Government of **Western Australia**
Department of **Health**

Subject: **TUBERCULOSIS AND HEALTH CARE WORKERS**

Definitions

ACC	Anita Clayton Centre, (centre for the WA TB control program).
HCW	Health Care Worker. In this document, HCW refers to anyone who is an employee or student in health-related work
LTBI	Latent Tuberculosis Infection
TST	Tuberculin skin test
NTAC	National Tuberculosis Advisory Committee
PT	Preventive Treatment
QIFN	QuantiFERON-TB Gold In-Tube assay

Introduction

Tuberculosis (TB) is uncommon in Australia and rare in health care workers (HCWs). However, even in a low incidence setting, occasional exposure of HCWs is inevitable and there is reliable evidence demonstrating the increased risk of acquiring TB infection and disease among some HCWs[1,2]. In addition, the increasing numbers of HCWs being recruited from countries with high TB incidence means that there is an increased risk that these workers will have been infected with TB before arrival[3] and will subsequently develop active disease. Among HCWs notified with TB, the proportion born overseas increased from 50% (10 of 20 cases) in 2001 to 92.9% (26 of 28 cases) in 2007[4].

This document addresses the assessment for TB risk of students and employees in health-related work and recommends minimum precautions that health care facilities (both public and private) in Western Australia should undertake to minimise the risk of TB transmission within the health care system.

1. Pre-employment assessment

Rationale

a. HCWs may be exposed to TB in the course of their work. Baseline assessment of TB status is useful in the post-exposure assessment.
b. HCWs may have latent TB (LTBI), especially if they come from, or have worked in, high incidence countries, and are therefore at increased risk of developing active TB while working. This group should be considered for preventive therapy.
c. HCWs may have active tuberculosis.

Risk assessment

All employees of health facilities, or students undertaking tertiary education that involves clinical work, should be assessed for risk of TB prior to starting clinical work. This assessment determines which TB tests are required and what action should be taken if the tests are positive.

A suggested proforma for risk assessment is included (Appendix A). The recommended procedure for using this assessment to determine the tests required and action to be taken is summarised in an included algorithm (Appendix B).

Risk assessment involves three components:

i. History indicating risk for prior TB infection:

- country of birth;
- residence &/or work in a high incidence country for more than 6 months;
- past history of TB; and
- past history of contact with TB (work or personal).

ii. Predicted risk of future occupational exposure: the risk of TB exposure should be categorised according to an employee's likely contact with TB (Table 1).

Table 1: Predicted risk of future occupational exposure

High risk	Medium risk	Low risk
Staff with regular contact with patients with possible TB infection e.g. staff working in: – TB clinics, – Respiratory wards or emergency departments, – Microbiology laboratories dealing with TB specimens, – Bronchoscopy or sputum induction, – Post-mortem examinations, – Lung function testing.	Staff with regular contact with patients, none of whom are considered to be high risk.	Staff who do not have contact with patients (e.g. clerical, administrative, non-microbiological laboratory staff)

iii. Other useful information:

- previous Mantoux test results;
- previous BCG vaccination;
- medical history and medications that may compromise immune response; and
- residency status and, if temporary, expected duration of stay in Australia.

Screening test

If written documentation of a prior TB test (Mantoux or Quantiferon) is available, TB tests do not need to be repeated i.e. results from a prior employer are transferable to all subsequent workplaces. There is no time limit on this.

Screening tests for TB are indicated in the following health care workers:

- Persons assessed as low risk of prior TB exposure (Group 1 in Appendix A) **but** predicted risk for future exposure to TB is high or medium.

- All persons assessed at high risk of prior TB exposure (Group 2 in Appendix A) regardless of future occupational exposure

Individuals who are likely to have minimal or no contact with patients (low risk), and do not have any history indicating likely TB exposure, are **not** required to have any test.

There should be no financial impediment to HCWs undertaking TB screening or any necessary treatment. Institutions should consider providing these free of charge to employees and students.

The result of the test should be given in written form to the employee or student (see proforma in appendix A). A record of the pre-assessment and results of tests should be kept by each institution.

Which screening test for LTBI should be used?

