

# INNOVATION IN MEDICAL IMAGING: DELIVERING BETTER CARE & A HEALTHY ECONOMY



PRESENTED ON BEHALF OF  
THE CANADIAN ASSOCIATION OF RADIOLOGISTS  
AUGUST 3, 2018



Canadian Association of Radiologists  
L'Association canadienne des radiologistes

## ABOUT

The CAR is the national specialty society for radiologists in Canada representing 2,225 members who provide vital medical imaging for millions of patients. We are dedicated to maintaining the highest standards of care, promoting patient safety and helping radiologists contribute to the very best health care for patients.

## EXECUTIVE SUMMARY

The Canadian Association of Radiologists (CAR) is the national voice for radiologists in Canada, representing over 2,000 members who provide vital medical imaging for millions of patients across the country. The CAR is dedicated to maintaining the highest standards of care, promoting patient safety and helping radiologists contribute to the very best care for patients.

Innovation in healthcare is essential for health of Canadians. Canadians face challenges related to inadequate distribution of health human resources and timely access to quality care. We must become more innovative in our approach to patient care.

Investment in medical imaging technology will yield a stronger, more sustainable and efficient healthcare system. Advancements in medical imaging will not only improve the quality of care but will also promote better care access for Canadians, while stimulating economic growth via the development of new technologies.

## RECOMMENDATIONS

1. Invest \$625 million over five years, as part of the federal transfer to the provinces, to ensure that available imaging equipment meets the quality standards that patients deserve inclusive of our seniors and indigenous communities
2. Invest \$3 million in 2019 for medical imaging equipment in Northern communities to help eradicate tuberculosis
3. Invest \$9 million over three years to fund projects to implement clinical decision support tools for imaging referrals
4. Invest \$10.5 million over three years to begin establishing federal frameworks to regulate the implementation of AI tools in medicine and healthcare.

## HEALTHCARE IN CANADA

Healthcare represents nearly 11% of GDP: however, Canada lags behind other OECD countries in health system performance across the domains of quality, access, efficiency, equity and expenditures. In 2017, the Commonwealth Fund ranked Canada 9th out of 11 nations.<sup>1</sup> There is ongoing concern about the value that Canadian patients are receiving relative to the investments being made by federal and provincial governments. Canada needs strategic investment in aspects of the healthcare system that will produce

measurable outcomes. It is imperative to harness new and innovative technologies to efficiently address quality and health system sustainability.

### RADIOLOGY CAN HELP

Imaging is vital to the diagnosis and treatment of diseases and conditions. In 2017, the Conference Board of Canada found that radiology adds value to the healthcare system by reducing downstream treatment costs for progressive disease, by harnessing innovative technologies to improve access to care, and by contributing to initiatives geared at improving the appropriateness of imaging referrals.<sup>2</sup>

Technological advancements such as telemedicine and Artificial Intelligence (AI) in radiology can also help to serve underserved communities including our seniors who otherwise would not have access to medical imaging and put Canada on the forefront of advanced medical research.

### INVEST IN INNOVATION

In 2015, the Advisory Panel on Healthcare Innovation advocated for programs and funding, spearheaded by the federal government, to generate health system improvement. Subsequently, the Mandate Letter for the Minister of Health called for “pan-Canadian collaboration on health innovation to encourage the adoption of new digital health technology to improve access, increase efficiency and improve outcomes for patients.”<sup>3</sup> The recommendations outlined below will advance innovation in healthcare and will contribute to the overall resiliency of the Canadian economy.

# 1. CLOSE THE GAP ON MEDICAL IMAGING EQUIPMENT

Improving access to quality equipment is one of the best ways to ensure efficient imaging services for patients. The median number of weeks patients must wait for access to a computed tomography (CT) or magnetic resonance imaging (MRI) scanner, or an electroencephalogram (EEG) has increased, and there are considerable variations in wait times between provinces.<sup>4</sup> Moreover, Canada appears below approximately half of the countries with data collected by the OECD in terms of number of CT and MRI units per million people.<sup>5</sup> This figure is exacerbated by unequal distribution of units across the country, and by ageing units that are no longer as safe and effective as they need to be for optimal patient care.<sup>6</sup> It has been estimated that between 10-20% of medical imaging equipment is more than 10 years old. We need to ensure that patients and providers have access to more efficient modern technologies that can better diagnose illness and treat disease. Ensuring better access to technology can improve health outcomes for underserved populations and keep our seniors out of hospitals and in their homes and long-term care centers longer through early diagnosis of illness and disease.

