6. Infection Prevention and Control

The extent and duration of measures required to prevent and control TB infection, depends upon the estimated degree of infectiousness of the patient, the response to treatment, the nature of the activities undertaken, and who will be exposed to the patient in the course of those activities.

Risk factors for acquiring TB infection

The risk of acquiring TB is determined by a number of factors such as the degree of infectiousness of the source patient or the presence of predisposing medical conditions in contacts e.g. HIV infection, diabetes, alcoholism, drug addiction, immunosuppression and renal failure. The following features in the source case have been shown to increase the risk of infection:

- Close contact with the source case (section 8.5)
- Duration of contact (the longer the contact the greater the risk)
- Sputum smear positive
- Presence of a productive cough
- Delay in diagnosis
- Open TB lesions requiring irrigation
- Institutional contact with the source case (prisons, nursing homes, shelters, etc).

6.1 Classification of Risk of Procedures in Healthcare

HCWs are at risk of infection depending on their contact with patients and the clinical procedures undertaken during care. These procedures have been categorised into high, medium and low risk activities.

High risk

- Cough inducing procedures (including sputum induction and bronchoscopy)
- Autopsy
- Pathology examination
- Bronchoscopy
- Designated TB laboratory procedures especially handling cultures of TB

Medium Risk

Staff whose work entails regular contact with the patient (e.g. nursing, physiotherapy, nursing attendants, cleaning staff, catering staff)

Low risk

Staff with minimal patient contact (e.g. administration, maintenance).

6.2 Definition of an Infectious TB Case

Patients aged 10 years and over with suspected or confirmed pulmonary or laryngeal TB should be considered infectious if any of the following are present **and** if they are not receiving therapy, have just started therapy or have a poor response to therapy[77;227-229]

- Are coughing
- Are undergoing sputum inducing procedures
- Have cavitations on chest X-ray
- Are sputum AFB smear positive
- Have suspected laryngeal involvement (i.e. hoarseness)

BAL AFB smear positive **if** any of the following are present:

- Cavitations on chest X-ray
- Suspected or confirmed MDR-TB
- Admitted to a ward or living with immunosuppressed*** individuals.

The determination of infectivity of all other BAL smear positive patients should be considered on a case-by-case basis (clinical/microbiology/public health input).

Most children aged less than 10 years with suspected or confirmed TB are not infectious (chapter 8) however, they should be considered infectious if any of the following are present:[77]

- Cavitations on chest X-ray
- Sputum smear positive (not BAL or gastric washings positive)
- Suspected laryngeal involvement
- Extensive pulmonary infection
- Congenital TB and undergoing procedures involving oropharyngeal airway.

In addition, patients with extrapulmonary TB in an open abscess or lesion should be considered infectious when aerosolisation of drainage fluid occurs.

When a patient with suspected or confirmed infectious TB is receiving healthcare, appropriate infection, prevention and control must be followed to protect employees and other patients from infection.

The effective prevention and control of TB relies on:

Administrative aspects

Implementation of Standard and Airborne Precautions.

6.3 Administrative Aspects

Administrative aspects of the prevention and control of TB comprise early investigation, diagnosis and treatment by:

- A high level of suspicion amongst clinical teams and GPs
- Local procedures and guidelines for the management of TB in acute hospitals and community care areas
- Staff education and training on current guidelines and procedures
- Informing the infection prevention and control team promptly of all suspected and confirmed cases of TB
- Collaboration between laboratory, microbiological and clinical teams to ensure rapid testing of specimens for acid–fast bacilli (AFB).

6.4 Standard Precautions

Standard precautions are defined as follows:[230]

Standard precautions are a set of work practices that require all HCWs to assume that all blood, body fluids (except sweat), excretions and secretions from all patients in all settings are potential sources of infection.

***Immunosuppressed is defined as either due to disease or therapies e.g. HIV, individuals receiving >15mg prednisone or equivalent for more than four week or other immunosuppressive agents for cancer, chemotherapeutic agents, anti-rejection drugs for organ transplantation and TNF-α antagonists or as defined by the attending consultant.

Implementation of standard precautions constitutes the primary strategy for the prevention of healthcare associated transmission of infectious agents among patients and healthcare personnel. [230] Full details of standard precautions are available in appendix 10.[230]

Standard precautions include the following work practices and measures:

- Occupational health programme
- Hand hygiene
- Personal protective equipment
- Management of spillages of blood and body fluids
- Appropriate patient placement
- Management of sharps
- Management of needle stick injuries and exposure to blood and body fluids
- Management of waste and laundry
- Safe injection practices
- Respiratory hygiene and cough etiquette
- Appropriate decontamination of reusable medical equipment
- Appropriate decontamination of the environment.

