



Meeting case investigation and contact tracing needs during COVID-19 in Alberta: the development and implementation of the Alberta Health Services Pod Partnership Model

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Received: 11 May 2021 / Accepted: 15 December 2021 / Published online: 10 January 2022
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Abstract

Setting In Alberta, a small team of specialized public health experts typically complete case investigation and contact tracing. High COVID-19 case counts and a shortage of trained public health professionals required a rapid and significant adaptation of staffing models to meet the population's needs.

Intervention A tiered, interdisciplinary staffing model, based on those in critical care, was developed, piloted, and implemented in the Alberta Health Services' Communicable Disease Control department in late 2020 to complete case investigation and contact tracing. The final model included novice, non-regulated professionals divided into pods of four to six investigators, led by an experienced regulated investigator. Team leads oversaw five pods. Communicable disease nurses provided an additional tier of clinical expertise. During the model development, roles and responsibilities of team members were delineated, ratios for supervision were tested, and rapid training was provided.

Outcomes The tiered staffing model began in November 2020 with staff members in two pods. At its peak in early May 2021, 72 pods of 502 non-regulated members, 134 regulated investigators, and 4 communicable disease nurses completed 780–973 case investigations daily, or 40–45% of all positive cases in Alberta. In comparison, the same number of regulated investigators working independently in the traditional staffing model without non-regulated pods completed, on average, 249 case investigations daily.

Implications A tiered staffing model can be effective at maximizing the skills of the experienced members of the case investigation team to maintain case investigation and contact tracing activities during a pandemic.

Résumé

Lieu En Alberta, une petite équipe de spécialistes de la santé publique mène généralement les enquêtes et la recherche des contacts. Un nombre élevé de cas de COVID-19 et une pénurie de professionnels de la santé publique formés ont nécessité une adaptation rapide et importante des modèles de dotation des équipes pour répondre aux besoins de la population.

Intervention Un modèle de dotation interdisciplinaire à plusieurs niveaux axé sur les patients aux soins intensifs a été élaboré, mis à l'essai et appliqué par la division de la lutte contre les maladies transmissibles des Services de santé de l'Alberta vers la fin de 2020 pour mener les enquêtes et la recherche des contacts. Le modèle final incluait des membres novices de professions non réglementées divisés en modules de quatre à six chercheurs et chercheuses sous la direction d'un chercheur ou d'une chercheuse d'expérience membre d'une profession réglementée. Les chefs d'équipes supervisaient cinq modules. Des infirmières et infirmiers en maladies transmissibles constituaient un niveau supplémentaire d'expérience clinique. Durant l'élaboration du modèle, les fonctions des membres des équipes ont été définies, les ratios d'encadrement ont été testés, et une formation rapide a été fournie.

Résultats L'application du modèle de dotation à plusieurs niveaux a commencé en novembre 2020 avec des effectifs dans deux modules. À son sommet au début de mai 2021, 72 modules, composés de 502 membres de professions non réglementées, de 134 chercheurs et chercheuses de professions réglementées et de 4 infirmières et infirmiers en maladies transmissibles, ont mené de 780 à 973 enquêtes par jour, ce qui englobait entre 40 et 45 % des cas positifs en Alberta. À titre de comparaison,

le même nombre de chercheurs et de chercheuses de professions réglementées, travaillant indépendamment selon le modèle de dotation classique sans modules non réglementés, a mené en moyenne 249 enquêtes par jour.

Conséquences Un modèle de dotation à plusieurs niveaux peut maximiser les compétences des membres expérimentés de l'équipe d'enquête pour maintenir les activités d'enquête et de recherche des contacts durant une pandémie.

Keywords COVID-19 · Public health · Contact tracing · Workforce · Quality improvement

Mots-clés COVID-19 · santé publique · recherche des contacts · main-d'œuvre · amélioration de la qualité

Setting

During the COVID-19 pandemic, Canadian public health and policy leaders provided guidance on personal protective equipment, travel, community-based measures, and case investigation and contact tracing began (Government of Alberta, 2021; Public Health Agency of Canada (PHAC), 2018). The Alberta Public Health Act assigns the leadership of communicable disease management to the Chief Medical Officer of Health (CMOH) and those physicians assigned to the roles of Medical Officers of Health (MOH) (Province of Alberta, 2021). Within Alberta, the largest group of MOHs work within Alberta Health Services (AHS), the province's singular health system that provides services to approximately 4.4 million people. Prior to the COVID-19 pandemic, a small team of specialized public health experts including MOHs and communicable disease control (CDC) nurses typically completed case investigation and contact tracing for reportable communicable diseases.

