

SECTION 5

RISK MITIGATION: TRANSMISSION-BASED PRECAUTIONS

CONTENTS

5 TRANSMISSION-BASED PRECAUTIONS	94
5.1 CONTACT PRECAUTIONS	96
5.1 CONTACT PRECAUTIONS IN SPECIFIC SETTINGS	99
5.1.1 NEONATOLOGY UNITS	99
5.1.2 COMMUNITY-BASED SETTINGS:	100
5.2 DROPLET PRECAUTIONS	100
TABLE 14. AS 4381: 2015 SINGLE USE SURGICAL FACE MASK STANDARD	101
5.3 AIRBORNE PRECAUTIONS	101
TABLE 15. REFERENCE GUIDE - AIR CHANGES PER HOUR (ACH) AND TIME REQUIRED FOR REMOVAL	
EFFICIENCIES OF AIRBORNE CONTAMINANTS	103
5.3.1 AIRBORNE PRECAUTIONS IN SPECIFIC SETTINGS	103
5.4 MANAGEMENT OF PATIENTS PRESUMPTIVE OR CONFIRMED INFECTIOUS TUBERCULOSIS (TB) IN	
HEALTHCARE SETTINGS (139)	105
5.4.1 TB INFECTION WITHOUT ACTIVE TB DISEASE	105
5.4.2 INFECTION CONTROL PRECAUTIONS FOR PEOPLE WITH PRESUMPTIVE ACTIVE TB DISEASE	105
5.4.3 DE-ISOLATION OF PRESUMPTIVE TB CASES WHERE THE DIAGNOSIS HAS BEEN EXCLUDED OR ARE	
CONSIDERED HIGHLY UNLIKELY (141).	106
5.4.4 INFECTION CONTROL PRECAUTIONS FOR PEOPLE WITH CONFIRMED TB	106
5.4.5 DE-ISOLATION OF CONFIRMED TB CASES	107
5.4.6 MANAGEMENT OF PATIENTS WITH PRESUMPTIVE OR CONFIRMED TB IN OPERATING THEATRES AND	
BRONCHOSCOPY SUITES	107
5.4.7 DECONTAMINATION OF ISOLATION ROOMS FOLLOWING OCCUPATION BY A CONFIRMED TB CASE	108
5.4.8 PATIENTS WITH CONFIRMED TB REQUIRING HOSPITALISATION AFTER COMMENCING TB TREATMENT	
5.4.9 NON-TUBERCULOUS MYCOBACTERIAL INFECTIONS	108
5.4.10 CONTACT TRACING IN HOSPITALS	108
5.5 PERSONAL PROTECTIVE EQUIPMENT (PPE) REQUIREMENTS	109
5.5.1 SURGICAL MASKS	109
5.5.2 P2/N95 MASKS	110
5.5.3 POWERED-AIR PURIFYING RESPIRATORS	110
5.6 TRANSMISSION-BASED PRECAUTIONS IN ORAL HEALTH SETTINGS (146)	110

5 Transmission-based precautions

“Since the infecting agent often is not known at the time of admission to a healthcare facility, Transmission-Based Precautions are used empirically, according to the clinical syndrome and the likely etiologic agents at the time, and then modified when the pathogen is identified or a transmissible infectious etiology is ruled out.”

Siegel et al, 2007 (3)

ESTABLISH THE CONTEXT

IDENTIFY INFECTION RISKS

ASSESS THE RISK OF INFECTION

CONTROL THE RISK OF INFECTION

REVIEW EFFECTIVENESS OF CONTROL MEASURES

Transmission-based precautions should be used when standard precautions alone are insufficient to interrupt the transmission of a microorganism. **Transmission-based precautions are to be applied in addition to standard precautions.** There are three types of transmission-based precautions, tailored to the different forms of transmission:

- Contact precautions;
- Droplet precautions; and
- Airborne precautions.

To support the requirements of transmission-based precautions, a HO is responsible for providing its staff, patients and visitors with hand hygiene opportunities and recommended PPE. The HO should also provide suitable accommodation and patient care equipment and ensure that health workers (HWs) are trained in the use of PPE and patient care equipment. If an infectious disease is suspected, HWs should apply appropriate transmission-based precautions as soon as possible and maintain these precautions until a definitive diagnosis (including pathology results) has ruled out the possibility of an infectious disease or until effective treatment has been commenced and continued for the appropriate period of time.

[NSQHS – Version 2 3.5](#)

[Section 4](#)
Risk Mitigation: Standard
Precautions

[Work Health and Safety
Regulation 2011](#)

HWs should be aware that there will be, however, certain instances where it may not be possible to identify all patients for whom contact, droplet and airborne precautions are required. For example, the risk of a transmission may be present before symptomatic illness is observed or a definitive diagnosis can be made (126, 127).

Emerging and novel pathogens require enhanced precautions, management and escalation to control and contain during the investigative period until prevention and control recommendations are understood.

Any triaging of patients suspected of an infectious disease should occur in a manner that prevents contamination of the environment and transmission in waiting rooms.

Patients suspected of having a communicable/infectious disease should be moved from public waiting rooms to a single patient accommodation or cohort area while awaiting treatment. If transfer or transport of the patient is required, transferring/transport agency should be informed of the transmission-based precautions on booking.