Certain transmissible infections require additional control measures to standard precautions to effectively prevent transmission. Infectious pulmonary and laryngeal TB require airborne precautions in addition to standard precautions.

6.5 Airborne Precautions

Full details of Airborne Precautions are available in appendix 10.[230]

The following section outlines the elements of Airborne Precautions and how they apply to the management of a suspected or confirmed infectious TB case.

Patient placement

Isolation rooms with ventilation

Specially engineered rooms have been designed to limit the spread of certain transmissible infections that are transmitted via air such as TB. Two designs are suitable for Airborne Precautions:

1. **Negative pressure isolation room with an ante room.** This room has an air handling unit which ensures that the air in the room remains at negative pressure to the ante room and the hospital environment
2. **Neutral pressure design** as detailed in HBN 04 Supplement 1.[231]

Air changes per room

It is recommended that a minimum of six air changes per hour (ACH) is required for the protection of staff and visitors however, in new buildings 12 ACHs are advised.[129; 232-234]

Isolation rooms can be designed for negative pressure use only but some may have an air handling unit that can be switched from negative pressure to positive pressure depending on infection control requirements. These dual action rooms have been implicated in outbreaks when the incorrect air pressure was selected for a specific infection or patient. This design should not be used in new builds or refurbishments.

Monitoring of ventilation system

Airborne isolation rooms should be monitored continuously by the pressure differential between the room and the surrounding ward. The monitoring system should alert staff of any failure.[235]

There should be:

- Standard operating procedures (SOPs) in place for changing the air handling settings at ward level (if applicable)
- SOPs in place for documenting the daily checks on the monitoring system at ward level
- Regular engineering checks on the number of air changes and air direction (smoke tests) to ensure compliance with best practice [234;235]
- Regular training for staff in their use
- Changing of HEPA filters as directed by manufacturers' instructions (if applicable).

More detailed information regarding the operation of these rooms is available in the UK Department of Health's document on "*The prevention and control of tuberculosis in the United Kingdom: UK guidance on the prevention and control of transmission of 1. HIV-related tuberculosis 2. drug-resistant, including multiple drug-resistant, tuberculosis, 1998*", "*Hospital and community acquired infection and the built environment-design and testing of infection control rooms. Journal of Hospital Infection* 2007 published by Walker *et al* and HBN 04 Supplement 1. [231;234;235]

The design of airborne isolation rooms planned for new buildings or major refurbishments should be based on the neutral pressure design, as detailed in HBN 04 Supplement 1 rather than a "switchable" negative/ positive pressure design.[236]

It is important to note that no ventilation system will function correctly if the doors or windows are open.

Sputum induction and aerosol-generating procedures

- **Sputum induction** is used to obtain sputum when patients are unable to expectorate a specimen. The procedure uses sterile water or hypertonic saline to irritate the airway, increase secretions, promote coughing, and produce a specimen. It is also recommended for children as a preferred option to gastric washings.[26] Sputum induction is classified as a high-risk procedure when performed on a person with suspected or known infectious TB.[26;229] There is a consensus in international best practice guidelines that sputum induction should only be performed in an airborne isolation room or if no such room is available a ventilated booth from which air is exhausted outside or HEPA filtered.[30;229] The committee agrees with this. These booths or local exhaust ventilation (LEV) systems must be maintained and regularly monitored to ensure they are working satisfactorily.
- **Aerosol-generating procedures** such as the administration of medications by nebuliser on suspected or confirmed cases of TB must be avoided in an open bay or in an unventilated area in all wards/departments. Treatment of an extrapulmonary TB open abscess or lesion where aerosolisation of drainage fluid may occur should only be undertaken in an airborne isolation room.

Current international guidelines

There are differing recommendations in the current international best practice guidelines on the type of rooms suitable for patients with infectious TB. The CDC guidelines[229] recommend that all suspected and confirmed TB cases be treated in negative pressure rooms while the NICE guidelines[26] advise a that negative pressure room is only required for suspected or confirmed MDR-TB cases. The NICE guidelines further advise that while single rooms without specific ventilation systems can be used for non-MDR-TB patients no immunosuppressed patients should be on the ward.

Recommendation:

Patients with known or suspected pulmonary or laryngeal TB should be admitted to an airborne isolation room (negative pressure isolation room with an ante room or a neutral pressure design as outlined in HBN 04 supplement 1). Hospitals need to have a risk assessment process to ensure the appropriate provision of isolation facilities (see figure 6.1).