*Despite the demonstrated need and strain on the system, radiology has not received targeted investment from the federal government to address the equipment gap in over a decade.*

In 2004, the government invested \$2.5 billion over five years in the *Diagnostic and Medical Equipment Fund*, which was dispersed to provinces on a per capita basis to support the purchase of equipment. During the July 2018 Premiers meeting provinces and territories committed to advancing multi-jurisdictional procurement processes for medical imaging including (CT), ultrasound and MRI. The CAR would like to have an active voice in this discussion and supports the federal government in taking a leadership role in this capacity.

***Recommendation: Invest \$625 million, over five years, as part of the federal transfer to the provinces, to ensure that available imaging equipment meets the quality standards that patients deserve.***

## RECOMMENDED YEARLY INVESTMENT – MEDICAL IMAGING EQUIPMENT

	2018	2019	2020	2021	2022
Investment	\$75 million	\$75 million	\$100 million	\$150 million	\$225 million

## AGE OF UNITS FOR ALL MODALITIES ACROSS CANADA, NUMBERS IN 2017

Age of Units <sup>a</sup>	Number (and %)				
	CT	MRI	PET-CT	SPECT	SPECT-CT
0–5 years	167 (34.0)	115 (36.4)	12 (31.6)	41 (12.9)	73 (39.5)
6–10 years	198 (40.3)	106 (33.5)	20 (52.6)	94 (29.2)	89 (48.1)
11–15 years	114 (23.2)	84 (26.6)	6 (15.6)	115 (36.2)	22 (11.9)
16–20 years	12 (2.4)	11 (3.5)	0	54 (17.0)	1 (0.5)
>20 years	0	0	0	14 (4.4)	0
Used Units	15	11	2	8	2
Total	506	327	40	326	197

CT = computed tomography; MRI = magnetic resonance imaging; PET-CT = positron emission tomography-computed tomography; SPECT = single-photon emission computed tomography; SPECT-CT = single-photon emission computed tomography-computed tomography.

<sup>a</sup> Age for each unit calculated from survey question: “What year did (or will) the [modality] unit become operational?” subtracted from 2017.

Source: CADTH <https://www.cadth.ca/canadian-medical-imaging-inventory-2017>

## 2. ERADICATE TUBERCULOSIS IN NORTHERN COMMUNITIES

In March 2018, the government promised to reduce active tuberculosis in the North by half within the next seven years. This is ahead of the broader goal to eliminate the disease by 2030. Tuberculosis is a preventable and curable bacterial infection that can be fatal if left untreated. Government figures show that the incidence of tuberculosis among all Canadians in 2016 was 4.8 cases per 100,000 people, while for Inuit living anywhere Canada it was slightly more than 170 cases per 100,000 people.<sup>7</sup>

Investing in imaging equipment for Northern communities can help address this public health crisis. By making modern imaging equipment available to these communities, we can better diagnose tuberculosis, treat patients earlier and more effectively, and improve health outcomes.

The government's most recent budget committed \$27.5 million over five years to eliminate tuberculosis in Inuit Nunangat, which includes funding for prevention, screening, diagnosis and treatment.<sup>8</sup> Diagnosing and staging TB disease involves a chest X-ray or chest CT, in addition to sputum and skin tests. A modest investment of \$3 million to update and improve access medical imaging equipment will go a long way to ensuring that there are adequate resources to better serve patients in Northern communities.

***Recommendation: Invest \$3 million in 2019 for medical imaging equipment in Northern communities to help eradicate tuberculosis.***

## 3. ENSURE THE APPROPRIATENESS OF IMAGING REFERRALS

Clinical decision support (CDS) for diagnostic imaging is a data-driven tool developed by innovative firms here in Canada.<sup>9</sup> CDS systems are software platforms that integrate into existing clinical workflows, and will help physicians make optimal decisions about which diagnostic test to request, ensuring that imaging resources are allocated efficiently.<sup>10</sup> The ultimate goal of this platform is to help physicians and patients make better more informed decisions regarding medical imaging tests and treatments. Targeted investment into CDS would operationalize millions of dollars of investment already made by Canada Health Infoway and provincial governments and improve efficiency and appropriateness for referrals.

Projects to demonstrate the value and effectiveness of CDS are already underway – at St. Michael's Hospital in Toronto, in the Saskatoon Health Region, and at Vancouver Island Health Authority.<sup>11</sup> The CAR has formulated a CDS Working Group with the intention to bring impacted stakeholders together to weigh in on the most appropriate infrastructure to support appropriate referrals for medical imaging. What is now required is support from the federal government to capitalize on the investments that have already made into EMR/EHR platforms, Choosing Wisely Canada, and government led health innovation initiatives. Targeted funding is needed to support CDS and other projects to link them in a robust clinical network.

