hospital of Eastern Ontario-OCTC	Teaching	2	63
Pembroke Regional Hospital	Community	1	42
Erie St. Clair LHIN			
Windsor Regional Hospital	Community	2	119
St. Joseph's Health Services Association of Chatham	Community	1	61
Bluewater Health	Community	1	28
Hamilton Niagara Haldimand Brant LHIN			
Niagara Health System ⁴	Community	2	117
Brant Community Healthcare System	Community	1	91
Hamilton Health Sciences Corp	Teaching	5	90
Joseph Brant Hospital	Community	1	82
St. Joseph's Healthcare Hamilton ^{3,5}	Teaching	4	Not Reported
Mississauga Halton LHIN			
Trillium Health Partners	Community	4	127
Halton Healthcare Services	Community	4	66

Hospital	Hospital Type	# of MRIs	Non-urgent Patients' Wait Times, at 90th Percentile, ² 2017/18 (# of Days)
North East LHIN			
Health Sciences North ³	Teaching	1	119
North Bay Regional Health Centre	Community	1	71
Timmins and District Hospital	Community	1	66
Sault Area Hospital	Community	1	57
North Simcoe Muskoka LHIN			
Royal Victoria Regional Health Centre	Community	2	64
Orillia Soldiers' Memorial Hospital	Community	1	56
North West LHIN			
Thunder Bay Regional Health Sciences Centre	Teaching	3	103
South East LHIN			
Kingston Health Sciences Centre	Teaching	1	136
Quinte Healthcare Corporation	Community	1	39
South West LHIN			
London Health Sciences Centre	Teaching	4	158
Grey Bruce Health Services	Community	1	59
St. Joseph's Health Care London	Teaching	3	55
Woodstock General Hospital	Community	1	44
Stratford General Hospital	Community	1	40
Toronto Central LHIN			
Sunnybrook Health Sciences Centre ⁴	Teaching	3	284
Hospital for Sick Children ⁴	Teaching	4	174
Sinai Health System	Teaching	2	139
University Health Network ⁴	Teaching	7	128
St. Michael's Hospital–St. Joseph's Health Centre Toronto	Teaching	4	119
Women's College Hospital	Teaching	1	75
Toronto East Health Network	Community	1	70
Waterloo Wellington LHIN			
Cambridge Memorial Hospital	Community	1	80
Grand River Hospital Corp	Community	1	66
Guelph General Hospital	Community	1	65
Total # of MRIs		108	

1. Excludes those machines used solely for research purposes.
2. Wait times are measured as the maximum amount of time in which 90% of patients have received their MRI scans.
3. Hospitals that we visited where we conducted detailed audit work.
4. Hospitals that we visited and met with their senior representatives.
5. Data from these hospitals had significant inaccuracies due to system implementation; hence, the information has not been published by the Ministry of Health and Long-Term Care nor included in this appendix.

Appendix 4: Number of CT Machines¹ and Wait Times, by Ontario Hospital, March 2018

Source of data: Cancer Care Ontario

Hospital	Hospital Type	# of CTs	Non-urgent Patients' Wait Times, at 90th Percentile, ² 2017/18 (# of Days)
Central LHIN			
Mackenzie Health ³	Community	2	152
Humber River Hospital	Community	4	55
Southlake Regional Health Centre	Community	2	53
North York General Hospital	Teaching	3	50
Markham Stouffville Hospital	Community	3	34
Stevenson Memorial Hospital Alliston	Community	1	30
Central East LHIN			
Peterborough Regional Health Centre	Community	2	35
Ross Memorial Hospital	Community	1	27
Lakeridge Health Corporation ⁴	Community	4	26
The Scarborough and Rouge Hospital	Community	5	25
Northumberland Hills Hospital	Community	1	22
Campbellford Memorial Hospital	Community	1	13
Central West LHIN			
Headwaters Health Care Centre	Community	1	34
William Osler Health System ⁵	Community	6	Not Reported
Champlain LHIN			
Ottawa Hospital ³	Teaching	6	234
Hôpital Montfort/Montfort Hospital	Teaching	2	117
Queensway Carleton Hospital	Community	2	106
Winchester District Memorial Hospital	Community	1	103
Children's Hospital of Eastern Ontario-OCTC	Teaching	1	95
Pembroke Regional Hospital	Community	1	43
University of Ottawa Heart Institute	Teaching	1	32
Renfrew Victoria Hospital	Community	1	32
Hawkesbury and District General Hospital	Community	1	16
Cornwall Community Hospital	Community	1	16
Erie St. Clair LHIN			
Bluewater Health	Community	2	41
St. Joseph's Health Services Association of Chatham	Community	1	40
Windsor Regional Hospital	Community	3	31
Erie Shores Healthcare	Community	1	14

