

COVID-19 outbreak management in a hospital ward: lessons learned to prevent, prepare for and respond to infectious disease outbreaks in healthcare settings

Catherine Habel, Jerome Ng, Phil Shoemack, Kate Grimwade, Fiona Miller, Jen Boryer, Hayley Bennett, Stephanie Chisholm

The COVID-19 pandemic has triggered an international public health response that has stretched the limits of many healthcare systems, including those in high-income countries. Aotearoa New Zealand has taken the path towards elimination and has been largely successful in limiting the spread and impact of the COVID-19 pandemic on its territory so far.¹

Despite this general success, several COVID-19 clusters occurred during the first few months of 2020.² One COVID-19 outbreak associated to a known COVID-19 cluster (Hereford Cattle Conference, Queenstown) occurred at Bay of Plenty District Health Board (BOPDHB) in the acute mental health ward. A total of four cases were identified over a period of seven weeks: three staff members and one patient. The outbreak was declared after the fourth case was identified. It is most likely that transmission occurred in the ward, although no definitive source was identified for the last two cases. Two staff members who had been symptomatic could potentially be the missing link. No further linked cases have been identified despite extensive contact tracing as well as surveillance testing of the staff and patients connected to the mental health ward. The outbreak was officially closed 28 days after the end of the isolation period of the fourth case. The detailed

timeline of the outbreak is described in Figure 1.

This outbreak has provided an opportunity to critically reflect on our response and better prepare for future outbreaks.

We asked ourselves: how can we strengthen our district health board (DHB) to develop and maintain its resilience over time? Health system resilience has been defined by Kurt et al (2017) as the capacity of health actors, institutions and populations to prepare for and effectively respond to crises, maintain core functions when a crisis hits and, informed by lessons learned during the crisis, re-organise if conditions require it.³ More specifically, Nuzzo et al (2019) discuss 16 attributes that a health system needs to develop and maintain to achieve resilience.⁴ From our reflection emerged suggestions on seven of these specific attributes: leadership and command structure, surge capacity, infection and prevention control, health workforce, communications, core public health capabilities for the DHB and a commitment to quality improvement.

In this article, we provide our suggestions to help other DHBs further refine their outbreak prevention and response. Like other jurisdictions who have experienced outbreaks in healthcare settings, we wish to share what we have learned.^{5,6,7}

Leadership and command structure

Roles, responsibilities and the outbreak response structure should be described and agreed upon prior to an outbreak. More specifically, there should be clarity on who leads the response and why.

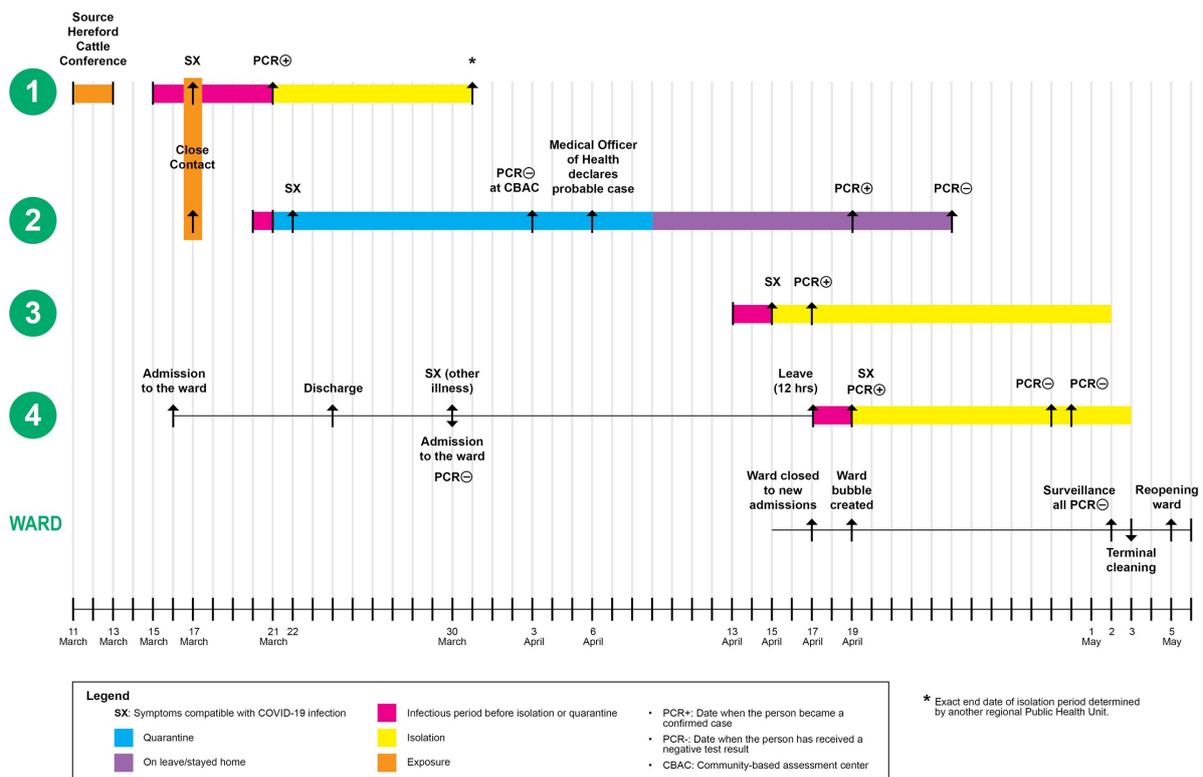
For this specific outbreak in the mental health ward, an outbreak management team was promptly formed at the request of the medical officer of health. Members of this team included the infection prevention and control team, an infectious disease consultant, the manager and lead physician of the mental health ward and Māori health services, as well as contact tracing staff from the public health unit (PHU) and the COVID-19 occupational health team.

