Research paper

Breaking the chain of transmission within a tertiary health service: An approach to contact tracing during the COVID-19 pandemic

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Abstract *Background:* Tertiary referral health service.
Intervention(s): An approach to hospital based contact tracing is described along with tools employed to streamline the process and including the development of an outbreak management team (OMT) for each contact trace.
Results: Forty-one OMTs occurred, involving 23 HCW and 18 patient index cases. The total furloughed HCWs arising from these contact traces was 383, with individual contact traces furloughing a mean (range) of 10 (0—80) HCWs. Importantly, 15 furloughed HCWs subsequently became COVID-19 positive during their 14-day isolation period, showing the importance of the contact tracing process and the ability to remove workers from the workplace before they become infectious.
Conclusions: A standardised, streamlined contact tracing procedure in healthcare settings ensures any impacts of COVID-19 positive cases are consistently managed. This response framework may be of use to other health services and help reduce the transmission of COVID-19 in the workplace.
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Highlights

The Known
- Test, trace and isolate are well known strategies for COVID-19 control.

The New
- We describe an outbreak management framework in a tertiary hospital during COVID-19.

The Implications
- This framework will aid health services dealing with COVID-19 outbreaks.

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Introduction

The ease of transmission of severe acute respiratory syndrome coronavirus 2 (SARS CoV-2), the virus which causes COVID-19, has been a key factor driving the current pandemic. With a reproductive rate between 2 and 3 [1], low case numbers can exponentially rise without proper infection prevention and public health interventions in place. In parallel to public health responses, health services have had to swiftly implement internal strategies to maintain their workforce. One of these key strategies is rapid and effective contact tracing within the healthcare workplace.

The World Health Organisation (WHO) defines contact tracing as "the process of identifying, assessing, and managing people who have been exposed to a disease to prevent onward transmission" [2]. In the context of COVID-19, this involves identifying index cases, establishing close contacts of the confirmed case and isolating them, with or without initial testing as appropriate. Predictive modelling has shown that contact tracing and case isolation is an effective way to contain COVID-19 outbreaks and prevent transmission [3,4]. As a vaccine is at least months away from being widely available, reducing the spread of COVID-19 is our only option to prevent mass hospitalisations and unnecessary deaths.

In Australia, contact tracing is the responsibility of the relevant state or territory public health department which, in the state of Victoria, is the Department of Health and Human Services (DHHS). However, the DHHS has outlined the expectation that local health services initiate their own contact tracing should they have a confirmed case involving a patient or healthcare worker (HCW) within their health service [5]. In the 2003 SARS CoV-1 epidemic, a significant proportion of cases were amongst HCWs, demonstrating that this group, and therefore hospitals, are susceptible to outbreaks [6—8]. Similarly, early evidence suggests that HCWs are at an increased risk of becoming infected with COVID-19 [9]. Given that HCWs can come into contact with hundreds of vulnerable patients each day, it is vital that contact tracing is completed in a timely manner to prevent the possibility of 'super-spreading' events. Despite this need, clear policies for large hospitals to enact in order to achieve this goal are lacking.

Here we describe the approach taken by Monash Health for contact tracing during the COVID-19 pandemic, in order that other centres may contrast their approach and outcomes.

Monash Health approach to contact tracing

Monash Health is the largest healthcare provider in the Australian state of Victoria, with more than 40 sites and 16,000 employees. It provides care to the south-eastern suburbs of Melbourne, a city of five million, with more than 250,000 admissions annually. In response to the COVID-19 pandemic, Monash Health implemented a strategy to establish rapid contact tracing for confirmed cases within the service.

This strategy consists of four steps completed within defined timeframes as outlined in Fig. 1. The intended benefit of this approach was to allow for rapid escalation and implementation of contact tracing once a positive COVID-19 case was identified. This approach was developed and led by the Hospital Incident Command Team (HICT) overseeing the COVID-19 response within Monash Health.

Step One: notify

When a patient or HCW is confirmed to have COVID-19 within the Health Service, Infection Prevention is notified. This occurs via the health service laboratory which sends all positive notifications directly to the Medical Director of Infection Prevention, or via the Department of Human Services if the pathology occurred outside the health service. The Medical Director of Infection Prevention and Epidemiology (MDIPE) then decides if a contact trace is required, based on if the HCW worked while potentially infectious and the likelihood of transmission in the workplace, and briefs the executive team comprising the Chief Executive (CE) and Chief Operating Officer (COO). Step One is completed within one hour of the confirmed COVID-19 case. This rapid notification is intended to ensure that the issue is escalated to the highest level so that a co-ordinated contact tracing process can commence.

Step two: build the team

To implement and monitor the contact tracing process, an Outbreak Management Team (OMT) is created, with clearly defined roles as outlined in Table 1. Once notification has been received, the CE and COO activate the OMT and an Infection Prevention Consultant (IPC) is allocated to drive the contact tracing process. Having this team structure ensures that there are no delays to commencing contact tracing and isolating individuals. It also reduces any lack of role clarity regarding individual responsibilities during the process.