Hospital	Hospital Type	# of CTs	Non-urgent Patients' Wait Times, at 90th Percentile, ² 2017/18 (# of Days)
Hamilton Niagara Haldimand Brant LHIN			
Hamilton Health Sciences Corp	Teaching	6	76
Brant Community Healthcare System	Community	1	48
Norfolk General Hospital	Community	1	29
Joseph Brant Hospital	Community	2	26
Haldimand War Memorial Hospital	Community	1	22
Niagara Health System ⁴	Community	4	21
St Joseph's Healthcare Hamilton ^{3,5}	Teaching	2	Not Reported
Mississauga Halton LHIN			
Trillium Health Partners	Community	5	93
Halton Healthcare Services	Community	4	27
North East LHIN			
Health Sciences North ³	Teaching	2	199
Timmins and District Hospital	Community	1	70
Sault Area Hospital	Community	2	68
North Bay Regional Health Centre	Community	2	56
Temiskaming Hospital	Community	1	30
West Parry Sound Health Centre	Community	1	20
North Simcoe Muskoka LHIN			
Muskoka Algonquin Healthcare	Community	1	45
Royal Victoria Regional Health Centre	Community	2	42
Georgian Bay General Hospital	Community	1	27
Collingwood General and Marine Hospital	Community	1	21
Orillia Soldiers' Memorial Hospital	Community	1	19
North West LHIN			
Thunder Bay Regional Health Sciences Centre	Teaching	2	32
Sioux Lookout Meno-Ya-Win Health Centre	Community	1	22
Lake of the Woods District Hospital	Community	1	18
Riverside Health Care Facilities Inc.	Community	1	16
South East LHIN			
Kingston Health Sciences Centre	Teaching	3	52
Quinte Healthcare Corporation	Community	2	28
Brockville General Hospital	Community	1	28
Perth and Smiths Falls District Hospital	Community	1	19
South West LHIN			
London Health Sciences Centre	Teaching	4	70
St. Joseph's Health Care London	Teaching	2	35
St. Thomas Elgin General Hospital	Community	1	29
Stratford General Hospital	Community	1	27
Grey Bruce Health Services	Community	1	27

Hospital	Hospital Type	# of CTs	Non-urgent Patients' Wait Times, at 90th Percentile, ² 2017/18 (# of Days)
Woodstock General Hospital	Community	1	25
Tillsonburg District Memorial Hospital	Community	1	25
South Bruce Grey Health Centre	Community	1	21
Strathroy Middlesex General Hospital	Community	1	12
Alexandra Marine and General Hospital	Community	1	12
Toronto Central LHIN			
Sunnybrook Health Sciences Centre ⁴	Teaching	4	173
St. Michael's Hospital–St. Joseph's Health Centre Toronto	Teaching	5	92
Toronto East Health Network	Community	2	92
Women's College Hospital	Teaching	1	84
Sinai Health System	Teaching	4	83
University Health Network ⁴	Teaching	14	64
Hospital for Sick Children ⁴	Teaching	2	56
Waterloo Wellington LHIN			
St. Mary's General Hospital	Community	1	58
Grand River Hospital Corp	Community	2	37
Guelph General Hospital	Community	1	35
Cambridge Memorial Hospital	Community	1	28
Groves Memorial Community Hospital	Community	1	27
Total # of CTs		165	