However, we were unable to reach agreement around leadership roles and responsibilities. In particular, while the medical officer of health expected the service management team to take leadership for the overall response, the managers did not feel it was their role nor

that they were the right people to do so. Furthermore, the emergency operations centre of the DHB did not have access to a written plan, protocol or procedure stating who should lead the outbreak response in the hospital and be accountable for its outcome. As this outbreak involved multiple areas of uncertainty (new disease, missing link) in a complex and vulnerable setting (mental health ward), this lack of clarity was a significant hindrance to an effective response.

From our experience, we suggest that oversight and accountability of the outbreak response should be held by the medical officer of health. The medical officer of health needs to be in a position where he or she has all information needed to pose a judgement related to the capacity of the outbreak team to provide a satisfactory outbreak response to protect the public. This includes two aspects: the capacity of the service to implement prevention and control measures, and the capacity of the public health unit to obtain and analyse information about the cases and contacts to inform the response.

Figure 1: Timeline and overview of the COVID-19 outbreak.



The leadership of the implementation of the control measures on site should be delegated to the management of the service. Both the infection prevention and control (IPC) team and the occupational health team should work closely with the management of the service. The IPC team are the technical experts on the ground, and they should be available seven days a week to join the response as early as possible. On the other hand, the service responsible for staff safety (in our case, the occupational health team) should be the first place for staff to obtain information about their own wellbeing in the context of an outbreak. Therefore, the service responsible for staff safety need to have strong capacity to scale up as needed.

Service coordination is required all throughout the response for these roles to be played effectively—and not only for specific outbreaks like this one in the mental health ward. Instead of establishing an outbreak response team for this episode only, the establishment of a hospital outbreak management team for the whole COVID-19 response would have provided a structure to position these roles early on and have more agility to scale up as needed. The DHB outbreak policy should be adopted and known by all key players and highlight objectives, roles, responsibilities, mandates and triggers for action. This document should be the foundation to enable effective coordination.

Surge capacity of contact tracing

Contact tracing must always be high quality and equitably offered to all groups of the affected population. Contact tracing is a skill. It involves appropriate assessment of the person, a thorough questionnaire and the application of clinical judgement to evaluate the completeness and validity of the information obtained. The interviews need to be done in a culturally and clinically safe way. We suggest that all contact tracing should be done under one team and structure with clear and accessible clinical leadership. Ideally, the public health unit should be responsible for all contact tracing. If the task is delegated to another team, role definition, reporting lines, communication

channels and training requirements should be documented and approved by all parties.

Responding to COVID-19 highlighted a historical division of the contact tracing work within the DHB that was not documented or agreed upon by the various services. While the public health unit quickly organised to scale-up with dedicated, trained staff, a small COVID-19 occupational health nursing team was also created to fill a gap and perform hospital-based contact tracing. Unfortunately, coordination of the overall workload was suboptimal.

During our outbreak, the possibility of a missing link in transmission, and the change of the date of the onset of symptoms of one case, generated significant additional contact tracing workload. The new structure had challenges in coping with the workload, which, at times, threatened the quality of the investigations. The follow-up of some contacts, including some mental health patients, was delegated to a staff member who had received insufficient training in contact tracing. Moreover, because of the organisational structure, neither the COVID-19 occupational health team nor the staff from the mental health ward had direct access to clinical support from the medical officer of health during this period.