Visitors to patients with highly communicable diseases should be restricted and each HO should address the need for visitor restrictions.

At a minimum (12):

- Visitors are encouraged to practise hand hygiene. Visitors are not routinely required to don PPE, unless exposure to body substance is anticipated.
- Any visitor attending a patient in Transmission based precautions are to be advised that they should not subsequently visit any other patient in the hospital during the same visit; and
- Parents should be advised to refrain from taking infants in to visit patients who are being cared for in Transmission based precautions.

If variation from these requirements is necessary, the local infection prevention and control unit should be consulted prior to the visit.

[NSW Health GL](#)

NSW Contingency Plan for
Viral Haemorrhagic Fevers

[WHO](#)

Haemorrhagic fevers, Viral
[Centers for Disease](#)

[Control and Prevention](#)

Viral Haemorrhagic Fevers

[NSQHS – Version 2](#)
[Standard 3](#)

[NSQHS – Version 2](#)
[Standard 3](#)

5.1 Contact precautions

Contact precautions, when used with standard precautions, are designed to reduce the risk of transmission of microorganisms by direct and/or indirect contact. Perform a risk assessment based on patients' communicability or risk of organism dispersal that can lead to high risk of contamination and subsequent spread of organisms to patients, HWs and others.

Contact precautions should be considered for patients colonised or infected with a multidrug-resistant organism (MRO) where there is significant patient and/or environmental contact (32).

Assessment of the patient's risk factors that potentially contribute to the spread of organisms in addition to local epidemiology will guide clinicians to whether patients require contact precautions with isolation, cohorting or management using standard precautions (128).

Conditions that potentially increase the risk of organism dispersal includes:

- diarrhoea, incontinence or uncontained wounds (wet patients). These patients may need contact precautions in a single room, dedicated toilet where single rooms not available, appropriate PPE based on the type of care you are providing.

Conditions with a low risk of organism dispersal includes;

- continent, contained wounds (dry patients) standard precautions may be appropriate.

Local epidemiology should be considered when deciding on how these organisms may be managed at local facilities.

[Section 1.2.1](#)

Contact Transmission
Routes

Specific requirements for contact precautions (high risk patients):

- Preferably, patients should be placed in a single room with ensuite bathroom. If not possible, patients could be cohorted with patients infected or colonised with the same microorganism and have access to a designated bathroom. The decision to cohort should be done in conjunction with the local infection prevention and control team.
- HWs to conduct a risk assessment on the requirement on type of PPE based on the episode care and anticipated contact with the patient and patient zone. All staff must risk assess before entering the patient care zone and deciding on application on appropriate PPE (128).
- If the care involves body substance contact based on individual risk assessment an apron/gown should be donned to protect HWs uniform/personal clothing. PPE should be applied based on anticipated level of contact with the patient and or their environment
- Facial and eye protection should be selected according to standard precautions.
- HWs must perform hand hygiene, put on an impervious apron/gown on entering the patient zone based on anticipated contact with body substance.
- The gloves are always the last PPE item to apply. They are put on inside the room directly before having contact with the patient where exposure to body substances is anticipated and after hand hygiene is performed (129).
- Compliance with hand hygiene inside the patient care zone must continue regardless of glove use.
- For high consequence diseases (e.g. Viral haemorrhagic fever (VHF), Middle East respiratory syndrome (MERS) and emerging infectious diseases contact precautions and application of

PPE may differ according to the risk of transmission and may require to be applied before entering the isolation or biocontainment area.

- Certain situations may require contact precautions to be maintained for the duration of the illness because there may not be treatment available.
- Depending on the microorganism, terminal cleaning with a disinfectant may be required.
- Use [contact precautions](#) signage at entrance of patient's zone to alert/inform HWs on patient status.
- Reusable shared patient equipment must be cleaned and disinfected in between use regardless of patients MRO status.
- Computer on wheels/workstation on wheels should only be accessed by clean hands. These items must be cleaned in between use. Establish a work process to manage these items (mitigate contamination risk) if taken into isolation rooms. Where work processes cannot be established these items should not be taken into these rooms.
- A risk assessment should be performed on the decision to transport patients on their own with a specific infectious disease. If not possible, cohort with patients infected or colonised with the same microorganism. If that is not possible either, ensure that physical separation of patients can be achieved in the transport vehicle. Physical separation is ensured when patients can neither touch each other nor common environmental surfaces. Educate patients on the importance of hand hygiene.

Figure 3 Contact Precautions

Contact precautions consist of:
Before entering room
Perform hand hygiene
Perform a risk assessment on the need for apron/gown i.e. type of patient contact or contact with body substance, type of MRO (i.e. new or emerging), patient status (wet or dry)
After entering room
Perform hand hygiene
Perform a risk assessment on the need for gloves i.e. contact with body substance
Change or remove glove (if worn) and perform hand hygiene in between dirty and clean task
On leaving
Remove and dispose gloves (if worn)
Perform hand hygiene
Dispose apron/gown (if worn)
Perform hand hygiene
Clean shared equipment (if used) and perform hand hygiene
Remember
When transporting patient outside of the room remove PPE and perform hand hygiene, as above, after placing patient on trolley/stretchers/wheelchair
Use patient-dedicated or single-use non-critical patient-care equipment
Use a single-patient room or, if unavailable, cohorting patients with the same strain of MRO in designated patient-care areas (upon approval from the healthcare facility's Infection prevention and Control Team)
Ensure consistent cleaning and disinfection of surfaces in close proximity to the patient and those likely to be touched by the patient and healthcare workers.

