



OFFICE OF THE
AUDITOR GENERAL
MANITOBA

Department of Health, Seniors and Active Living
Diagnostic Services Manitoba
Prairie Mountain Health
Winnipeg Regional Health Authority

Management of MRI Services

April 2017

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April 2017

The Honourable Myrna Driedger
Speaker of the House
Room 244, Legislative Building
450 Broadway
Winnipeg, Manitoba R3C 0V8

Honourable Ms. Driedger:

It is an honour to present my report titled *Management of MRI Services* to be laid before Members of the Legislative Assembly in accordance with the provisions of Sections 14(4) and 28 of *The Auditor General Act*.

Respectfully submitted,

Norm Ricard, CPA, CA
Auditor General

Table of contents

Auditor General’s comments	1
Main points	3
Response of officials	7
Background	10
Audit approach	14
Findings and recommendations	15
1. Improvements needed to make MRI services more efficient and timely	15
1.1 Problems in managing the intake of MRI requests	15
1.1.1 Limited processes for reducing inappropriate requests	15
1.1.2 Better processes needed to prevent and detect duplicate requests	17
1.1.3 Room to better balance wait times across the province.....	20
1.1.4 MRI requests often incomplete, causing inefficiencies	21
1.2 Issues in prioritizing MRI requests and meeting related targets	21
1.2.1 No province-wide priority classification system	21
1.2.2 Some patients given priority for non-medical reasons	23
1.2.3 Many scans not scheduled within wait-time target for assigned priority level.....	24
1.3 MRI scanners not fully and efficiently used	25
1.3.1 Scanner hours of operation not maximized.....	25
1.3.2 Differing MRI protocols affect time and cost of similar scans.....	26
1.3.3 Inefficiencies in scheduling practices result in fewer scans per day	26
1.3.4 Patient no-shows reduce scanner utilization	27
1.3.5 Inadequate measurement and monitoring of scanner productivity	28
1.4 Better monitoring needed to ensure all MRI scan results reported promptly	29
1.4.1 Most MRI reports prepared quickly, but better monitoring needed to flag exceptions .	29
1.4.2 Most MRI reports sent to referring clinicians promptly	30
1.5 Weaknesses in MRI planning and performance reporting	31
1.5.1 Insufficient information supporting decisions about new additional scanners.....	31
1.5.2 More comprehensive strategic planning needed	32
1.5.3 Outcome of strategies to increase supply of technologists uncertain	33
1.5.4 Inconsistencies and gaps in performance information provided to Department	33
1.5.5 MRI volumes and wait times publicly reported, but improvement needed.....	34

2. Gaps in patient safety and quality assurance processes35

2.1 Some weaknesses in patient safety processes35

 2.1.1 Patient safety procedures in place, but some patient screening forms incomplete35

 2.1.2 Critical incidents reported; remedial action taken to address gaps in processes36

2.2 Quality assurance processes need improvement.....37

 2.2.1 All MRI facilities accredited, but future of accreditation process uncertain37

 2.2.2 Some gaps in scanner quality-control processes.....38

 2.2.3 Delayed replacement of MRI scanners cause quality and efficiency concerns38

 2.2.4 Radiologists and technologists meet qualification requirements, but peer review processes weak.....39

Summary of recommendations 41

Auditor General's comments

Magnetic Resonance Imaging (MRI) scans help clinicians diagnose, monitor, and treat patients' medical conditions. MRI use has increased significantly over the past decade, both across Canada and in Manitoba. The Department of Health, Seniors and Active Living's data shows the annual volume of MRI scans in Manitoba increased 169% between 2005 and 2015, from 27,789 scans to 74,684.

It is concerning, however, that between 2011 and 2015 the average MRI wait time in Manitoba steadily grew from 12 to 23 weeks—an increase of 92%. As of June 2016, there were 21,323 people waiting for MRI scans and the average wait time was still 23 weeks. A 2016 Canadian Institute for Health Information report showed that Manitoba's wait times were among the longest in Canada for provinces with available data.



Delays in receiving an MRI scan can lead to delays in definitive diagnosis and appropriate treatment. In addition, excessive wait times can increase patient anxiety and negatively impact quality of life. They can also result in economic costs, such as lost labour productivity.

We chose to audit the management of MRI services because of its importance to the health and well-being of Manitobans. MRI scanners are in such high demand that it is imperative they be used as efficiently and effectively as possible and that they be properly located.

We found opportunities to strengthen the intake of MRI requests, including the need for better processes to identify inappropriate requests, and increasing use of central intake to help reduce the number of duplicate requests and better balance wait times across facilities. And there were opportunities to better prioritize and schedule MRI scans based on medical need. We also found that management could do more to ensure that MRI scanners are more fully used, such as maximizing each scanner's hours of operation, and measuring and monitoring scanner productivity.

Ensuring the quality of MRI scans and reports is critical because poor quality scans or mistakes in reading and interpreting scans, as well as incomplete patient screening, can adversely affect patient outcomes and safety. We found some gaps in the quality assurance processes used at each facility.

Given that an MRI scanner costs about \$2 to \$3.5 million (not including costs to construct or renovate a space for the scanner), proper planning when deciding when and where to add a scanner is critical. Yet the decisions on the acquisition and location of the last 4 approved scanners were not supported with analyses of options, costs, benefits, and risks. Without comprehensive analysis, new scanners may not be properly located to provide Manitobans with the best possible value for their investment.

Management of MRI Services

We recognize that managing MRI services in an efficient, effective, economic, and equitable manner requires the consideration of many factors. I am pleased that the Department of Health, Seniors and Active Living; Diagnostic Services Manitoba; Prairie Mountain Health; and Winnipeg Regional Health Authority have acknowledged the value of our 24 recommendations to their continuing efforts to strengthen their management of MRI services. We will initially follow-up on the implementation status of our recommendations as at September 30, 2018.

I would like to thank the dedicated staff we met with during our audit for their cooperation and assistance.



Norm Ricard, CPA, CA
Auditor General

Main points

What we examined

Magnetic Resonance Imaging (MRI) is a non-invasive procedure that uses a strong magnetic field and radio waves to create detailed images of organs and structures inside the body—most commonly the brain, spine, heart, abdomen, pelvis, and soft tissues in joints. This advanced imaging helps clinicians diagnose, monitor, and treat patients' medical conditions. The Department of Health, Seniors and Active Living (the Department) funds and oversees MRI services. Two Regional Health Authorities (RHAs) and Diagnostic Services Manitoba (a provincial health agency) manage and deliver these services.

We examined the adequacy of processes in the Department, Diagnostic Services Manitoba (DSM), Prairie Mountain Health (PMH), and Winnipeg Regional Health Authority (WRHA) for ensuring:

- timely and efficient MRI services.
- patient safety and quality of MRI scans and reports.

What we found

1. Improvements needed to make MRI services more efficient and timely

1.1 Problems in managing the intake of MRI requests

Inappropriate requests: Several Department and RHA staff told us inappropriate MRI requests are a problem and the Canadian Agency for Drugs and Technologies in Health reports that evidence indicates 10-20% of medical imaging exams are unnecessary or inappropriate. Despite this, Manitoba has limited processes to prevent inappropriate requests, while some other provinces do more. This unnecessarily increases MRI volumes and corresponding wait times.

Duplicate requests: Many duplicate MRI requests occur because MRI requests are not centrally managed in the province. In WRHA, where multiple facilities provide MRI services, clinicians can fax requests to a central intake office—but this is not mandatory. In 2015, the office only processed about 35% of the MRI requests for WRHA facilities. Without mandatory central intake, clinicians may try to reduce their patients' wait times by sending the same request to multiple locations. Duplicate requests sent to multiple facilities increase the number of cancelled and no-show appointments because facilities' booking systems are not integrated and cannot detect them.

Wait time imbalance across province: More could be done to balance wait times across the province. Patients and health care providers may not all be aware of the option to have MRI referrals sent to another region with a shorter wait time. And while WRHA's central intake helps balance MRI wait times between Winnipeg facilities, it doesn't help balance wait times across the province. In June 2016, the average MRI wait time in Winnipeg facilities ranged slightly, from 24 to 27 weeks. But the average wait time was 17 weeks at Boundary Trails Health Centre (located between Winkler and Morden) and 12 weeks at Brandon Regional Health Centre.

Incomplete requests: MRI requests submitted by clinicians were often incomplete, causing inefficiencies. In our review of 270 outpatient files, only 6% of the MRI request forms were initially complete. Facility staff generally try to obtain any key missing information, but only 73% of the MRI request forms in our sample ultimately had all key information. While similar patient information is also gathered at appointments, if it isn't obtained ahead of time patients may only find out they are unable to be safely scanned after arriving for their appointments.

1.2 Issues in prioritizing MRI requests and meeting related targets

No province-wide prioritization system: Radiologists assign MRI requests a priority code. The code indicates the urgency of the request and how soon the appointment should be scheduled. However, regions had differing priority levels and they set different wait-time targets for similar priority levels. There were no provincial wait-time targets.

Scans not scheduled within wait-time targets for assigned priority levels: In the outpatient files reviewed, only 21% of scans were scheduled to be done within the target wait time for the assigned priority level. This included 92% of emergent scans—but only 42% of urgent scans, 24% of semi-urgent scans, and 12% of routine scans. Facilities were not monitoring MRI wait times by priority level. Some regional management said wait times by priority levels were not tracked due to IT system limitations.

Higher priority sometimes given for non-medical reasons: Some patients were given higher priority for non-medical reasons. One WRHA facility had an agreement with the Workers Compensation Board (WCB) to give MRI appointments to WCB clients within 20 business days of receipt of the MRI request. At some facilities, patients covered by private insurers or having to pay for their own scans received higher priority. On average, members of professional sports teams received MRI scans within a day of referral. And some patients with influence (such as government officials, donors, or people working in the health care system) received quick scans—often the same or next day and without any priority code assigned to their request forms. Regional management said these latter individuals may have been available on short notice to fill spots opening up from last minute cancellations or no-shows, and they also may have been unaware of any special treatment received. But other people may also be available on short notice and most facilities keep cancellations lists for these situations.

1.3 MRI scanners not fully and efficiently used

Scanner hours of operation not maximized: Hours of operation for scanners in June 2016 ranged from 47.5 to 117 hours weekly. We estimated that nearly 11,300 more scans could be done annually if all 11 scanners ran 16 hours a day, 7 days a week—a 14% increase.

Differing protocols and scheduling practices affect scans per day: Each facility had standard scanner protocols for producing different types of images—but the protocols for similar scans differed between facilities, affecting the time and cost of scans. For example, the scanner ran twice as long for a routine shoulder scan in one facility as another. Scheduling practices also differed between facilities, and longer standard appointments were not always related to longer standard protocols. Standard appointment times for similar types of exams varied between facilities (for example, from 20-30 minutes for a spine exam). And our review of a 2-week schedule at each facility showed the percentage of operating hours booked with MRI exams ranged from 81% to 96%.

Managing patient no-shows a challenge: Patient no-shows for MRI appointments reduce the number of scans done in a day if they can't be filled at the last minute, increasing wait times. We estimated there were about 3,400 no-shows annually and found that facilities could do more to reduce the number of no-shows.

Scanner productivity inadequately monitored: Facility and regional management had some productivity measures, but these were insufficient to assess efficiency and help drive process improvement. None of the facilities tracked and monitored MRI scanner utilization rates (active scanning time as a percentage of operating hours) or scanner throughput (scans per operating hour).

1.4 Better monitoring needed to ensure all MRI results reported promptly

Most MRI results reported promptly: Radiologists' reports were generally prepared quickly after scans were done, although we found some exceptions. This showed a need for better monitoring to flag any exceptions. Most MRI reports were sent to referring clinicians promptly.

1.5 Weaknesses in MRI planning and performance reporting

Insufficient information for decisions on additional scanners: We examined the decision-making process for the 4 most recently approved MRI scanners. The Department did not conduct province-wide assessments to determine the need for additional scanners. The proposals submitted to Treasury Board did not compare costs, benefits, and risks of different options for expanding MRI services, including alternative locations. Nor did they consider key information such as patient referral patterns across the province, travel costs, and clinical environments.