The COVID-19 pandemic has challenged health systems globally. In the spring of 2020, in anticipation of higher case counts and a shortage of trained public health professionals, health and policy leaders identified that adaptation of CDC processes and staff was required to meet the province's case investigation needs. A Ministerial Order made on May 4, 2020 allowed for the use of health practitioners regulated under the Health Professions Act of Alberta (e.g., registered nurses, dietitians, physiotherapists, social workers, licensed practical nurses) to support COVID-19 case investigation and contact tracing (Alberta Health, 2020). This order expanded on July 27, 2020 to allow non-regulated providers to support specified elements of this work, including surveillance, contact follow-up, and other CDC activities. However, as cases increased, there was a need for additional case investigators and a shortage of regulated providers persisted. Non-regulated providers came with backgrounds in healthcare administration, information technology, customer service, and other sectors.

In order to include non-regulated providers in case investigation, the staffing model needed to be adapted for those without a clinical background. Searches of grey and published literature identified tiered or pyramidal staffing

models used in emergent critical care settings when shortages of experienced staff occurred and novice staff were available (Kumaraiah et al., 2020; Society of Critical Care Medicine, 2020). These models emphasized the clear delineation of roles and responsibilities and the use of experienced intensivists or emergency department physicians and staff for roles of leadership. This paper documents how a tiered, interdisciplinary staffing model was developed, piloted, and implemented in the AHS CDC department in 2020 and 2021 to provide case investigation and contact tracing for the COVID-19 pandemic.

Intervention

Development and pilot of the Pod Partnership Model

A group of 10 non-regulated providers, 4 regulated providers, 3 evaluators, and 1 CDC content expert participated in the development and piloting of the program during the period November 23–27, 2020.

Objectives

The objectives for the pilot phase were to:

1. Develop and test the staff model, processes, and supporting materials,
2. Assess the acceptability and effectiveness of the model,
3. Identify training needs for staff to help with the subsequent implementation of the model, and
4. Project the potential impact of the model on case investigation.

Development process

As a first step, the group identified the specific tasks associated with the typical case investigation process. These were organized according to three categories: intake assessment and preparation, case investigation call and documentation, and notifications and referrals. Once the components were

identified, the group assigned each task to an appropriate staff member (regulated or non-regulated) based on the clinical responsibilities and expertise required. The identification of these roles and responsibilities was essential and allowed us to create a workflow and handover process between team members that prevented any potential bottlenecks in transitioning cases between non-regulated and regulated staff.

Additionally, participants agreed that the scope of the Pod Partnership Model would ideally be cases who were less likely to be high-risk clients. At the time of development, high-risk clients included healthcare workers, children and school staff, returning travelers, those in high-risk workplaces, and those living or working in congregate care sites. Approaches for identifying and transferring clients who exceeded this scope were built into the model.

Following the initial draft of roles and responsibilities and our development of processes for handovers and

communication, we completed timing studies of how long each team member required to complete their tasks. It was at this time that ratios for supervision were tested. A 5:1 ratio was piloted and the workload for Pod Leads was significant. A 3:1 ratio was also piloted and the workload was manageable. A 4:1 ratio seemed the best fit for the novice group. Throughout implementation, the expertise of all members grew and the ratio was adapted to 6:1.

Figure 1 provides an overview of the tasks and workflow developed for case investigation in the Pod Partnership Team. The standard, regulated provider model is shown for comparison to highlight the triaging and handover of high-risk cases that occurred.