During the contract tracing, the OMT meets numerous times via video conference to monitor and support the contact tracing process. Other relevant staff members are invited as necessary. Each OMT meeting covers a specific agenda, as outlined in Table 2. The use of a consistent agenda provides a formal structure to each meeting, ensuring that all implications of a positive COVID-19 case are managed, limiting unintended consequences such as HCW shortages. Frequent meetings over a short time period also provide an easy way to track the progress of contact tracing and provide any additional support as required.
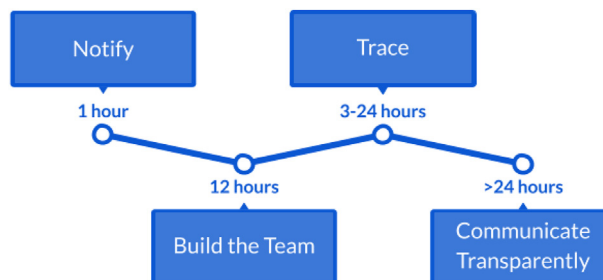

Figure 1   Four key steps to successful contact tracing.

Step Three: trace

Predictive modelling has shown that any delays in contact tracing can significantly reduce its effectiveness [10]. In recognition of this, Step Three commences simultaneously with Step One. This process is led by Infection Prevention, a multidisciplinary unit tasked with preventing nosocomial infections. First, a comprehensive phone interview is conducted with the index case to determine where and how the virus was acquired, time of symptom onset, and identify any potential close contacts. A contact tracing team (CTT) is then formed, with the assistance of the Operational Lead (see Table 1), to notify relevant managers and compile a list of potential contacts through employee and patient lists. The CTT proceeds to call each potential contact to determine exposure risk, based on amount of contact, the environment in which the potential exposure occurred, PPE use, and whether the employee works at multiple sites or across different wards. Using this information, contacts can be stratified using a risk matrix (Table 3) to determine the need for 14-day quarantine and/or testing. This risk matrix is able to be adjusted for an individual situation and ensures consistent guidance for the CTT. To update the HCW team impacted upon by the case and provide support, a forum for team members via video conference is also organised.

As contacts are identified and placed in isolation or quarantine, the Operational Lead assesses how this will impact on service delivery. If a large number of employees need to be furloughed, a Contingency Workforce Plan is activated to ensure services can be provided as close to normal levels as possible. While Step 3 is underway, it is vital that Infection Prevention and the Operational Leads meet regularly to ensure that it is progressing at an appropriate speed. This can be achieved through regular team 'huddles' via video or phone conference. It is critical that this step is completed within three to 24 h of the confirmed COVID-19 case so that employees can be furloughed before onward transmission.

Step four: communicate transparently

Once close contacts are identified and in isolation, it is imperative that they are followed-up daily to monitor for any symptoms of COVID-19 infection as well as their general health and wellbeing. This responsibility is initially given to Infection Prevention to communicate the need for isolation. Thereafter this is handed over to the People and Culture (Human Resources) team who provide daily welfare checks, help with accommodation needs, and provide

Table 2 OMT meeting agenda items.

Agenda Item	Lead
Tracing	Infection Prevention
Operational Issues	Operational Lead of Impacted Areas
Employee Matters	Infection Prevention People and Culture
Communications and engagement	OMT Lead Communications

Table 1 Core members of OMT and roles.

Team Member	Role
OMT Lead	• Organise and chair OMT meetings • Facilitate a discuss that supports the contact tracing process and briefs all attendees • Schedule staff forums with relevant groups • Summarise actions from each OMT meeting
CE/COO	• Provide updates to all employees • Activate OMT
MDIPE	• Brief CEO and COO on confirmed case • Notify DHHS • Lead the contact trace
IPC	• Identify and communicate with all close contacts of index case • Create and maintain list of furloughed staff and rostered shifts • Update OMT during meetings progress of contact tracing
Communications Lead	• Prepare noticeboard poster and script for staff forum • Report back on employee forums regarding any specific concerns and need for follow-up forums
Operational Leads (Nurse Manager)/Unit Director (or equivalent)	• Provide rosters, patient lists, and telephone numbers to IPC • Organise cover for furloughed employee shifts • Review and arrange for impacted areas to undergo deep cleaning • Outline any possible longer-term impact to health services in OMT meetings
People and Culture	• Provide welfare support for staff on furlough • Advise WorkSafe and unions as necessary
Support Services	• Provide and support extra cleaning requirement
Designated note taker	• Take minutes of OMT meetings • Schedule subsequent OMT meetings

reminders for testing on day 11. If a large number of staff have been furloughed, the Operational Lead will implement the Contingency Workforce Plan to ensure continuity of health service delivery. The DHHS and HICT are also updated.