More comprehensive strategic planning needed: Department officials told us that increasing MRI capacity without broader provincial planning was not a viable long-term solution to the growing demand for MRI services, and that there was a need to develop a sustainable provincial plan for diagnostic imaging. The Diagnostic Imaging Joint Council, which has representatives from the RHAs and DSM, might be a logical forum for strategic discussions about MRI services—but at the time of our audit the Department had no representative on the Council.

Inconsistencies and gaps in performance information: DSM, PMH, and WRHA reported monthly MRI volume and wait-time statistics to the Department, but these statistics were calculated inconsistently, reducing their comparability. For example, 2 of the 3 reported wait times prospectively (how long patients could currently expect to wait), the other reported retrospectively (how long patients actually waited). Further, facilities did not report wait times by priority levels, or any efficiency measures.

Publicly reported information needs improvement: MRI volumes and wait times were publicly reported, but there were problems with the accompanying narrative and the data. For example, the Department's web page inaccurately described how wait times were calculated. And the inconsistent statistics reported to the Department were reflected in the publicly reported data. Some other provinces reported more wait time information, such as the number of people waiting, the length of time to serve 90% of the people waiting, and wait times by priority level in comparison to targets.

2. Gaps in patient safety and quality assurance processes

Incomplete patient screening forms: An MRI scanner's strong magnetic field can make it unsafe to scan people with certain implants. There were safety screening forms in 99% of the 270 outpatient files reviewed; however, 18% were incomplete or not signed as reviewed by staff.

Facilities accredited, but annual medical physics reviews not done: All MRI facilities were fully accredited under the Manitoba Quality Assurance Program (MANQAP). This accreditation is done every 5 years. MANQAP also requires facilities to have their quality control programs assessed by a medical physicist each year. None of the 5 facilities had these assessments done each year, but all told us they planned to remedy this issue.

Peer review quality assurance processes lacking: At the time of the audit, all radiologists and MRI technologists had the qualifications required to do their work. However, most facilities did not regularly perform the peer reviews required for each MRI technologist's work. And no facilities had a peer review process to assess how accurately radiologists read and interpreted MRI scans, although this practice has been implemented in some other provinces.

Response of officials

Manitoba Health, Seniors and Active Living (the Department), The Winnipeg Regional Health Authority (WRHA), Diagnostic Services Manitoba (DSM), and Prairie Mountain Health (PMH), would like to extend their thanks to the Office of the Auditor General (OAG) for its review of the Management of Magnetic Resonance Imaging (MRI) Services. The review and recommendations will further inform current and ongoing efforts of the department for policy and planning, oversight, and funding of MRI services and for the operations and management of MRI services by WRHA, DSM, and PMH.

The Department commits to responding to those recommendations that are in scope of the department's role and function and to facilitate the response of the service providers; DSM, WRHA and PMH to those recommendations in scope of the service delivery system.

The Department notes the collective effort of these organizations to address those recommendations that are more closely aligned to operations and clinical management. Furthermore, the department acknowledges the work that is underway and, in regards to some recommendations, near completion.

Jointly DSM, PMH and WRHA have reviewed the Auditor General's report on Management of MRI Services and its recommendations. Actions are already underway that address many of the recommendations and we look forward to continuing to making improvements to the MRI services that we provide Manitobans.

In regard to educating clinicians on ordering MRIs, it is important to note that first year medical students receive educational training on the appropriate use of diagnostic imaging delivered by radiologists working at WRHA facilities. As well, educational sessions for family physicians about appropriateness criteria for MRIs are held, most recently in the spring of 2016.

Appropriateness of test utilization is actively supported by the Department through key stakeholders, and specifically addressed by efforts such as Choosing Wisely, to help physicians and patients engage in conversations about unnecessary tests, treatments and procedures so they can make informed choices that ensure high-quality care.

DSM, PMH and WRHA agree timely booking of MRI exams is important and requires ongoing monitoring. Audit field work identified gaps in this area. We made immediate efforts to reduce the number of unscheduled MRI exams by increasing clerical resources and redistributing requisitions. Based on 2 recent site audits, we can confirm that there has been a substantial (ranging from 43% to 80%) reduction in un-booked exams from the levels found in the audit.

We will evaluate further the recommendation to make mandatory the central intake of MRI requests. The Manitoba Government has signaled its interest in examining the wait time for priority diagnostic imaging, with the announcement of the Wait Time Reduction Task Force. A Priority Procedures Wait Times Committee will provide recommendations to address wait times for MRI Scans, in addition to other priority procedures.

We agree patients should be able to obtain their MRI exams at any facility in the province with the available medical services and sub-specialties needed to support the specific MRI exam indicated. Uncomplicated MRI exams can be done at any site. The WRHA has updated the

website and we will take steps to increase awareness of this amongst physicians and patients. In DSM's SHSS facility, 47% of patients receiving MRIs are from outside the SHSS region which indicates a high level of awareness already.

We recognize the need to establish more formal policies and procedures to reinforce the utilization of priority codes to ensure those waiting for MRI scans are prioritized according to clinical need.

As it relates to MRIs for WCB patients, it's important to note a previous agreement and policy framework had been in place to account for WCB patients receiving priority scans. The WCB had provided \$1.5M in financial support to fund an additional MRI machine at the Pan Am Clinic on top of paying for individual scans for WCB patients.

We recognize no such formalized contract has been developed for the past use of the MRI scanner for professional athletes.

There is insufficient information regarding the audit finding around 'patients of influence' for the Department to provide a response at this time.

We welcome the opportunity the review provides for an open discussion regarding the role factors other than clinical need have historically played in the current system and impact on overall access. The discussion will inform ongoing efforts to explore innovative solutions to increase the efficiency, and sustainability of our healthcare system.

All three organizations have adopted the Canadian Association of Radiologists (CAR) national maximum wait time access targets for priority classification of MRI exams. The jointly agreed upon priority to standardize MRI requisitions between our organizations will be instrumental in providing complete information to prioritize referrals appropriately. We are exploring a new information system tool which will run wait time reports by priority level.

We are committed to identifying and implementing best practices in MRI service delivery that improve operational efficiencies and increase throughput. MRI services in each organization are managed on a volume funding basis; we regularly exceed specific volume deliverables, and work diligently to maximize services to meet demand.

As outlined above, DSM, PMH, WRHA and the Department have engaged in joint wait time reporting and common metrics development for the purposes of advancing consistency and accuracy in public reporting.

The audit report recommends that the organizations have a medical physicist assess their MRI quality control programs each year as required by the Manitoba Quality Assurance Program. The parties will undertake to implement this recommendation within available medical physics resources in the Province.

DSM, PMH and WRHA recognize the potential benefits of medical peer learning programs. Regimented peer review processes alone however, may not achieve the desired outcome of

improved diagnostic accuracy.¹ We will study this aspect of medical quality improvement and adopting evidence based practices that support effective peer learning.

Growth in demand for MRIs increases year over year in Manitoba, as in other jurisdictions, owing to a growing and aging population. The Canadian Agency for Drugs and Technologies in Health (CADTH) reports² that in 2010 Canadians underwent 1.4 million MRI tests—nearly double the number performed in 2003. This demand is added to by practice changes in the use of MRI as a modality of choice.

Balancing access and appropriateness is critical to the sustainable provision of MRI services and provincial efforts have been focussed on ensuring MRI facilities in key locations in urban and rural Manitoba.

All organizations are committed to ensuring a sustainable health system that betters the patient's experience and improves the health of all Manitobans.

¹ <http://www.healthimaging.com/topics/practice-management/5-reasons-radiology-should-replace-%E2%80%98gotcha%E2%80%99-style-peer-review-%E2%80%98peer-learning%E2%80%99?nopaging=1>

² Canadian Agency for Drugs and Technology in Health 2010

Background

Responsibility for MRI services

The Department of Health, Seniors and Active Living (the Department) is responsible for providing strategic direction, establishing standards and policies, promoting quality and safety, allocating funding, and ensuring accountability for the provincial health care system. The Provincial Cancer and Diagnostic Services Branch of the Department supports the Minister of Health, Regional Health Authorities (RHAs), and Diagnostic Services Manitoba (a provincial health agency) in planning and delivering diagnostic imaging services, including MRI services. It is also responsible for leading diagnostic imaging quality-improvement initiatives and informing Manitobans about access and capacity matters related to diagnostic imaging. The Branch has three staff members with some oversight responsibility for diagnostic imaging, including MRI services, in addition to other duties.

RHAs are generally responsible for the delivery and administration of health services in their geographic area. However, Diagnostic Services Manitoba (DSM), a provincial health agency established in 2002, is responsible for the delivery of diagnostic imaging services outside of Winnipeg and Brandon. Together, DSM, Prairie Mountain Health (PMH), and Winnipeg Regional Health Authority (WRHA) oversee over 100 staff delivering MRI services (42 radiologists, 57 MRI technologists, and various management and support staff).

Number and location of MRI scanners

The Province has invested significantly in additional MRI scanners over the past several years. Nine scanners have been added since 2004, for a total of 11 as of June 2016. **Figure 1** shows the location of the scanners. In June 2016, 3 of Manitoba's 5 RHAs had a scanner in their area, and WRHA had 9 of the 11 scanners.

Figure 1: 11 MRI scanners operating in 3 RHAs (as of June 2016)

Regional Health Authority	Facility	Scanners
Winnipeg Regional Health Authority (WRHA)	St. Boniface General Hospital	3
	Health Sciences Centre*	4
	Pan Am Clinic	1
	Grace Hospital	1
Prairie Mountain Health (PMH)	Brandon Regional Health Centre	1
Southern Health-Santé Sud [managed by Diagnostic Services Manitoba (DSM)]	Boundary Trails Health Centre (located between Winkler and Morden)	1
	Manitoba Total	11

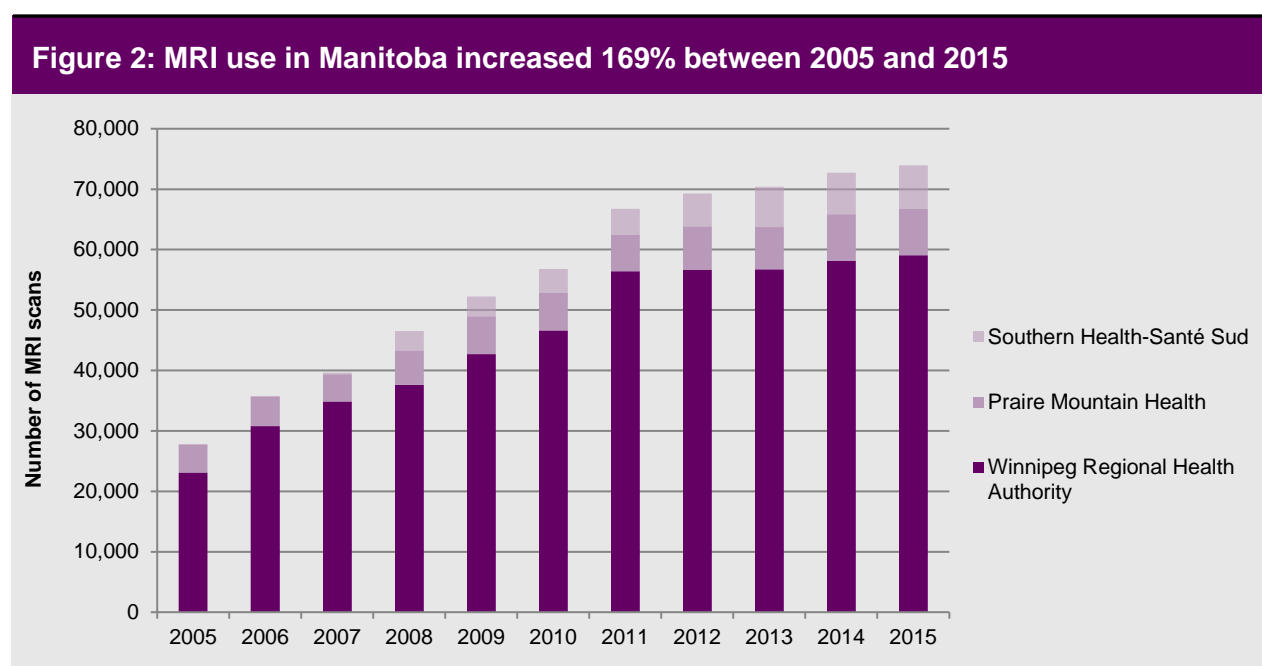
*includes one scanner located at the National Research Council building on Ellice Avenue

Source: Department of Health, Seniors and Active Living records

At the time of our audit, the Province had also committed to adding 3 more scanners: 1 in PMH (to be located in Dauphin), 1 in the Interlake-Eastern Region (to be located in Selkirk) and 1 in Winnipeg (at the Health Sciences Centre, to be a dedicated pediatric scanner). In accordance with its mandate, DSM will operate the Dauphin and Selkirk scanners. There are no privately-owned MRI scanners in Manitoba.