A key element of the model was the review of case investigation documentation by the regulated provider (Pod lead). This ensured accuracy and completeness of the information collected and assisted in the identification of any clinical

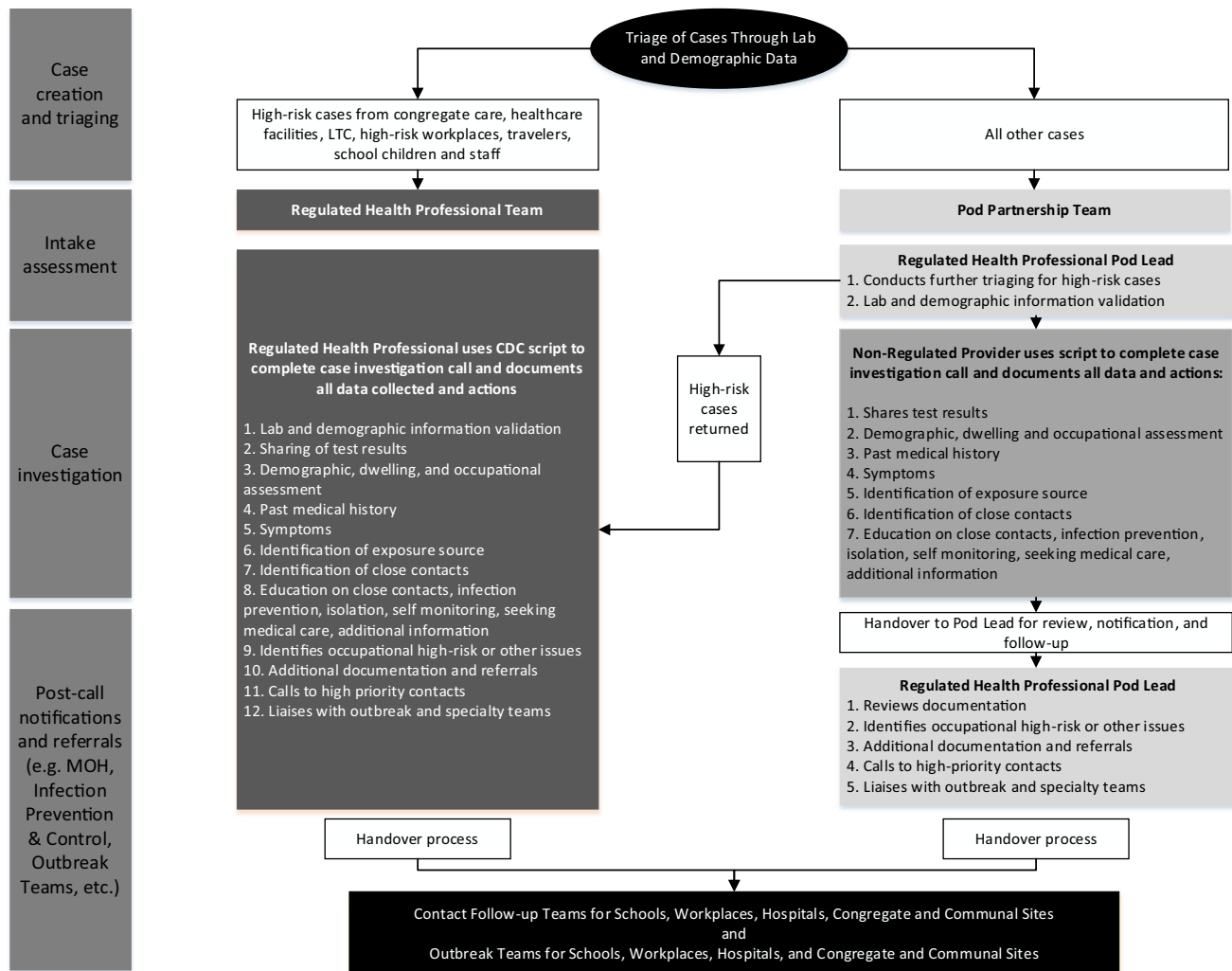


Fig. 1 Regulated Health Professional and Pod Partnership streams of case investigation services including the tasks, roles, handover points, and triaging of cases

concerns and necessary follow-up. In order to support efficient workflows and prevent bottlenecks from occurring within the pod, an additional role was added; non-regulated investigators worked alongside the regulated provider as a ‘float’ to help complete follow-up tasks as needed. This role provided substantial flexibility within the model as the float could support investigators and pod leads with challenging cases, prepare follow-up notices, and complete additional administrative tasks as needed.

The final model (depicted in Fig. 2) included non-regulated professionals divided into pods of four to six investigators, including one ‘float’ non-regulated staff member, led by an experienced regulated investigator acting as a Pod Lead. Team leads oversaw five pods. CDC nurses provided an additional tier of clinical expertise to all staff.

