Fending off Delta – Hospital measures to reduce nosocomial transmission of COVID-19

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Highlights

- There is a need for enhanced hospital measures against new variants of COVID-19
- We enhanced personal protective equipment, surveillance and rostered testing
- Our measures may have reduced nosocomial transmission of the delta variant
**Title.** Fending off Delta – Hospital measures to reduce nosocomial transmission of COVID-19

**Running title.** Fending off Delta

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**ABSTRACT**

**Objectives**

Following emergence of the Delta variant of SARS-CoV-2 in Singapore, our hospital experienced a Delta-linked ward cluster. We review the enhanced strategies in preventing nosocomial transmission of COVID-19 following wide-spread community transmission of Delta.

**Methods**
We conducted a cohort study on exposures to unexpected COVID-19 cases for which contact tracing was initiated, from June to October 2021. Strategies evaluated included upgraded personal protective equipment (PPE) and rostered routine testing (RRT) for staff and patients, surveillance of staff with acute respiratory illness (ARI), and expanded quarantining and testing for contacts of cases.

Results

From 193 unexpected COVID-19 exposures, 2,573 staff, 542 patient and 128 visitor contacts were traced. Four staff contacts subsequently had SARS-CoV-2 infection. Two were likely from exposure in community settings; while 2 had exposure to the same positive staff in the hospital, forming the only hospital cluster. One inpatient had nosocomial infection, possibly from visitors. The SARS-CoV-2 detection rate among staff was 0.3% (of 11,200 staff) from bi-weekly RRT, and 2.5% (of 3,675 staff) from ARI surveillance.

Conclusion

Enhanced hospital measures including upgraded PPE and RRT for staff and patients, staff sickness surveillance, and more rigorous management of contacts of COVID-19 cases were likely to have reduced nosocomial transmission amidst Delta.

Keywords. COVID-19; Delta; personal protective equipment; staff surveillance; rostered routine testing
INTRODUCTION

From September 2020 to mid-April 2021, fewer than five Coronavirus Disease 2019 (COVID-19) community cases were reported in Singapore daily. However, in April 2021, the Delta (B.1.617.2) variant of severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) emerged, with a shorter incubation period and higher transmissibility compared to the ancestral strain (Zhang et al., 2021). This variant was responsible for causing a hospital cluster in end-April 2021, and quickly became the predominant circulating strain in Singapore, fuelling resurgence of COVID-19 cases despite >80% vaccination rate in the Singaporean adult population (Lim et al., Ministry of Health, 2021a, 2021b).

Until then, hospital measures against COVID-19 including appropriate personal protective equipment (PPE) for staff, staff temperature and sickness monitoring, and contact tracing and surveillance of individuals with potential COVID-19 exposure have been effective in preventing nosocomial transmission of COVID-19 (Chow A. et al., 2020, Htun et al., 2020). However, the emergence of the Delta-linked ward cluster signalled a need to strengthen our hospital’s defences in managing COVID-19 (Teo, 2021). Thus, we implemented PPE upgrade and rostered routine testing (RRT) for staff and inpatients, aggressive quarantine practices and testing measures for exposed-contacts, and ward environmental enhancements. We describe and review the effectiveness of these strategies in preventing the nosocomial transmission of COVID-19 amidst widespread community transmission.

MATERIAL AND METHODS

Design, Setting, and Participants

Tan Tock Seng Hospital (TTSH) is a 1,600-bed multidisciplinary acute-care hospital with close to 13,000 staff. It supports the co-located 330-bed National Centre for Infectious Diseases (NCID), which is the designated centre for outbreaks of Emerging Infectious
Diseases (EIDs) in Singapore. Since January 2020, the campus has managed more than 14,000 COVID-19 patients.

We conducted a cohort study of unexpected exposures to COVID-19 cases for which contact tracing was initiated, from 6th June to 9th October 2021 covering a period of 17 epidemiological weeks, post-closure of the Delta-linked cluster in TTSH.

Upgraded PPE for staff, patients and visitors

From 2nd May 2021, the recommended minimum PPE for all staff during patient interactions in non-COVID-19 wards was upgraded from surgical mask to N95 mask and eye protection, and this was extended to staff in clinics from 23rd July 2021 (Table 1). Staff managing suspected/confirmed COVID-19 cases, working in high-risk areas such as the Emergency Department, or performing aerosol-generating procedures had to don a full set of PPE (N95 mask or equivalent, gown, gloves, and eye protection) as per existing recommendations.

