



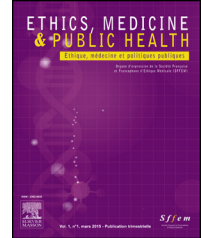
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SHORT REPORT

Optimization of physician resources in primary care during a pandemic: A 'hot' and 'cold' team approach

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Summary

Background. – Healthcare in rural localities has faced unique pressures in the midst of the COVID-19 (coronavirus disease 2019) pandemic.

Methodology. – The Marathon Family Health Team physicians created a novel pandemic model that divides active physicians into 'hot' and 'cold' teams with a "sideline" reserve based on physician infectious status and ongoing exposure risk, in order to address the potential instability of small medical groups in isolated situations.

Results. – Implemented in stages, the model maximizes group agility and healthcare provisions, while minimizing the risk of physicians as vectors for transmission or a possible healthcare system collapse from simultaneous physician incapacitation.

Conclusion. – The hot/cold pandemic model can be applied to various healthcare facilities, including but not limited to hospitals and assessment centres, and the model's scale can be further adjusted for larger settings. By making use of incapacitated physicians who have been "sidelined" due to illness or burnout but still able to work from home, this model is integrative, efficient and innovative.

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Introduction

The Marathon Family Health Team is a group of nine family physicians in rural Northern Ontario, Canada that provides comprehensive care to the town of Marathon and the surrounding region including two Indigenous communities (total catchment 3 913 people). Healthcare is delivered out of a single hospital and clinic, and includes out-patient family medicine, hospitalist, 24/7 emergency coverage, and low-risk obstetrics. Marathon is similar to many other rural Canadian communities that are faced with limited human health resources, infrastructure [1] and more healthcare inequities and disparities in comparison to their urban counterparts [2]. While remote and rural communities in Canada comprise 20% of the total population only 9.4% of family physicians and 3% of specialists practice rurally [3] which necessitates for the transfer of complex and critically-ill patients to larger urban centres on a regular basis.

The COVID-19 pandemic has exacerbated the already fragile and vulnerable healthcare systems in rural communities within Canada and abroad [4–7] through hospital closures due to disease outbreaks [8], lack of intensive care units and equipment such as ventilators in addition to the loss of human health resources due to infection with Covid-19 [4,5]. Furthermore, from a demographic perspective, rural populations are often older with a greater prevalence of chronic illness including respiratory diseases and hence at higher risk of acquiring COVID-19 infection [4,9,10].

Rationale

Primary care physicians in rural and remote communities are considered the core of their healthcare systems [11]; they have been described as the “the backbone” of healthcare [5,12] and “the first line of defense” [13] against the COVID-19 pandemic. The severity of pandemics in terms of disease transmission, morbidity and mortality has been shown to be disproportionate between rural and urban areas due to the aforementioned limited human and non-human resources [4,10] which places rural and remote healthcare systems at a disadvantage in terms of pandemic preparedness. In spite of these challenges, providers in rural and remote areas have adopted a wide range of innovative strategies and approaches to continue to deliver healthcare in rural and remote areas during the Covid-19 pandemic.

In order to avoid patient transfers from rural hospitals to tertiary centres and urban areas, telemedicine initiatives have been proposed [14] and utilized [9,15]. Virtual-based initiatives increased the level of support to nurse practitioners and physician assistants in rural hospitals from physician colleagues at tertiary hospitals [15]. Virtual programs were further expanded to allow for COVID-19 screening [9], discharge follow-up appointments, mental health services, and to enable at-risk healthcare providers (e.g., immunocompromised or elderly) to work from home or to enhance their training through continuing medical education endeavors [15–17]. During the COVID-19 pandemic, some jurisdictions have eased telemedicine rules and regulations while others have created new billing codes for the expansion of virtual and telephone visits as a means of decreasing the need for in-person visits thus minimizing the risk of disease

transmission [9,11], [18–21] and protecting limited healthcare resources [19]. Some primary healthcare services have even shifted from indoors to outdoors to further decrease risk of exposure [21].

Policy recommendations have also been put forward urging governments to help sustain rural hospitals during the pandemic by improving collaborations between rural hospitals and academic tertiary centres in addition to increasing financial investment to support initiatives such as the expansion of telemedicine capacity and primary care training in emergency medicine [12]. Practice restrictions were removed in 17 US states in order for advanced practice nurses to expand their scope of practice without physician supervision to provide comprehensive patient care during the pandemic [22].