Outputs from pilot testing

All participants expressed satisfaction with the pilot and their training during the one-on-one debriefings that occurred and all expressed support for expansion of the model.

During the final day’s pilot testing, the two pods, each with one regulated pod lead, were able to complete 5 case investigations, or 2.5 on average per pod. The second week, each pod completed on average 7.5 case investigations daily. At this time, a regulated health professional completing case investigations on their own was completing 2.15 cases in one shift (7-day average, November 22–28, 2020). Not only was the pilot successful in training non-regulated and regulated health professionals to work together to the full scope of their roles to complete case investigations, it was successful in leveraging the skills of experienced staff to complete more case investigations each shift.

Implementation

Scaling the model through training

Rapid expansion of the model occurred from December 2020 to April 2021. During this period, 451 regulated providers trained as Pod and Team Leads and 668 non-regulated staff trained as case investigators in the new model. Groups of 30–100 staff trained weekly over a 5-month period. Separate training sessions were held for regulated and non-regulated providers.

A team of dedicated trainers developed materials and ran sessions for participants. Additional resources such as self-assessment checklists, templates, online learning opportunities, e-simulations, and charting ‘sandbox’ environments facilitated the training of pod members. Once staff were assigned to operational pods, teams had experienced staff and trainers embedded within their structure to support continuous learning. Figure 3 provides an overview of the training program.

Strengths of the model

Pilot testing and initial implementation of the model demonstrated many strengths to the approach. Quite quickly, we were able to maximize the impact of experienced regulated case investigators and train a high volume of new non-regulated staff. As cases were surging in Alberta during the development period, this supported our teams in managing workload, as pods were able to close many cases each shift. Key strengths of the model were the clearly defined roles of each team member, streamlining of processes, and structured resources to support staff

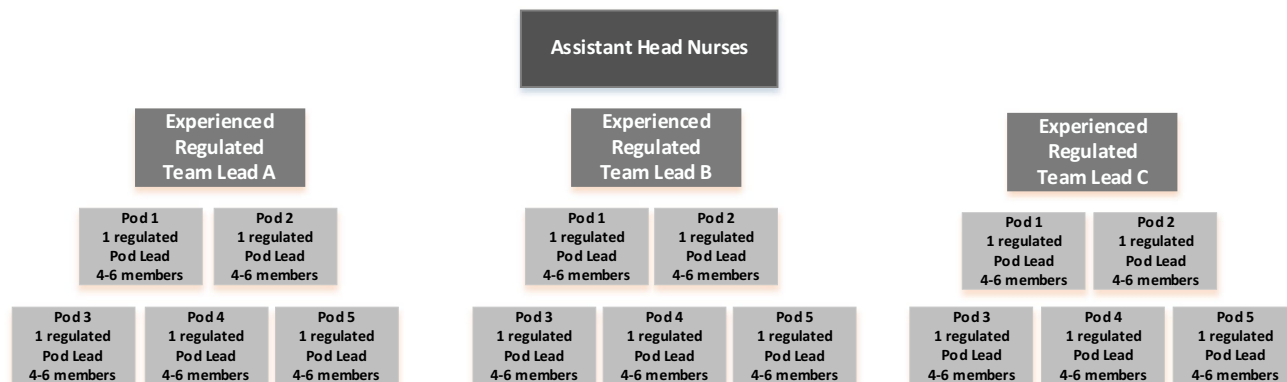


Fig. 2 Alberta Health Services tiered model of case investigation used during the COVID-19 pandemic: the Pod Partnership Model

