



Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.



Training/Practice Contemporary Issues in Cardiology Practice

Cardiovascular Care Delivery During the Second Wave of COVID-19 in Canada

Idan Roifman, MD, MSc,^a Rakesh C. Arora, MD, PhD,^b David Bewick, MD,^c
Chi-Ming Chow, MD,^d Brian Clarke, MD,^e Simone Cowan, MD, MSc,^f
Anique Ducharme, MD, MSc,^g Kenneth Gin, MD,^f Michelle Graham, MD,^h Anil Gupta, MD,ⁱ
Sean Hardiman, MHA,^j Michael Hartleib, MD,^k Simon Jackson, MD,^l Davinder Jassal, MD,^m
Mustapha Kazmi, MD,ⁿ Yoan Lamarche, MD, MSc,^o Jean-François Légaré, MD,^p
Howard Leong-Poi, MD, PhD,^d Samer Mansour, MD,^q Ariane Marelli, MD, MPH,^r
Marc Ruel, MD, MPH,^s Gary Small, MD, PhD,^s Larry Sterns, MD,^t
Ricky Turgeon, BSc(Pharm), PharmD,^u Sean Virani, MD, MSc, MPH,^f
Harindra C. Wijeyesundera, MD, PhD,^a Kenny Wong, MD,^v David A. Wood, MD,^f
Shelley Zieroth, MD,^w Gurmeet Singh, MD, MSc,^h and Andrew D. Krahn, MD^f

^aSchulich Heart Program, Sunnybrook Health Sciences Centre, University of Toronto, Toronto, Ontario, Canada; ^bDepartment of Surgery, Section of Cardiac Surgery, Max Rady College of Medicine, University of Manitoba, Winnipeg, Manitoba, Canada; ^cSaint John Regional Hospital, Saint John, New Brunswick, Canada; ^dSaint Michael's Hospital, Toronto, Ontario, Canada; ^eLibin Cardiovascular Institute, University of Calgary, Calgary, Alberta, Canada; ^fCentre for Cardiovascular Innovation, Division of Cardiology, University of British Columbia, Vancouver, British Columbia, Canada; ^gMontréal Heart Institute, University of Montréal, Montréal, Québec, Canada; ^hMazankowski Alberta Heart Institute, University of Alberta, Edmonton, Alberta, Canada; ⁱTrillium Health Partners, Mississauga, Ontario, Canada; ^jCardiac Services BC, Provincial Health Services Authority, Vancouver, British Columbia, Canada; ^kKawartha Cardiology Clinic, Peterborough Regional Health Centre, Peterborough, Ontario, Canada; ^lQEII Health Sciences Center, Halifax, Nova Scotia, Canada; ^mSaint Boniface Hospital, University of Manitoba, Winnipeg, Manitoba, Canada; ⁿLibin Cardiovascular Institute of Alberta, Calgary, Alberta, Canada; ^oDepartment of Surgery, Institut de Cardiologie de Montréal, Université de Montréal, Montréal, Québec, Canada; ^pNew Brunswick Heart Centre, Saint John, New Brunswick, Canada; ^qDepartment of Medicine, Centre Hospitalier de l'Université de Montréal, Université de Montréal, Montréal, Québec, Canada; ^rMcGill University Health Centre, Montréal, Québec, Canada; ^sUniversity of Ottawa Heart Institute, Ottawa, Ontario, Canada; ^tRoyal Jubilee Hospital, Victoria, British Columbia, Canada; ^uFaculty of Pharmaceutical Sciences, University of British Columbia, Vancouver, British Columbia, Canada; ^vIWK Health, Dalhousie University, Halifax, Nova Scotia, Canada; ^wWinnipeg Regional Health Authority Cardiac Sciences Program, Winnipeg, Manitoba, Canada

ABSTRACT

Hospitals and ambulatory facilities significantly reduced cardiac care delivery in response to the first wave of the COVID-19 pandemic. The deferral of elective cardiovascular procedures led to a marked reduction in health care delivery with a significant impact on optimal cardiovascular care. International and Canadian data have reported dramatically increased wait times for diagnostic tests and cardiovascular procedures, as well as associated increased cardiovascular

RÉSUMÉ

Les hôpitaux et les services de soins ambulatoires ont considérablement réduit leur prestation de soins en cardiologie en réponse à la première vague de la pandémie de COVID-19. Le report des interventions cardiovasculaires non urgentes a entraîné une réduction marquée de la délivrance des soins de santé, ce qui a eu un impact significatif sur l'optimisation des soins cardiovasculaires. Des données internationales et canadiennes ont fait état d'une augmentation

Received for publication November 20, 2020. Accepted November 30, 2020.