The development of specialized programs including both the implementation and upscaling of telemedicine, changes to billing codes and scopes of practice demonstrate how rural healthcare delivery was transformed during the COVID-19 pandemic. While the media has depicted COVID-19 as primarily confined to the hospital setting, this is not the reality for many rural communities [20], and specific direction for community-based primary care is needed. Krist et al. [13] offer practical recommendations on how primary care practices can deliver healthcare during the various stages or intervals of a pandemic such as when to implement virtual care and when to resume usual care. Monteith et al. [23] recognize the increased risk of suicide in rural communities during the pandemic and put forward tangible solutions for healthcare providers in order to decrease the risk. Patey et al. [24] acknowledge the lack of guidance for rural emergency departments in Canada on how to prepare for the Covid-19 pandemic as they redesigned their rural emergency department, and in doing so shared their model which focused on the prevention of disease transmission and the protection of staff. Other rural hospital-based frameworks have proposed strategies to implement specific to staffing dilemmas during times of patient surges, and introduce the potential need for increasing human resources by re-training staff, community members and accessing military support as needed [25].

Chang et al. [26] outline the model employed in Taiwan that prevented the collapse of their healthcare system as a whole. Their tiered model that materialized based on past experience with the Severe Acute Respiratory Syndrome (SARS) epidemic used primary and community-based healthcare groups to manage those with general ailments and mildly symptomatic patients while those with moderate to more advanced disease were cared for in designated assessment clinics and hospitals. While Taiwan was successful in implementing a collaborative healthcare system approach, this has not been the case elsewhere with many jurisdictions left to navigate and devise innovative strategies and models on their own based on the confines of their specific geographies and government healthcare legislation. More specifically, there remains a lack of guidance and research on how to effectively prepare and adapt rural primary healthcare during the COVID-19 pandemic likely due to greater attention being paid to urban areas, and with a focus on hospital-based care [19,20]. Rural healthcare tends to involve more outpatient services, and thus models are required to address both outpatient and inpatient