Regulated Pod Lead and Team Lead Training Process	Two-day CDC online orientation	Mentor shifts	>4 weeks practice in Case Investigation	Two-day Pod training and mentor shift	Ongoing support within the Operational Pods
	<ul style="list-style-type: none"> AHS, Public Health, Case Investigation content Technology checks and training Clinical and Process Documentation 	<ul style="list-style-type: none"> Hands-on learning with an expert peer 	<ul style="list-style-type: none"> Support from Team Leads, AHNs and Managers Standardized resources 	<ul style="list-style-type: none"> Orientation to Partnership model Simulations Guidance from Pod Educators Hands-on learning from a peer 	<ul style="list-style-type: none"> In-pod support provided by Pod Educators Support from Team Leads, AHNs and Managers Standardized resources
Non-Regulated Provider Training Process	Two-day CDC online orientation	Three-day Pod training and mentor shift	Ongoing support within the Operational Pods		
	<ul style="list-style-type: none"> AHS, Public Health, Case Investigation content Technology checks and training Clinical and Process Documentation 	<ul style="list-style-type: none"> Orientation to Partnership model Simulations Guidance from Pod Educators Hands-on learning 	<ul style="list-style-type: none"> In-pod support provided by Pod Educators Support from Pod Leads, Team Leads, AHNs and Managers Standardized resources 		

Fig. 3 Overview of training for those members working within the Pod Partnership Model

decision-making. Reorganized and simplified scripts, delineating documentation requirements, and providing checklists, templates, and process guides were tremendous assets of the program. These elements were later modified and adapted to support the traditional case investigation stream. Additionally, the training program developed and the emphasis on hands-on-learning and feedback were of great benefit. The model was flexible and adaptive to changing case volumes.

Challenges of implementation

Following demonstration of the feasibility of the model, immediate implementation was required. The pace of spread and scale was a significant challenge. Large cohorts of new staff were hired and trained, and the team quickly grew, requiring concurrent management and training support. A robust 5-day training program was used; however, as case investigation is inherently complex, a great deal of learning occurred over time as investigators gained experience with the various circumstances of each case. While the teamwork, reviews, and supportive resources assisted with this, the volume of new staff in a learning stage created challenging dynamics. Early on, new, inexperienced staff significantly outnumbered experienced staff

and regulated providers. Additionally, case investigation within AHS relies upon multiple IT systems and this presented as a very steep learning curve for many. Finally, the model was established in response to there being insufficient regulated providers. As the model expanded and required more and more regulated providers to maintain the appropriate staffing ratios, this required careful balancing of the needs of the traditional case investigation model. The traditional model was still required for those high-risk cases with greater clinical complexity.

Outcomes

Figure 4 provides an overview of the 7-day average of COVID-19 cases in Alberta from March 2020 until May 2021. Additionally, it displays the total case investigations completed each day by all AHS case investigators as well as the case investigations completed specifically by the Pod Partnership Model. The Model began its rapid expansion during Alberta’s second wave of COVID-19 cases. During this period, both regulated and non-regulated team members joined the Model each week. While this model of case investigation was expanding, the traditional, regulated model for case investigation was also expanding capacity as both