We believe this situation revealed issues that result from having multiple teams responsible for contact tracing in different parts of the DHB.

Health workforce: adequate, trained and willing

We suggest that DHBs should identify which of its staff members will be involved in an outbreak response and receive appropriate training.

Some teams and individuals struggled in their capacity to step up to the challenges associated with the COVID-19 outbreak in the mental health unit. Although working under an emergency response structure is not common, new and emerging infectious diseases that will continue to pose a threat to healthcare settings are a reality of the twenty-first century.

As for other events that require emergency response preparation, training

(including table-top exercises and simulations) should be considered to maintain and enhance staff competencies in responding to outbreaks in a multidisciplinary team. This should be offered and adapted to staff in all services, including the mental health ward.

Infection prevention and control

To provide a strong foundation for an effective response, we suggest that each service should have a pre-prepared outbreak management plan (covering both the outbreak response and business continuity) and ongoing, up-to-date training in emergency management for key staff. This is an opportunity for the services to examine different potential scenarios and assess their capacities to respond. All plans should have the same foundations and be developed under the leadership of the hospital outbreak management team.

In our case, the mental health service reacted promptly and effectively to control the outbreak and prevent further transmission. They had to take difficult decisions: the ward was closed to new admissions, and an agreement with neighbouring hospitals to re-direct admissions was put in place. Facing a potential staff shortage, a 'ward bubble' was created to ensure business continuity. Staff volunteered to work in the ward bubble while being isolated from their household members.

However, these decisions were taken in a context of limited information. For example, the management team did not know how many staff members of their service could provide some of the most specialised and essential care, as their rosters are based on roles and not on individual skillsets. As described above, the management team of the service was also uncertain of their role and who they should seek support from.

Clear communication and early support for staff

Although the emphasis is often on external communication in a situation of crisis, communication to staff is also vital and should be a priority. A communications plan covering internal and external audiences

should be included as part of any outbreak management plan. Internal communications should aim to support the affected service, as well as communicating to the staff across the organisation to maintain a culture of transparency and trust.

During the response, communication with the staff directly involved in business continuity (the ward bubble) was clear, regular and supportive. The staff were supported by both their senior managers and Māori health services as they continued to provide care to the patients in a stressful and high-risk situation. Accommodation and food were provided for staff, and regular karakia were held, which provided an opportunity to reflect and bring people together.

However, around this outbreak, general communication with staff was, at times, contradictory and delayed. Managers quickly encouraged their staff to get tested before they were interviewed by the COVID-19 occupational health nurse, which created confusion in the identification of the contacts. It generated increased workload for the COVID-19 occupational health team, which was already under pressure.

The importance of information management

We suggest that a public health analyst should be dedicated to the outbreak management team at the beginning of each outbreak.

Analysing and understanding an outbreak as it unfolds is difficult. This was accentuated in our mental health unit outbreak due to poor documentation (including missing data) and the use of three different databases and PDF documents. The first days of an outbreak response are critical to ensure uniform data collection and storage, especially when staff are seconded to help with the response.

The role of the analyst is also to contribute to analysis and interpretation of the data. Sharing data between all the involved parties maintains transparency and allows for appropriate and timely decisions.

Core public health capabilities for the DHB

We suggest that a district health board needs to invest in public health expertise to ensure that they can deliver services based on public health principles and fulfil their responsibilities for the health of the population.

Part way through, a public health physician was assigned to lead the outbreak response. For a period of three weeks prior to the arrival of this public health physician, the emergency operations centre functioned without dedicated public health technical. Although DHBs need to be prepared to activate its outbreak management team, it is important to stress that the required public health technical expertise should always be available to advise as needed.

Consolidating public health expertise in a DHB should be done at multiple levels: create and support open communication channels with the public health unit, establish positions for public health physicians and other public health professionals and ensure public health expertise is available at all levels of decision-making. This would contribute to building stronger public health expertise in the DHB, so it is better placed to face emergencies of a public health nature, like outbreaks in healthcare settings during a pandemic.

Commitment to quality improvement

This reflective exercise is our contribution to quality improvement. We suggest that reflective practices should be incorporated into the emergency response processes, as disruption can often create a fertile environment for change and improvement. This requires allocation of quality improvement resources to work alongside the response from its initiation.