Adapted from (128)

Naomi is a 25 year old woman who presented to the local hospital's maternity unit with labour pain. Information regarding her medical history, antenatal care, previous pregnancies and birth was gathered and the midwife reviewed Naomi's file.

*During a recent antenatal assessment Naomi disclosed that she had some boils under her arm that were quite painful and have not healed. The midwife noted that an axillae swab taken during this previous visit returned positive for methicillin-resistant *Staphylococcus aureus* (MRSA). The midwife explained that MRSA can be acquired by either your own intrinsic factors or contact with someone with MRSA or MRSA-contaminated items and surfaces. The midwife also explained to Naomi that to reduce the risk of transferring MRSA to other patients, she will be nursed where possible in isolation and that any HW in direct contact with her will be wearing gowns/apron, and gloves if they need to do procedures or they are in contact with her body fluids. The importance of personal hand hygiene for patients, visitors and when caring for her baby is explained to Naomi and the midwife gives her an information factsheet about MRSA. The midwife also informs Naomi that an infection prevention and control nurse can be called to answer any further questions for her or her family. She then continues her assessment adhering to contact precautions. The midwife also arranges for a medical consult to review Naomi's MRSA treatment options.*

Naomi's labour progressed and a baby boy was delivered via vaginal birth later that day.

What happened?

Upon transfer to the post-natal ward, Naomi was placed in a single room with a contact precautions sign on the door. Her son was not placed in the nursery but shared the room with her. Naomi followed the advice of her healthcare team and used ABHR before and after contact with her baby and regularly throughout her stay. She was also compliant with hand hygiene before leaving the room during her admission so as not to spread the bacteria further within the hospital. Naomi's medical consult provided some treatment options and a recommendation for GP follow-up after discharge.

What is the lesson to be learnt?

The timely identification and risk assessment of Naomi's MRSA facilitated control and containment eliminating risk of transmission to others. Compliance with hand hygiene and transmission based precautions reduces the further risk of transmission. Naomi's healthcare team initiated early information-sharing on how to manage MRSA at home with her baby and her partner when discharged, and discussed options for treatment. Provision of an information sheet for patient and family for future reference.

5.1 Contact precautions in specific settings

5.1.1 Neonatology Units:

Neonates, especially premature neonates are extremely vulnerable to infections, whether by vertical transmission or healthcare acquired infection. HWs need to be aware of appropriate interventions to minimise the possibility of cross transmission and infections. The process detailed throughout this document equally applies to these settings. Unit should comply with restrictions and exclusions based on the disease and cross transmission/communicability risk. Refer to Infectious disease table in Section 11 Outbreak management.

5.1.2 Community-based settings:

Contact precautions for the management of MRO colonised or infected patients may not be indicated based on the associated reduced risk of transmission in this environment.

[Section 7](#)

Risk mitigation: precautions for multi-resistant organisms and *Clostridium difficile*

5.2 Droplet precautions

Droplet precautions should be employed in addition to standard precautions when caring for any patient known to be or suspected of being infected with a microorganism that can be transmitted by the respiratory droplet transmission route.

[Section 1.2.2](#)

Droplet transmission route

Specific requirements for droplet precautions are:

Preferentially, the patient should be placed in a single room with ensuite bathroom. If not possible, the patient should be cohorted with patients infected or colonised with same microorganism and have access to a designated bathroom (130).

Maintain a spatial separation of greater than 2.4 m between bed central lines in cohorted patients (2, 3) or draw bed curtains between patients to impede the direct spread of droplets and space beds at least 2.4m apart (127).

HWs are to wear a disposable fluid repellent level 1 or level 2 surgical mask (see table 13). Masks should be removed and disposed of on leaving the patient's zone (e.g. at the door, curtain or the anteroom) and perform hand hygiene (131).

Protective eyewear (goggles or face shield) is to be worn as part of standard precautions if working within 2m of the patient

[Australasian Health Facility Guidelines](#)

Part B - Health Facility Briefing and Planning - Inpatient Accommodation Unit

[AS 4381:2015](#)

Single use surgical face mask standard

If a patient who is being cared for under droplet precautions requires an aerosol generating procedure (AGP), this procedure should be undertaken in a dedicated treatment room away from other patients. If aerosol generating-procedures are anticipated, a P2/N95 mask should be worn by attending HWs. Protective eyewear should be worn as part of standard precautions.

- Transfer or transport of patient on their own or with patients infected or colonised with same microorganism.
- If clinically able, patient should wear surgical mask when outside of the usual patient zone (including outpatient and emergency settings) (130, 132-134). Refer to [Section 5.5.1, surgical masks](#).
- Depending on the microorganism, disinfection may be required in addition to cleaning.
- Visitors are recommended to wear a surgical mask if within 1m of patient and practice hand hygiene.
- Use [droplet precautions](#) signage at entrance of patient's zone.

Given that droplets do not remain suspended in the air, special air handling and ventilation is not required under droplet precautions.