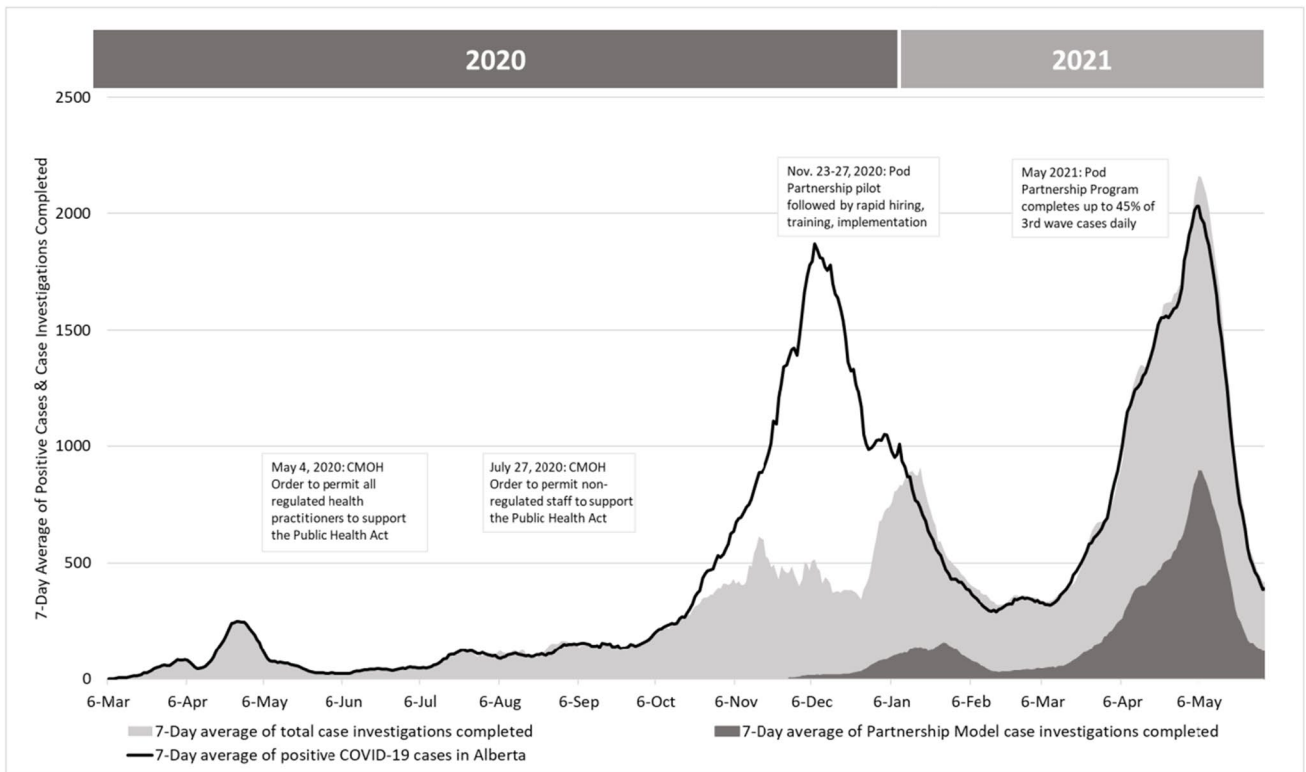
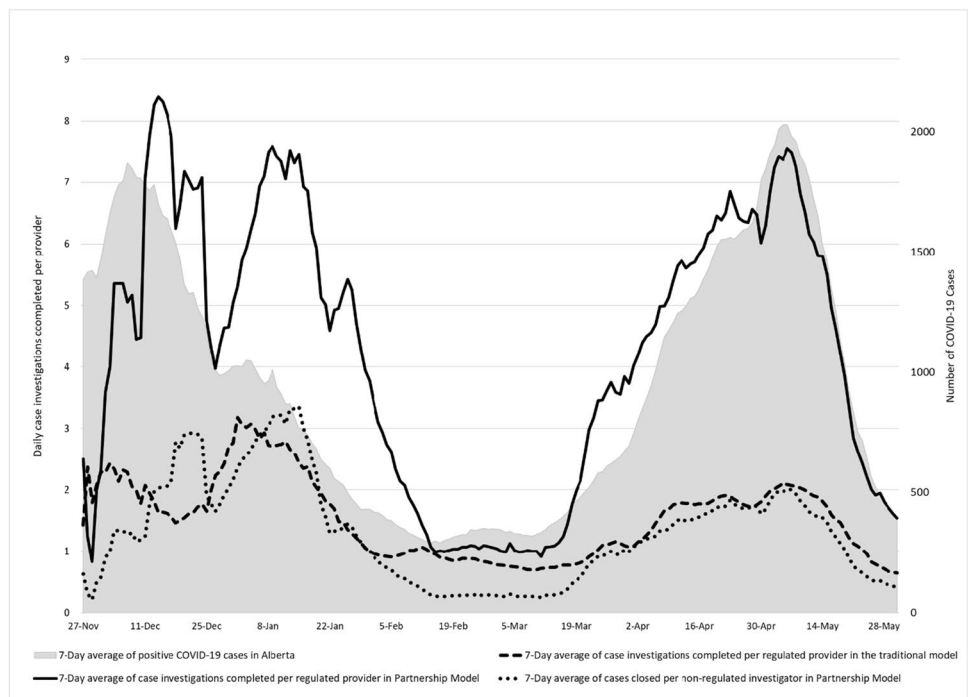


Fig. 4 Seven-day average of COVID-19 positive cases in Alberta, total and pod case investigations completed daily. Data source: Alberta Health at www.alberta.ca/covid-19-alberta-data.aspx for total cases, AHS internal data for cases closed

Fig. 5 Seven-day average cases closed daily in the Pod Partnership Model per non-regulated and regulated provider compared to the traditional model for case investigation from December 2020 until May 2021



high-risk, clinically complex, and routine cases increased concurrently. Together, the two approaches increased case investigation capacity for the province. Figure 4 shows that between January 1 and May 31, 2021, the Pods completed on average 24% of all case investigations (range 7–45%) and closed between 30 and 973 cases daily. Total cases closed depended upon the caseload within the province.