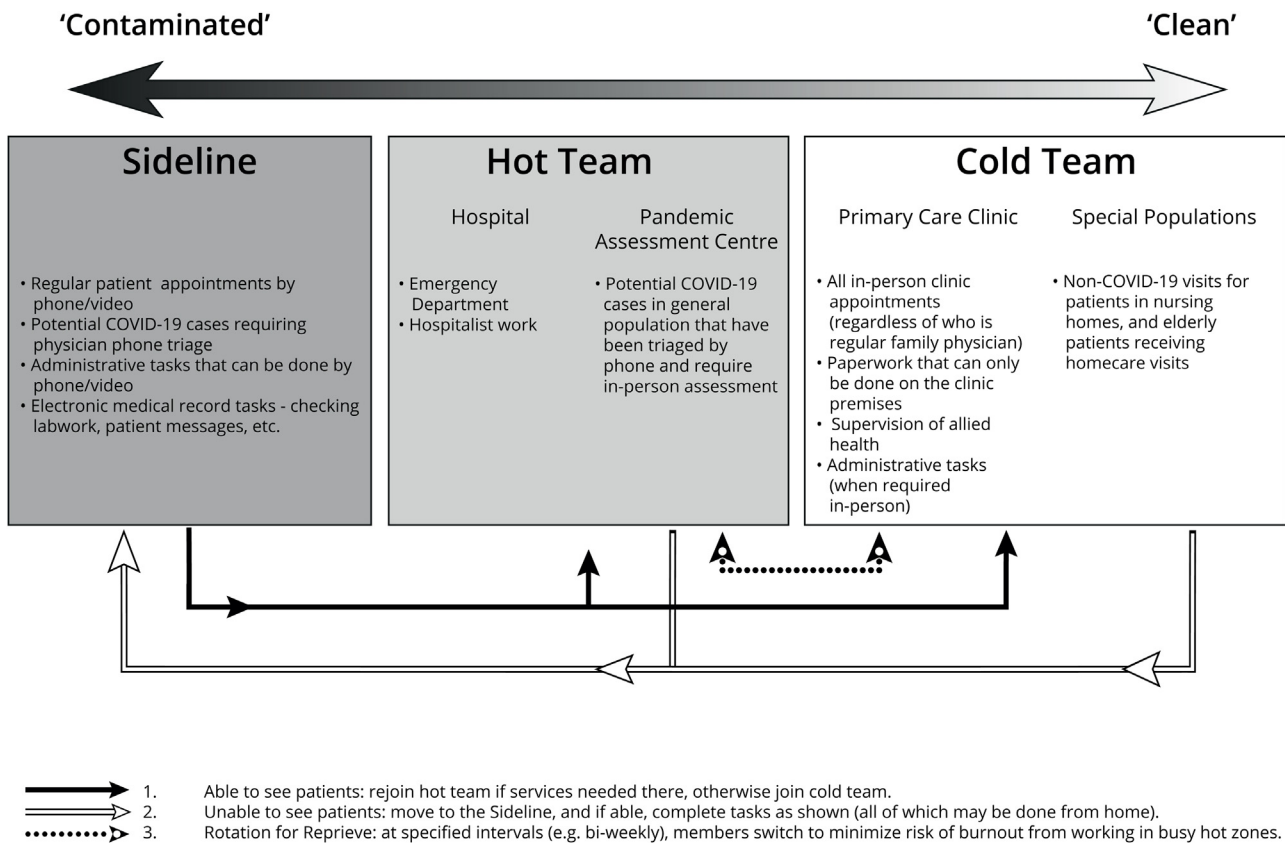


Figure 1. ("Team Role Guideline"): Illustrated here is an overview of how the pandemic model, shown here during a full pandemic, uses "hot" and "cold" teams to optimize delivery of primary care services while mitigating risks of healthcare provision collapse. After compiling a list of all the healthcare responsibilities of our physician group, tasks were organized into one of three categories – "cold", "hot", or "sideline". Hot and Cold are based on the infectious risk and exposures of the physician completing the task, as illustrated. The "Sideline" category on the left is composed of tasks that may be completed without direct patient contact, such that even a physician who is actively "contaminated" could still perform them from home. The Hot Team is originally staffed with the number of physicians required for "hot tasks" in your particular setting, and the remainder of physicians join the Cold Team. While still contributing through performing cold tasks, the Cold Team can be seen as reserves who are ready to be "deployed" as needed to the Hot Team. Even if Hot Team members do not develop infectious symptoms, Cold Team members switch with Hot Team members at regular intervals to prevent burnout (see dashed arrow). Note that our team assigned one member to only do the coldest tasks (no switching teams), such that the nursing home and other elderly patients who required non-pandemic medical care could still receive it, with minimal risk of acquiring an infection from a healthcare worker who was recently in a hot zone. This model acknowledges advances in technology (e.g video and phone appointments) and is designed to delegate the many tasks that can be done from home to a physician who can only contribute from home, so that the number of physicians exposed to hot zones at any given time is minimized. Also note that if there is a physician who would be high risk for morbidity/mortality if exposed to the contagion (advanced age, medical comorbidities, etc.), he/she may simply contribute from the sideline throughout the pandemic.

capacity that address rural challenges including limited resources [19] and a finite workforce.

Aim and Objective

As discussed above, a pandemic introduces unique challenges for family physicians especially in rural and remote environments. This necessitates a healthcare model that remains efficient and agile through rapid shifts in physician supply and demand, with built-in contingencies aimed at both preventing and potentially managing disaster scenarios.

Unaware of such an existing model, the authors of this report explored possible solutions. The team started by creating a comprehensive list of medical responsibilities and

grouping each task into one of three categories (Fig. 1). The 'hot' and 'cold' categories include tasks that require direct patient contact and are high or low risk, respectively, for physician exposure to the contagion. The 'sideline' category is composed of tasks that may be done without direct patient contact such that a physician with mild symptoms could perform them from home. By incorporating physicians who are incapacitated or "sidelined" due to illness or burnout but still able to perform clinical duties from home virtually this model is integrative, efficient and innovative.