Following this situation analysis, our DHB has engaged in improvement processes: consolidation of contact tracing under the public health unit leadership, strengthening of both the infection prevention and control team and the occupational health team under clinical leadership and adoption of an outbreak response structure with clear roles and responsibilities, as well as the development of outbreak management plans by all wards. It is likely that further opportunities for improvement might have been realised had the improvement work started in parallel to the response.

Conclusion

Overall, this outbreak remained small, with low morbidity and no mortality associated. However, this is an example of how the COVID-19 pandemic has tested the resilience of our health system to respond and exposed some of its challenges.

We hope that our suggestions can help other regional hospitals and district health boards to better prepare for infectious disease outbreaks in healthcare settings. While Aotearoa New Zealand is doing well to limit the spread of COVID-19 so far, let's take this as an opportunity to engage in quality improvement processes before the next episode. It is an important aspect of the recovery phase of emergency management, and it will ultimately contribute to increasing the resilience of our healthcare system to future threats.

Competing interests:

Nil.

Author information:

Catherine Habel: Public Health Physician,
Bay of Plenty District Health Board.

Jerome Ng: Clinical Director, Health Quality and Patient Safety,
Bay of Plenty District Health Board.

Phil Shoemack: Medical Officer of Health and
Public Health Clinical Lead—Toi Te Ora Public Health,
Bay of Plenty District Health Board.

Kate Grimwade: Infectious Disease Physician and Medical Cluster Clinical Lead,
Bay of Plenty District Health Board.

Fiona Miller: Psychiatrist and Mental Health and Addictions Clinical Director,
Bay of Plenty District Health Board.

Jen Boryer: Mental Health and Addictions Business Leader,
Bay of Plenty District Health Board.

Hayley Bennett: Public Health Physician, Clinical Effectiveness and Equity Lead,
Bay of Plenty District Health Board.

Stephanie Chisholm: Medical Registrar, Bay of Plenty District Health Board.

Corresponding author:

Catherine Habel
cthnrhabel@gmail.com

URL:

www.nzma.org.nz/journal-articles/covid-19-outbreak-management-in-a-hospital-ward-lessons-learned-to-prevent-prepare-for-and-respond-to-infectious-disease-outbreaks-in-health-care-settings-open-access

REFERENCES

- Baker MG, Kvalsvig A, Verrall AJ, Telfar-Barnard L, Wilson N. New Zealand's elimination strategy for the COVID-19 pandemic and what is required to make it work. *N Z Med J*. 2020 April 3;133 (1512):10-14.
- Covid-19 – Significant clusters. Ministry of Health Manatū Hauora [Internet]. 2020 July 6. Available from: <https://www.health.govt.nz/our-work/diseases-and-conditions/covid-19-novel-coronavirus/covid-19-current-situation/covid-19-current-cases/covid-19-significant-clusters>
- Kruk ME, Myers M, Varpilah ST, Dahn BT. What is a resilient health system? Lessons from Ebola. *The Lancet*. 2015;385(9980):1910-1912. Available from: [https://doi.org/10.1016/S0140-6736\(15\)60755-3](https://doi.org/10.1016/S0140-6736(15)60755-3)
- Nuzzo JB, Meyer D, Snyder M, Ravi SJ, Lapascu A, Souleles J et al. What makes health systems resilient against infectious disease outbreaks and natural hazards? Results from a scoping review. *BMC Public Health* [Internet]. 2019;19(1310):1-9. Available from: <https://doi.org/10.1186/s12889-019-7707-z>
- Peiffer-Smadja N, Lucet JC, Bendjelloul G, Bouadma L, Gerard S, Choquet C, et al. Challenges and issues about organising a hospital to respond to the COVID-19 outbreak: experience from a French reference centre. *Clin Microbiol Infect* [Internet]. 2020 Jun;26(6):669-672. Available from: <https://doi.org/10.1016/j.cmi.2020.04.002>
- Government of Tasmania. COVID-19 North West Regional Hospital Outbreak Interim Report. [Internet] 2020 April 29. Available from: https://www.health.tas.gov.au/_data/assets/pdf_file/0006/401010/North_West_Regional_Hospital_Outbreak_-_Interim_Report.pdf
- Veritti D, Sarao V, Bandello F, Lanzetta P. Infection control measures in ophthalmology during the COVID-19 outbreak: A narrative review from an early experience in Italy. *European Journal of Ophthalmology*. 2020 May 17;30(4):621-628. Available from: <https://doi.org/10.1177/1120672120927865>