The greatest test for the Pod Partnership Model was during Alberta's third wave; 72 pods of 502 non-regulated members, 134 regulated investigators, and four communicable disease nurses completed 780–973 case investigations daily, or 40–45% of all positive cases in Alberta. In comparison, the same number of regulated investigators working in the traditional staffing model without non-regulated pods completed, on average, 249 case investigations daily.

Figure 5 presents the longitudinal data of average cases closed daily in the Pod Partnership Model per non-regulated and regulated provider compared to the traditional model for case investigation from December 2020 until May 2021. It demonstrates how the capacity of both models changed with caseloads. The daily number of cases closed per regulated provider in the traditional model was comparable to that of the non-regulated provider in the pods. The Pod Partnership Model was able to expand its capacity during surges significantly compared to the traditional model, likely due to the triaging of less complex cases to this model and to the team members each working to their full scope of practice. During periods of surge, a single regulated provider working in the Pod Model oversaw seven cases completed by four to six non-regulated pod members daily. Comparatively, in the traditional model, regulated providers closed two cases independently.

Implications

Feasibility of the Pod Partnership Model

For the COVID-19 pandemic in Alberta, there was a continued emphasis on case investigation and contact tracing, in addition to implementation of substantial public health measures. This decision was based on expert opinion of managing a novel coronavirus, policy decisions, and modeling of COVID-19 that showed that when case investigation is implemented as soon as possible after symptom onset, contact tracing could significantly reduce onward transmission of disease (Kretzschmar et al., 2020).

Non-regulated staff were integrated into many aspects of the AHS CDC team following the Ministerial orders on May 4th and July 27th. However, it was not until the development of the Pod Partnership Model in November 2020 that a

feasible staffing model existed to incorporate non-regulated providers into case investigation. This model was essential due to a significant shortage of regulated staff and surging COVID-19 cases during Wave 3 of the COVID-19 pandemic. It successfully supported case investigation during the 4th wave of cases in the summer/fall of 2021 as well. As of the time of publication, the Pod Partnership Model continues to be used to support case investigation in Alberta. The tiered staffing model was an innovative approach to maximizing the skills of the experienced members to maintain case investigation and contact tracing activities.

Implications for broader adoption

One of the factors that facilitated the success of the Model was the triaging of cases based on the anticipated complexity. This process allowed both regulated and non-regulated providers to work to their full scope of practice, ensuring that those cases that required medical expertise received it. During the periods of high case volumes, there was adequate caseload for the Model to be feasible. In the context of non-pandemic case investigation, this may not be feasible due to smaller caseloads and a myriad of different communicable diseases. The scope of practice for non-regulated providers was a single communicable disease. In non-pandemic periods, there would be variability of notifiable diseases in a day requiring clinical expertise and it would not be feasible to have non-regulated staff become familiar with all possible reportable diseases, infection prevention needs, and communicability scenarios. Also of consideration is that the utilization of non-regulated individuals for this work required temporary legislative changes specific to the management of COVID-19 that do not exist for other communicable diseases.

The Canadian Pandemic Influenza Preparedness Guide, updated in 2018 based on available evidence and recommendations from the 2003 SARS and 2009 H1N1 Pandemics, suggests that case investigation and contact tracing are likely to be possible for the “first few hundred cases.” They indicate public education should be used to “reinforce individual and community measures” (PHAC, 2018). Given the complexity and staffing demands required to support case investigation and contact tracing, we believe that the Pod Partnership Model may be a staffing approach that increases our case investigation and contact tracing capabilities for future pandemics.

Implications for policy and practice

What are the innovations in this policy or program?

- A tiered staffing model is an innovative approach that:

- Maximizes the skills of experienced public health practitioners while expanding staff numbers to maintain case investigation and contact tracing activities during a pandemic;
- Uses technology to facilitate communication, triaging, and transitioning of cases;
- Employs robust rapid training for novice staff combined with on-the-job mentoring;
- Creates system efficiency to manage high caseloads during the pandemic;
- May be feasible in the event of surging COVID-19 cases or other disease outbreaks.