1. Excludes those machines used solely for research purposes.

2. Wait times are measured as the maximum amount of time in which 90% of patients have received their CT scans.

3. Hospitals that we visited where we conducted detailed audit work.

4. Hospitals that we visited and met with their senior representatives.

5. Data from these hospitals had significant inaccuracies due to system implementation; hence, the information has not been published by the Ministry of Health and Long-Term Care nor included in this appendix.

Appendix 5: Comparison of Wait-Time Reporting Methods

Prepared by the Office of the Auditor General of Ontario

Wait-Time Calculation			
Method	Definition	Advantages	Disadvantages
Past Performance (Data Compiled by Cancer Care Ontario)			
Average or Mean	The average (mean) refers to the simple average of the given set of values or quantities. It is the mathematical average. It is calculated by adding up all the observations and then dividing the value obtained by the number of observations.	Appropriate for normally distributed data. It is the most commonly used statistical measure and easily understandable to everyone.	Sensitive to outliers; i.e., the calculation of the average (mean) value changes if there are very low wait times or very high wait times, regardless of the experience of most patients on the list. In real life, the average (mean) does not show the complete distribution of the wait times and therefore it distorts the picture of the real waits patients are facing.
Median or 50th Percentile	The median is defined as the middle number in an ordered list of values. It is a positional average. It is calculated by arranging the data set in ascending or descending order and picking the value that falls in the exact middle of the new data set.	Not sensitive to outliers and remains unchanged even if there are very low or very high wait times. It provides information on the number of days by which 50% of patients had their MRI/CT scan, and so it lets patients know how long they are waiting in comparison to other patients on the list. It gives them a sense of the fairness of the system in their own case.	Does not show a complete picture of the higher outliers of wait-time data, especially in hospitals with high wait times. It does not help patients know how long they are likely to wait.
90th Percentile	The 90th percentile is a measure used in statistics indicating the value below which 90% of observations/values in a group fall.	Highlights the highest 10% of outliers in a range of data. From a wait-time perspective, it can provide users of the data with useful information on the maximum number of days by which 90% of patients had their MRI/CT scan, and helps them evaluate how well the system is working. It also lets patients on the list see how their own experience compares to the patients with some of the longest wait times.	This measure may be more difficult to understand for a common user of the data, unless it is plainly stated as the time by which nine out of 10 people on the list are given their scans. It also does not help patients know how long they are likely to wait.
Wait-Time Ranges	Ranges categorize the actual time that patients waited to receive their MRI/CT scans within predetermined wait-time ranges and show the percentage of scans performed within these ranges.	Represent every patient who has been scanned in a given hospital. Therefore, they provide a more complete picture of how many patients waited in the past and for how many days.	This measure may be more time-consuming to calculate.
Real-Time Performance (Data Not Compiled by Cancer Care Ontario)			
Real-Time Wait Time	The real-time wait time reflects the next available appointment date that patients can expect to get for receiving their MRI/CT scans.	Compared to the other measures noted, which are based on patient wait times in the past (i.e., patients who have already been scanned), this measure provides specific information to patients who are still waiting to be scanned on the length of the wait they can expect.	This measure is specific to every hospital, and additional resources may be required to compile it for the province as a whole.