Availability of isolation rooms

A study in 2003 reported that only 14% of Irish hospitals had an isolation room suitable for Airborne Precautions.[237] While the available number of rooms may have increased with recent new builds and refurbishments in Irish hospitals, it is likely that some hospitals have an insufficient number of isolation rooms with a ventilation system to isolate all known or suspected infectious TB cases.

Hospitals should prioritise the building of airborne isolation rooms. New buildings or major renovations in acute general hospitals should have a minimum of one airborne isolation room to 150 beds or one to 75 beds for regional/tertiary hospitals. Critical care and accident and emergency units should have at least one airborne isolation room.[236]

Risk assessment for all confirmed or suspected pulmonary or laryngeal TB cases. [26]

Recommendation:

All patients with suspected or known pulmonary or laryngeal TB must have a risk assessment for MDR-TB.

Risk factors for MDR-TB include the following:

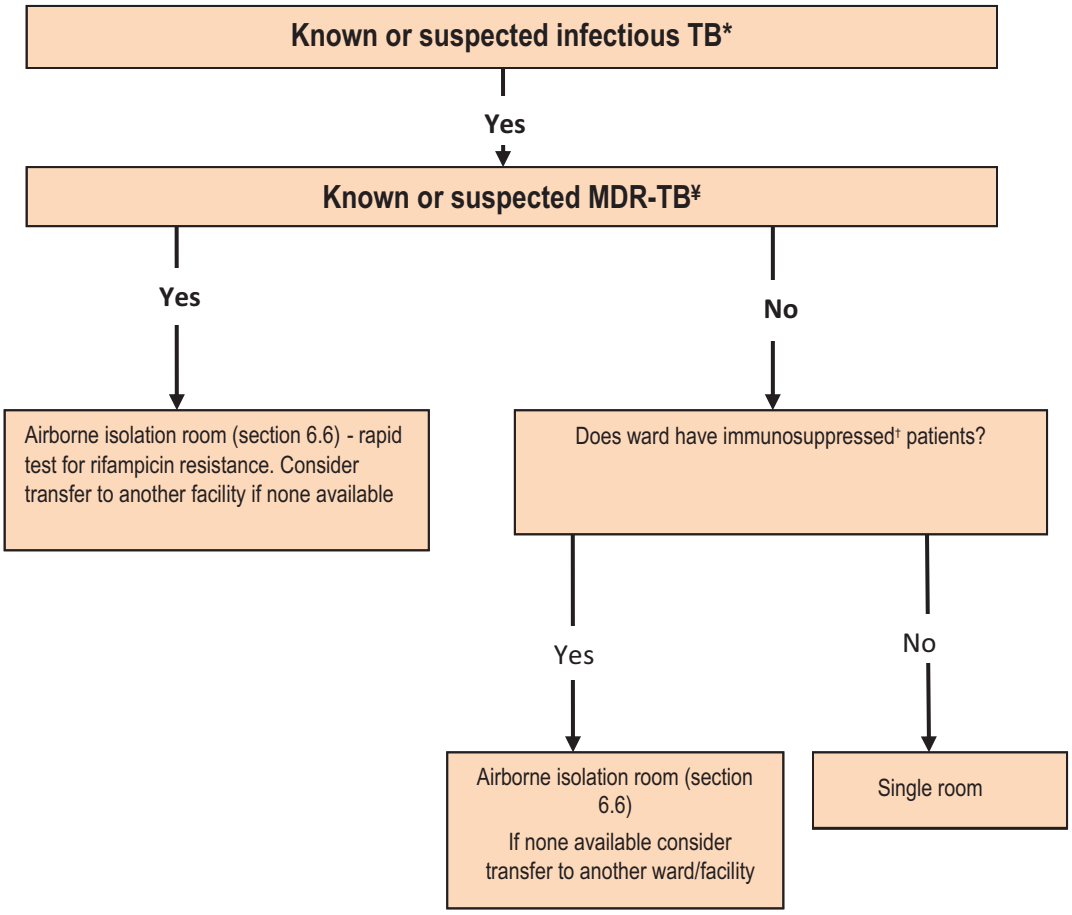
- A history of prior TB treatment (especially incomplete treatment) and/or prior TB treatment failure
- Contact with a known case of MDR-TB
- Birth in a foreign country, particular a high incidence country for MDR-TB (Lithuania, Estonia, Latvia, Uzbekistan, Kazakhstan, China (Henan & Liaoning provinces) Tomsk Oblast (Russian Federation) and Ecuador) (refer to www.who.int/tb/publications/mdr_surveillance/en/index.html for latest information on countries with high incidence of MDR-TB)
- HIV infection

Recommendation:

Patients with suspected or confirmed MDR-TB must be admitted to an airborne isolation room (negative pressure isolation room with an ante room or a neutral pressure design as outlined in HBN 04 supplement 1). (This may require transferring the patient to another institution where the facilities, together with a physician experienced in the management of complex drug-resistant cases are available).