Inpatients were advised to don surgical masks where tolerated, particularly when leaving their rooms/beds and during transfers for procedures outside the ward. In line with national mask-wearing policy, patients visiting outpatient clinics and visitors to the hospital were also required to wear masks.
Management of unexpected exposures

Unexpected exposure was defined as an exposure to an individual with polymerase chain reaction (PCR)-confirmed COVID-19 within the hospital premises when the individual was not identified at the outset and managed according to the suspected COVID-19 protocol. Upon detection of an unexpected COVID-19 case, contact tracing would immediately commence. Two types of contacts during the index case’s infectious period were traced (i) close contact: an individual within 2 metres of the COVID-19 case for a cumulative duration of ≥15 minutes, and (ii) transient contact: a potentially-exposed person (e.g. in the ward at the same time but did not fulfil the close contact criteria). Each contact was followed up for 14 days (the maximum incubation period of SARS-CoV-2) from the last exposure.

Staff close contacts who had unprotected exposure (not donning minimally a surgical mask) were furloughed and quarantined at home for 14 days following the last date of exposure to the case, while those with protected exposure (donning minimally a surgical mask, or N95 or equivalent, but not the full set of PPE) underwent various combinations of hospital measures including SARS-CoV-2 PCR testing regimes, and temperature and acute respiratory illness (ARI) symptom surveillance by the Ministry of Health (MOH) or their respective Heads of Departments. Staff contacts who were in a full set of PPE did not require follow-up. Inpatient close contacts were isolated in negative pressure single rooms for 14 days and underwent SARS-CoV-2 PCR testing. The MOH followed up with public health actions for outpatient or visitor close contacts.

Thorough cleaning of areas and surfaces contacted by the unexpected COVID-19 case would be performed. For exposures in the general ward, the ward would be locked down to restrict patient movements (admission/transfer/discharge), and visitors would be disallowed with exceptions for dangerously ill patients. Additionally, staff based in the affected wards would
also be screened for SARS-CoV-2 via PCR test at the point of notification of exposure event. The lockdown would then be lifted when SARS-CoV-2 was not detected in all screening swabs.

**Enhanced staff ARI surveillance**

Ongoing hospital-wide enhanced staff sickness surveillance was established in addition to routine staff sickness absenteeism surveillance to identify sick staff early and prevent nosocomial COVID-19 transmission due to an infected staff. Sick staff and their SARS-CoV-2 PCR results were monitored daily (Htun et al., 2020).

We assessed the changes in temporal trends of ARI incidence amongst staff using joinpoint regression, with epidemiological week as the independent variable. This regression uses data to fit the simplest joinpoint model, and tests the statistical significance of joinpoints using the Monte Carlo permutation, whilst setting the level of significance at 0.05 and maximum number of joinpoints at two (Kim et al., 2000). Weekly percent change (WPC) was estimated for each segment along with 95% confidence interval (CI) using the Joinpoint Regression Program version 4.9.0.0.

**Staff and patient rostered routine testing**

Singapore implemented RRT for all staff working in acute-care hospitals on 5th May 2021. At TTSH and NCID, weekly or fortnightly RRT cycles were administered via SARS-CoV-2 PCR test for unvaccinated and fully vaccinated staff, respectively.

SARS-CoV-2 PCR tests were performed for all inpatients on admission, day-4, day-7, and subsequently, weekly. Inpatients also needed to undergo a PCR test 48-hours prior to planned discharges to home or step-down healthcare facilities.
Individuals were considered fully vaccinated two weeks after receiving the second dose of either the Pfizer-BioNTech (BNT162b2), Moderna (mRNA-1273), or Sinovac-CoronaVac COVID-19 Vaccine series.

**Other safe management measures**

Staff were advised to order only takeout meals, and to eat alone at their work desks or assigned staff pantries within their work zones. Vaccinated staff were further allowed to use designated staff eating areas within the hospital food and beverage outlets, but were to eat alone with no interactions across tables. Other workplace measures included split-teams, tele-consultations, and work-from-home arrangements where practicable.