MRI volumes

Demand for MRI scans has increased significantly since 2005. As **Figure 2** shows, annual MRI use increased from 27,789 to 74,684 scans between 2005 and 2015—an increase of 169%. In contrast, Manitoba’s population only grew about 11% over this period. In 2015/16, 79% of the MRI scans in Manitoba were done in the WRHA, 11% in PMH, and 10% in Southern Health-Santé Sud.



Source: Department of Health, Seniors and Active Living records

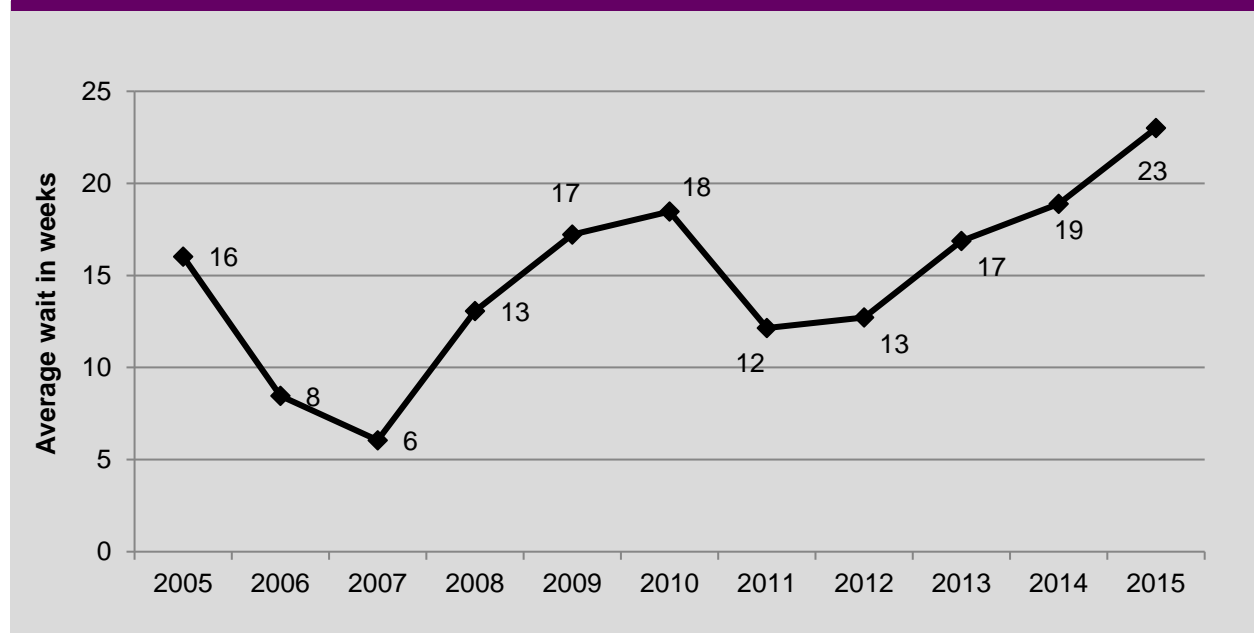
MRI literature cites many factors as contributing to increased MRI use. Department, RHA, and DSM officials also cited several factors. In summary, these included:

- making more scanners available.
- growing concerns over the harmful effects of radiation exposure from CT scans.
- an aging population requiring more diagnostic imaging.
- changing technology and clinical practice, resulting in increased breadth of MRI use.
- patients demanding more advanced imaging technologies.
- allowing all general practitioners and nurse practitioners to request MRI scans, instead of restricting requests to specialists (not all general practitioners were allowed to request scans until 2008, and nurse practitioners were not allowed to request scans until 2013).
- training new physicians with more advanced diagnostic tools.

MRI wait times

MRI wait times in Manitoba have fluctuated as capacity has changed, typically dropping and then gradually increasing after the addition of more scanners. However, as **Figure 3** shows, the average wait time increased steadily from 12 to 23 weeks between 2011 and 2015—an increase of 92%. The wait time in 2015 was higher than at any other point during the past 10 years.

Figure 3: Average wait time for an MRI scan in Manitoba increased 92% between 2011 and 2015 (from 12 to 23 weeks)



Source: Department of Health, Seniors and Active Living records

In June of 2016, there were 21,323 people waiting for MRI scans and the average wait time remained at 23 weeks. In contrast, the average wait time for a CT scan was 5 weeks and the average wait time for an ultrasound was 12 weeks. Manitobans wait longer for an MRI scan than for any other diagnostic service.

Although Manitoba’s average wait time for an MRI scan was 23 weeks, average wait times varied significantly between facilities, from 12 weeks at Brandon Regional Health Centre to 27 weeks at the Grace Hospital in Winnipeg. The 9 Winnipeg facilities all had significantly longer wait times than the 2 facilities outside Winnipeg.

Meeting the growing demand for MRI scans and managing increasing wait times are not challenges unique to Manitoba. However, **Figure 4** shows that, amongst provinces with available data, Manitoba has some of the longest wait times. Between April and September 2015, Manitoba took the longest to serve 50% of the people waiting for an MRI scan (on average, 99 days or 14.1 weeks) and the second longest to serve 90% of the people waiting (on average, 189 days or 27 weeks).

Figure 4: Manitoba's MRI wait times among the longest in Canada

MRI wait times in days, April to September 2015		
Province	To serve 50% of the people waiting (50th percentile)	To serve 90% of the people waiting (90th percentile)
Manitoba*	99 days (14.1 weeks)	189 days (27 weeks)
Alberta	90	172
Prince Edward Island	56	167
Nova Scotia	55	202
Ontario	36	91
Saskatchewan	30	149

* Results for only WRHA, which reflects about 80% of MRI exams in Manitoba.

Note: Wait times were unavailable for Newfoundland and Labrador, New Brunswick, Quebec, and British Columbia.

Source: *Wait Times for Priority Procedures in Canada, 2016*, Canadian Institute for Health Information

Responsibilities of key health care personnel

Medical radiation technologists specialized in magnetic resonance (MRI technologists) are responsible for screening and preparing patients for MRI scans, operating MRI scanners, and ensuring the safety of patients and staff around the magnetic field. MRI scans can pose risks to patients with metallic implants and other implanted materials, and can result in thermal burns or hearing loss if patients are not properly protected. Comprehensive screening procedures and safety protocols are critical for managing these risks.

Diagnostic radiologists supervise the delivery of MRI services and provide direction to technologists on the protocols to be followed in producing images. Radiologists also review MRI requests for appropriateness, prioritize the requests, read and interpret MRI images, and produce reports on scan results for referring clinicians.

Audit approach

We examined the adequacy of Departmental, DSM, PMH, and WRHA processes for ensuring timely and efficient MRI services. We also examined the adequacy of processes for ensuring patient safety and the quality of MRI scans and reports.

We conducted most of the audit between September 2015 and June 2016. We primarily examined processes in place between January 2015 and June 2016. Our audit was performed in accordance with the value-for-money auditing standards established by the Chartered Professional Accountants of Canada and, accordingly, included such tests and other procedures as we considered necessary in the circumstances.

The audit included review and analysis of legislation, policies and practices, information systems, data, records, reports, minutes, and correspondence. We reviewed processes and files at the 5 facilities operating MRI scanners in 2015: Boundary Trails Health Centre, Brandon Regional Health Centre, Health Sciences Centre, Pan Am Clinic, and St. Boniface General Hospital. Most of our audit testing excluded the Grace Hospital as its MRI scanner was not operational until mid-April 2016.

Our audit was primarily based on a random selection of 270 outpatient and 85 inpatient files from the population of MRI scans performed in 2015 (with additional patient files selected in specific areas as needed). We also interviewed staff from the Department, DSM, PMH, WRHA, and the 5 facilities. In addition, we reviewed publicly available information on MRI services in other provinces. This included information on wait times, scan volumes, initiatives to improve the appropriateness of MRI scan requests, quality assurance processes, and performance reporting.

Findings and recommendations

1. Improvements needed to make MRI services more efficient and timely

1.1 Problems in managing the intake of MRI requests

1.1.1 Limited processes for reducing inappropriate requests

The Canadian Agency for Drugs and Technologies in Health reports that evidence indicates 10-20% of medical imaging exams are inappropriate. And several Department and RHA staff told us inappropriate MRI requests are a problem. Examples of inappropriate requests are those that are unlikely to help diagnose or detect what the referring clinician is requesting the image for, plus those where a different diagnostic imaging technique may be more suitable. These requests increase the volume of MRIs and corresponding wait times.

One facility had investigated the volume of MRI scans requested by individual clinicians in 2014/15. To better understand the potential scope of inappropriate ordering, we analyzed this data. On average, general practitioners and nurse practitioners requested 22 scans during the year, while physician specialists requested 12. Eighteen physicians (a neurologist, 3 orthopedic surgeons, and 14 general practitioners) each requested over 100 scans—including one general practitioner who requested 306 scans and accounted for 3% of all the MRIs done at the facility that year. At the time of our audit, facility management was still considering what (if anything) to do to remedy significant anomalies in physician ordering. They noted the need to consider differences in physicians' practices when comparing ordering volumes, and that it was not surprising that neurologists and orthopedic surgeons ordered more exams than many other types of clinicians. It was also noted that some specialists expect referring clinicians to order tests in advance so that the results are available to the specialist at the time of the appointment, increasing the number of requests by non-specialists.

There are limited processes in place to help prevent inappropriate requests; however, much more could be done. Radiologists' review of MRI requests for appropriateness, use of ordering guidelines to promote appropriateness, and appropriateness initiatives underway in some other provinces are discussed below.

Having radiologists review MRI requests for appropriateness poses several challenges

Radiologists said they review MRI requests for appropriateness before prioritizing them, and may decide to decline them outright or redirect them to a more suitable diagnostic imaging technique. However, our audit showed few MRI requests declined or redirected. Only 3 of the 5 facilities kept related documentation. For these 3 facilities, radiologists rejected or redirected less than 1% of the MRIs requested.

Some radiologists said they sometimes discussed inappropriate requests with referring clinicians before rejecting or redirecting the requests. And some facilities sent letters to referring clinicians explaining rejected or altered requests. However, radiologists, management, and other regional

staff identified several challenges in relying on radiologists to play a gatekeeper/educator role in detecting and preventing inappropriate referrals.

One challenge is that radiologists' decisions about appropriateness depend on the information provided in MRI requests. However, often this information is insufficient to properly assess appropriateness, and it would take time for radiologists to follow-up each request and gather better information. Another challenge is that radiologists rejecting requests are putting themselves in conflict with ordering clinicians and patients who have been told they will be getting an MRI. A further challenge is that the radiologists' fee structure is based on the number of MRI scans they read; it provides no incentive for radiologists to reject requests or take time to follow-up on requests with referring clinicians. Finally, following-up with referring clinicians would take time away from reading scans, which could affect the timeliness of MRI reports.

To address some of these challenges, in 2010 WRHA management considered hiring a non-radiologist clinician to act as an MRI gatekeeper/educator. However, this was not implemented due to staffing and funding problems.

Ordering guidelines need to be promoted and embedded in clinicians' regular workflow

Ordering guidelines encourage appropriate requests at the front end of the process. Both the Canadian Association of Radiologists (CAR) and the American College of Radiology (ACR) have published guidelines on ordering appropriate diagnostic tests. CAR has also established 3 appropriateness recommendations relevant to MRI through the work and national campaign called Choosing Wisely Canada (a team of physicians working in partnership with the Canadian Medical Association that aims to help reduce unnecessary tests and treatments). The 3 recommendations focus on unnecessary tests for lower back pain, minor head trauma, and uncomplicated headaches.