Corresponding author: Dr Idan Roifman, Department of Medicine, University of Toronto, 2075 Bayview Ave, Toronto, Ontario M4N 3M5, Canada. Tel.: +1-647-280-9750.

E-mail: idan.roifman@sunnybrook.ca

See page 793 for disclosure information.

In March, 2020, hospitals and ambulatory facilities significantly reduced cardiac care delivery in preparation for a surge of COVID-19. Procedures such as noninvasive diagnostic tests, angiograms, percutaneous coronary interventions, heart rhythm devices and ablations, and cardiac surgeries were severely restricted, performed only on an urgent or emergency

morbidity and mortality. In the wake of the demonstrated ability to rapidly create critical care and hospital ward capacity, we advocate a different approach during the second and possible subsequent COVID-19 pandemic waves. We suggest an approach, informed by local data and experience, that balances the need for an expected rise in demand for health care resources to ensure appropriate COVID-19 surge capacity with continued delivery of essential cardiovascular care. Incorporating cardiovascular care leaders into pandemic planning and operations will help health care systems minimise cardiac care delivery disruptions while maintaining critical care and hospital ward surge capacity and continuing measures to reduce transmission risk in health care settings. Specific recommendations targeting the main pillars of cardiovascular care are presented: ambulatory, inpatient, procedural, diagnostic, surgical, and rehabilitation.

basis. The deferral of elective procedures led to a significant impact on optimal cardiac care and resulted in backlogs for cardiac procedures and diagnostic tests.¹ Specific Canadian data regarding the extent of these backlogs are currently being compiled and have not yet been published.

International data have reported increased cardiovascular morbidity and mortality during the first wave of health care lockdowns.² Emerging Canadian data similarly suggested cardiovascular morbidity and mortality increased during the first wave of COVID-19.³ Health care teams demonstrated an ability to create emergency operations teams to oversee the creation of rapid and safe care delivery. Such teams are key to balance preparedness, as COVID-19 case volumes increase, with the cost of deferred cardiovascular care and its associated consequences.

As a result of lessons learned during the first COVID-19 wave, we advocate a different approach during the second and subsequent pandemic waves. We suggest an approach, informed by local data and experience, that balances the need for an expected rise in demand for health care resources to ensure COVID-19 surge capacity with continued delivery of needed cardiovascular care. To help preserve the capacity of our health care system, cardiovascular care providers should advocate and practice infection mitigation strategies such as physical distancing, hand hygiene, and staying home when unwell. By incorporating cardiovascular care leaders into pandemic planning and operations, health care systems can minimise cardiovascular care delivery disruptions while maintaining critical care surge capacity. Importantly, cardiovascular health service delivery should follow the guiding principles of fairness (ie, follow a fair priority setting process that is relevant, transparent, and engages all relevant stakeholders), balance (ie, balance priorities such as human resources and limited physical resources such as PPE and medications), and equity (ie, manage all people presenting with similar priority problems in the same manner). These principles should apply nationally and be free from political considerations. The following recommendations based on