Appendix 6: Audit Criteria

Prepared by the Office of the Auditor General of Ontario

1. Effective governance and planning processes are in place to ensure the capacity, allocation and utilization of MRI and CT equipment meet patients' clinical needs across the province.
2. Effective procedures and co-ordination among service providers are in place to ensure patients have timely and equitable access to MRI and/or CT scans when needed.
3. Evidence-based policies, procedures and clinical guidelines are in place and followed to ensure that the referral and delivery of MRI and CT scanning services are appropriate.
4. MRI and CT equipment are acquired, used and maintained in a cost-effective, safe and appropriate manner.
5. Effective processes are in place to accurately report, track and access patient test results on a timely basis.
6. Performance measures and targets are established, monitored, compared against actual results and publicly reported to ensure that the intended outcomes are achieved and that corrective actions are taken on a timely basis when issues are identified.
7. Financial and operational data are collected to provide accurate, complete and timely information to help guide management decision-making, compare against best practices in other jurisdictions, and assist with performance management.

Appendix 7: Canadian MRI and CT Machine Inventories and Number of Scans Performed, January–December 2017

Source: Canadian Agency for Drugs and Technologies in Health

Province/Territory	Population (as of July 1, 2017)	# of Machines	# of Scans	# of Scans per 1,000 Population
MRI Machines				
Prince Edward Island	149,790	1	4,279	28.6
British Columbia	4,789,221	46	173,678	36.3
Saskatchewan	1,161,365	10	44,461	38.3
Newfoundland and Labrador	528,683	5	20,990	39.7
Alberta	4,291,980	41	192,375	44.8
Quebec	8,371,498	107	380,357	45.4
Nova Scotia	953,173	12	47,490	49.8
Yukon	37,808	1	2,200	58.2
Manitoba	1,332,629	12	77,735	58.3
New Brunswick	757,641	11	44,592	58.9
Ontario	14,135,610	120	866,953	61.3
Northwest Territories	44,381	0	n/a	n/a
Nunavut	37,462	0	n/a	n/a
Canada	36,591,241	366	1,855,110	51.0
CT Machines				
Nunavut	37,462	1	2,000	53.4
Yukon	37,808	1	3,500	92.6
Alberta	4,291,980	56	405,332	94.4
Prince Edward Island	149,790	2	15,811	105.6
Northwest Territories	44,381	1	4,695	105.8
Saskatchewan	1,161,365	15	128,415	110.6
Manitoba	1,332,629	23	186,197	139.7
British Columbia	4,789,221	66	695,248	145.2
Quebec	8,371,498	163	1,350,792	161.4
Nova Scotia	953,173	18	155,099	162.7
Ontario	14,135,610	184	2,430,739	172.0
Newfoundland and Labrador	528,683	16	90,985	172.1
New Brunswick	757,641	15	142,294	187.8
Canada	36,591,241	561	5,611,107	153.0

Appendix 8: Comparison of Wait-Time Targets for Receiving MRI and CT Scan Services across Jurisdictions and as Recommended by Canadian Association of Radiologists

Source: Provincial health ministry websites and Canadian Association of Radiologists

Jurisdiction/ Category	Emergency	Urgent	Semi-urgent	Non-urgent	How Wait Time Is Measured
Ontario	Within 24 hours	Within 2 days	Within 10 days	Within 28 days	From receipt of the MRI/CT request to the date that the scan is performed
Alberta	Not specified	Within 7 days	Within 30 days	MRI: Within 90 Days CT: Within 60 Days	Between the time when a patient and specialist decide that a procedure or diagnostic test is required and the date the procedure or test is performed
PEI	Within 48 hours	Within 14 days	Within 28 days	MRI: Within 84 Days CT: Within 56 Days	From receipt of the MRI/CT request to the date that the scan is performed
Saskatchewan	Within 24 hours	2-7 days	8-30 days	31-90 days	The wait time is calculated from the date the procedure is requested to the date the procedure is performed
Canadian Association of Radiologists	Within 24 hours	Within 7 days	Within 30 days	Within 60 days	From the date a completed referral for a medical examination is received until the date the examination is completed

Note: In Ontario and Saskatchewan, wait-time targets are measured as the maximum amount of time in which 90% of patients have received their scans. However, other provinces do not publicly report a similar wait-time measure.