The tests available for screening for latent TB infection (LTBI) in health care workers are the Mantoux or tuberculin skin test (TST) and the QuantiFERON TB-Gold In-Tube assay (QIFN). The National TB Advisory Committee (NTAC) recommends that TST be used as the primary test for LTBI[3], and that Interferon Gamma Release Assays, such as QIFN, be used only as supplementary tests in specified circumstances[5].

The preferred test of the WA Tuberculosis Control program is the TST. However, this policy recommends that either test can be used to screen for LTBI in HCWs. The choice of which test is used should be made by the institution conducting the screening. The advantages and disadvantages of the two tests are summarised below.

1. Tuberculin skin test (Mantoux test)

Advantages:

- Cutoffs for a positive result and conversion are well supported by research data; and
- Longitudinal data is available to validate the predictive value of results.

Disadvantages:

- Reduced specificity: cross reactions may occur, giving false positive results in subjects who have had prior BCG vaccination or who have had exposure to environmental mycobacteria;
- Requires 2 visits. Compliance with return visit to obtain the result is usually about 60%;
- Reduced sensitivity: co-morbidity or medication may render a subject anergic resulting in false negative results;
- Requires skilled practitioners that regularly administer and read the test;
- Booster effect: pre-employment TST can boost the result causing false positive conversion.

2. QuantiFERON-TB Gold Assay

Advantages:

- Convenience - a blood sample for QIFN testing can be taken at the same time as other blood sampling. This substantially improves compliance;
- Improved specificity: the test is minimally affected by previous BCG or sensitisation to non-tuberculous mycobacteria[6]. This is especially useful in low incidence populations (Group 1);
- Less inter-reader variability than with the TST[6];
- No boosting effect from previous QIFN testing[6,7]; and
- Results are recorded and easily retrieved from a results database such as iSoft.

Disadvantages:

- Lack of evidence supporting its use for HCW screening and follow up;
- Lack of longitudinal studies that inform us how the test performs over time, especially conversion from negative to positive;
- The problem of indeterminate tests has yet to be resolved[7];
- Uncertainty about the significance of threshold results (positive or negative results that are near the cutoff) and the phenomenon of "flip-flopping" (threshold results that change from positive to negative or vice-versa between two tests)[8]; and
- Time limitations: blood samples need to be collected and processed within limited time-frames. This can be a problem for samples collected outside the metropolitan area.

Provision of TST for Health Care Workers

The Anita Clayton Centre (ACC, centre for the TB Control Program) **does not** routinely provide pre-employment screening tests for HCWs or tertiary students. In certain circumstances the ACC can provide this screening, but this is only by prior arrangement with the TB Nurse Manager.

The ACC is available to train practitioners in the provision of TST testing. This training can be arranged through the TB Nurse Manager. Alternatively TST is available through some private pathology providers, or Regional Public Health Units.

General considerations:

- Informed consent must be obtained from the HCW.
- A record of the TST (including date of the test and the reading) must be kept, with a copy given to the HCW.
- TST should only be undertaken by appropriately trained health care providers**.**

Management of abnormal results

The procedure for management of abnormal screening results, including what further tests are indicated (e.g. chest x-ray) and whether preventive therapy is recommended, is summarised in the attached algorithm (Appendix B).

HCWs with a positive TST test, or a positive or indeterminate QIFN, require a chest x-ray and medical evaluation by, or in conjunction with, a medical practitioner experienced in TB management. The Western Australian TB Control Program, based at the Anita Clayton Centre, is available for management or advice. Alternative practitioners for medical evaluation are Infectious Disease Physicians, Respiratory Physicians or Public Health Physicians with expertise in TB.

2. Post-exposure follow-up

Follow up of staff is required when they have had significant exposure to a patient with TB. 'Significant' exposure should be assessed on a case by case basis, but can be defined as:

> 'Contact with an inpatient with sputum that is smear positive for pulmonary TB who has not been isolated or where a breach of TB isolation precautions has occurred'.

Significant contact includes:

- Contact on a single occasion or cumulatively, for ≥2 hours if close contact (direct care) or ≥5 hours if casual contact; and/or
- Contact involving a procedure that confers increased risk (e.g. sputum induction, bronchoscopy, post-mortem examination); and/or
- Contact where physical containment requirements in a microbiological laboratory are breached.