**Visitor restriction**

Visiting guidelines changed several times throughout the study period. The maximum number of visitors per patient per day and at the bedside at any one time, as well as maximum visiting duration, was limited to varying degrees, with exceptions granted on a case-by-case basis (2021, Chan, 2021). From 19th August 2021, all visitors to hospital wards also needed to show a valid negative Antigen Rapid Test (ART) or PCR result within 24 hours, with fully vaccinated visitors exempted only until 23rd September 2021 (Ministry of Health, 2021c, Tham, 2021).

**Enhancements to hospital environment**

Other safe management measures such as safe distancing in clinic waiting areas, and enhanced cleaning of common facilities, high-touch surfaces and equipment were implemented. Several environmental enhancements including installation of high-speed extraction fans to improve air circulation in general wards and placement of portable high-efficiency particulate absorbing (HEPA) filters in patients’ rooms and clinics were carried out.
RESULTS

Staff RRT

From 6th June to 9th October 2021 (Epidemiological Weeks 23-40, 2021), an average of 11,200 staff underwent bi-weekly SARS-CoV-2 PCR RRT, and 61 (0.5%) had detected/equivocal results. Among them, 40 (66%) and 21 (34%) were ‘detected’ and ‘equivocal’ (i.e. borderline positive with cycle threshold >37-45) respectively (Fig. 1).

Among the 40 staff with detected SARS-CoV-2 result, seven (17.5%) had two subsequent swabs taken 24 hours apart yielding negative results by the hospital’s laboratory and the national reference laboratory, and were classified as ‘false positives’ (Table 2). Of the remaining 33 (82.5%) staff that were true positives, 22 remained asymptomatic throughout the course of illness, while 11 subsequently developed ARI symptoms. All 21 staff with equivocal SARS-CoV-2 results remained asymptomatic and two subsequent swabs taken 24 hours apart yielded negative results, and were categorised as false positives. Thus, 33 staff true positives PCR arising from RRT providing a SARS-CoV-2 detection rate of 0.3% (Table 2).

Staff ARI surveillance

For the same period, 3,675 staff with ARI were identified. A joinpoint regression analysis showed a significant rising trend in the incidence rate of staff ARI (WPC 2.6%, 95%CI 1.4-3.7, P<0.001) (Fig. 2).

Ninety-four (2.6%) staff had detected/equivocal SARS-CoV-2 test results – of which 92 (98%) were detected and two (2%) were equivocal. Of the 92 staff with a detected result, two had two subsequent swabs taken 24 hours apart yielding negative results, and were classified as false positives. Of the two staff with an equivocal result, one staff subsequently had a detected result and was confirmed with COVID-19. The remaining staff had two subsequent
swabs taken 24 hours apart that yielded negative results, and was classified as a false positive. Altogether, 91 staff had true positive results from staff ARI surveillance, giving a true positive SARS-CoV-2 detection rate of 2.5% (Table 2).

Unexpected exposures to COVID-19 staff and patients

There were 193 unexpected exposures to COVID-19 staff (n=135), patients (n=43) and visitors (n=15) (Table 3). Incidents occurred in the ward (n=83), clinic (n=51) and other parts of the hospital (n=58).

As a result of these exposures, 2,573 staff contacts were traced (919 close and 1,654 transient). Among the close staff contacts, 160 had unprotected exposure to the index case, all of whom were immediately furloughed, with most receiving 14-day Quarantine Orders (QOs) from MOH; 172 close staff contacts who wore surgical masks during exposure to the case were furloughed and/or underwent SARS-CoV-2 testing; remaining 2,241 staff contacts (587 close and 1,654 transient) who wore N95 masks and eye protection underwent various combinations of hospital measures including enhanced surveillance swab regimes and surveillance of temperature and/or ARI symptoms. A QO is a legal order under the Infectious Diseases Act (IDA) requiring an individual, who is suspected to be a carrier of an infectious disease or a contact of a confirmed case to be quarantined at a designated place. Orders end 14 days following the last exposure date to the case.