While guidelines are designed to help clinicians make appropriate decisions, clinicians may not always consult published guidelines or even follow guidelines embedded in software tools they use as part of their regular workflow. Two pilot projects in Manitoba studied the effects of embedding appropriateness guidelines in an electronic order-entry system. Both showed physicians frequently over-rode the system's recommendations, although general practitioners did so less often than specialists. Nonetheless, some staff suggested ordering guidelines could help reduce inappropriate ordering. And regional directors of diagnostic services said introducing a province-wide electronic ordering system with embedded appropriateness guidelines was a future goal.

In 2015, Treasury Board directed the Department to advance appropriateness guidelines for MRI scans among health care professionals as part of its efforts to achieve health care system efficiencies. The Department supported concentrated activities promoting appropriate diagnostic imaging ordering (including MRI) between 2006 and 2011, but not more recently.

Department officials said the Department was promoting appropriate clinician ordering through its support of Choosing Wisely Manitoba (CWM), which was established in 2014. CWM is a partnership between DSM and the Centre for Healthcare Innovation (which in turn is a partnership between the University of Manitoba and the WRHA). CWM advised us that it included MRI in general presentations and workshops to health care professionals, but that it had not yet launched any appropriateness initiatives specific to MRI—although it planned to do so in the future. It

added that in 2015 it focused on engaging with key stakeholders (such as the College of Physicians and Surgeons) to build awareness and support for CWM.

Some provinces more advanced in promoting appropriateness initiatives

In reviewing publicly available information, we found 2 provinces (Alberta and Ontario) had implemented initiatives promoting appropriate use of diagnostic imaging. Both initiatives involved a partnership between the provincial health ministry, medical associations, physicians, and other organizations, such as provincial chapters of Choosing Wisely. They were aimed at both referring clinicians and the public, and focused specifically on low back pain. Specific strategies included providing both guidance for physicians and patient handouts, plus introducing more rigorous requirements for ordering imaging tests (such as requiring more information in MRI requests to better assess appropriateness). Directing appropriateness campaigns to the public as well as clinicians is important because research shows some clinicians report patient demand as a reason for ordering inappropriate MRIs.

Recommendation 1: We recommend that the Department, DSM, PMH, and WRHA (working together and collaboratively with Choosing Wisely Manitoba and other stakeholders) develop specific initiatives to improve the appropriateness of MRI requests, and that in doing so they assess the costs and likely benefits of:

- developing and implementing ordering guidelines and stricter requirements for the MRI requests most often inappropriately ordered.
- educating the public on inappropriate scan demands.
- providing targeted education to clinicians with unusually high ordering rates.
- altering radiologists' fee structure to recognize time spent dealing with inappropriate orders.
- embedding ordering guidelines in order-entry software.

1.1.2 Better processes needed to prevent and detect duplicate requests

Duplicate MRI requests are problematic. Undetected duplicate requests result in duplicate bookings, which in turn contribute to patient cancellations and no-shows for appointments. Moreover, staff resources spent identifying and resolving issues related to duplicates could be better used. Duplicate requests can occur for a variety of reasons, including the lack of a consistent central intake process and backlogs in booking MRI appointments.

MRI requests are not centrally managed in the province. In Southern Health-Santé Sud (where MRI services are managed by DSM) and PMH, which each have one facility with one scanner, clinicians send their requests directly to the MRI facility. In WRHA, where multiple facilities provide MRI services, clinicians can fax non-emergency outpatient requests to a central intake office that coordinates diagnostic imaging requests in the region and tries to balance wait times between facilities—but use of central intake is not mandatory. Clinicians can also send requests directly to any Winnipeg MRI facility.

Clinicians may send the same request to multiple locations, including WRHA's central intake office, trying to reduce their patients' wait times. Clinicians may also resend a request to a facility or the central intake office if they are worried that the original request was not received because patients have not yet been given appointment times. Delays in receiving appointment times often result from booking backlogs.

Processes to detect duplicate requests, use of centralized intake, and backlogs in booking MRI appointments are further discussed below.

Current processes cannot identify duplicate requests sent to multiple facilities

Neither MRI facilities nor WRHA's central intake office have processes to flag duplicates sent to multiple facilities because the facilities' booking systems are not integrated. Facility staff have to rely on patients to notify them if they receive multiple appointment letters from different facilities for the same exam. To this end, one facility includes a slip with their patient appointment letters asking patients to call if they are booked for the same exam at a different location.

There are processes to flag duplicates sent to the same site. These duplicates are either auto-flagged by the IT system or manually detected by booking clerks. However, the central intake office is the only site that keeps track of these duplicate requests. In 2015, it detected 692 duplicates, about 3% of all requests processed by the office. But management said that in 2016 the office began sending identified duplicates back to referring clinicians for resolution, which significantly reduced the number of subsequent duplicates being received. We asked the 2 facilities in the other 2 regions to track identified duplicates for a 1-month period and found that identified duplicates accounted for about 5% of the requests at Boundary Trails Health Centre and 10% of the requests at Brandon Regional Health Centre.

Use of centralized intake not maximized or actively promoted

In 2015, the central intake office only processed about 35% of the MRI requests for WRHA facilities. Requiring all requests to be funneled through a central intake office would significantly reduce duplicate requests, plus help direct requests to facilities with the shortest wait time. However, some WRHA management personnel told us a mandatory central intake would bring other challenges. One concern was that needless extra time might be added to the request process, particularly for specialized MRIs that can only be done at a single facility, or for patients who want their scans done at a particular facility. However, in a sample of over 50 files processed through central intake, we found that the centralized process added little time to the overall patient wait—on average just half a day. Other concerns were a lack of funding for an expanded central intake office and radiologists' lack of support for mandatory central intake.

Duplicate requests have the potential to become more problematic when the planned MRI scanners in Selkirk and Dauphin start operating. Given Selkirk's proximity to Winnipeg, some clinicians may send requests to multiple Winnipeg locations plus Selkirk. And Dauphin is close enough to Brandon that some clinicians may send requests to both locations. A central intake office for the PMH region, shared central intake processes for geographically close regions, and greater clinician use of the non-mandatory centralized intake or a mandatory central intake would help reduce this risk. Central intake would also help to better balance intake and wait times across the province. **Section 1.1.3** discusses this further.

WRHA management said they promoted use of the central intake office to clinics and physicians when it opened in 2007. Information about the office is also available on WRHA's website. However, at the time of our audit, WRHA had not recently reminded clinicians that central intake was available in the region or advertised the benefits of using the central intake office.

Backlogs in booking MRI appointments

We reviewed a sample of 270 outpatient files for MRI scans performed in 2015. We found it took an average of 18 days from the time the MRI request was received just to book the patient's appointment. Average booking time varied by facility, from 2 days at Pan Am Clinic to 57 days at Brandon Regional Health Centre.

During our visits to facilities in the spring of 2016, we found some facilities even further behind in booking appointments than indicated by our sample. The MRI department in Brandon was taking 2-3 months to book some MRI appointments, although process changes eliminated the backlog later in the year. And Health Sciences Centre (HSC) staff reported booking was taking up to 6 weeks, with 1,328 requests received but not booked as of May 2016—over 40% of the facility's typical monthly workload. This may have reflected issues with the adequacy of resources dedicated to scheduling appointments.

Even if backlogs in booking appointments don't result in duplicate bookings, they can result in patients having short notice of their appointment date and time. This contributes to patient cancellations and no-shows, as well as re-bookings. And staff resources spent responding to patients' phone calls about delayed appointments could be better spent.

No facility in any region measured how long it was taking to book appointments, although WRHA management tracked and monitored the number of scan requests waiting to be booked at each of its facilities. And in each of the facilities with significant scheduling backlogs, facility officials were aware of the issue.

Recommendation 2: We recommend that the WRHA make central intake of MRI requests mandatory.

Recommendation 3: We recommend that DSM, PMH, and WRHA evaluate the costs and benefits of sharing centralized MRI intake services within or across regions.

Recommendation 4: We recommend that DSM, PMH, and WRHA monitor the length of time it is taking to book MRI appointments and promptly remedy any significant booking backlogs.

1.1.3 Room to better balance wait times across the province

In addition to helping reduce duplicate MRI requests, WRHA's central intake helps balance MRI wait times between Winnipeg facilities. Central intake staff obtain weekly wait-time information from each facility to help decide where requests should be sent. **Recommendations 2 and 3** in **section 1.1.2** address the benefits of increased use of central intake services.

Our review of wait times at the different facilities over a one-year period found no significant variations between the Winnipeg facilities. But wait times were considerably lower outside Winnipeg, indicating that provincial demand is not evenly distributed or met. In June 2016, the average MRI wait time (time from receipt of request to scan) in Winnipeg averaged 24 weeks, and ranged from 24 to 27 weeks. Outside Winnipeg, the average wait time at Boundary Trails Health Centre (located between Winkler and Morden) was 17 weeks and the wait time at Brandon Regional Health Centre was 12 weeks.

Patients may ask for their MRI referral to be sent to any facility in any region with a shorter wait time, although this must be done in consultation with the patient's health care provider since not all facilities perform all types of MRI scans. (At the time of our audit, only St. Boniface General Hospital did cardiac scans and only the Health Sciences Centre did pediatric scans requiring sedation). However, patients and health care providers may not all be aware of the option to have their referral sent to another region.

Staff at the Boundary Trails facility told us about 50% of their patients come from outside the Southern Health-Santé Sud region—mostly from Winnipeg. This is consistent with our sample of outpatient files, where 47% of the files randomly selected for the Boundary Trails facility were for patients with home addresses outside the Southern Health-Santé Sud region. The data shows some health care providers and patients are aware that MRI referrals can be sent to alternative facilities. However, more could be done to ensure greater awareness and more balanced wait times across the province.

The Department, DSM, and WRHA websites all note that patients, in consultation with their health care providers, can request that their referrals be sent to different locations. The Department did not include this information on the same web page where it reported MRI wait times for the various facilities. In addition, none of the websites specified that the different locations could be in a different region. Department officials also said they told patients calling about MRI wait times that scans could be done at different locations. But it may not have been clear that these locations could be in different regions. Southern Health-Santé Sud and PMH websites had no information about the option to have MRI scans done at alternative facilities.

Section 1.5.1 discusses the need to improve planning around the placement of new additional MRI scanners. This may also help to better balance wait times across the province.

Recommendation 5: We recommend that the Department, DSM, PMH, and WRHA make it clear on all websites that, following consultation with their health care providers, patients may have their MRI scans done at different facilities and in different regions.

Recommendation 6: We recommend that the Department, DSM, PMH, and WRHA work together to develop a specific initiative (or initiatives) to remind clinicians that MRI scans can be requested at facilities in different regions.

1.1.4 MRI requests often incomplete, causing inefficiencies

Clinicians either fax or mail their MRI requests to the central intake office or MRI facilities. But many of these requests are not fully complete when initially received. Collecting missing information increases processing time, and ultimately the wait time. In our sample of 270 outpatient files, only 6% of the MRI request forms were initially complete. When the forms were processed through WRHA's central intake office, intake staff sometimes obtained some of the missing information before they sent the requests to facilities; however, most of these were still not fully complete.

Facility staff generally try to obtain any key missing information, either by phoning the referring clinician or patient, or by sending the request back to the clinician's office. Despite this, only 73% of the MRI request forms in our sample had all key information. Examples of missing information included answers to questions indicating whether or not a scan could be safely performed; patient height or weight, which is important because scanners' maximum weight capacity varies; and the clinician's signature authorizing the request. Similar safety and patient information is also obtained at the beginning of every scan appointment (in case of changes)—but if it isn't obtained ahead of time, patients may discover they are unable to have their scans only after arriving for their appointments.

At the time of our audit, each region had its own diagnostic imaging request forms. The multiple forms and different designs may be confusing for clinicians sending requests to multiple regions and could be contributing to the large number of initially incomplete request forms. To help reduce the number of incomplete forms (as well as to increase simplicity for users), diagnostic imaging directors from all regions were working together to re-design and standardize diagnostic imaging request forms across the province. A future goal was to introduce an electronic referral system with an autocomplete function and mandatory information fields. This would make the intake process faster and ensure forms are fully complete when sent.

Recommendation 7: We recommend that DSM, PMH, and WRHA work together to finish standardizing MRI request forms across the province in the short-term and work with the Department to implement an electronic MRI request form in the long-term.

1.2 Issues in prioritizing MRI requests and meeting related targets

1.2.1 No province-wide priority classification system

Using the information on MRI request forms, radiologists assign each request a priority code that determines how soon the appointment should be scheduled. However, there is no province-wide priority classification system to help them do this.