Post exposure follow up should include:

a) Informing the contact in writing of the possible exposure;
b) TB testing according to the test used for baseline testing. If a QIFN was done initially, a repeat QIFN should be done; if the baseline test was a TST, this should be repeated; and
c) If the TB test is positive (as compared to the baseline test), a chest x-ray should be done and the HCW should be referred to a medical practitioner experienced in TB management (as described above).

3. Routine follow-up tests

Repeat TB test or chest x-ray is generally not recommended as a routine. However, staff that are identified as being regularly exposed to infectious TB e.g. clinical staff having 'significant' exposure more than once in a calendar year, or staff working in mycobacteriology laboratories, should be offered routine checks. If the baseline screening test was negative, these employees should be offered an annual test, using the same test that was done as the baseline test. If the test was positive, then annual chest x-ray can be considered.

4. Active TB

A HCW suspected of or diagnosed with active TB should be urgently referred (appointment within 1 week) to a TB physician at the Anita Clayton Centre or a suitable alternative specialist for assessment and treatment. If possible, arrangements should be made for the individual to submit 3 sputum samples collected on consecutive days for TB culture.

In addition:

a) Informed consent must be obtained from the HCW to disclose details of the infection to the employer;
b) The diagnosing practitioner is required, under the Health Act, to notify the Communicable Disease Control Directorate
c) The HCW is to be excluded from the workplace, if diagnosed with pulmonary TB, until cleared by the medical supervisor nominated by the institution in consultation with a medical practitioner experienced in TB management; and

d) The HCW must complete a satisfactory course of treatment and follow up, with appropriate certification provided to the institution by the treating doctor.

5. BCG vaccination

BCG vaccination is not recommended for HCWs in Western Australia.

6. Responsibilities

Health care facilities
Health care facilities should:

a) Periodically review the Tuberculosis Infection Control Policy for the facility and ensure that all HCWs are updated on current policy on a regular basis;
b) Have protocols to ensure the rapid detection, isolation and treatment of patients with infectious TB;
c) Manage patients with known or suspected TB as outpatients wherever possible;
d) Have isolation rooms for patients with known or suspected infectious TB that require inpatient management. These rooms should have appropriate engineering controls including negative pressure ventilation separated from general air conditioning, and exhausted to the outside of the building. The ventilation of the rooms should achieve at least six air changes per hour;
e) Promptly transfer inpatients with known or suspected TB to a facility with an appropriate isolation room; if inpatient management is required, and isolation as described above is not available (the size or function of the facility may make the provision of such a room impractical). On rare occasions where immediate transfer is impractical, patients should at least be managed in a single room that is as isolated from other patients as is possible;
f) Supply appropriate personal respiratory protection (e.g. a close-fitting, one micron filter mask; regular surgical masks are inadequate) to staff dealing with patients with, or suspected to have, infectious TB. Such patients should also be educated to cover their mouth or nose when coughing or sneezing;
g) Maintain microbiological laboratory protocols that ensure minimal risk of transmission of TB from potentially infectious specimens[9];
h) Educate staff about TB appropriate to their work category. It should be emphasised that the most effective way to control TB is early detection and commencement of treatment; and
i) Exclude HCWs who are HIV positive, immune-compromised or pregnant from work in an environment with known or suspected infectious TB patients.

Health Care Worker (HCW)
The HCW should:

a) Comply with this policy and ensure maintenance of adequate infection control standards in the workplace; and
b) Present promptly for medical assessment at the onset of any signs or symptoms suspicious of TB.

Western Australian TB Control program
The Western Australian TB Control Program should:

a) Provide specific advice to the health care facility about pre-employment screening, post-exposure contact tracing and maintenance of infection control infrastructure and policy;
b) Provide training as required in TB infection control and HCW TB risk management. This includes training in TST if this is the screening test chosen by the institution; and

c) Provide a consultative service for review of HCWs with positive tests for LTBI or suspicion or evidence of active TB.