Table 14. AS 4381: 2015 Single use surgical face mask standard

AS 4381:2015 SINGLE USE FACE MASK				
Characteristics	Level 1	Level 2	Level 3	Test method
	APPLICATIONS: For general purpose medical procedures, where the wearer is not at risk of blood or bodily fluid splash or to protect staff and/or the patient from droplet exposure to microorganisms (e.g. patient with upper respiratory tract infection visits GP)	APPLICATIONS: For use in emergency departments, dentistry, changing dressings on small or healing wounds where minimal blood droplet exposure may possibly occur (e.g. endoscopy procedures)	APPLICATIONS: For all surgical procedures, major trauma first aid or in any area where the health care worker is at risk of blood or bodily fluid splash (e.g. orthopaedic, cardiovascular procedures)	
	Level 1 barrier Medical face mask materials are evaluated for resistance to penetration by synthetic blood at the minimum velocity specified in row 2, bacterial filtration efficiency and differential pressure.	Level 2 barrier Medical face mask materials are evaluated for resistance to penetration by synthetic blood at the middle velocity specified in row 2, bacterial filtration efficiency and differential pressure.	Level 3 barrier Medical face mask materials are evaluated for resistance to penetration by synthetic blood at the maximum velocity specified in row 2, bacterial filtration efficiency and differential pressure.	
Bacterial Filtration Efficiency (BFE) %	≥ 95%	≥ 98%	≥ 98%	ASTM F2101-14 or EN 14683:2014
Particulate Filtration Efficiency (PFE) % (0.1 µm)	< 4.0	< 5.0	< 5.0	EN 14683:2014
Resistance to penetration by synthetic blood (fluid resistance) min pressure in mm Hg for pass result	80mm Hg	120mm Hg	160mm Hg	ASTM F1862 / F1862M-13 or ISO 22609

Extracted from AS 4381: 2015 Single use surgical face mask standard

5.3 Airborne precautions

Airborne precautions are designed to interrupt the airborne transmission route. Airborne precautions should be employed in addition to standard precautions when caring for patients who are known or suspected to be infected with a microorganism that can be transmitted by the airborne route.

[Section 1.2.3](#)
Airborne Transmission Routes

Specific requirements for airborne precautions are:

- The patient should be placed in a negatively pressurised single room with ensuite bathroom.
- If isolation in a negative pressure room is not available, place the patient in a single room where the door should be closed at all times.
 - Without a central ventilation system, opening the door may cause aerosols to move out of the room and into any adjacent areas, opening a window where able may assist in aerosol control and improve the air exchange reducing this risk. This option is only advised usually in non-conventional settings
 - Where the patient is not in a negative pressure isolation room, the patient should have access to an ensuite or designated bathroom.
- HWs are to wear a P2/N95 mask (section 5.4.2) on entering the patient's zone. P2/N95 masks require a proper seal to the face and all HWs are to be instructed on fit check of a P2/N95 mask. Masks should be removed and disposed in the anteroom or outside the patient's room.
- Visitors are recommended to wear a surgical mask. P2/N95 respirators may be an alternative, but must be accompanied with training and fit checking by a HW. P2/N95 mask requires a proper seal to the face and instruction should be given on how to perform a fit check. This should include a demonstration of donning, removing and disposing of PPE in addition to hand hygiene.
- Visitors with chronic respiratory, cardiac, or other medical conditions that make breathing difficult should check with their healthcare provider before using a P2/N95 respirator because the P2/N95 respirator can make it more difficult for the wearer to breathe (135).
- Consideration should be given to limit visitation for those visitors requiring high levels of protection.
- Patients in airborne precautions are to be transported or transferred on their own
- If the patient can tolerate wearing a surgical mask, this should be worn when outside of the isolation zone (including transport, outpatient and emergency settings) (130, 132-134). Refer to [Section 5.4.1](#). Patients on oxygen therapy are to change to nasal prongs and have a surgical mask over the top of the nasal prongs for transport (if medical condition allows). P2/N95 mask is not recommended for patient use.
- Depending on the microorganism, disinfection may be required in addition to cleaning.
- Use [airborne precautions](#) signage at entrance of patient's zone. If aerosol-generating procedures are to be performed in a suitable environment
- Ensure all HWs involved in the procedure have performed a fit check of their P2/N95 masks.
- Protective eyewear should be worn as part of standard precautions
- The standard minimum air changes per hour for a negative pressure room is ≥ 12 which requires a period of 35 minutes for 99.9% air removal between room occupancy (refer table 15).
- P2/N95 mask should be worn by all HWs entering these rooms until terminal cleaning is completed and the time period has lapsed (136).
- Adequate time must be allowed after patient discharge or transfer for removal of at least 99% of airborne contaminants(137). This time period will vary; depending on the amount of air exhausted from the room, room air mixing, and the size of the room (see table below)

Table 15. Reference guide - Air changes per hour (ACH) and time required for removal efficiencies of airborne contaminants

ACH §	Time (mins.) required for 99% efficiency	Time (mins.) required for 99.9% efficiency
2	138	207
4	69	104
6+	46	69
8	35	52
10+	28	41
12+	23	35
15+	18	28
20	14	21
50	6	8