DSM, PMH, and WRHA each have their own priority levels and related wait-time targets, with both PMH and WRHA meeting or exceeding the guidelines published by the Canadian Association of Radiologists (CAR). And only WRHA had defined criteria for assigning priority levels. Based on the clinical information provided, radiologists are to decide the priority level by considering if no negative medical outcome related to a delay in treatment is expected for the patient if the MRI scan is done within the target time frame.

Some regions have more priority levels than others and priority levels are not named consistently between regions. However, it is still possible to compare wait-time targets for different priority levels between regions. As **Figure 5** shows, the targets vary between the regions and are not always consistent with CAR guidelines.

Figure 5: Targets used to prioritize MRI requests differ between regions

Wait-time targets				
Priority level ¹	WRHA	PMH	DSM/Southern Health-Santé Sud	CAR guidelines
Emergent	24 hours	0–1 days	0–3 days	24 hours
Urgent	7 days	7 days	3–7 days	7 days
Semi-urgent	30 days	14 days ²	2–3 weeks/4–6 weeks ³	30 days
Routine/Elective	60 days	56 days (8 weeks)	no target	60 days

¹ All regions also had a “follow-up” level, which was for follow-up exams where a specified appointment date was requested. Given its nature, it is excluded from the table.

² PMH had Urgent 1 and Urgent 2 priority levels, but no Semi-urgent priority level; for comparative purposes, Urgent 2 is presented as Semi-urgent.

³ DSM had 5 priority levels, whereas the other regions had only 4; for comparative purposes, 2 priority levels are presented as Semi-urgent.

Source: DSM, PMH, and WRHA documents and policies; *National Maximum Wait Time Access Targets for Medical Imaging (MRI and CT)*, Canadian Association of Radiologists, 2013

Without a province-wide method of prioritizing requests that includes well-defined priority levels and standard wait-time targets to provide guidance and promote consistency, radiologists may prioritize patients with similar conditions differently, both within and across facilities. In reviewing publicly-available information, we found 4 provinces that had province-wide priority classification systems, although none were entirely consistent with CAR guidelines. For example, while all 4 had a provincial target for elective or routine scans, it ranged from 28 days in Ontario to 90 days in both Saskatchewan and Quebec.

In a sample of 270 outpatient files, 9 (3%) had no priority code. At one facility, in the absence of any coding, an MRI request was assumed to be a routine priority. With this approach, there is a risk that a patient that should be prioritized more urgently will instead be treated as routine. MRI requests without priority codes are also discussed in **section 1.2.2**.

Recommendation 8: We recommend that the Department, DSM, PMH, and WRHA work together to develop a single province-wide method of prioritizing MRI requests that includes a clear definition and standard wait-time target for each priority level, at minimum meeting the Canadian Association of Radiologists’ guidelines.

1.2.2 Some patients given priority for non-medical reasons

We assessed if radiologists assign priority codes to all MRI requests based on medical considerations, which would then determine the appointments needing to be scheduled sooner than others. We found some patients were given priority for non-medical reasons.

One WRHA facility has had agreements with the Workers Compensation Board (WCB) that prioritize WCB clients differently than other patients. Under the current agreement, which spans 2013 to 2023, the facility is required to give MRI appointments to WCB clients within 20 business days of receipt of the MRI request (to an annual maximum of the greater of 2,000 scans or one third of the total of all scans done by the facility in the prior year). And WCB is required to pay about \$830 per scan. In 2015, the facility performed 1,440 scans for WCB clients, earning nearly \$1.2 million. We noted that WCB patients are covered under Manitoba's *Workers Compensation Act*, so WCB is required to pay for its patient's scans—regardless of how quick the patients receive their scans. And at this facility, all third-party insurers, including WCB, are required to pay about \$830 per scan.

WRHA senior management told us that, as part of a similar earlier agreement, WCB also provided lease fees totaling \$1.5 million between 2005 and 2013 for dedicated timely access to the MRI scanner at the facility. We note that the current agreement does not include such lease fees. WRHA senior management also told us that they reinvest the profit from all WCB revenue in the health care system, creating a win-win situation for all patients.

To meet the wait-time target for WCB patients, the facility held 6 appointment slots open for them each day. This was about 2,190 spots a year—750 more than needed in 2015. Facility staff said that if the slots weren't filled, other outpatients used them. In a sample of WCB patient files at the facility, on average these patients received their scans within 14 days of receipt of the request.

There was no evidence of similar treatment of WCB patients at any other facility, even though WCB is always required to pay for its clients' scans. And facility management in each region said there were no similar agreements with other entities. But additional tests showed evidence of other types of patients accessing quicker scans. In one facility, patients coded as not covered by a Canadian health care plan (which meant they had to pay for their scans) received their scans quicker than other patients—on average, within 3 days of the referral. In another facility, patients who had their scans paid for by a private insurer or who paid for their own scans also received their scans more quickly—on average, within 2 days of the referral. Moreover, the average wait time from referral to scan was just one day for scans for members of professional sports teams. The common thread between all these MRI scans was that, like the scans done for WCB patients, they generated revenue of \$676 to \$1,352 per scan, depending on the circumstances and facility. In addition, nearly all the MRI request forms for these scans had no priority codes.

We also checked if patients with influence (such as government officials, donors, or people working in the health care system) might be receiving priority for non-medical reasons. We found some instances over the past 3 years where some of these patients got unusually quick scans. Of these, about 33% received their scans the same day as the request. About half of the MRI request forms for the quick scans had no priority code and, where there was a priority code, it often did not support the quickness of the scan. Regional management said some of these patients may have been available on very short notice to fill spots opening up because of patient no-shows or other scheduling gaps, and they also may have been unaware of any special treatment received. While

we could not find evidence that conclusively demonstrated that some persons of influence sought expedited access, we are concerned that they may have been given priority in filling cancellations and last minute no-shows, over patients on the cancellation lists. Most facilities keep cancellation lists of patients available on short notice. Some patients on these lists stated they could be available with as little notice as 5-20 minutes; others required 1-2 days' notice. Cancellation lists and patient no-shows are further discussed in **section 1.3.4**.

Recommendation 9: We recommend that DSM, PMH, and WRHA assign priority codes to all MRI scan requests based solely on medical considerations and then schedule all scans—including those where a third party is paying for them—based on assigned codes.

1.2.3 Many scans not scheduled within wait-time target for assigned priority level

In the sample of outpatient files reviewed, only 21% of scans were scheduled to be done within the target wait time for their assigned priority level. As **Figure 6** shows, this included 92% of emergent scans—but only 42% of urgent scans, 24% of semi-urgent scans, and 12% of routine scans. Rural facilities succeeded in meeting targets more frequently than Winnipeg facilities. **Figure 6** also shows the median wait time for the different scan priority levels.

Figure 6: Most MRI wait times exceeded targets for scans' assigned priority levels			
Scan priority level	Maximum regional wait-time targets	% of sample scans meeting regional targets	Median wait time
Emergent	24 hours–3 days	92%	0 days
Urgent	7 days	42%	21 days
Semi-urgent	14 days–6 weeks	24%	46 days
Routine	60 days–8 weeks*	12%	120 days

* 60 day CAR target applied to Boundary Trails Health Centre's scans prioritized as routine as the Centre had no target.

Source: 285 MRI outpatient files reviewed by OAG: 12 emergent, 26 urgent, 66 semi-urgent, 172 routine, 9 no priority code

Facilities did not track MRI wait times by priority level to monitor whether targets were being met. Some regional management said this was because their current information systems lacked this capability. Having the ability to track wait times by priority level would help them flag when their scheduling processes need to be adjusted to reserve more appointment spaces for urgent and semi-urgent scans, which may be riskier to delay than routine scans.

Inpatients generally received MRI scans more quickly than outpatients, no matter how they were prioritized, because facilities reserved appointment slots to accommodate them. In a sample of 85 inpatient files, patients in a hospital with a scanner waited on average 1 day for a scan; those having to travel to another facility for their scan waited on average 3 days. The additional wait time for inpatients travelling to another facility was reasonable given the additional logistics involved in transporting and supervising them.

Recommendation 10: We recommend that DSM, PMH, and WRHA track and monitor MRI wait times by priority level, and that they adjust their scheduling processes when monitoring shows a significant number of the more urgent scans are not being scheduled so as to meet wait-time targets.

1.3 MRI scanners not fully and efficiently used

Monitoring scanner use can help capacity planning and pinpoint inefficiencies requiring corrective action. An MRI scanner is costly to acquire and maintain, but increasing operating hours, minimizing downtime, and maximizing the number of scans being done per hour can effectively decrease the cost per scan and also shorten wait times.

1.3.1 Scanner hours of operation not maximized

Operating hours for each MRI scanner varied and most were not maximized. This was largely because on weekends 4 of the 11 scanners only operated during the day and 3 were closed. As **Figure 7** shows, hours of operation for scanners in June 2016 ranged from 47.5 to 117 hours weekly (excluding one scanner mainly used for surgeries and research).

Figure 7: Scanner availability varied due to different operating hours

Scanner availability	Lowest	Average	Highest
Weekly operating hours ¹	47.50	97.08	117
Annual number of days open ²	249	329	364
% of weekly operating hours on weekends ¹	0%	16%	27%

¹ – As of June 2016

² – For the fiscal year 2015/16

Source: Calculations by the Office of the Auditor General based on DSM, PMH, and WRHA records.

Most scanners were better utilized on weekdays. Nine of the 11 scanners operated between 16 and 17 hours per day, Monday to Friday. The 2 exceptions were one scanner at HSC with some weekday hours dedicated for research, and the scanner at Grace Hospital, which only operated during the day. Seven scanners operated on most statutory holidays. We estimated that nearly 11,300 more scans could be done if all 11 scanners ran for 16 hours a day, 7 days a week—a 14% increase.

A 2015 survey of Canadian MRI facilities found only 1 scanner in Ontario and 2 in Quebec that operated 24 hours a day. At the time of our audit, none of the scanners in Manitoba were operating 24 hours a day and only the HSC had on-call MRI services for emergency scans needed outside regular operating hours.

In January 2016, the Manitoba government publicly announced that HSC would expand MRI hours on 2 scanners to 24 hours a day, 7 days a week. But at the time of our audit WRHA had not received funding for this initiative and the extra shifts had not been added. Both HSC and St. Boniface General Hospital temporarily introduced overnight shifts in the past, when one of their

scanners was being replaced. Facility management said there was more administrative work associated with these shifts because all appointments were confirmed and patients chose their appointment times, but that patient no-show rates were low.

Although there is a cost to expanding scanners' hours of operation, this option should be considered before deciding to add new scanners. As **section 1.5.1** notes, this was not the case for the 4 most recently approved new scanners. **Recommendation 17** addresses this gap.

1.3.2 Differing MRI protocols affect time and cost of similar scans

MRI protocols are a combination of MRI sequences (radiofrequency pulses), which each produce a set of images for radiologists to optimally assess a specific body part. The number and types of sequences in a protocol affect scanning time, the number of images produced, and the amount the Department pays a radiologist for reading a scan. Radiologists at each MRI facility have developed standard protocols for the various types of scans done at their facility, but each facility's standard MRI protocols differ—even for the same type of exam on a similar type of scanner (either the 1.5 or 3 Tesla scanner). Establishing consistent or harmonized protocols across regions and the province would enable consistent and comparable exams, and may help maximize scan quality and ensure efficient use of MRI equipment. If needed, these protocols could still be adjusted to better assess a patient.

To better understand the differences in the facilities' standard protocols, we reviewed protocols for routine brain, knee, shoulder, c-spine, and l-spine exams. The number, type and duration of sequences varied for the same type of exam on the same type of scanner, so the standard length of time the scanner ran for the same exam also varied—sometimes significantly. For example, the scanner ran twice as long for a routine shoulder scan in one facility compared to another. And the scans were not always quicker on the newer scanners; one of the oldest scanners had the shortest scan time for 4 of the 5 scan types, and a new scanner installed in 2015 had one of the longest scan times for one type of scan.

WRHA management said they were working on harmonizing protocols between facilities in the region. This will reduce, but not eliminate, the differences. However, it could result in scheduling efficiencies—if the protocols adopted lead to shorter scan times, thus allowing more scans per day. Facility scheduling practices are discussed further in **section 1.3.3**.