Appendix 9: Analysis of MRI and CT Patient Real-Time Wait Times at Three Hospitals, July 2018

Source of data: three of the four selected hospitals where information was available

Hospital	A	B	C
MRI Patients			
(a) Average wait time for non-urgent patients, in days—reported to the public	193	72	92
(b) # of patients on hospital wait list	8,230	2,305	3,944
(c) # of non-urgent patients on hospital wait list	7,508 [91% of (b)]	2,103 [91% of (b)]	3,816 [97% of (b)]
(d) # of non-urgent patients who have <i>not</i> received an appointment date	6,872 [92% of (c)]	954 [45% of (c)]	0
# of patients waiting for more than the average wait time reported to the public in (a)	2,106 [31% of (d)]	310 [32% of (d)]	0
# of patients waiting less than the average wait time reported to the public in (a)	4,766 [69% of (d)]	644 [68% of (d)]	0
(e) # of non-urgent patients who have received an appointment date	636 [8% of (c)]	1,149 [55% of (c)]	3,816 [100% of (c)]
# of patients waiting for more than the average wait time reported to the public in (a) for their scheduled scans	625 [98% of (e)]	423 [37% of (e)]	3,315 [87% of (e)]
# of patients waiting less than the average wait time reported to the public in (a) for their scheduled scans	11 [2% of (e)]	726 [63% of (e)]	501 [13% of (e)]
CT Patients			
(a) Average wait time for non-urgent patients, in days—reported to the public	156	116	59
(b) # of patients on hospital wait list	5,842	2,945	1,304
(c) # of non-urgent patients on hospital wait list	4,659 [80% of (b)]	2,434 [83% of (b)]	1,123 [86% of (b)]
(d) # of non-urgent patients who have <i>not</i> received an appointment date	4,499 [97% of (c)]	390 [16% of (c)]	0
# of patients waiting for more than the average wait time reported to the public in (a)	2,087 [46% of (d)]	82 [21% of (d)]	0
# of patients waiting less than the average wait time reported to the public in (a)	2,412 [54% of (d)]	308 [79% of (d)]	0
(e) # of non-urgent patients who have received an appointment date	160 [3% of (c)]	2,044 [84% of (c)]	1,123 [100% of (c)]
# of patients waiting for more than the average wait time reported to the public in (a) for their scheduled scans	129 [81% of (e)]	1,604 [78% of (e)]	968 [86% of (e)]
# of patients waiting less than the average wait time reported to the public in (a) for their scheduled scans	31 [19% of (e)]	440 [22% of (e)]	155 [14% of (e)]

Note: Once hospitals receive the requisition forms for MRI or CT scans from the patients' referring physicians, the radiologists triage patients based on the information available in the requisitions. They classify patients by assigning priority levels and then assessing the patients for the type of scan they should be given. The hospitals schedule appointments based on these patient classifications. This appendix excludes patients who were waiting for follow-up scans.

Appendix 10: Number of MRI and CT Scan Machines and Wait Times by Independent Health Facility, March 2018

Source of data: Cancer Care Ontario

Independent Health Facilities (IHF)	# of Machines	LHIN	Non-urgent Wait Times 2017/18 (# of Days at 90th Percentile)
IHFs Operating MRI Machines			
KMH MRI and Healthcare Centres - Thornhill	1	Central	104
Kingston MRI	2	South East	93
Oxford Advanced Imaging Inc. - Mississauga	1	Mississauga Halton	88
Oxford Advanced Imaging Inc. - Ajax	1	Central East	64
KMH MRI and Healthcare Centres - Kitchener	1	Waterloo Wellington	58
Total	6		
IHFs Operating CT Machines			
Oxford Advanced Imaging Inc. - Mississauga	1	Mississauga Halton	17
Oxford Advanced Imaging Inc. - Ajax	1	Central East	9
Superior Imaging	1	North West	Not reported*
Huntsville CT Clinic	1	North Simcoe Muskoka	Not reported*
Total	4		

* Wait-time data will be reported after an information system is implemented; the setup of the system was in progress at the time of our audit.