Note: + Denotes frequently cited ACH for patient-care areas

§ Values were derived from the formula: $t_2 - t_1 = - [\ln (C_2 / C_1) / (Q / V)] \times 60$, with $t_1 = 0$

t_1 = initial time point in minutes

t_2 = final time point in minutes

C_1 = initial concentration of contaminant

C_2 = final concentration of contaminant

$C_2 / C_1 = 1 - (\text{removal efficiency} / 100)$

Q = air flow rate in cubic feet/hour

V = room volume in cubic feet

Q / V = ACH

[Adapted from CDC Guidelines for Environmental Infection Control in Health-Care Facilities \(2003\)](#)

5.3.1

Airborne precautions in specific settings

Requirements for airborne precautions in specific settings are detailed below:

- If a sputum-inducing procedure is being performed, such as sputum induction, chest physiotherapy or bronchoscopy, then all HWs in the room should don P2/N95 masks and use standard precautions, including protective eyewear.
- Sputum inducing procedures should be performed in a Type 5/Class N (respiratory isolation) room (or sputum induction booth). The patient should be left in the Type 5/Class N room or booth until coughing subsides. Other patients and staff not wearing P2/N95 mask should not enter the Type 5/Class N room or booth until enough time has passed for a sufficient number of air exchanges to occur for adequate removal of contaminated air (Table 5.3.1 for ACH). Consult with facility engineers to determine the air changes per hour for each room/booth.
- Type 5/Class N air handling requirements provide negative pressure relative to the corridor and adjacent areas. Ideally (and for all new buildings), air from Type 5/Class N rooms should not be reticulated via, or to, any other ventilation system, i.e. it should be a single pass system. The discharge points should be located as far as possible from air-intakes, persons and animals.

[NSW Health GL](#)

Tuberculosis - Sputum Induction Guidelines

[HB 260-2003c](#)

Hospital acquired infections - Engineering down the risk

[Australasian Health Facility Guidelines](#)

Part D Infection Control

- Where existing facilities do not allow external exhausting, air that is to be recirculated should be directed through high efficiency particulate air (HEPA) filters.
- The door to the room must remain closed at all times.
- For Type 5/Class N rooms, air change rates greater than or equal to twelve changes per hour with a minimum of two air changes per hour of outside air, whichever results in the greater air quantity, should be achievable when the filters have reached their maximum pressure drop.

Case study 9 - Mathew's story - It's all about the timing!

A 42 year old gentleman, Mathew, presented to the emergency department at 1000 hrs with fever, cough and rash; he had been unwell for 5 days. On examination he had a fever of 38.9°C, a rash to his face and trunk with some vesicles on his arms, and signs of bilateral pneumonia. He was commenced on IV antibiotics for pneumonia. A note was made in the medical record that the rash may be viral and that this was to be investigated. After being in the emergency department for 8 hours, Mathew was transferred to a 4 bed room on the medical unit. The next day (Day 2) the doctor documented a possible diagnosis of chickenpox but was awaiting laboratory confirmation. Nursing staff noted the entry and waited for the laboratory result.

At 1200 hrs on Day 3 Infection Prevention and Control was notified of a positive Varicella Zoster Virus (VZV) polymerase chain reaction (PCR) result for Mathew; this was the first notification to Infection Control regarding this patient. IPC immediately contacted the medical ward to determine what precautions were in place and to provide direction for what was needed. The ward's NUM reported that Mathew had been in a 4 bed room with standard precautions. IPC advised that Mathew needed to be managed using contact and airborne precautions. IPC undertook a risk assessment to identify patient, visitor and HW contacts and follow up was required in both the emergency department and in the medical ward.

What happened?

Chickenpox is a highly infectious virus that is transmitted by contact and airborne routes. Because the appropriate transmission-based precautions were not implemented at the time of suspicion, on Day 1 after examination, many patients and HWs were exposed to the chickenpox virus. Patients, visitors and HWs who had been in the same room as Mathew for at least 1 hour (138), in the emergency department or medical ward, had to be checked for their chickenpox immunity. Patients who were not immune and remained in hospital had to be accommodated in a single room with negative pressure during the period of incubation, day 10 after exposure to day 21.

How could it have been prevented?

The presence of fever and a vesicular rash is grounds for suspicion of chickenpox (Varicella) or disseminated shingles (VZV). Had triage or other HWs caring for Matthew recognised a vesicular rash and transmission based precautions (contact and airborne precautions) had been implemented when a viral cause was suspected, there would have only been a small number of patients and HWs exposed in the emergency department. Had the triage recognised the presence of a rash and fever as trigger to implement precautions until a complete diagnosis was made, Mathew would have had a surgical mask put on and moved immediately to a single room? HWs would then have commenced contact and airborne precautions from the initial consult. Had the doctor on Day 2 or the medical ward nursing staff notified IPC when a possible diagnosis of chickenpox was made, and implemented appropriate precautions that would have prevented at least 24 hours of exposure to patients, visitors and HWs?

5.4 Management of patients presumptive or confirmed infectious Tuberculosis (TB) in healthcare settings ⁽¹³⁹⁾

Mycobacterium tuberculosis (MTB) is the infectious pathogen that causes tuberculosis (TB) disease. Each year, there are over 500 cases of active TB diagnosed in New South Wales (140).