spectaculaire des temps d'attente pour les tests de diagnostic et les interventions cardiovasculaires, ainsi que d'une augmentation connexe de la morbidité et de la mortalité cardiovasculaires. Compte tenu d'une capacité démontrée à créer rapidement une capacité de soins intensifs et de services hospitaliers, nous préconisons une approche différente lors de la deuxième vague de la pandémie COVID-19 et des éventuelles vagues ultérieures. Nous suggérons une approche fondée sur les données et expériences locales, qui concilie la nécessité d'une augmentation prévisible de la demande de ressources de soins de santé afin d'assurer une capacité de montée en puissance adaptée à la COVID-19 avec une prestation continue de soins cardiovasculaires essentiels. L'intégration des responsables des soins cardiovasculaires dans la planification et les opérations liées à la pandémie aidera les systèmes de soins de santé à minimiser les perturbations dans la prestation des soins cardiaques tout en maintenant la capacité de montée en puissance des soins intensifs et des services hospitaliers et en poursuivant les mesures visant à réduire le risque de transmission dans les milieux de santé. Des recommandations spécifiques ciblant les principaux piliers des soins cardiovasculaires sont présentées : soins ambulatoires, hospitaliers, procéduraux, diagnostiques, chirurgicaux et de réadaptation.

consensus are provided for the key pillars of cardiovascular care.

Recommendations

1. Ambulatory care

To protect the fragile population with cardiovascular disease, shifting toward hybrid care models with virtual care components, and in some instances remote monitoring, was initiated during the first wave of COVID-19. Coordinated efforts between health systems and cardiovascular leaders created new virtual capacity for those requiring emergency care or in-person management. High-quality remote ambulatory care is feasible for a great proportion of cardiovascular patients, providing timely access to local laboratories, unencumbered access to guideline-directed medical therapy, and up-to-date information systems.⁴ However, there is significant variability in resources for remote health care infrastructure across the country. Government should prioritise and invest in enhancing this capacity. There is a concurrent need to ensure that in-person evaluation and investigation of high-risk patients are not delayed. This approach is crucial to prevent the unintended consequence of increased morbidity and mortality due to acute presentations of heart failure, acute coronary syndromes, and syncope.

2. Hospital inpatient and critical care

Before the COVID-19 pandemic, most Canadian centres had both inpatient ward and critical care occupancy rates very near maximum capacity, severely compromising the ability to manage surges posed by pandemics. Regarding cardiovascular critical care, some Canadian centres incorporate cardiac surgery patients into medical-surgical critical care units, while others have distinct cardiovascular surgery and cardiac intensive care areas. In both contexts, surge capacity directly affects cardiac patient access to critical care. It is recommended that

the perioperative team develop a location and process to safely care for cardiac surgery patients in an environment that is able to maintain strict COVID-19 infection mitigation protocols. Cardiology inpatient capacity may also be significantly affected by surge capacity aimed at ensuring adequate bed resources for noncritically ill hospitalised COVID-19 patients. Individual health care system decisions regarding inpatient ward and critical care resources should factor in cardiovascular patient acuity and flow. To this end, strategic bed allocation will benefit from cardiovascular leader participation during pandemic logistical planning.

3. Procedural care

The majority of needed procedural care can continue without impact on the necessary in-hospital bed capacity that may be required for a potential COVID-19 surge. Redeployment of health care workers may affect the ability to perform procedural care. Scheduling of shared resources for procedural care must be sufficiently nimble to address increasing wait lists in areas such as electrophysiologic ablations and transcatheter aortic valve replacement while concurrently being able to address acute needs such as cardiac device implants, diagnostic angiography, and percutaneous coronary intervention. This will require new models of cardiac catheterisation lab operations that emphasise flexibility. For example, to balance outpatient wait lists while concurrently addressing urgent cases across procedures, blending planned elective case mixes may be considered (intervention and electrophysiology), while ensuring reserve capacity for urgent and emergency cases.

4. Diagnostic care

It is essential that access to diagnostic cardiac testing is maintained. However, the potential increased risk of exposure and infection highlights the importance of following appropriate use criteria. This applies to both ambulatory and inpatient testing, including electrocardiography, Holter monitoring, stress testing, echocardiography, nuclear imaging, cardiac computed tomography (CCT), and cardiac magnetic resonance imaging (CMR). Appropriate diagnostic testing may involve utilisation rates at or near pre-pandemic levels, although a modest reduction in testing may be necessary during surges if hospital resources and staff are redeployed for COVID-19 clinical activities. During periods of constrained hospital resources, patients may be triaged based on test indication. When deciding which modality has the best capability to answer the clinical query, the risk of infection and contamination for patients, health care workers, and infrastructure should also be considered in the decision-making process. Specifically, the American College of Cardiology and American Society of Echocardiography consider transesophageal echocardiography (TEE) to be an aerosol-generating procedure that requires additional consideration of its incremental value over transthoracic echocardiography. Alternative imaging modalities including CCT, CMR, and/or cardiac positron-emission tomography should be considered over TEE, if appropriate.