See figure 6.1 for risk assessment for patient placement if a sufficient number of airborne isolation rooms are not available.

Figure 6.1: Patient placement for pulmonary or laryngeal TB if a sufficient number of airborne isolation rooms (section 6.6) are not available



***Definition of an infectious case**
> 10 years of age
Coughing, undergoing sputum inducing procedures, cavitations on CXR, sputum smear positive, suspected laryngeal involvement, extrapulmonary TB in an abscess or lesion if aerosolisation of drainage fluid occurs. Bal AFB positive if any of the following is present: Cavitations on CXR, suspected or confirmed MDR-TB, admitted to a ward or living with immunosuppressed individuals.
< 10 years of age
Cavitations on CXR, sputum smear positive (not BAL or gastric washings) suspected laryngeal involvement, extensive pulmonary infection, congenital TB & undergoing procedures involving oropharyngeal airway, extrapulmonary TB in an abscess or lesion if aerosolisation of drainage fluid occurs.

¥Risk factors for MDR-TB
A history of prior TB treatment (especially incomplete treatment) and/or prior TB treatment failure.
Contact with a known case. Birth in a foreign country, particular a high incidence country for MDR-TB (Lithuania, Estonia, Latvia, Uzbekistan, Kazakhstan, China (Henan & Liaoning provinces) Tomsk Oblast (Russian Federation) & Ecuador) (refer to www.int/tb/publications/mdr_surveillance/en/index.html for latest information on countries with high incidence of MDR-TB).

†Immunosuppressed is defined as either due to disease or therapies e.g. HIV, individuals receiving >15mg prednisone or equivalent for more than four week or other immunosuppressive agents for cancer, chemotherapeutic agents, anti-rejection drugs for organ transplantation and TNF-α antagonists or as defined by the attending consultant.

Patients with HIV

A HIV positive patient with suspected or confirmed pulmonary or laryngeal TB must be placed in an airborne isolation room. HIV positive or other immunosuppressed individuals should not be exposed to possible or confirmed infectious TB cases. In wards with HIV positive patients all aerosol-producing procedures (e.g. sputum induction) regardless of whether a diagnosis of TB has been considered or not should be conducted in airborne isolation rooms.[26]

Emergency departments
Emergency departments (ED) without airborne isolation rooms must have a process in place to prioritise transfer of suspected or confirmed pulmonary or laryngeal TB cases to an appropriate room. ED with no single or isolation rooms should place a surgical mask on the patient and place him/her in an examination room while awaiting transfer. This room should be left vacant for at least one hour after the patient is transferred to allow for a full exchange of air.[230]

Bronchoscopy departments
Bronchoscopy should preferably be performed in an appropriate negative pressure suite with adequate ventilation. Unnecessary staff and other patients should be excluded during the procedure. If endoscopy rooms are without air handling equipment, a bronchoscopy procedure on a patient with suspected or confirmed laryngeal or pulmonary TB should be undertaken at the end of the list for the day, or in the patient's room. Avoid placement of recovering patients in a multi-bedded ward. Bronchoscopy for other clinical reasons on a confirmed TB case should be delayed if possible until the patient has had three sputum smear negative samples.

Autopsy
It has been estimated that the risk of TB in mortuary workers is 100-200 times more than the general population.[238] Recommendations to reduce the risk of infection are detailed in good practice guidelines from the Royal College of Pathology, 2003.[239]

Laboratory
See chapter 4 for infection control precautions in the laboratory.

Use of personal protective equipment
In addition to the use of personal protective equipment (PPE) as outlined in Standard Precautions (see appendix 10), respiratory protection is advised for HCWs when Airborne Precautions are applied.

Health care workers
Exposure of HCWs to TB should be minimised by reducing the number involved in the direct care of an infectious case. Recommendations for the use of respiratory protective equipment vary from country to country. The NICE guidelines[26] recommend that healthcare staff do not need to use respiratory protection unless MDR-TB is suspected or for cough-inducing procedures such as bronchoscopy and sputum induction. Where MDR-TB is suspected or known they recommend that staff and visitors use FFP3 masks or equivalent. The NICE guidelines also recommend that patients while infectious should wear a surgical mask when they are outside their room, for example visiting the X-ray department. In New Zealand and Canada, N95 (equivalent to European FFP2) masks are recommended when caring for patients with known or suspected infectious pulmonary TB.[30;52] In the USA, the N95 mask is recommended as the minimum standard for respiratory protection in areas where patients with suspected or confirmed infectious TB might be encountered. A higher level of protection should be considered where the risk for exposure to *M. tuberculosis* is especially high e.g. cough inducing procedures.[230]