Recommendation 11: We recommend that DSM, PMH, and WRHA work together to harmonize MRI scan protocols across all facilities in the province, and that they adjust the standard length of scan appointments to reflect any resulting time savings.

1.3.3 Inefficiencies in scheduling practices result in fewer scans per day

We reviewed a 2-week schedule at each facility, both to calculate the percentage of operating hours booked with MRI exams and to identify better scheduling practices. Scheduling practices differed between facilities and there was room to increase the number of daily scans in all facilities.

We found that the percentage of operating hours (excluding set up and clean up time) booked with MRI exams ranged from 81% to 96% in the 5 facilities. Some had fewer scheduling gaps because

they usually had more than one MRI technologist on a shift and didn't have to stop scanning to accommodate staff breaks. And others were simply better at ensuring all appointment slots were filled. This can be complex because slots initially held open for inpatient and more urgent exams may remain unfilled if staff don't review the schedule to fill in last-minute gaps.

Standard appointment times for similar types of exams varied between facilities. For example, the length of standard appointments ranged from 20–30 minutes for a spine exam, 20–45 minutes for a shoulder exam, and 30–60 minutes for liver and pancreas exams. Longer standard appointment times did not always correspond with longer standard protocols or older scanners. Therefore facilities scheduling longer time slots may be able to gain efficiencies, even without adjusting standard MRI protocols. If standard appointment slots are longer than needed to complete the scan, there may be unnecessary scanner downtime between patients.

When the same patient was scheduled for 2 types of exams (e.g. right and left knee), facilities sometimes booked less time than they would for 2 different patients receiving these exams, presumably because there was no need to do the patient screening and preparation twice. However not all facilities booked a shorter appointment time for 1 patient with 2 exams and none did this consistently.

Different types of scans require hardware changes between appointments, so batching similar types of scans together saves time. All facilities did this, but some applied the practice more consistently than others. Two facilities sometimes booked 3 exams per hour by batching certain similar types of scans together; the others never booked more than 2 exams per hour.

Recommendation 12: We recommend that DSM, PMH, and WRHA identify and implement facility scheduling practices that can increase the number of MRI scans done daily at each facility.

1.3.4 Patient no-shows reduce scanner utilization

Even when a facility's scheduling practices have filled all appointment slots, subsequent patient cancellations or no-shows can create gaps in the MRI appointment schedule. While both cancellations and no-shows cause problems, no-shows are more difficult to remedy because of the lack of advance notice. As described further below, facilities generally managed cancellations better than no-shows for this reason. No-shows, as well as last-minute cancellations, can reduce the number of scans done in a day, increasing wait times.

All facilities recorded patient cancellations and the reasons. These included family obligations, transportation issues, symptoms relating to the MRI request diminishing or disappearing, and having already had the scan at another facility. Four of the 5 facilities kept lists of patients willing to fill spots that opened up due to cancellations. Patients were made aware of these cancellation lists through word of mouth, or if they phoned the facility to complain about their wait time. This did not allow all patients equal access to the lists.

Cancellation lists showed the type of scan required and the notice patients needed to get to the facility to fill a cancelled timeslot. This helped clerks select an appropriate patient when cancellations occurred. One drawback of filling cancelled spots from a cancellation list is that filling a spot with a patient already scheduled can create a domino effect of yet more cancellations

and spots to fill. The facility without a cancellation list generally filled cancellations with patients not yet scheduled.

Two of the 3 regions regularly tracked and monitored patient no-shows or no-show rates by facility, and we asked the third to track no-shows for 2 months so we could calculate the no-show rate for its facility. No-shows as a percentage of scheduled exams for each facility ranged from 2.8% (at Boundary Trails Health Centre) to 6.1% (at HSC). Using this information, we estimated there were about 3,400 no-shows annually.

Although their practices varied, all facilities tried to minimize last minute cancellations and no-shows. Three of the 5 facilities required patients to call and confirm appointments ahead of time, and 2 of the 3 cancelled unconfirmed appointments. The other 2 facilities called patients 2 days before their scheduled scans to remind them of their appointments. Facilities cancelling unconfirmed appointments had the lowest no-show rates. Facilities furthest behind in booking appointments had the highest no-show rates.

There can be challenges in confirming patient appointments and leaving reminders. WRHA management said contact information was sometimes incorrect or outdated, and privacy concerns prevented staff from leaving detailed voicemails or using email. One facility analyzed its no-shows and found almost 50% of patients that no-showed had confirmed their appointments. Facilities tried to fill empty appointment slots created by no-shows or last-minute cancellations, but staff reported the slots could not always be filled.

WRHA management told us it was considering an educational campaign to help the public understand the impact of not showing up for a diagnostic imaging appointment. They hoped the campaign would reduce the number of no-shows by 25%, based on what other provinces had achieved through similar campaigns.

Recommendation 13: We recommend that DSM, PMH, and WRHA implement further strategies for reducing no-show rates for MRI appointments and monitor their effectiveness.

Recommendation 14: We recommend that DSM, PMH, and WRHA provide all patients with the option to be placed on a cancellation list.

1.3.5 Inadequate measurement and monitoring of scanner productivity

Given the significant wait time and cost for MRI services, we expected MRI facilities to regularly measure and monitor scanner productivity and reasons for downtime. Otherwise, management may not be fully aware of lost productivity or areas that could be improved. Some productivity measures were in place, but these needed improvement. No facilities tracked and monitored MRI scanner utilization rates (active scanning time as a percentage of scanner operating hours) or scanner throughput (scans per operating hour). Various productivity measures are discussed further below.

One WRHA facility tracked the hours of scanner downtime (both planned and unplanned), reasons for the downtime, and the number of patients affected. Some reasons for planned downtime were scheduled equipment maintenance and staff meetings; some reasons for unplanned downtime were scanner breakdowns and unfilled appointment slots.

WRHA management monitored productivity at all Winnipeg facilities using indices that compared the hours that should have been worked to produce the number and types of scans done to the actual hours worked and paid. Management said this was calculated using standardized minutes of work that the Canadian Institute for Health Information had developed for different types of scans. But management also said that the indices were not yet being calculated accurately so as to properly reflect facility productivity.

The Boundary Trails scanner generated a report with current and potential system utilization but there were discrepancies between the report and the facility's own data, indicating the function wasn't working properly. DSM management said they do not rely on this report. Other facilities' scanners, particularly newer ones, may be able to provide reliable productivity measures. Obtaining these measures directly from the scanners, or through automated tools integrated with the scanners, would be less time-consuming than manual data collection methods. It could also provide more consistent measures for comparing scanners, both within and between facilities. This would help managers monitor scanner productivity more efficiently and effectively.

We analyzed 2015/16 facility data and found the number of scans performed in the year on each scanner ranged from 4,423 to 9,467, with throughput ranging from 1.19 to 1.91 scans per operating hour. A variety of factors make comparisons between scanners difficult. For example, some scanners have longer operating hours or do more of the types of scans that take longer. However, facility scheduling practices (discussed in **sections 1.3.2 and 1.3.3**) also made a difference as facilities with longer scan protocols, longer standard appointment times, and a higher frequency of unfilled appointment slots had lower throughput.

Recommendation 15: We recommend that DSM, PMH, and WRHA develop and monitor scanner productivity measures that can help assess efficiency and drive process improvement, and that over the long-term the Department require the regions to develop standardized productivity measures.

1.4 Better monitoring needed to ensure all MRI scan results reported promptly

1.4.1 Most MRI reports prepared quickly, but better monitoring needed to flag exceptions

After an MRI scan is done, radiologists review the images and complete a report on the results. The time from the scan to report completion, known as report turnaround time, is excluded from wait-time calculations; however, it is still part of a patient's wait. Our file review found most MRI reports were completed within 2 days of the scan, but report promptness for urgent scans and monitoring for overdue reports could be enhanced.

The maximum report turnaround times recommended by the Canadian Association of Radiologists (CAR) for MRI scans are: 1 hour for emergent scans, 12 hours for urgent scans, and 4 calendar days for all others. WRHA policy set a maximum turnaround time of 72 hours (3 days) and stipulated that emergency scans be read first. PMH policy set a maximum turnaround time of 24 hours, and DSM had no policy on report turnaround time.

Report monitoring was inconsistent between regions and facilities. Only WRHA management regularly monitored the average turnaround time for MRI reports. And only 2 facilities (1 in WRHA and the 1 in PMH) flagged overdue MRI reports for follow-up by regularly running reports on scans completed but not read. This practice caught anomalies likely to be missed by simply monitoring the average turnaround time.

Overall, our review of outpatient files found the turnaround time for most MRI reports was quick. Most reports for non-urgent scans were done within CAR's recommended turnaround time, and many were done sooner. But less than half the emergency and urgent scans met CAR's recommended corresponding timelines of 1 hour and 12 hours. And, while 93% of the turnaround times did not exceed 4 days, there were 4 significant anomalies in one facility, indicating a need to improve processes for identifying overdue reports. The anomalies had turnaround times for urgent or semi-urgent scans ranging from 12 to 51 days—the latter for an urgent scan.

Some management officials said that, particularly for emergency or urgent scans, radiologists sometimes provide verbal reports on the results before completing written reports. Report turnaround times were sometimes slower for scans done on Friday evenings or weekends as radiologists do not work on weekends.

Report turnaround times were quicker for inpatient scans than for outpatient scans. In a sample of 85 inpatient files, the radiologist completed the report the same day as the scan 80% of the time.

Recommendation 16: We recommend that DSM, PMH, and WRHA track and monitor MRI report turnaround times using policies and targets that take clinical urgency into consideration, and that DSM and WRHA develop processes to identify and promptly follow-up overdue reports.

1.4.2 Most MRI reports sent to referring clinicians promptly

Facilities send MRI reports to referring clinicians (and any other clinicians designated on MRI request forms) after the reports are completed and signed by radiologists. In WRHA and Brandon, facilities auto-fax reports immediately after sign-off. At the time of our audit, the Boundary Trails facility didn't have an auto-fax function, but management told us planned system upgrades (expected by early 2017) would remedy this. In the meantime, the facility couriered MRI reports to local clinicians and manually faxed all others.

WRHA clinicians could also access radiologist reports through EChart Manitoba and there were plans underway to extend this access to clinicians in other regions. EChart Manitoba is a secure electronic system that allows authorized health care providers to view certain patient health information when needed.

We could only verify that reports were sent to referring clinicians in 93% of the outpatient files reviewed. This was in part because one facility did not keep records of reports delivered by courier. Where we could verify reports were sent, 97% were sent the same day the radiologist signed them as complete; the remainder within 3 days.

1.5 Weaknesses in MRI planning and performance reporting

1.5.1 Insufficient information supporting decisions about new additional scanners

We examined the decision-making process for approving additional MRI scanners, focusing on the 4 most recently approved at the time of our audit. We found insufficient information was being provided and considered in the decision-making process, as further explained below.

The 4 most-recently-approved new scanners were for Dauphin, Selkirk, HSC in Winnipeg (to be dedicated for use as a pediatric scanner) and the Grace Hospital in Winnipeg. Treasury Board approved the pediatric scanner for HSC in October 2008 and the Province publicly announced the investment later that year. The Province publicly announced the 3 other scanners in October 2011, and the Department provided detailed analyses for Treasury Board approval subsequent to the announcements. At the time of our audit, only the Grace Hospital scanner had started operating (in April 2016).

The Department did not conduct province-wide assessments to determine the need for additional scanners. Department officials told us that scanner proposals were typically driven by specific requests submitted to the Department through RHAs' regional health plans and 5-year community health assessments, although requests also sometimes came via other avenues. Communities or RHAs lobbying for an MRI scanner may communicate directly with the Health Minister or Deputy Minister.

The proposals didn't compare the costs, benefits, and risks of different options for expanding MRI services, and then provide a rationale for a preferred option. For example, they didn't consider increasing the operating hours of existing scanners versus purchasing new scanners. Most new scanners were already announced before the detailed proposals were sent to Treasury Board. The Department may have also lacked accurate information; in one proposal, it stated that existing scanners were operating at maximum capacity, which was incorrect (as **section 1.3.1** shows).