***Recommendation: Invest \$9 million over three years to fund projects to implement clinical decision support tools for imaging referrals.***

*"Family physicians value our collaboration with radiologist colleagues. Clinical Decision Support tools that are well-integrated in family practice clinical workflows would aid family physicians in providing evidence-based patient-centred care. We look forward to contributing family medicine expertise and perspectives to the work involved in the creation and implementation of such tools."*

– CFPC Executive Director and CEO Francine Lemire, MD CM, CCFP, FCFP, CAE

## 4. HARNESS AI, DEEP LEARNING, AND BIG DATA FOR USE IN MEDICINE

Canada is positioned to take a leading role in the drive to integrate AI into healthcare, by capitalizing on its strengths in research, bioinformatics, and single-payer healthcare system. On June 7, 2018 the Prime Minister announced a partnership with France for the creation of an international study group on artificial intelligence made up of subject matter experts. The CAR would like the opportunity to be part of this exemplary initiative and can add considerable amount of value as leaders in this field.

Harnessing AI research for applications in medicine will define the way that the next generation of Canadians access and experience care. These applications will transform every aspect of patient care, from improving medical decision-making in diagnostics, prognosis, selecting treatment methods and in providing robotic surgeries and examinations. In May 2018, the CAR published its White Paper on Artificial Intelligence in Radiology, which provides a blueprint for the involvement of the CAR in research, development, and implementation of AI applications for imaging.<sup>12</sup>

In its 2017 budget, the government funded the Pan-Canadian Artificial Intelligence Strategy. Further, the Senate Committee on Social Affairs, Science and Technology's 2017 report Challenge Ahead: Integrating Robotics, Artificial Intelligence and 3D Printing

Technologies into Canada's Healthcare Systems revealed that the federal government has a leadership role to play in encouraging provincial governments to integrate new technologies into the publicly-funded systems. Catalyzing AI research that seeks to apply innovative approaches to address health system challenges will encourage support for industry that will permit Canadian firms to flourish and contribute to economic growth.

To ensure that AI tools for medicine are developed and deployed with patient safety and privacy in mind, the federal government must lead on setting standards for the interoperability of AI systems, while addressing regulatory and legal issues that accompany the use of AI in medicine. The CAR wants to work with the government to guide and facilitate the appropriate development and implementation of AI tools to help radiologists improve imaging care.

***Recommendation: Invest \$10.5 million through the Strategic Innovation Fund, sponsored by Innovation, Science and Economic Development Canada, over three years to begin establishing federal frameworks to regulate the implementation of AI tools in medicine and healthcare.***

***The CAR would like to thank the Standing Committee on Finance for the opportunity to submit a pre-budget submission and would welcome the opportunity to elaborate further on the recommendations included in this brief.***

## REFERENCES

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- 6 CADTH. Diagnostic Imaging Equipment Replacement and Upgrade. December 2015. Available from: <https://www.cadth.ca/diagnostic-imaging-equipment-replacement-and-upgrade>.
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- 8 The Star, Canadian Press, Omand, G. Federal government aims to eliminate tuberculosis in Canada's North by 2030, March 23, 2018. Available from: <https://www.thestar.com/news/canada/2018/03/23/federal-government-aims-to-eliminate-tuberculosis-in-canadas-north-by-2030.html>
- 9 Medcurrent, a firm based in Toronto, is one of the world leaders in developing CDS technology. In 2016, Medcurrent received \$800,000 of FedDev Ontario funding.
- 10 Chakraborty S, Reed M, Rybicki FJ, Fraser J, Glanc P, Levesque J, et al. Clinical Decision Support in Computerized Providers' Order Entry for Imaging Tests in Canada. *Can Assoc Radiol J*. 2017;68(4):357-8.
- 11 These projects have received letters of support from provincial health authorities, local health networks, and pan-Canadian quality improvement programs including Choosing Wisely Canada.
- 12 Tang A, Tam R, Cadrin-Chenevert A, Guest W, Chong J, Barfett J, et al. Canadian Association of Radiologists White Paper on Artificial Intelligence in Radiology. *Can Assoc Radiol J*. 2018;69(2):120-35.



600 – 294 Albert Street  
Ottawa, Ontario K1P 6E6  
Tel.: 613 860-3111  
Fax: 613 860-3112  
[www.car.ca](http://www.car.ca)



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