Respiratory masks are only effective if there is a tight seal to the wearer's face. Fit testing is a method for checking that the mask matches the person's facial features and seals adequately to the wearer's face. A good seal is only possible when the wearer is clean shaven. Fit testing will also help to ensure that incorrectly fitting respiratory masks are not selected for use. [240]

A respiratory protection programme for staff advised to wear respiratory masks should be provided by each healthcare facility to ensure compliance with the following health and safety legislation and standard:
- Safety, Health and Welfare at Work Act, 2005
- Safety, Health and Welfare at Work (General Application) Regulations 2007 (S.I. No. 299 of 2007). Chapter 3 of Part 2: Personal Protective Equipment
- Safety, Health and Welfare at Work (Biological Agents) Regulations 1994 (S.I. No. 146 of 1994) (as amended by S.I. 248 of 1998)
- IS EN 529:2005 (Irish Standard on Respiratory Protective Devices).

The respiratory protection programme should include the following;

Governance
- Identify department responsible to deliver the respiratory protection programme
- Identify personnel responsible for the implementation of the respiratory protection programme
- Allocation of resources to deliver the programme
- Selection, purchase and supply of suitable masks to each healthcare facility
- Storage of equipment
- Maintenance of equipment
- Disposal of used equipment
- Record keeping.

Theoretical information, training and instruction including:
- Types of risk
- Knowledge and understanding of respiratory equipment including limitations
- Personal factors including medical conditions, improper fitting
- Fit testing and fit checking.

Practical training
- An initial fit test using qualitative method
- Ongoing check fitting to confirm the seal each time the mask is donned
- Donning, removing and disposing of masks.

FFP2 or FFP3 respiratory masks are unsuitable for HCWs with facial hair as it affects the seal between the mask and the face. Beards, sideburns or even a visible growth of stubble will affect the face seal of such masks which rely on close contact between the face and the mask.

For HCWs where the removal of facial hair is not possible, an employer must look at the provision of suitable respiratory equipment which does not rely on a good face seal for protection e.g. powered/air-supplied hoods. Otherwise, redeployment may be required as an employer cannot ensure the safety of personnel.

Recommendation:

A respiratory protection programme for staff advised to wear respiratory masks should be provided by each healthcare facility.

HCWs (including HCWs visiting a patient in their own home) should wear FFP2 masks when caring for patients with suspected or confirmed infectious TB where MDR-TB or XDR-TB is not suspected. These patients are usually non-infectious after a minimum of two weeks treatment. The supervising clinician should be consulted before the use of masks is discontinued (section 6.7).

HCWs should wear FFP3 masks when undertaking cough-inducing procedures on all patients (fully susceptible and resistant strains included) e.g. sputum induction, bronchoscopy, administration of aerosolised medications, airway suctioning, endotracheal intubation, caring for patients on mechanical ventilation and during treatment of lesions/abscesses when aerosolisation of drainage fluid is anticipated.

HCWs (including HCWs visiting a patient in their own home) should wear FFP3 masks when caring for patients with suspected or confirmed infectious MDR-TB or XDR-TB. The supervising clinician should be consulted before the use of masks is discontinued (section 6.7).

A respiratory protection programme should be provided for all HCWs who may be required to use respiratory masks during the course of their work. HCWs should be fit tested by a trained professional as part of this programme. All HCWs should fit check each time a mask is donned.

Patients

CDC and NICE guidelines advise that patients with suspected TB when not in an isolation room should wear surgical masks to reduce the expulsion of droplet nuclei into the air. Respirators masks (FFP2/3) are designed to filter the air before it is inhaled by the person wearing the mask. In addition, correctly wearing respiratory masks increases respiratory effort which can be difficult for a patient already compromised. In line with this, the recommendation of the National TB Advisory Committee is as follows:

Recommendation:

Patients should wear a surgical mask while they are infectious, when they are outside their room, for example visiting the X-ray/OPD department.

Removal of PPE

Remove PPE in the following sequence:

1. Gloves
2. Apron/gown
3. Decontaminate hands
4. Eye wear
5. Respiratory mask – (handle with the straps of the mask to avoid touching the front)
6. Decontaminate hands.

Gloves, apron/gown are removed in the room. Mask and eyewear are removed outside the room.