The proposals also didn't consider alternative locations for new scanners; they only considered why a scanner would be beneficial in the proposed location. Often, the same or stronger arguments could have been made for adding scanners in other locations. The proposals typically didn't consider the demand for MRI scans in the different geographic areas of the province. There was no analysis of the source of MRI requests (where the referring clinicians and their patients lived in the province), except in one case where it was provided for just the location being proposed. Proposals also didn't consider the clinical environment of proposed locations (for example, whether there were radiologists trained to read MRI scans in the proposed location or the needs of clinicians practising in the area).

Patients in regions without scanners have to sometimes travel significant distances to access MRI services, but the proposals didn't consider the number of these patients or where they were traveling from. Nor did they consider potential impacts on government transportation costs for

patients in hospitals without scanners and patients in northern Manitoba needing MRI services. Northern transportation costs vary, but Department officials told us the cost of a trip from Thompson could range from \$650 (patient travels by family car) to over \$8,000 (patient not capable of sitting in a scheduled airline seat and requires an air ambulance). The burden of transportation costs was only casually considered in one proposal.

The proposed annual scan volumes for the 4 new additional scanners ranged from 2,860 to 10,140 scans, partly because there were no initial plans to operate 3 of the 4 scanners on weekday evenings or weekends. The throughput effectively proposed for the 3 adult scanners ranged from 1.43 to 2.09 scans per operating hour. There was no rationale for these differences and the Department had not set expectations for scanner throughput and minimum operating hours.

In July 2014, after all of the new MRI scanners had already been publicly announced, the Department estimated the likely impact of the scanners on the province's average wait-time for an MRI scan over the next 3 years. It also estimated the likely impact of expanding the operating hours of some existing scanners. However, the Department did not consider the potential impact on wait-times at the regional or facility level. The average wait time in the province may decrease without correcting the imbalance in wait times between Winnipeg facilities and facilities outside Winnipeg.

Recommendation 17: We recommend that the Department provide government decision-makers considering new additional MRI scanners with more comprehensive data, such as data on the:

- volume of MRI demand from the different geographic areas of the province.
- various proposed scanner locations and their related costs, benefits, and risks; clinical environments; transportation impacts; and impacts on provincial, regional and facility wait-times.
- costs and benefits of expanding the operating hours of existing scanners as opposed to adding new scanners.
- rationale of proposed operating hours and throughput for new scanners.

1.5.2 More comprehensive strategic planning needed

Department officials told us wait-time reductions achieved by adding more MRI scanners could be quickly offset by increased demand because demand is not static and continues to rise. They also said they expected MRI demand to increase with lower wait times. In addition, they noted that increasing MRI capacity without broader provincial planning was not a viable long-term solution to the growing demand for MRI services, and that there was a need to develop a sustainable provincial plan for diagnostic imaging. Other provinces have developed or are developing strategic plans for MRI services, sometimes as part of a broader provincial plan for diagnostic services or for reducing wait times.

At the time of our audit, the Department had no representative on the Diagnostic Imaging Joint Council, which was comprised of representatives from the RHAs and DSM. The Council collaborated on common issues of concern (such as quality assurance), and may be a logical existing forum for strategic discussions about MRI services.

Comprehensive and multi-faceted strategic planning for MRI services would include strategies to reduce inappropriate MRI requests, make more efficient use of scanners, and increase the supply of scanners. In other words, it would consider ways to affect demand and productivity, as well as supply. It would also consider patient safety and quality assurance issues. And this planning would help facilitate the implementation of most of the recommendations in this audit report.

Recommendation 18: We recommend that the Department work collaboratively with DSM, PMH, and WRHA to ensure there is comprehensive strategic planning for MRI services in the province that holistically considers demand, productivity, supply, safety, and quality assurance issues.

1.5.3 Outcome of strategies to increase supply of technologists uncertain

Regional management told us there were current MRI technologist vacancies and there was minimal coverage for technologist vacation or sick time. Department and regional management officials also told us the strategies they had in place for increasing the supply of MRI technologists would provide sufficient staff for the planned new scanners.

One strategy for increasing supply was to add 2 more clinical placements for individuals studying to be MRI technologists at Red River College. Department officials said the Health Workforce Secretariat discussed program capacity with Red River College. Another strategy was to encourage staff already trained as radiology technologists to take the additional training needed to operate an MRI scanner. This training was available through distance education courses offered in other provinces, as well as at Red River College.

DSM, PMH, and WRHA worked together through a Diagnostic Imaging MRI Recruitment Strategy Committee. The Committee estimated 17 additional MRI technologists were needed to staff the 4 new scanners—an increase of 31% from their current staff. Given the uncertainty as to when all planned scanners will be operational, the likely uptake of initiatives developed, and the future MRI technologist vacancy rate, we were unable to conclude whether the strategies put in place will be sufficient to increase the supply of MRI technologists by the time they are needed.

1.5.4 Inconsistencies and gaps in performance information provided to Department

The Department received monthly volume and wait-time statistics from DSM, PMH, and WRHA (including information for each MRI facility). However, there were several issues with this information, as further explained below. This made it more difficult for the Department to properly gauge trends and compare facilities.

Department staff did not periodically test the accuracy, completeness, or consistency of the information it received. Department officials said they lacked the ability to access regional information systems to do this. They also said that regional staff were responsible for ensuring the accuracy of submitted data.

There were several differences in how DSM, PMH, and WRHA calculated and reported wait times and volumes, plus some minor inaccuracies. Two of the 3 reported wait times prospectively; the other retrospectively. A prospective wait time reflects how long patients currently waiting for

scans can expect to wait. A retrospective wait time reflects how long patients waited for scans received. There were also inconsistencies in the types of scans included in the reported data (all emergency, inpatient, and outpatient scans – or a subset of these). Two of the 3 entities calculated an average wait time; the other calculated a minimum prospective wait time by reviewing the facility schedule to pinpoint the next appointment date available for a routine scan.

Department officials said they initially expected retrospective wait-time data, then changed to prospective data after finding this was all some facilities could provide because of limitations in their IT systems. They also expect emergency scans to be included in scan volumes, but not wait times. And they expect median wait times to be reported, not average wait times. Given the various deviations from expectations, all expectations need to be clarified and better-communicated.

Both retrospective and prospective information can be useful, so ideally Department and regional officials should have both for internal management purposes (even if only one is reported publicly). Prospective information is likely of greater interest to patients waiting for a scan or trying to decide where they would like to have their scan request sent. However, most provinces publicly report retrospective wait times, making this method best for jurisdictional comparisons.

Other wait time perspectives may also be needed. For example, both average and median wait times may be useful. The median is the middle value of a data set and less affected by outliers than the average. Also, reported wait-time information is currently skewed by the wait times for routine scans, making it impossible to assess wait times for the more urgent scans. **Section 1.2.3** discusses in more detail the need to separately measure wait times for emergent, urgent, semi-urgent, and routine scans.

Finally, the Department's performance information lacked sufficient productivity measures, such as data on scanner utilization. **Section 1.3.5** discusses productivity measures in greater detail.

Recommendation 19: We recommend that the Department work collaboratively with DSM, PMH, and WRHA to:

- a. review and clarify how it expects MRI scan volumes and wait-times to be calculated and reported (both short-term and long-term).
- b. include wait-time information by priority level, including comparisons to targets, in its reporting requirements, as systems allow.
- c. include productivity measures (other than scan volumes) in its reporting requirements.
- d. ensure the accuracy and consistency of reported data.

1.5.5 MRI volumes and wait times publicly reported, but improvement needed

The Department publicly reports monthly and year-to-date scan volumes, plus wait times, for each MRI facility. The information is posted on its MRI wait-time information web page, together with a report showing data for the previous 13 months. However, it needs to be more accurately explained and could be expanded to provide additional information.

The Department's web page on understanding wait times states that wait times for diagnostic services are estimated based on the next available slot in the schedule and that reported wait times

are maximum wait times, rather than averages or medians. This is inaccurate. Most facilities report an average prospective wait time, one reports an average wait time based on completed cases, and one reports a minimum prospective wait time for a routine scan. And the web page doesn't disclose the number of scanners at each facility, which would help explain some of the differences in reported volumes. The weaknesses and inconsistencies in wait-time and volume calculations discussed in **section 1.5.4** also apply to the data on the web page.

Some provinces publicly report more information on MRI wait times, often providing multiple perspectives. Examples include:

- MRI wait times and volumes by priority level.
- wait times using a 90th percentile (length of time to serve 90% of the people waiting).
- both median and average wait times.
- comparisons to wait-time targets.
- the number of people waiting for MRI scans.

Recommendation 20: We recommend that the Department enhance public information on MRI wait times and volumes by:

- a. accurately explaining the information.
- b. reporting a greater variety of wait-time information to better meet users' needs (such as percentile information; both average and median wait times; and, as systems allow, wait times by priority level against established targets).

2. Gaps in patient safety and quality assurance processes

2.1 Some weaknesses in patient safety processes

2.1.1 Patient safety procedures in place, but some patient screening forms incomplete

Patient safety procedures are important because an MRI scanner's strong magnetic field can make it unsafe to scan people with certain implants. All facilities had patient safety procedures in place, but patient screening forms were sometimes not completely filled out. In addition, the forms were not always signed by MRI technologists to confirm all safety procedures had been properly followed. The procedures and forms are described in further detail below.

All facilities have 2 levels of patient safety screening. First, the MRI request form includes safety screening questions. Second, at the beginning of their appointments, all patients (or guardians or relatives) fill out more thorough safety screening forms. There is also another screening form for patients needing a contrast agent injected during their scans, which requires the patient's signature as evidence of consent before the contrast is administered.

Two regions had MRI request forms with boxes that only needed to be checked if a given risk existed. It was therefore unclear if unchecked boxes meant the risk didn't apply or if the question was missed. **Section 1.1.4** also discusses incomplete MRI request forms.

All patient safety screening forms required “yes” or “no” answers to specific questions. We compared these forms to CAR’s recommended screening form and found none included all recommended questions. Also, some region’s screening forms had less comprehensive coverage of particular safety risks than others. In some cases, the safety risks associated with missing questions were covered by the information on the MRI request forms. However, patient circumstances may change between the time the MRI is requested and the scan date, making it prudent to review the safety risk again.

Facility staff said they discussed the importance of MRI safety screening with patients when asking them to complete the safety screening forms. And MRI technologists (or nurses at some facilities) were required to verbally review the forms with patients (or guardians or relatives) and confirm patient safety before scanning could be done. Technologists at each facility had access to the internet and an MRI reference manual to research whether patient implants were MRI-safe. Some facilities also subscribed to a website designed to help with this research.

There were safety screening forms in 99% of the 270 outpatient files reviewed; however, 18% were incomplete or not signed by an MRI technologist or nurse. In total, 41 forms had one or more safety questions left unanswered (4 with large sections unanswered) and 9 forms were not signed by a technologist or nurse. There was also a contrast consent form for 77 of the 78 patients requiring contrast. Of these, 15 (19%) had unanswered questions. In addition, one was missing the patient’s signature and one was missing the technologist’s signature. Incomplete forms provide less assurance that all aspects of patient safety have been properly considered.

As an additional safety measure, WRHA and DSM websites, plus some WRHA facility websites, posted some patient safety information. The appointment letters issued by the Boundary Trails facility also discussed patient safety.

Recommendation 21: We recommend that DSM, PMH, and WRHA implement processes to ensure patient safety screening forms are fully completed and properly signed.

2.1.2 Critical incidents reported; remedial action taken to address gaps in processes

The Regional Health Authorities Act defines a critical incident as an unintended event that occurs when the health services provided to an individual result in a serious and undesired consequence unrelated to the individual’s underlying health condition or an inherent risk in the health services provided. The Act requires health care facilities to report these incidents to the RHA, and the RHA is in turn required to report them to the Department. RHAs are also required to investigate the incident and take any necessary follow-up action.

A report of critical incidents supplied by the Department showed there had been 3 critical incidents related to MRI between January 1, 2013 and June 15, 2016, all in the WRHA. WRHA investigated the 3 incidents, took remedial action to prevent similar incidents in the future, and reported the details of its follow-up actions to the Department. The report showed no critical incidents involving MRI in DSM or PMH.

Based on documentation supplied by WRHA management, 2 of the incidents resulted from weaknesses in properly assessing the urgency of the MRI. In both cases, the remedial action established better processes for consultation between radiologists and specialists in certain circumstances. In the third case, an MRI technologist didn't properly mitigate a safety risk noted on a patient's screening form and the remedial action was to put in place multiple flags for this particular risk.