Likewise, 542 patients and 122 visitors who were close contacts were also traced. Among them, 198 patients and 38 visitors received QOs. Actions for the remaining patient and visitor contacts contacted directly by MOH’s public health officers could not be ascertained in our study.
Amongst 2,573 staff contacts of COVID-19 cases, only four staff (Staffs B, D, E, F) subsequently had detected SARS-CoV-2 results. Staff B had worked on the same shift in the same ward as the index staff (Staff A), but did not have close contact with that staff. Staff B (Staff A’s transient contact) had undergone surveillance swabs on day 1, 4, 7 and 14 post-exposure - of which the day-14 swab was detected, and remained asymptomatic throughout the course of illness. Of interest, the other three staff contacts confirmed with COVID-19 (Staff D, E and F) were epidemiologically linked to another index staff (Staff C). Staff D was a housemate of Staff C although they worked in different areas in the hospital, suggesting that transmission likely occurred outside of the hospital. Staff D had developed ARI symptoms the day after the RRT surveillance swab. The remaining two staff contacts (Staff E and F) worked in the same non-clinical area as Staff C. Both had transient unprotected contact with Staff C in the pantry. This departmental cluster was the only hospital cluster identified during the study period.

Of the 14 unexpected inpatient COVID-19 cases, only 1 case (Patient A) was infected in the hospital. Patient A’s RRT swab was detected 44 days into the hospitalisation, which surpassed the SARS-CoV-2 incubation period of 14 days. However, the source of infection was unknown, as SARS-CoV-2 was not detected in the swabs of staff (all who donned N95 masks and goggles) and close patient contacts. Nonetheless, during the course of hospitalisation, Patient A had five visitors, who could not be ruled out as potential sources of infection.

DISCUSSION

Our findings provide confidence that the enhanced hospital measures implemented after the ward cluster were likely to have reduced nosocomial transmission risks despite widespread community transmission of the highly-transmissible Delta. Among 2,531 staff contacts who
had unexpected exposures to a COVID-19 case across the 193 incidents, only four were subsequently confirmed with COVID-19. For Staff B, a few factors suggest that acquisition from the index case was unlikely: (i) transient and protected exposure to the index case (Staff A); and (ii) positive result only on day 14 post-exposure, while the mean incubation period of Delta is reported to be under four days (Li et al., 2021). For our only hospital cluster, transmission was likely to have occurred in the pantry when the two staff contacts had unprotected exposures to the index staff in the pantry, when the index staff was infectious. Within the hospital, risk of spread in non-clinical areas (such as in office and rest areas) where staff may mingle (particularly, when masks are taken off during meals or drinks) are higher than in clinical areas, thus safe workplace measures play a crucial role (Wee et al., 2020). Staff are at high risk of acquiring COVID-19 and EIDs during patient care, and countries have reported outbreaks occurring in healthcare settings (Abbas et al., 2021, Nguyen et al., 2020, Suwantarat and Apisarnthanarak, 2015). As staff also interface with the community, they may initiate or amplify outbreaks in hospital settings, thus, protection of staff is a key priority (Asad et al., 2020). Contrasting our hospital cluster with other COVID-19 nosocomial outbreaks in Israel (Shitrit et al., 2021) and Canada (Susky et al., 2021) where surgical masks and ASTM level 3 masks were used respectively, our enhanced measures including upgraded PPE, surveillance, prompt detection and isolation of cases have been successful in reducing nosocomial transmission among staff.

During the study period, only one definitive nosocomial infection occurred among inpatients (Patient A), although investigations failed to identify the source of infection. Visitors may have played a role in the acquisition, as fully vaccinated visitors had been allowed in without requiring prior SARS-CoV-2 testing during the patient’s probable incubation period. The case is consistent with other reported cryptogenic asymptomatic nosocomial transmissions of COVID-19 (Abbas et al., 2021). Active patient case-finding via patient RRT as well as
testing visitors for SARS-CoV-2 may be advantageous as we transit towards living with COVID-19 and relaxing visitation policies.

Our study demonstrated that there was increased, but still limited, effectiveness of bi-weekly PCR Staff RRT in detecting asymptomatic infection amidst widespread community transmission of the Delta SARS-CoV-2 strain. Amongst the 11,200 staff who underwent RRT, 33 had a true detected result. Among the 33 true positives, 22 remained asymptomatic throughout the course of the illness. The other 11 developed symptoms following the RRT swab, and would have been identified by ARI surveillance regardless. Thus, RRT discovered 22 additional asymptomatic true positive cases. Unlike our previously published letter prior to the emergence of Delta, RRT allowed for earlier detection and isolation of asymptomatic staff in our study (Chow et al., 2021). Nevertheless, the SARS-CoV-2 detection rate of staff RRT (0.2%) was considerably lower than that of active surveillance of staff with ARI symptoms (2.5%), and the numerous false-positives resulted in unnecessary staff anxiety and furloughs. Routine asymptomatic surveillance has not been recommended as a primary infection prevention strategy to decrease COVID-19 transmission in healthcare facilities, and there is a possibility that the existing staff protection and surveillance measures may have played a role in the low detection rate of staff RRT in our study (Shenoy and Weber, 2021). The benefits of RRT for staff remain questionable and further studies are required (Tan et al., 2021).