In addition:

- Discard PPE that is contaminated with blood or body fluids from patients with known or suspected infection in healthcare risk waste
- Discard respiratory masks in healthcare risk waste
- Gloves, aprons/gowns and eye wear are not required for Airborne Precautions but are required to be worn if contact with blood or body fluid is anticipated as per Standard Precautions (appendix 10).

Patient transportation

Limit the movement and transport of the patient to essential purposes only. If transport or movement is necessary, staff should ensure that precautions are maintained to minimise the risk of transmission to other patients and the contamination of environmental surfaces or equipment.

Transfer of patients with suspected or confirmed infectious TB

International best practice guidance on respiratory protection required for HCWs when transferring a patient with suspected or confirmed TB is not consistent. Guidance from the Public Health Agency of Canada and the Bureau of TB control in New York recommend that HCWs wear the equivalent of FFP2 masks during transfer.[30 77] CDC recommends that FFP2 or equivalent masks are only required for transfer if the patient is unable or unwilling to wear a surgical mask.[230] The newly published Scottish guidelines do not specifically address transfer however, do advise the use of FFP3 masks if intensive nursing is required leading to close contact (equivalent to household contact) for a cumulative total of eight hours or more. [241]

The following actions are recommended prior to patient transfer:

- The transferring facility should inform transport personnel (emergency medical technicians, porters) and the receiving department/facility of the need for Airborne Precautions
- Prior to accepting a patient with known or suspected TB, it is the responsibility of the receiving facility to ensure compliance with facilities as described above under patient placement
- Remove contaminated apron/gown/gloves (if worn) and mask and dispose prior to transporting patients. Staff do not need to wear FFP2/FFP3 mask during internal hospital transportation unless the patient is unable to wear a surgical mask (e.g. confused, respiratory distress)
- Ambulance staff should consider the use of FFP2 or FFP3 mask in the following situations: (a) the patient is unable or unwilling to wear a surgical mask; (b) it is anticipated that the duration of the journey will be ≥ 8 hours (≥ 4 hours if HCW is immunocompromised) and (c) if the patient has either MDR-or XDR-TB (consult infection prevention and control team in this situation)
- Request the patient to wear a surgical mask which should be changed when heavily contaminated and/or wet or if torn. Educate on cough etiquette and ensure patient has a supply of tissues
- Don FFP2 or FFP3 mask prior to handling the patient at the transport destination (e.g. X-ray, bronchoscopy suite)
- Transport equipment (stretcher, bed, wheelchair) used to transport the patient should be cleaned and disinfected using a disinfectant with 1,000ppm of available chlorine if contaminated with sputum/respiratory secretions.

Patients and visitors

To preserve privacy and confidentiality, restricting visiting to immediate family should be discussed with the patient.

Each hospital should have a system in place to alert visitors to check with ward nursing staff regarding hand hygiene and other requirements before and after visiting a patient with TB.

Patients with TB and their visitors/carers should be given information on the following;

- Preventing transmission of TB
- Medications used to treat TB and the importance of compliance with the treatment plan
- The range and need for appropriate infection prevention and control precautions
- Hand hygiene
- How to don/remove masks.

6.6 Discontinuation of Airborne Precautions

Discontinue Airborne Precautions, if MDR-TB is not suspected or confirmed, when all of the criteria (1-3) below are met:[26;77]

1. On standard multi-drug therapy for a minimum of two weeks
2. Clinical symptoms are improving
3. Three consecutive (properly performed) negative sputum smear examinations collected over 48 to 72 hours of which at least one should be an early morning sample. Patients unable to produce sputum i.e. no productive cough should be discussed with clinical and infection prevention and control teams.

See figure 6.2 for criteria for discharge from hospital.

Patients who are on standard multidrug therapy for TB and remain hospitalised after Airborne Precautions have been discontinued should have sputum tested for AFB smear every one to two weeks.[77]

Discontinue Airborne Precautions for suspected or confirmed MDR-TB when all of the following criteria (1-3) are met:[30]

1. Three consecutive sputum samples are smear and culture negative after six weeks incubation
2. Current treatment with anti-TB regimen to which the strain is known or likely to be susceptible
3. Clinical symptoms are improving/resolving.

See figure 6.2 for criteria for discharge from hospital.

Discontinue Airborne Precautions for suspected or confirmed XDR-TB when:

- Patients with XDR-TB should remain in airborne isolation for the duration of their hospital stay.[30] Such patients should not be discharged to home until three consecutive sputum samples are smear and culture negative after six weeks incubation.

Discontinue Airborne Precautions for suspected cases when TB is ruled out if:

- Three sputum samples are negative for AFB taken on separate days or an alternative diagnosis is made that accounts for respiratory symptoms (e.g. cancer, pneumonia).