The hot/cold delineation provides a foundational support for our pandemic model and the related innovations. Implementation occurs in stages to ensure that the group is not forced into a dichotomy of "usual care" or "full-scale pandemic", when a hybrid would best balance efficient healthcare delivery and disaster preparedness

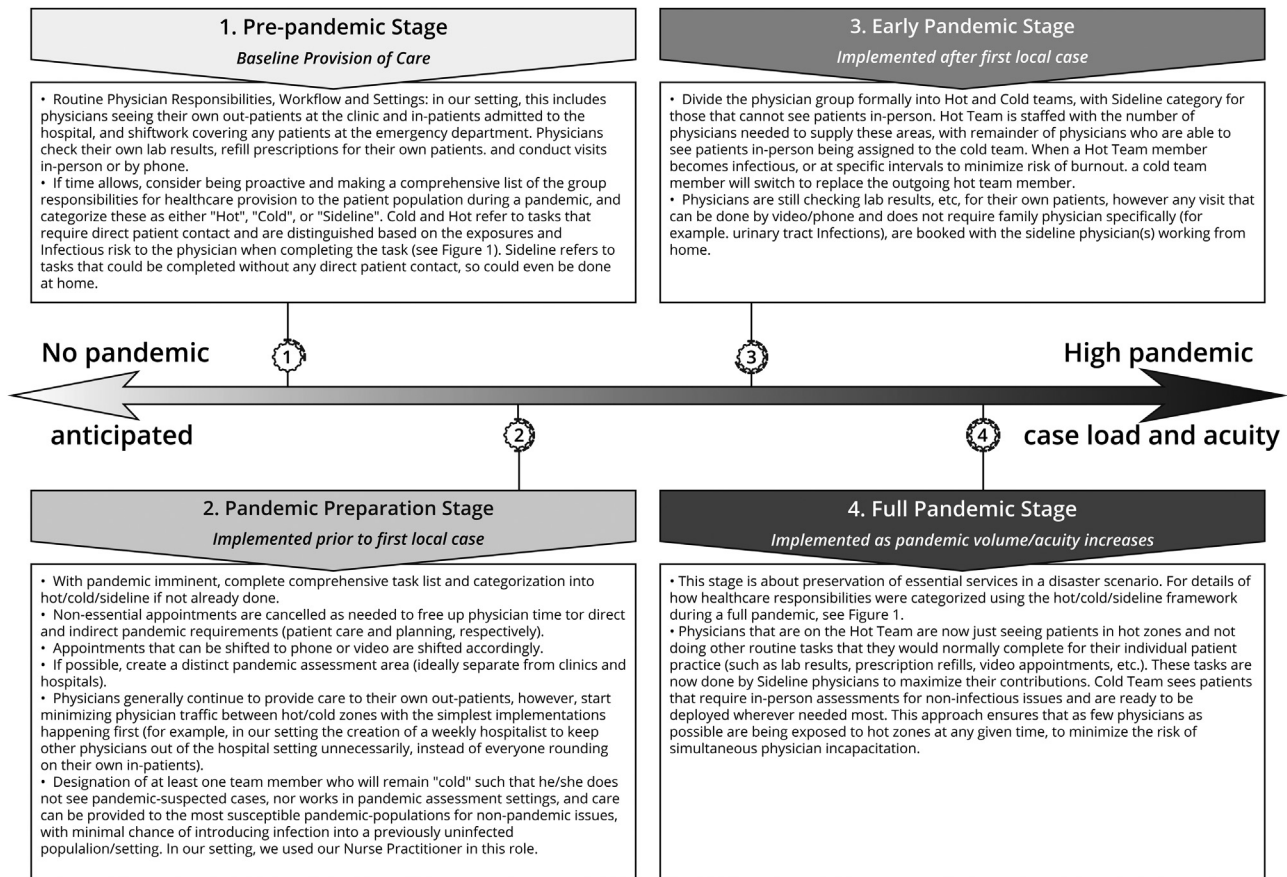


Figure 2. ("Pandemic Stage Guideline"): Shown here is how this pandemic model could be implemented in a primary care setting in various stages, moving from the pre-pandemic "usual model" of care to the pandemic model incrementally based on the number and acuity of pandemic cases and healthcare demands. The goal here is to balance disaster planning with efficiency. For example, prior to the first pandemic case in the community, there is no need to have cross-coverage of paperwork or lab results when physician supply is high and it is much easier for the group as a whole if each physician looks after his/her own practice. Likewise, with the first case in the community it may now be worthwhile to begin slotting physicians into predominantly hot or cold zones as a precaution to mitigate risks of simultaneous physician incapacitation (infection or burnout), and to lower the risk of physicians serving as vectors of transmission. With a high level of cases and acuity, it is important to maximize contribution from sidelined physicians by offloading anything that can be offloaded (prescription refills, lab results, etc.) from the physicians still seeing patients in-person.