As community transmission in Singapore surged, the number of COVID-19 cases detected among staff increased (Fig. 1). Staff should remain vigilant outside of the hospital in observing public health measures such as mask-wearing and physical distancing, especially during heightened community transmission of COVID-19. We also observed that ARI incidence among staff increased as community transmission of COVID-19 increased. Previous studies suggested that public health measures implemented to control COVID-19
could also have an inadvertent effect on the transmission of *Streptococcus pneumoniae* and Influenza (Chow Angela et al., 2020, Lim et al., 2020). By abiding to public health measures, staff may also protect themselves against ARI due to other respiratory pathogens.

Although our measures were effective, they come at a cost. Significant resources were dedicated to support COVID-19 operations with numerous staff furloughed due to contact tracing efforts. Quarantine and changes in working conditions to accommodate COVID-19 measures may affect the psychological wellbeing of staff (Digby et al., 2020, Fawaz and Samaha, 2020). Isolation of inpatient contacts has been associated with adverse effects on patient care, and cancellation or avoidance of elective appointments could also hinder timely access to healthcare (Abad et al., 2010, Kuhlen et al., 2020, Nair et al., 2020, Purssell et al., 2020). With a highly-vaccinated population (>80%) and an even more highly-vaccinated staff population (>90%), a balance needs to be struck between channelling healthcare resources towards managing COVID-19 and other competing priorities.

Our study had several limitations. During the study period, the infection control and safe management measures, as well as guidelines for management of contacts, were ever-evolving, thus recommendations for a specific regime could not be made. Furthermore, as there was only one staff cluster observed, we were unable to compare the efficacy of certain measures, such as the adequacy of surgical versus N95 masks in protecting against COVID-19 acquisition in the hospital. In addition, our healthcare system had sufficient manpower, financial and infrastructural resources to perform extensive surveillance, testing and quarantining of staff, although the same practices may not be feasible for resource-limited settings or if the hospital was overwhelmed with the management of COVID-19 cases.

In the era of the highly transmissible Delta variant, hospitals need to strengthen their defences against COVID-19. Enhanced measures including upgraded PPE for staff and patients, RRT
for staff and patients, surveillance of staff with ARI, and aggressive testing and quarantining measures for contacts with potential COVID-19 exposure may have reduced nosocomial transmission of COVID-19 despite wide-spread community transmission of the Delta variant.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Ethics approval. The study was approved with waiver of informed consent by the Domain Specific Review Board of National Healthcare Group, Singapore (DSRB - 2021/00891).

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Potential conflicts of interest. The authors: No reported conflicts of interest.
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Outbreak of the COVID-19 Delta Variant B.1.617.2 - Guangdong Province, China, May-June
Figure 1
Figure 2
### Table 1. Risk-based enhanced personal protective equipment matrix for staff, patients and visitors

<table>
<thead>
<tr>
<th>Category</th>
<th>Hand hygiene</th>
<th>N95 mask or equivalent</th>
<th>Surgical mask</th>
<th>Eye protection (e.g. face shield/goggles)</th>
<th>Gown/ Apron</th>
<th>Gloves</th>
</tr>
</thead>
</table>

#### STAFF

1. **Isolation rooms**
   - All staff, including housekeeping staff
     - ✓ ✓ ✓ ✓ ✓

2. **Inpatients/ Ambulatory/ Radiology and Procedural areas**
   - Medical/ Nursing, allied health professionals*, housekeeping staff
     - ✓ ✓ ✓

3. **Specialist outpatient clinics**
   - Medical/ Nursing staff, allied health professionals*
     - ✓ ✓ ✓
   - Patient service associates
     - ✓ ✓ ✓
   - Staff transporting specimens to laboratory
     - ✓ ✓
   - Housekeeping staff (when cleaning toilets)
     - ✓ ✓ ✓ ✓ ✓
   - Staff at forward triage areas (e.g., hospital entrances, ganttries)
     - ✓ ✓ ✓