If no alternative diagnosis is made such patients should not be admitted to an open ward with immunosuppressed patients until culture negative confirmed.

6.7 Discharging Patients with TB from Hospital

MDR-TB not suspected or confirmed

Patients who are confirmed with infectious TB (but MDR-TB is not suspected or confirmed) can be discharged home in most situations from hospital while still sputum AFB positive when the following criteria are met:

1. Commenced on standard multidrug anti-TB therapy
2. Clinical symptoms are improving
3. Can be discharged to a stable residence at a verified address
4. Is willing and able to observe risk reduction activities e.g. respiratory hygiene, cough etiquette and follow discharge instructions (see appendix 11)
5. Is willing and able to follow up with DOT if necessary (see appendix 9 for HSE South (Cork and Kerry) DOT referral form)
6. Arrangements are in place for outpatient clinic review.

These patients should not be discharged to following situations unless they fulfill criteria 7 and 8 below in addition to criteria 1 to 6 above:

- Congregate setting (nursing or care home, prison, etc.)
- Living with immunosuppressed* individuals

*Immunosuppressed is defined as either due to disease or therapies e.g. HIV, individuals receiving >15mg prednisone or equivalent for more than four week or other immunosuppressive agents for cancer, chemotherapeutic agents, anti-rejection drugs for organ transplantation and TNF-α antagonists or as defined by the attending consultant.

- Living with children < five years of age who have not been evaluated by a public health physician for window period prophylaxis for LTBI
- Settings where the patient or a family member requires care from HCWs (home helps, nursing staff) for several hours a day

7. Completed at least two weeks of standard multi drug anti-TB treatment
8. Three consecutive sputum AFB negative samples taken at least 24 hours apart with at least one early morning specimen (if patient cannot produce sputum i.e. non-productive cough discuss with clinical, public health and infection prevention and control teams).[77]

MDR-TB suspected or confirmed

Patients who are confirmed or suspected with infectious MDR-TB should not be discharged home in most situations unless the following criteria (1-7) are met:

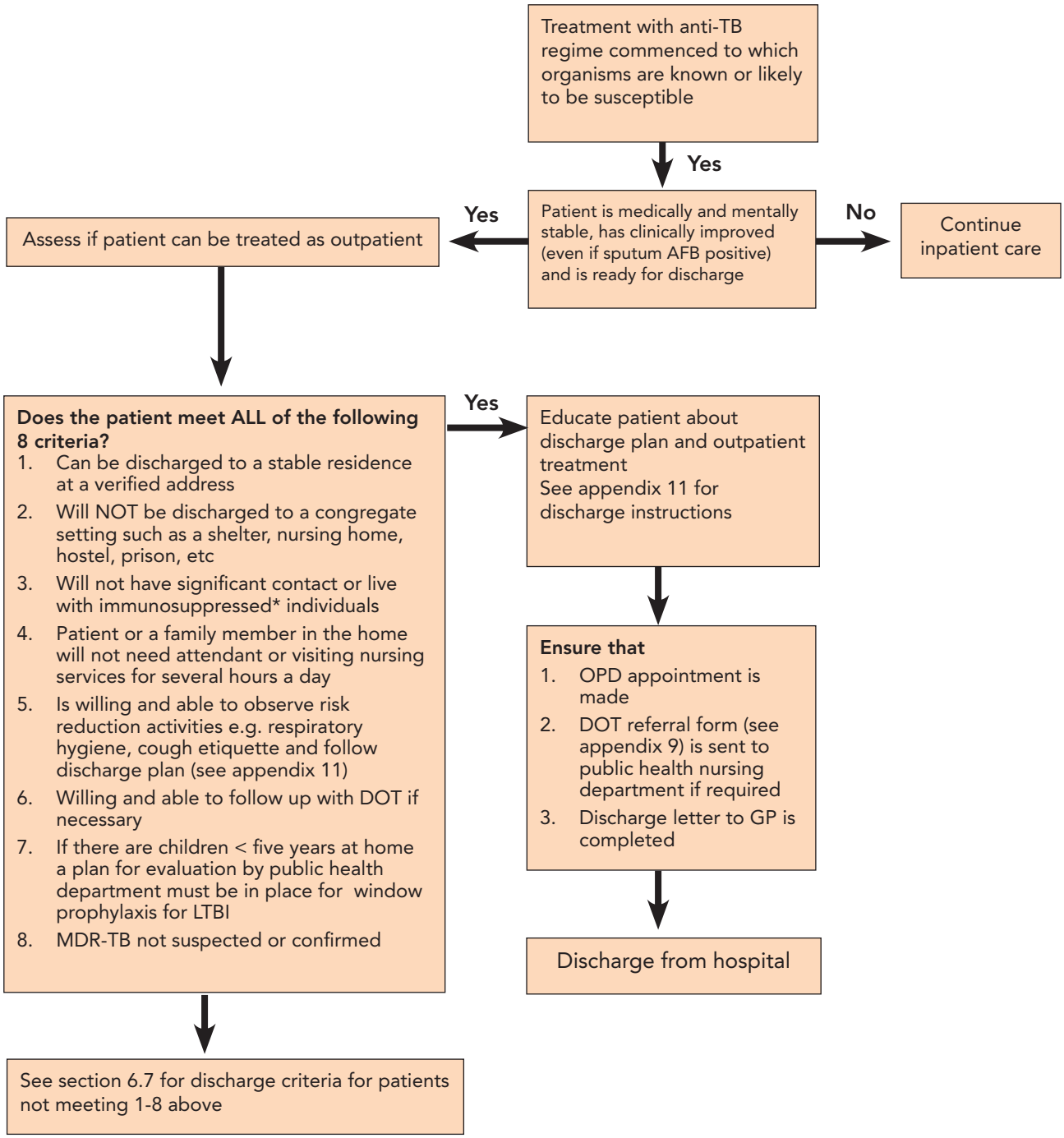
1. Clinical symptoms are improving
2. Current treatment with anti-TB regimen to which the strain is known or likely to be susceptible
3. Three consecutive sputum AFB negative samples taken at least 24 hours apart with at least one sample an early morning specimen (if patient cannot produce sputum i.e. no productive cough, discuss with clinical and infection prevention and control teams)
4. Can be discharged to a stable residence at a verified address
5. Is willing and able to observe risk reduction activities e.g. respiratory hygiene, cough etiquette and follow discharge instructions (see appendix 11)
6. Willing and able to follow up with DOT (see appendix 9)
7. Arrangements are in place for outpatient clinic review.