2.2 Quality assurance processes need improvement

2.2.1 All MRI facilities accredited, but future of accreditation process uncertain

The Department monitored the accreditation status of MRI facilities. At the time of the audit, it had up-to-date accreditation reports for all facilities, and each facility was fully accredited. However, the future of the accreditation process was uncertain as the accreditation service provider planned to withdraw its services by June 2017.

The accreditation process in place at the time of our audit operated pursuant to a service purchase agreement between the Department and the College of Physicians and Surgeons of Manitoba (CPSM). CPSM established a Program Review Committee (which included a radiologist, a Department representative, and a public representative), which in turn oversaw the operation of the Manitoba Quality Assurance Program (MANQAP). MANQAP's objectives were to establish standards for diagnostic facilities, investigate and inspect diagnostic facilities for accreditation, and monitor compliance with established standards.

Facilities are required to be accredited before offering services to the public. Ongoing accreditation, which involves documentation review and on-site inspection, occurs every 5 years. MANQAP most recently accredited the MRI facilities between March 2012 and December 2014. While deficiencies were identified at each facility, they were remedied within the deadlines set by MANQAP, and MANQAP granted each facility full accreditation within 9 months of its on-site inspection.

Department officials told us CPSM decided in December 2015 that it would withdraw from providing accreditation services within 18 months (by June of 2017). Department officials said they were considering various options to ensure continued stability in accreditation.

Recommendation 22: We recommend that the Department ensure there is a qualified service provider in place to continue accrediting MRI facilities beyond June 2017.

2.2.2 Some gaps in scanner quality-control processes

DSM, PMH, and WRHA followed some, but not all, of the key quality-control processes for scanners that we identified through review of applicable standards, guidelines, and recommended practices.

Both MANQAP standards and guidelines established by the Provincial Quality Control group (which is composed of representatives from DSM, PMH, and WRHA) require facilities to have their quality control programs assessed by a medical physicist each year. None of the 5 facilities had these assessments done each year, but all told us they planned to remedy this issue.

MANQAP standards also required equipment maintenance to be scheduled and performed at least annually; more frequently if recommended by the manufacturer or required by a facility's quality management program. For a selected 12-month period, all facilities had documentation showing their MRI vendors performed regular preventative maintenance, with a few minor exceptions. One quarterly maintenance visit was cancelled for two different scanners at one facility and there was a delay in commencing preventative maintenance on a new scanner at the same facility.

WRHA and DSM management said their MRI technologists performed daily or weekly quality control tests on scanners. PMH management said their technologists were not doing similar testing as they were waiting for guidance from the medical physicist.

Recommendation 23: We recommend that DSM, PMH, and WRHA have a medical physicist assess their MRI quality control programs each year, as required by Manitoba Quality Assurance Program standards.

2.2.3 Delayed replacement of MRI scanners cause quality and efficiency concerns

CAR lifecycle guidelines recommend that high use scanners (more than 8,000 scans per year) be replaced every 8 years, medium use scanners (4,000 to 8,000 scans per year) be replaced every 10 years, and low use scanners (less than 4,000 scans per year) be replaced every 12 years. At the time of our audit, 4 scanners were older than recommended by these guidelines (by 2 to 4 years). Of these, 2 had already been approved for replacement and 2 had replacement proposals pending. Another scanner was close to the end of its recommended lifecycle.

Managers at facilities with scanners exceeding their recommended lifecycles reported challenges with the scanners' image quality (which often required repeat scans) and scanner breakdowns (which sometimes resulted in significant downtime). WRHA and PMH officials said scanners were not always replaced as quickly as needed due to numerous competing priorities for health care equipment.

All requests to replace diagnostic imaging equipment in the province are reviewed by the Provincial Imaging Advisory Council (PIAC). PIAC is chaired by the Assistant Deputy Minister of the Department's Regional Policy and Programs Division and has voting representatives from WRHA, PMH, and DSM. PIAC recommendations are sent to the Department's Equipment Committee for consideration. If the Equipment Committee agrees with the recommendation, it is then sent to Treasury Board. All specialized equipment items exceeding \$250,000 require Treasury Board approval.

When reviewing and evaluating equipment replacement proposals, PIAC generally considered the following key information: scanner age, equipment downtime, the cost of replacement, number of scans done annually, the need for repairs, benefits of new technology, and the negative impact of using aged equipment (such as substandard image quality, resulting in repeat scans).

At the time of our audit, PIAC had not considered CAR lifecycle guidelines when making decisions. However, it was soon going to be considering them as WRHA had included the guidelines in a recent proposal not yet reviewed by PIAC. PIAC had no set criteria that it applied to each proposal, but PMH management said diagnostic imaging directors were working together to develop a standard template with set criteria to help PIAC members evaluate proposals more consistently in the future. Consistent criteria linked to better productivity data (including measures of scanner downtime, as discussed in **section 1.3.5** and **Recommendation 15**), would better inform PIAC when making replacement decisions.

2.2.4 Radiologists and technologists meet qualification requirements, but peer review processes weak

All MRI technologists performing scans in 2015 were members of the Canadian Association of Medical Radiation Technologists and certified in magnetic resonance, as required by MANQAP. And all physicians reading MRI scans in 2015 were licensed in diagnostic radiology by CPSM, as required by CAR standards. But peer review processes for MRI technologists at most facilities were weak and there were no peer review processes for radiologists, although this better practice existed in some other provinces.

MANQAP standards require facilities to document quarterly quality assessments of MRI technologists' images. We found recent peer reviews for all technologists in the Boundary Trails facility and 60% of the technologists in WRHA facilities. No assessments of the technologists in the Brandon facility had been done since March 2012, when the facility was last accredited.

There were no similar standards requiring review of radiologists' work. However, our review of publicly available information showed that both Alberta and Saskatchewan have quality assurance programs (led by their College of Physicians and Surgeons) that include peer review of radiologists' work. Also, the Diagnostic Accreditation Program of the College of Physicians and Surgeons in British Columbia requires facilities to establish peer review programs for physicians interpreting scans, and some Ontario hospitals have peer review programs. In all of these provinces, mistakes in reading and interpreting medical imaging tests led to detailed reviews of past scans for discrepancies. And in many of these provinces, this led to calls for a more rigorous and documented peer review process.

At the time of our audit, there was no peer review process for radiologists reading and interpreting MRI scans in Manitoba. Radiologists in Brandon and Boundary Trails said they consulted with one another on an ad hoc basis when interpreting scans. Also, in August 2016 the radiologists in Boundary Trails said they began meeting every other month to review a collection of cases that were interesting or had missed findings. And WRHA management said radiologists had regular meetings where challenging cases, missed findings, and misinterpretations were presented. All these processes were informal and undocumented.

Sections 1.2.2 and 2.1.2 highlight the importance of properly prioritizing MRI requests. Therefore, ideally, peer reviews for radiologists would include review of their prioritization of MRI requests, as well as their reading and interpretation of MRI scans.

Recommendation 24: We recommend that DSM, PMH, and WRHA:

- a. regularly complete all required peer reviews for MRI technologists.
- b. implement a formal and documented annual peer review process for radiologists that includes assessing how they prioritize, read, and interpret MRI scans.

Summary of recommendations

Intake of MRI requests

1. We recommend that the Department, DSM, PMH, and WRHA (working together and collaboratively with Choosing Wisely Manitoba and other stakeholders) develop specific initiatives to improve the appropriateness of MRI requests, and that in doing so they assess the costs and likely benefits of:
 - developing and implementing ordering guidelines and stricter requirements for the MRI requests most often inappropriately ordered.
 - educating the public on inappropriate scan demands.
 - providing targeted education to clinicians with unusually high ordering rates.
 - altering radiologists' fee structure to recognize time spent dealing with inappropriate orders.
 - embedding ordering guidelines in order-entry software.
2. We recommend that the WRHA make central intake of MRI requests mandatory.
3. We recommend that DSM, PMH, and WRHA evaluate the costs and benefits of sharing centralized MRI intake services within or across regions.
4. We recommend that DSM, PMH, and WRHA monitor the length of time it is taking to book MRI appointments and promptly remedy any significant booking backlogs.
5. We recommend that the Department, DSM, PMH, and WRHA make it clear on all websites that, following consultation with their health care providers, patients may have their MRI scans done at different facilities and in different regions.
6. We recommend that the Department, DSM, PMH, and WRHA work together to develop a specific initiative (or initiatives) to remind clinicians that MRI scans can be requested at facilities in different regions.
7. We recommend that DSM, PMH, and WRHA work together to finish standardizing MRI request forms across the province in the short-term and work with the Department to implement an electronic MRI request form in the long-term.

Prioritization of MRI requests

8. We recommend that the Department, DSM, PMH, and WRHA work together to develop a single province-wide method of prioritizing MRI requests that includes a clear definition and standard wait-time target for each priority level, at minimum meeting the Canadian Association of Radiologists' guidelines.
9. We recommend that DSM, PMH, and WRHA assign priority codes to all MRI scan requests based solely on medical considerations and then schedule all scans—including those where a third party is paying for them—based on assigned codes.

10. We recommend that DSM, PMH, and WRHA track and monitor MRI wait times by priority level, and that they adjust their scheduling processes when monitoring shows a significant number of the more urgent scans are not being scheduled so as to meet wait-time targets.

Ensuring MRI scanners are fully and efficiently used

11. We recommend that DSM, PMH, and WRHA work together to harmonize MRI scan protocols across all facilities in the province, and that they adjust the standard length of scan appointments to reflect any resulting time savings.
12. We recommend that DSM, PMH, and WRHA identify and implement facility scheduling practices that can increase the number of MRI scans done daily at each facility.
13. We recommend that DSM, PMH, and WRHA implement further strategies for reducing no-show rates for MRI appointments and monitor their effectiveness.
14. We recommend that DSM, PMH, and WRHA provide all patients with the option to be placed on a cancellation list.
15. We recommend that DSM, PMH, and WRHA develop and monitor scanner productivity measures that can help assess efficiency and drive process improvement, and that over the long-term the Department require the regions to develop standardized productivity measures.

Reporting MRI scan results

16. We recommend that DSM, PMH, and WRHA track and monitor MRI report turnaround times using policies and targets that take clinical urgency into consideration, and that DSM and WHRA develop processes to identify and promptly follow-up overdue reports.

MRI planning and performance reporting

17. We recommend that the Department provide government decision-makers considering new additional MRI scanners with more comprehensive data, such as data on the:
 - volume of MRI demand from the different geographic areas of the province.
 - various proposed scanner locations and their related costs, benefits, and risks; clinical environments; transportation impacts; and impacts on provincial, regional and facility wait-times.
 - costs and benefits of expanding the operating hours of existing scanners as opposed to adding new scanners.
 - rationale of proposed operating hours and throughput for new scanners.
18. We recommend that the Department work collaboratively with DSM, PMH, and WRHA to ensure there is comprehensive strategic planning for MRI services in the province that holistically considers demand, productivity, supply, safety, and quality assurance issues.

Management of MRI Services

19. We recommend that the Department work collaboratively with DSM, PMH, and WRHA to:
 - a. review and clarify how it expects MRI scan volumes and wait-times to be calculated and reported (both short-term and long-term).
 - b. include wait-time information by priority level, including comparisons to targets, in its reporting requirements, as systems allow.
 - c. include productivity measures (other than scan volumes) in its reporting requirements.
 - d. ensure the accuracy and consistency of reported data.
20. We recommend that the Department enhance public information on MRI wait times and volumes by:
 - a. accurately explaining the information.
 - b. reporting a greater variety of wait-time information to better meet users' needs (such as percentile information; both average and median wait times; and, as systems allow, wait times by priority level against established targets).

Patient safety and MRI quality assurance processes

21. We recommend that DSM, PMH, and WRHA implement processes to ensure patient safety screening forms are fully completed and properly signed.
22. We recommend that the Department ensure there is a qualified service provider in place to continue accrediting MRI facilities beyond June 2017.
23. We recommend that DSM, PMH, and WRHA have a medical physicist assess their MRI quality control programs each year, as required by Manitoba Quality Assurance Program standards.
24. We recommend that DSM, PMH, and WRHA:
 - a. regularly complete all required peer reviews for MRI technologists.
 - b. implement a formal and documented annual peer review process for radiologists that includes assessing how they prioritize, read, and interpret MRI scans.

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