TB most commonly affects the lungs, referred to as pulmonary TB, but can also affect other organs or systems, referred to as extra-pulmonary TB. Lymph node TB is the second most common site of disease. Pulmonary TB and TB of the larynx (voice box) should be assumed to be infectious. Extra-pulmonary TB is generally non-infectious, assuming that concurrent pulmonary involvement has been actively excluded.

TB is transmitted via airborne particles expelled when a person with infectious pulmonary TB coughs, sneezes, sings, or otherwise forcibly exhales. High risk diagnostic procedures include coughing to produce a sputum specimen, or having an induced sputum sample collected or bronchoscopy performed. There is also a risk of aerosolisation of TB bacilli during surgical procedures involving diseased tissue, abscess drainage or wound irrigation.

Airborne droplet nuclei remain suspended in the air for prolonged periods and can be inhaled by another person. The risk is increased in settings with poor ventilation. Once inhaled, the droplet nuclei can lodge in the lung and cause TB infection, which may progress to active disease at a later time point.

[NSW Health PD](#)

Principles for the Management of Tuberculosis in New South Wales

[NSW Health GL](#)

Tuberculosis Contact Investigations

5.4.1 TB infection without active TB disease

People with TB infection, diagnosed by a tuberculin skin test (TST) or blood test (IGRA or QuantiFERON TB Gold®) should be assessed for signs and symptoms of active TB disease and a plain chest X-ray ordered to exclude TB disease. People with TB infection (without active disease) are not infectious and pose no infection risk to others.

In the circumstance where a person with TB infection without active TB disease requires care in a healthcare setting, there is no indication to isolate or otherwise implement infection control precautions.

5.4.2 Infection control precautions for people with presumptive active TB disease

The time prior to diagnosis is particularly important for TB infection control – transmission of TB is much more likely when the diagnosis is not considered, or where appropriate precautions have not been implemented from the beginning of people's encounter with the healthcare system.

The diagnosis of TB should be considered by healthcare workers assessing patients with respiratory symptoms who present with radiographic features consistent with TB (such as pulmonary cavities or upper zone lung infiltrates), especially if they have risk factors for TB (including birth in, or travel to, countries with a high incidence of TB). Prompt isolation of patients with presumed active TB disease in Emergency Department settings is an important administrative strategy to reduce hospital transmission of TB.

People with presumptive pulmonary TB should be asked to wear a surgical mask until an appropriate isolation room is available. Patients are not required to wear a mask whilst in appropriate isolation rooms. For their own protection, visitors and carers should wear a properly fitted P2/N95 mask whilst in the room – see [Section 5.5.2 P2/N95 Masks](#).

People with presumptive or confirmed pulmonary TB should be taught appropriate cough etiquette – see Section 4.2 [NSW Health Respiratory Hygiene poster](#)

People with presumptive extra-pulmonary TB should be assumed to also have pulmonary involvement until this has been excluded, and should be isolated accordingly.

5.4.3 De-isolation of presumptive TB cases where the diagnosis has been excluded or are considered highly unlikely (141).

People with presumptive TB may be removed from isolation (either in hospital or at home) when infectious TB disease is considered clinically unlikely, and one or more of the following criteria are met (142):

- The patient has had at least two (2) expectorated and/or induced sputum specimens (collected during the one procedure) assessed and/or one (1) bronchial lavage specimen which have all been found to be negative on Acid Fast Bacilli (AFB) smear and PCR negative (N.B. PCR tests for *Mycobacterium tuberculosis* should be requested on at least one sample), AND/OR
- An alternative diagnosis has been established.

The decision to de-isolate a patient should be documented in the clinical record.

5.4.4 Infection control precautions for people with confirmed TB

An infectious risk assessment should be conducted using clinical, laboratory and radiological findings to inform the isolation precautions needed, whether in hospital or in the local community (143, 144).

Unless there are clinical or public health concerns, all patients with a confirmed diagnosis of active TB disease should be considered for isolation and management in their home, as long as the home situation is assessed as appropriate in consultation with the local TB Coordinator, i.e.

- There are no children under 5 years of age or immunocompromised adults living in the household, or, if there are, they have been commenced on TB preventive therapy;
- The local TB service has the capacity to deliver or coordinate the required care and treatment and monitor the patients' progress in the local community.

When admission to hospital is deemed necessary, the following guidelines should inform the level of airborne precautions to be implemented:

- TB patients with AFB positive sputum or bronchial washings/ lavage smears, laryngeal involvement and/or cavitating lesions on chest X-ray are considered highly infectious. If hospitalised, these patients should be managed in airborne precautions in a negative pressure room (if available in the facility) or, at a minimum, in airborne precautions in a single room with the door closed. These patients should not be co-located with other patients until deemed no longer infectious.
- TB patients with negative AFB sputum smears, but who have a positive sputum or bronchial washings/lavage PCR and/or a positive culture for *M. tuberculosis* are moderately infectious, and may still carry a substantial risk of TB transmission. If hospitalised, these patients should be managed in airborne precautions in a negative pressure room (if available in the facility) or in a single room with the door closed and should not be co-located with other patients until deemed no longer infectious (145).