(Fig. 2). Detailed below is how the hot/cold foundation operates during the most advanced stage of a full-scale pandemic.

Creation of teams to maximize agility and minimize the risk of simultaneous physician incapacitation.

The division into 'hot' and 'cold' tasks naturally leads into forming hot and cold teams. The hot team performs listed tasks such as managing the COVID-19 assessment centre by caring for both Covid-19 positive patients and those with viral illness symptoms in the emergency department and hospital; its members switch to the sideline when they are no longer able to provide direct patient contact or members switch to the cold team at scheduled time intervals to prevent burnout. These physicians will work off-site by accessing the electronic medical record typically from home, conducting virtual visits via telephone or video in

addition to other clinical administrative tasks such as prescription refills and reviewing lab work. They will also be involved in triaging potential COVID-19 cases, and performing wellness checks via telephone with COVID-19 positive patients under home isolation. The cold team performs their tasks and supplies reserves for the hot team. The tasks performed by the cold team include maintaining clinic operations (e.g., seeing patients who do not have symptoms of a viral illness in-person regardless of who is their family physician; completing paperwork that can only be done on clinic premises; supervising allied healthcare providers including physician assistants, nurse practitioners and nursing staff). In addition, cold team members continue to provide home-care for asymptomatic vulnerable patients including the elderly living at home or in the nursing home. Cold team members are deployed to fill gaps when hot team members are switched to the sideline. The "protected" cold team and regular rotations both act to buffer against simultaneous physician incapacitation from Covid infection or burnout.

Maximizing contributions from sidelined physicians

The sideline category shifts responsibilities from clinic to home for physicians who can only work from home or physicians with mild symptoms of COVID infection. By allowing work-from-home, the total provision of healthcare is maximized as every available physician is contributing to the maximum of their potential given their current infectious status. The work of sidelined physicians is supported by e-health infrastructure.

Reducing the risk of physicians as vectors

During a pandemic, requirements for routine medical care do not stop and physicians can become vectors for transmission into previously uninfected populations/settings. The strategic division into hot and cold teams minimizes this risk because physicians are not rapidly alternating between different virus exposure zones. To ensure that there is no transmission in the process of switching between hot and cold teams, physicians adhered to public health guidelines, daily self-screening for COVID-19 symptoms which was standardized via an online tool at the clinic and hospital, and through as needed expedited COVID-19 polymerase chain reaction (PCR) testing.

Conclusion

The COVID-19 pandemic has placed additional strain on rural healthcare systems, and there has been little guidance for rural primary care workforces on how to respond and adapt their practices. While there has been a surge and upscaling of telehealth initiatives in rural and remote areas, and proposals geared towards rural hospitals, there is a lack of research and guidance for frontline “on the ground” healthcare providers. The hot/cold model is not only practical, but it builds rural resilience by focusing on how to sustain a limited workforce when threatened by risk of infection in addition to burnout during a pandemic [20]. Dividing into ‘hot’ and ‘cold’ teams allows a physician group to optimize primary care provision while mitigating the risks of disaster pandemic scenarios, such as healthcare system collapse from incapacitation or extreme shortage of physician resources. By integrating ‘sidelined’ physicians who have been incapacitated by illness or burnout but still able and willing to work, this model is innovative in the way that it uses e-health to take advantage of its finite human health resources. Adopting this model prevented the collapse of the local healthcare system in Marathon which relies on a finite number of physician providers. The simple and versatile model described may be adapted to other primary care settings, both in rural, remote and larger localities. Future studies examining the utility of the model presented herein might include an examination of patient satisfaction, its effect on the continuity of care and ability to maintain clinic and hospital operations (e.g., preventing emergency department or hospital closures) in addition to an examination of healthcare provider burnout.

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Statement of Ethics

The special communication piece entitled “*Optimization of physician resources in primary care during a pandemic: A ‘hot’ and ‘cold’ team approach*” does not require ethics approval as there is no hypothesis being tested in this article and because patient care is not altered or compromised in any capacity. Similarly, there are no recruited participants or use of secondary data. The extent of this communication simply involves a proposed primary model for the physicians, and patients will be able to access services just as they did before, without any risk factors.

Contributor Statement

Authors RPM, EO, and LD developed the primary care model protocol and figure models, equally and collaboratively.

Author RPM drafted and wrote the article with assistance from EO, LD and SF.

Disclosure of interest

The authors declare that they have no competing interest.

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