What are the burning research questions for this innovation?

- Additional research is required to:
 - Identify the role of non-regulated providers in non-pandemic situations. This staffing model was designed to investigate cases less likely to be medically complex. In non-pandemic situations, the volume and complexity of cases might not make this feasible;
 - Assess the impact of case investigation and contact tracing on the spread of COVID-19;
 - Assess the quality of work in the Pod Partnership compared to the traditional stream. Each case investigated by a non-regulated provider was reviewed for accuracy and chart auditing processes were implemented across all streams of case investigation, but data are currently unavailable.

Acknowledgements We are grateful to all those who contributed to the COVID-19 case investigation and contact tracing team. We would like to acknowledge the initial pilot team of regulated and non-regulated providers who helped identify the structure and function of the team, and the support of an additional evaluator, Sandra Johansen. The initial implementation of the program could not have succeeded without the exceptional work of the Pod Partnership Training Team of Ashley Burton, Norah Fines, Amy Keith, Jocelyn Graham, Kaitlyn Hill, Ildiko Lakatos, Shannon Savoy, and Jacqueline Schnider. Management of the Pod Partnership team, led by Lois Ward, Jeanne Besner, Agnes Lehman, and Michelle Nummi, was integral to the success of the model. Additional thanks go to Dr. David Strong for his guidance and support. Finally, thank you to all of the Pod Partnership team members, including non-regulated providers, Pod Leads, Team Leads, Assistant Head Nurses, and Managers who worked so hard to complete case investigations over the past months.

Author contributions All the authors whose names appear on the submission made substantial contributions to the conception or design of

the work; drafted the abstract and approved the attached version; and agree to be accountable for all aspects of the work.

Funding Alberta Health Services funded this quality improvement project.

Availability of data and material N/A

Code availability N/A

Declarations

Conflict of interest The authors declare no competing interests.

Ethics approval According to the TCPS2, quality assurance, program improvement initiatives, or any other systematic investigation meant to inform change in only local practice or policy is not considered research and is not subject to REB review. REB approval was not sought for this work.

Consent to participate N/A

Consent for publication N/A

References

- Alberta Health. (2020). Ministerial Order 631/2020 [Health]. <https://open.alberta.ca/dataset/e9bdca16-9a48-4d21-a780-479927de8f3a/resource/fc2afdec-a428-40bd-bd02-871b797d1f80/download/health-covid-ministerial-order-631-2020.pdf>. Accessed on November 24, 2021.
- Government of Alberta. (2021). COVID-19 info for Albertans. <https://www.alberta.ca/coronavirus-info-for-albertans.aspx>. Accessed on June 7, 2021.
- Kretzschmar, M. E., Rozhnova, G., Bootsma, M., van Boven, M., van de Wijgert, J., & Bonten, M. (2020). Impact of delays on effectiveness of contact tracing strategies for COVID-19: A modelling study. *Lancet Public Health*, 5, e452–e459. [https://doi.org/10.1016/S2468-2667\(20\)30157-2](https://doi.org/10.1016/S2468-2667(20)30157-2)
- Kumaraiah, D., Yip, N., Ivascu, N., & Hill, L. (2020). Innovative ICU physician care models: COVID-19 pandemic at New York-Presbyterian. *New England Journal of Medicine Catalyst*. Online version. <https://catalyst.nejm.org/doi/full/10.1056/CAT.20.0158>. Accessed June 10, 2021.
- Province of Alberta. (2021). Public Health Act. Alberta Queen's Printer. <https://www.qp.alberta.ca/documents/Acts/P37.pdf>. Accessed on June 7, 2021.
- Public Health Agency of Canada. (2018). Public health measures: Canadian Pandemic Influenza Preparedness: Planning Guidance for the Health Sector. <https://www.canada.ca/en/public-health/services/flu-influenza/canadian-pandemic-influenza-preparedness-planning-guidance-health-sector/public-health-measures.html>. Accessed on June 4, 2021.
- Society of Critical Care Medicine. United States resource availability for COVID-19. Published March 19, 2020. <https://sccm.org/Blog/March-2020/United-States-Resource-Availability-for-COVID-19>. Accessed on June 10, 2021.

Publisher's note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

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