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Canadian Medical Imaging Inventory Service Report

CT-in-a-Box

Context

CT-in-a-box is a self-contained, portable unit that is separate to a hospital facility. It was developed by engineers in China in February 2020, in response to the coronavirus disease 2019 (COVID-19) and the urgent need for additional imaging capacity. This CT system is intended for deployment to remote and pop-up hospitals to assess disease progression and complications in COVID-19 patients.[1]

CT-in-a-box represents a new innovation within the context of COVID-19. With the design of the modular unit specifically configured to limit the spread of infection,[1] it builds on the concept of the mobile CT unit, which has been available since the 1980s.[2] As well, the military have been using "deployable CT," based on the same concept, since 2013.[3]

Objective

This report summarizes information on the use of CT-in-a-box in Canada. The key objectives are, as follows:

- to describe the key characteristics of the technology
- to determine the extent of the adoption of the technology across Canada.

About This Document

This document summarizes information identified through the Canadian Medical Imaging Inventory (CMII) and a limited literature search. Published literature on this technology is limited and is mostly contained to information found on the manufacturers' websites and published in media releases.

Results

The Technology

CT-in-a-box is a modular pop-up system that, once fitted together, is approximately 36 square metres in size and looks similar to a trailer home or temporary home for a construction project.[4] It consists of prefabricated cabins, with a partition wall between the exam and control rooms. The configuration of the unit enables technicians in the control room to monitor the exam room via real-time webcam images and a TV screen. The module includes leaded shielding for radiation protection; heating, ventilation, and air-conditioning (HVAC) for ventilation; an electricity supply; and temperature control.[1] It uses a CT unit that is technologically identical to conventional CT and provides the same imaging capabilities.[5]

The design of CT-in-a-box has evolved over the course of its short lifetime, with ongoing refinements to optimize safety protocols and improve patient access and throughput.[6] It takes a few weeks to operationalize (construct) a pop-up CT unit after it has been deployed to the site where it will be used, and this includes the time needed to calibrate the CT unit.[5]

The main benefits of CT-in-a-box include:[7]

- provides rapid deployment and quick installation
- boosts imaging capability
- provides faster decontamination
- increases access to CT imaging
- helps to minimize contact with potential COVID-19 cases.

The first CT-in-a-box system to minimize virus contagion was developed by GE Healthcare in February 2020.[1] A similar system developed by Canon Medical Systems was marketed in April 2020. The main difference between the 2 systems pertains to their decontamination process. The former is decontaminated manually, whereas the latter uses multiple automated ultraviolet emitters that are intended to decontaminate a room in minutes.[8]

Exam Volume

The number of patients who can be imaged in a day is unclear and is likely dependent on the type of decontamination method used. Chest imaging for COVID-19 can be completed in seconds. However, the length of time needed to sanitize the exam room and wait areas has been recorded to be between a few minutes to 60 minutes.[9,10]

Availability

No CT-in-a-box systems were reported through the CMII survey. However, CMII data collection closed February 2020, which was the same time as the first CT-in-a-box was developed. It may be that this system was deployed after the survey closed. According to GE Healthcare, one of the main manufacturers of CT-in-a-box, more than 100 units have been installed in more than 20 countries.[7] No information was found on the deployment of CT-in-a-box to Canada.

There are at least 2 mobile CT units in Canada, both located in urban settings in Quebec and operating as fixed units. As well, there is a mobile stroke unit in Alberta that includes a portable CT unit.[11] Canada's Department of National Defence installed a "deployable CT" at Canadian Forces Base Halifax in Nova Scotia, in October 2020.[12]

Conclusion

The concept of CT-in-a-box was developed to limit the spread of COVID-19 infection and manage increased demand for imaging arising from COVID-19 cases. The box employs a CT unit that is technologically identical to conventional CT and provides the same imaging capabilities. It builds on the concept of mobile imaging, which has been available since the 1980s.

There are no known CT-in-a-box imaging units in Canada. There are at least 3 mobile CT units, all operating at fixed sites and 1 of which is owned and operated by the military. As well, there is 1 mobile stroke unit that includes a portable CT unit.

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References

1. CT in a box helps rapidly boost imaging capability at COVID surge hospitals. *Imaging Technology News* 2020; https://www.itnonline.com/article/ct-box-helps-rapidly-boost-imaging-capability-covid-surge-hospitals. Accessed 2021 Feb 17.
2. CCOHTA. A comparison of fixed and mobile CT and MRI scanners. Ottawa: Canadian Coordinating Office for Health Technology Assessment (CCOHTA); 1995: https://www.cadth.ca/sites/default/files/pdf/compar_ctmri_tr_e.pdf. Accessed 2021 Feb 17.
3. World's first fully deployable CT scanner on display at DSEI 2013. *Military Systems and Technology* 2013; https://www.militarysystems-tech.com/articles/world-s-first-fully-deployable-ct-scanner-display-dsei-2013. Accessed 2021 Feb 17.
4. GE Healthcare. Think inside the box: this Parisian hospital has a dedicated CT cabin for its COVID-19 patients. 2020: https://www.ge.com/news/reports/think-inside-the-box-this-parisian-hospital-has-a-dedicated-ct-cabin-for-its-covid-19-patients Accessed 2021 Feb 17.
5. Murphy K. Inside the massive logistics push to equip the world's caregivers. *Barron's* 2020; https://www.barrons.com/articles/whats-next-for-health-care-after-covid-19-51587556800. Accessed 2021 Feb 17.
6. GE Healthcare. When big CT scanners come in a box, easy to unpack and ready to use. 2020: https://www.gehealthcare.co.uk/article/when-big-ct-scanners-come-in-a-box-easy-to-unpack-and-ready-to-use. Accessed 2021 Feb 17.
7. GE Healthcare. CT in a box: quick solution to increased and isolated scans. 2020: https://www.gehealthcare.in/products/computed-tomography/ct-in-a-box. Accessed 2021 Feb 17.
8. Palmer W. Canon Medical releases quick CT contamination system amid COVID-19. *Diagnostic Imaging* 2020; https://www.diagnosticimaging.com/view/canon-medical-releases-quick-ct-decontamination-system-amid-covid-19. Accessed 2021 Feb 17.
9. Coronavirus update: a look at the UAE's first "CT in a container". 2021; https://insights.omnia-health.com/coronavirus-updates/coronavirus-update-look-uaes-first-ct-container. Accessed 2021 Feb 17.
10. Catalina Imaging. CT in a box greatly increases imaging capability of COVID hotspot hospitals. *Catalina Imaging* 2020; https://catalinaimaging.com/ct-box-greatly-increases-imaging-capability-covid-hotspot-hospitals/. Accessed 2021 Feb 17.
11. CADTH. The Canadian Medical Imaging Inventory 2019-2020. Ottawa: CADTH; 2021: https://cadth.ca/sites/default/files/ou-tr/op0546-cmii3-final-report.pdf. Accessed 2021 Feb 17.
12. Department of National Defence continues investment in the health care for Canadian Armed Forces members. *National Defence* 2020; https://www.canada.ca/en/department-national-defence/news/2020/10/department-of-national-defence-continues-investment-in-the-health-care-for-canadian-armed-forces-members.html. Accessed 2021 Feb 17.

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CADTH is an independent, not-for-profit organization responsible for providing Canada's health care decision-makers with objective evidence to help make informed decisions about the optimal use of drugs and medical devices in our health care system.

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