Local guidance and other society recommendations regarding personal protective equipment (PPE) for TEE vary. Health care providers performing TEE may consider wearing

N95 masks in addition to standard PPE to mitigate the risk of COVID-19 infection.

Finally, we recommend that local health centres consider establishing expert panels to oversee test triage processes to ensure appropriate indications and urgency, in line with local capacity and expertise.

5. Surgical care

Surges in COVID-19 cases affect the ability to provide surgery for life-threatening cardiovascular conditions. It is likely that health systems will face cyclical phases of reducing and ramping up cardiac surgical activity, with ongoing strain on health care resources, access to care, and provider teams. While there is a clear need to maintain emergency services, it is also essential to ensure that those awaiting nonurgent surgery are closely followed and regularly triaged to undergo surgery as expeditiously as resources allow. Preliminary data compiled from the University Health Network in Toronto in April 2020 estimated that 35 deaths may have been attributable to delays in scheduled cardiac surgeries. In the initial phases of the pandemic, many centres optimised capacity by adjusting case volumes up and down, relatively rapidly. This strategy provided capacity for patients with severe COVID-19-related illness that required critical care resources, while continuing to offer cardiac surgery services. Therefore, the ability to predict intensive care unit length of stay after cardiac surgery may be useful because it helps to predict ramp-down capacity.⁵ When strained beyond local capacity, cardiac surgery and critical care teams should consider referral beyond the usual health care institutions, regions, and/or provincial boundaries, with collaboration from governments and less-affected centres.

6. Rehabilitation care

The cardiovascular community adapted cardiac rehabilitation (CR) strategies during the initial wave of the COVID-19 pandemic. Unable to continue the traditional transition from in-hospital care to on-site CR, most Canadian programs developed various degrees of a virtual patient-centric model. This format blended limited face-to-face encounters with scheduled meetings. Home-based CR has enabled overcoming many long-established barriers encountered with on-site programs, including access, distance, elderly, minorities, and the socioeconomically disadvantaged. Challenges persist with home-based CR, however. When it is not possible to offer conventional symptom-limited exercise treadmill testing before initiating a prescribed exercise program, alternative methods to assess functional capacity are needed. In particular, an emphasis on patient education for alarming symptoms and acceptance of reduced exercise intensity is required. CR programs must adapt to the “ebb and flow” imposed by COVID-19 to prevent significant gaps of care delivery.

Conclusion

To ameliorate challenges with cardiovascular care access and delivery during COVID-19, incorporating cardiovascular leadership into pandemic planning with operational leaders will assist in minimising cardiovascular care delivery

disruptions while maintaining critical care and inpatient surge capacity.

Funding Sources

The authors have no funding sources to declare.

Disclosures

The authors have no conflicts of interest to disclose.

References

1. Ontario Health: Optimizing care through COVID-19 transmission scenarios: recommendations from Ontario Health. October 1, 2020.

Available at: <https://www.corhealthontario.ca/Optimizing-Care-Through-COVID-19-Transmission-Scenarios.pdf>.

2. Woolf SH, Chapman DA, Sabo RT, et al. Excess deaths from COVID-19 and other causes, March-July 2020. *JAMA* 2020;324:1562-4.
3. Botly LCP, Martin-Rhee M, Kasiban A, et al. COVID-19 pandemic: global impact and potential implications for cardiovascular disease in Canada. *CJC Open* 2020;2:265-72.
4. Virani SA, Clarke B, Ducharme A, et al. Optimizing access to heart failure care in Canada during the COVID-19 pandemic. *Can J Cardiol* 2020;36:1148-51.
5. Sun LY, Bader Eddeen A, Ruel M, MacPhee E, Mesana TG. Derivation and validation of a clinical model to predict intensive care unit length of stay after cardiac surgery. *J Am Heart Assoc* 2020;9:e017847.