- Patients with extra-pulmonary TB require airborne precautions when:
 - infectious pulmonary involvement has not been actively excluded (clear chest x-ray; at least 2 negative sputum AFB smears and negative PCR if the chest x-ray is abnormal); or
 - a procedure is being performed that may result in aerosolisation of infected tissue is possible e.g. surgery to drain/debride abscesses caused by *M. tuberculosis* or irrigation of wounds (e.g. a tuberculous peri-anal abscess, scrofula)

Patients in isolation may leave their room for short periods of time as long as they wear a surgical mask covering both nose and mouth. Examples are: to attend investigations in other departments, to go for a walk or go outside.

If the clinical condition of an inpatient has recovered sufficiently, the option of discharge to 'home isolation' should be considered, in consultation with the local TB Coordinator/ TB Service. The least restrictive form of isolation is preferred, to reduce negative psychological consequences of isolation for the patient.

5.4.5 De-isolation of confirmed TB cases

For patients with confirmed pulmonary TB that are in isolation in hospital or in the community, decisions regarding de-isolation should be guided by the following:

- there is no indication of drug resistance to the prescribed treatment; AND
- the patient is adherent to and tolerant of the prescribed treatment; AND
- effective treatment* has been given for two weeks or more; AND
- clinical improvement is observed, or the patient continues to be asymptomatic; AND
- there is evidence of a mycobacteriological response to treatment (i.e. if the patient was initially smear positive, a reduction in the quantity of acid fast bacilli visualised on subsequent smear microscopy)

* Effective treatment is defined as a course of anti-tuberculosis medications appropriate for the drug susceptibility profile (if available) and site of disease that results in a clinical response.

Patients with confirmed extra-pulmonary TB disease are not considered infectious and airborne precautions can be discontinued once:

- Pulmonary TB has been actively excluded by a clear chest x-ray (or at least 2 negative sputum smears for AFB and a negative PCR if the chest x-ray is abnormal); and
- Procedures involving aerosolisation of infected tissue (e.g. surgery to drain/debride abscesses or irrigation of wounds) are not required / no longer being performed.

The decision to de-isolate a patient should be documented in the clinical record.

5.4.6 Management of patients with presumptive or confirmed TB in operating theatres and bronchoscopy suites

Where possible, patients with presumptive or confirmed TB should be scheduled last on a procedure list and the room decontaminated before next use – see below.

5.4.7 Decontamination of isolation rooms following occupation by a confirmed TB case

Isolation rooms may be used by an infectious TB patient, then the patient transferred to another isolation room, e.g. isolated in ED, then transferred to a ward or discharged to home isolation.

The time that the room should be left empty to ensure all pathogens are no longer airborne is determined by the exhaust system in the room, referred to as the air changes per hour (ACH).

Please check with your local Engineering Department to confirm the ACH for the isolation room in question.

[See Table 5.3.1. For US CDC recommended guidelines on room decontamination.](#)

5.4.8 Patients with confirmed TB requiring hospitalisation after commencing TB treatment

It is not uncommon for patients recently commenced on TB treatment to require hospitalisation due to an adverse drug reaction or other complication.

Where TB treatment is interrupted for prolonged periods (e.g. due to adverse drug reaction), a patient's infectivity can recur.

Whether to isolate a patient with TB on treatment requiring hospitalisation is determined in consultation with the treating TB physician, with reference to the above de-isolation criteria.

5.4.9 Non-tuberculous mycobacterial infections

Non-tuberculous mycobacteria (NTM) are not transmissible from person to person in most circumstances. However, there is emerging evidence regarding the transmission of *Mycobacterium abscessus complex* between patients with Cystic Fibrosis (CF). Infection control requirements for CF patients with *M. abscessus complex* should be determined by local experts involved in CF care and Infection Prevention and Control Units.

5.4.10 Contact tracing in hospitals

Contact tracing in hospitals should be undertaken in accordance with the [NSW Health Tuberculosis Contact Investigation Guidelines](#) or subsequent iterations.

Healthcare facilities should ensure that roles and responsibilities between themselves and the local TB Coordinator / TB Services are clearly defined in regards to contact identification and screening following a TB exposure within the facility.

The role and responsibilities of the healthcare facility is to determine:

- the position or unit designated with the responsibility to collate a list of contacts of the TB case including staff, patients and visitors;
- a mechanism to assess and screen staff who were contacts of a TB case during the course of their employment – this may be via the staff health unit or the local TB Service;
- the position or unit designated with the responsibility to document the outcomes of TB screening for individual staff as per the [NSW Health Policy Directive Occupational Assessment, Screening and Vaccination Against Specified Infectious Diseases](#) or subsequent iterations.

The role and responsibilities of the local TB Service include:

- being the designated contact for notification of confirmed TB cases;
- notifying Hospital Executive, the local Public Health Unit and NSW TB Program as indicated in the [NSW Health Tuberculosis Contact Investigation Guidelines](#) or subsequent iterations
- risk assessing identified contacts and determining risk categories;
- coordinating the assessment and screening of identified high-risk contacts and other lower-risk contacts as appropriate; and
- documenting and reporting the outcomes of a contact screening investigation.