4. **Emergency department**
   - Security officers at ED entrances
     - ✓ ✓ ✓
   - Security officers at ED non-fever/fever zone
     - ✓ ✓ ✓ ✓ ✓
   - All other staff working at any area of ED
     - ✓ ✓ ✓ ✓ ✓

5. **Ancillary staff**
   - Ambulance driver
     - ✓ ✓ ✓ ✓ ✓ ✓
   - Staff performing ambulance decontamination
     - ✓ ✓ ✓ ✓ ✓ ✓
   - Waste disposal
     - ✓ ✓ ✓ ✓ ✓ ✓
   - Spill management
     - ✓ ✓ ✓ ✓ ✓ ✓
   - Mortuary staff†
     - ✓
<table>
<thead>
<tr>
<th>(6) Non-patient-fronting staff</th>
<th>✓</th>
</tr>
</thead>
<tbody>
<tr>
<td>PATIENTS (inpatients or outpatients)</td>
<td>✓</td>
</tr>
<tr>
<td>VISITORS (inpatients or outpatients)</td>
<td>✓</td>
</tr>
</tbody>
</table>

*Allied health professionals include pharmacists, occupational therapists, physiotherapists, phlebotomists, radiographers, and respiratory therapists.

†No autopsy or embalment done.
**Table 2:** Categories of staff screened for and Detected With SARS-CoV-2 Infection from Rostered Routine Testing (RRT) and staff acute respiratory illness (ARI) surveillance, 6\textsuperscript{th} June – 9\textsuperscript{th} October 2021

<table>
<thead>
<tr>
<th>Screening category</th>
<th>Staff screened</th>
<th>SARS-CoV-2 test result</th>
<th>True positive detection rate, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Staff RRT</td>
<td>11200</td>
<td>33</td>
<td>0</td>
</tr>
<tr>
<td>Staff ARI</td>
<td>3675</td>
<td>90</td>
<td>1</td>
</tr>
</tbody>
</table>

*First swab result Detected/Equivocal but Not Detected on 2 subsequent samples sent 24h apart.*
Table 3: Numbers of staff, patient and visitor contacts traced from exposures to unexpected staff, patient and visitor COVID-19 cases in the hospital from 6th June to 9th October 2021, as well as details of positive SARS-COV-2 PCR results from surveillance swabs of these contacts.

<table>
<thead>
<tr>
<th>Unexpected COVID-19 cases</th>
<th>N95 (close)</th>
<th>N95 (transient)</th>
<th>Surgical mask (close)</th>
<th>Unprotected exposure (close)</th>
<th>Close* patient contacts</th>
<th>Close* visitor contacts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Staff cases (n=135)</td>
<td>376</td>
<td>1459</td>
<td>170</td>
<td>160</td>
<td>355</td>
<td>28</td>
</tr>
<tr>
<td>Patient cases (n=43)</td>
<td>198</td>
<td>188</td>
<td>2</td>
<td>0</td>
<td>171</td>
<td>100</td>
</tr>
<tr>
<td>Visitor cases (n=15)</td>
<td>13</td>
<td>7</td>
<td>0</td>
<td>0</td>
<td>16</td>
<td>0</td>
</tr>
<tr>
<td>Total no. of contacts</td>
<td>587</td>
<td>1654</td>
<td>172</td>
<td>160</td>
<td>542</td>
<td>128</td>
</tr>
</tbody>
</table>

Positive SARS-CoV-2 results from swabs of contacts

- 4 staff contacts with detected SARS-CoV-2 PCR result
  - 1 unprotected, close*
  - 1 unprotected, transient†
  - 1 N95 mask, transient†
  - 1 surgical mask, transient†

*Close contacts: Contacts who are <2m and ≥ 15 minutes of a positive COVID-19 case
†Transient contacts: those who had potential exposure to a COVID-19 case (e.g. were in the ward at the same time as the case), but did not fulfil the criteria for close contact.

(during unexpected exposures to SARS-CoV-2 cases whereby there was an exposure to a COVID-19 staff, patient or visitor within the hospital premises) and not in a full set of PPE (N95 mask or equivalent, gown/apron, gloves, eye protection).