During this step, it is important that communication with employees is open and transparent. This is achieved through a series of strategies. Organisation-wide emails, and regular 'huddles' lead by managers, take place daily or on alternate days. Weekly staff fora are held that allow frank and open communication between those directly affected by the contact tracing process and leadership including the CE and COO. Additional communications strategies include a dedicated COVID-19 website allowing around the clock access to the latest information such as PPE tier requirements, and regular updates from the CE. When an outbreak occurs, the CE uses these updates to inform all employees of data including the number of positive COVID-19 patients, HCW cases, and employees on furlough. This transparency is intended to build trust, allow for questions to be answered to reduce knowledge asymmetry, and maintain a sense of belonging.

A review of every HCW infection is also undertaken. This is aimed to establish processes that need refining and lessons learnt are then communicated to both the OMT and wider health service community, so that an ongoing infection prevention strategy is maintained.

Outcomes

This report covers the period between June and September 2020, during the second wave of the pandemic in Melbourne, Victoria. At this time case numbers escalated to a peak of over 600 cases a day, compulsory mask wearing was in place and community lockdown was at stage 4 for a prolonged period. In this time, forty-one OMTs occurred, involving 23 HCW and 18 patient index cases. The total furloughed HCWs arising from these contact traces was 383, with individual contact traces furloughing a mean (range) of 10 (0—80) HCWs. Importantly, 15 furloughed HCWs subsequently became COVID positive during their 14-day isolation period, showing the importance of the contact tracing process and the ability to remove workers from the workplace before they become infectious. No ongoing transmission has been identified from any outbreak once an OMT has been put in place.

Conclusion

Since implementing the contact tracing process outlined here in June 2020, we have been able to evaluate risk and follow the identify, trace and isolate algorithm in a timely, open and transparent manner in every case. The development of an OMT with dedicated roles and structured meeting agenda items ensures any impacts of COVID-19

Table 3 Monash Health Healthcare Worker COVID-19 workplace exposure risk matrix.

The matrix below is a guide only, and there may be circumstances where the risk action is elevated to the next level eg. moderate risk becomes high risk etc. Considerations when determining risk include:

1) **Case details:** asymptomatic versus symptomatic, time of exposure in relation to when symptoms developed, case acquisition (known vs unknown)
2) **Contact details:** distance from case and physical contact, length of exposure time, shared environmental space (significance depends on case symptoms)
3) **PPE:** mask use in index case, was PPE aligned to guidelines, reported breaches in technique
4) **Environment:** were AGPs performed, shared equipment (computers, phones) and use of communal spaces (tea rooms/work-stations/offices)
5) **Staff mobility:** HCWs working at more than one facility, highly mobile staff within facility eg orderly, security

From the period 48 hours before onset of symptoms until the case is deemed no longer infectious	Aerosol generating procedures	Close Contact 15 min or more cumulative over 1 week AND less than 1.5m distance OR Greater than 2 hrs in closed space	Limited Contact Less than 15 mins cumulative over 1 week AND greater than 1.5m distance OR Less than 2 hrs in closed space	Transient contact Large areas
No PPE[1]	High Risk[2]	High Risk[2]	Moderate Risk[3]	Low Risk
Surgical mask only	High Risk[2]	High Risk[2]	Low Risk	Low Risk
Mask and shield only	High Risk[2]	Moderate Risk[3]	Low Risk	Low Risk
Full PPE N95 (AGPs) or surgical mask (routine care) gown, gloves, eye protection	Low Risk	Low Risk	Low Risk	Low Risk

[1] Refer to the appropriate PPE for your healthcare setting.

[2] Consider testing on furlough where a positive result will affect the need for further contact tracing around the exposed HCW; consider point prevalence screening of staff if case acquisition unknown.

[3] For moderate risk cases – considerations include: the extent of the contact trace (eg is there a need to extend the contact trace for unresolved outbreaks), whether HCWs could return to work with a limited testing program in place – eg: testing regimen day 3, 7, 11 for HCWs who remain asymptomatic.

High risk	Moderate risk	Low risk
• Quarantine for 14 days • Test if symptomatic at any time • Test Day 11 (no earlier than D11) • Negative result required for return to work	• Continue to work • Surgical mask to be worn at all times • If role permits consider work from home • HCW alert to mild symptoms • Routine syndromic screening	• Continue to work • HCW alert to mild symptoms • Test only if symptomatic • Routine syndromic screening

positive cases are consistently managed. This response framework may be of use to other health services and help reduce the transmission of COVID-19 in the workplace.

Ethics

Ethics approval not required.

Authorship statement

Rhonda Stuart contributed to the concept, analysis, methodology, supervision, writing, reviewing and editing.

Wendy Zhu contributed to the methodology writing, reviewing and editing.

Eric Morand contributed to the supervision, reviewing and editing.

Andrew Stripp contributed to the concept, methodology, supervision, reviewing and editing.

Conflict of interest

The authors declare no conflict of interest or financial interests.

Provenance and peer review

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