5.5 Personal Protective Equipment (PPE) requirements

Surgical and P2/N95 masks are to be used in accordance with manufacturer's IFU and local procedures. HWs should perform a risk assessment prior to the healthcare interaction expected with their patient before deciding on what PPE they should be donning. The choice of impervious apron or gown depends on the degree of risk, including the anticipated degree of contact with infectious material, mode of transmission and the potential for body substances to contaminate your clothes. HWs should rationalise the need for gloves by performing their own risk assessment of each care activity.

Considerations when using a Surgical or P2/N95 mask include:

- masks should not be touched while being worn
- masks should be changed when they become moist
- masks should never be reapplied after they have been removed
- masks should not be left hanging around the neck; and
- hand hygiene should be performed upon touching or disposing of a used mask

5.5.1 Surgical masks

HWs should wear a fluid resistant surgical mask within the operating room or during aseptic procedures, such as lumbar punctures, intra-articular joints, injections or insertion of a central line, as part of standard precautions. However, in transmission-based precautions the surgical mask is used to:

- (i) Protect the wearer against transmission of disease
- (ii) Protect others in the environment from the patient's infection. If a patient is clinically able to do so, the patient under droplet or airborne precautions should wear surgical masks if outside of their patient zone. If a patient is being cared for under droplet or airborne precautions and requires oxygen therapy, nasal prongs should be used and a surgical mask should be worn over the top of the nasal prongs during any patient transport (if the medical condition allows).

[AS 4381:2015](#)

Single use face masks for use in healthcare

HWs should still wear correct facial protection even if a patient is wearing a surgical or oxygen mask.

Note that surgical masks are also known as procedural masks in some settings.

5.5.2 P2/N95 masks

HWs are to wear a P2/N95 mask when airborne precautions are required and if aerosol generating procedures are anticipated. Protective eyewear should be worn as part of standard precautions.

Fit testing is a complex process that provides an opportunity for HWs to correctly identify which size and style is suitable for them and allows them to be trained in the correct use of the mask.

HWs are to perform a fit check each time a P2/N95 mask is used and prior to undertaking any clinical activity in which a P2/N95 mask is required. Fit checks ensure that the mask is sealed over the bridge of the nose and mouth and that there are no gaps in the seal between the mask and the face. HOs are to ensure that all HWs are informed how to perform a fit check.

The procedure for conducting a fit check is (1):

1. Place mask on the face;
2. Place the headband or ties over the head and at the base of the neck;
3. Compress the mask against the face to ensure a seal across the bridge of the nose;
4. Compress the mask to ensure a seal across the cheeks and the face; and
5. Check the negative pressure seal of the mask by gently inhaling. If the mask is not drawn in towards the face, or air leaks around the face seal, readjust the mask and repeat process or check for defects in the mask or review the correct size of the P2 /N95 mask

HWs who have facial hair (including a ≤ 2 -day beard growth) should be made aware that an adequate seal cannot be guaranteed between the P2/N95 mask and the wearer's face.

[AS/NZS 1716:2012](#)

Respiratory protective devices

5.5.3 Powered-air purifying respirators

A HO is only to provide HWs with powered-air purifying respirator devices that comply with the relevant Australian Standards. The HO is to ensure use of these devices is limited to HWs who are trained in their use, have maintained their skills and that manufacturer's instructions for cleaning, decontamination and maintenance are followed. These devices may be suitable for HWs with facial hair (1).

[AS/NZS 1715:2009](#)

Selection, use and maintenance of respiratory protective equipment

[AS/NZS 1716:2012](#)

Respiratory protective devices

5.6 Transmission-based precautions in oral health settings ⁽¹⁴⁶⁾

Compliance with standard precautions, including hand hygiene, cleaning of shared equipment and the patient zone after each patient, and disposal or reprocessing of instruments after each procedure, will reduce the transmission of infections and multidrug-resistant organisms. The HO should ensure that patients and carers have access to hand hygiene resources and are enabled to clean their hands before and after appointments.

Contact precautions

If a patient discloses a history of a transmissible infection or colonisation that can be spread by the contact route it is not necessary to place a '[Contact Precautions](#)' sign on the door in an ambulatory or day-surgery oral health facility. Single-use personal protective equipment, cleaning of shared equipment, environmental cleaning and hand hygiene should be practiced

Droplet precautions

Routine oral health treatment should be deferred until the patient is no longer coughing or sneezing and can breathe easily. This will minimise the need for exercising droplet precautions and will also reduce patient discomfort and the risk of intra-oral injury from sharp instruments.

If a patient requires *urgent* dental care and droplet precautions are necessary, a risk assessment is to be undertaken and documented.

Airborne precautions

Routine oral health treatment should be deferred until airborne precautions are no longer required.

If a patient requires *urgent* dental care and airborne precautions are necessary, a risk assessment is to be undertaken and documented. If the procedure is to go ahead on the basis of the risk assessment, the following should be adhered to:

- If possible, schedule patient at the end of the day
- Attend to patient in a single room with the door closed and, if available, negative-pressure ventilation
- HWs to wear a P2/N95 mask before they enter the room and until they leave the room
- HWs who are considered protected from vaccine preventable communicable diseases e.g. measles and VZV (see [Section 2.5](#), *Staff health and HAI risk*) are to provide care for patients with these disease.
- Use of pre-procedural mouth rinses and rubber dams will limit the spread of aerosol.