These patients should not be discharged to the following situations unless they fulfil criterion 8 below in addition to criteria 1-7 above:

- Congregate setting (hostel, nursing or care home, prison, etc.)
- Living with immunosuppressed individuals
- Living with children < five years of age who have not been evaluated by a public health physician for window period prophylaxis for LTBI
- Settings where the patient or a family member requires care from health care workers (home help, nursing staff) for several hours a day[77]

8. Three consecutive sputum samples are smear and culture negative after six weeks incubation. If patient cannot produce sputum i.e. does not have a productive cough, discuss with clinical, public health and infection prevention and control teams[30]

Figure 6.2: Criteria for discharging patients with suspected or confirmed infectious TB from a hospital



Adapted with kind permission from *Tuberculosis, Clinical Policies and Protocols*. New York City Department of Health and Mental Hygiene (2008). Available from www.nyc.gov/html/doh/downloads/pdf/tb/tb-protocol.pdf.

6.8 Education

Healthcare workers

There should be an ongoing education programme for HCWs that includes the following:

- Signs and symptoms of TB
- Definition of infectious TB
- Local guidelines and protocols for the management of TB
- Local incidence of TB
- Management of dual action, negative pressure ventilated rooms or neutral pressure design rooms

*Immunosuppressed is defined as either due to disease or therapies e.g. HIV, individuals receiving >15mg prednisone or equivalent for more than four week or other immunosuppressive agents for cancer, chemotherapeutic agents, anti-rejection drugs for organ transplantation and TNF-α antagonists or as defined by the attending consultant.

- Management of sputum induction to minimise risk to staff and other patients
- Reducing risk associated with immunosuppressed patients.

Education of patients/family/carers

See appendices 6 and 11 for patient information leaflet and hospital discharge leaflet. Some patients who are infectious can remain at home in the household that has already been exposed, as it has been shown that the risk of additional transmission of infection in this setting is extremely low.[52]

The infectious patient must be instructed to take the following precautions until advised by their doctor to return to normal activities:

- Stay at home and not go to work, school, public places or any other locations where there will be previously unexposed people until advised to do so by the treating clinician
- No visits by previously unexposed people
- No visits by children (young children living at home will be assessed by public health doctors regarding the need for LTBI window prophylaxis)
- Avoid visits by relatives or friends who are immunosuppressed
- Cover their mouth and nose with a tissue when sneezing or coughing.

The infectious patient must be educated regarding:

- Safe disposal of tissues and the importance of hand washing after coughing/sneezing
- Disease transmission and disease control
- The importance of compliance with medication
- Side-effects of anti-TB medication
- Contact tracing.