Any queries regarding these recommendations should be directed to:

Western Australian TB Control Program
Anita Clayton Centre
Suite 1, 311 Wellington St
Perth WA 6000
Tel: (08) 9222 8500
Fax: (08) 9222 8501

Regional Public Health Units
North Metropolitan Area Health Service Perth (08) 9380 7700
South Metropolitan Area health Service Perth (08) 9431 0200
Great Southern (08) 9842 7500
South West (08) 9781 2350
Kimberley (08) 9194 1630
Mid West (08) 9956 1985
Goldfields (08) 9080 8200
Wheatbelt (08) 9622 4320
Pilbara (08) 9172 8333

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DEPARTMENT OF HEALTH WA

This information is available in alternative formats upon a request from a person with a disability.

References

1. Stuart R, Bennett N, Forbes A, Grayson M. Assessing the risk of tuberculosis infection among healthcare workers: the Melbourne Mantoux Study Med J Aust. 2001;174:569-73.
2. Menzies D, Joshi R, Pai M. Risk of tuberculosis infection and disease associated with work in health care settings. Int J Tuberc Lung Dis. 2007;11:593-605.
3. National Tuberculosis Advisory Committee. Health care worker screening recommendations for tuberculosis prevention and control. 2007.
4. National Tuberculosis Advisory Committee. Tuberculosis notifications in Australia 2007.
5. National Tuberculosis Advisory Committee (2009). Position Statement on interferon gamma release immunoassays in the detection of latent tuberculosis infection. Department of Health and Ageing. Available at: http://www.health.gov.au/internet/main/publishing.nsf/Content/cdna-ntac-interferon.htm
6. Pai M, O'Brien R. New diagnostics for latent and active tuberculosis: state of the art and future prospects. Seminars in respiratory and critical care medicine. 2008;29:560-8.
7. Mazurek G, Jereb J, LoBue P, Iademarco M. Guidelines for using the QuantiFERON-TB Gold test for detecting mycobacterium tuberculosis infection, United States. Morb Mort Wkly Rep. 2005; 54:49-55.
8. Mazurek GH, Jereb J, Vernon A, LoBue P, Goldberg G and Castro K. Updated guidelines for using interferon gamma release assays to detect Mycobacterium tuberculosis infection – United States 2010. MMRW Recomm Rep 2010; 59(RR-5) 1-25.
9. National Tuberculosis Advisory Committee. Guidelines for Australian mycobacteriology laboratories. Comm Dis Intell. 2006; 30:116-28.

Appendix A:
Suggested Proforma for Assessment of Risk of TB in HCWs

Surname: _____
First name: _____
Date of Birth: _____
Address: _____
Telephone contact: _____
Employee or student number: _____

What is the risk of TB infection?

1. Have you been treated for TB in the past? _____
2. Have you had contact, personally or at work, with somebody that suffered from TB? _____
3. Country of Birth? _____
4. What countries have you lived or worked in for more than 6 months, other than your country of birth?

   _____

   _____
5. Are you Aboriginal or a Torres Strait Islander? _____

Office Use Only

Y □ N □

Y □ N □

TB incidence > $50/10^5$ *

Y □ N □

TB incidence > $50 / 10^5$ *

Y □ N □

Y □ N □

Y □ N □

If "Y" to ANY of the above, then Group 2 (yellow) in algorithm (Appendix B)

** For country based TB incidence refer to http://www.phac-aspc.gc.ca/tbpc-latb/itir-eng.php*

What is the risk of TB contact from work?

What is the proposed area in which you will be working or studying in the health system?

Specify: 1) position (e.g. doctor, RN, physio, student etc): _____

2) speciality area (e.g. medical, surgical, paediatric etc) _____

Other information

Have you had a Mantoux skin test before? □ No □ Yes Result: _____

Have you had BCG vaccination? □ No □ Yes When: _____

Do you have a medical history of immune deficiency, □ No □ Yes

or take medicines that reduce immune response? □ No □ Yes

Are you a permanent resident / citizen of Australia? □ Yes □ No Visa expiry date?_____

Office Use Only

Past history of TB treatment: □ No □ Yes ⟶ Refer to TB specialist for assessment

Risk of Latent TB infection? □ Low ⟶ Group 1 (blue) in algorithm

□ High ⟶ Group 2 (yellow) in algorithm

Predicted risk of future occupational exposure: □ High □ Medium □ Low

Test for Latent TB Infection: Date: _____

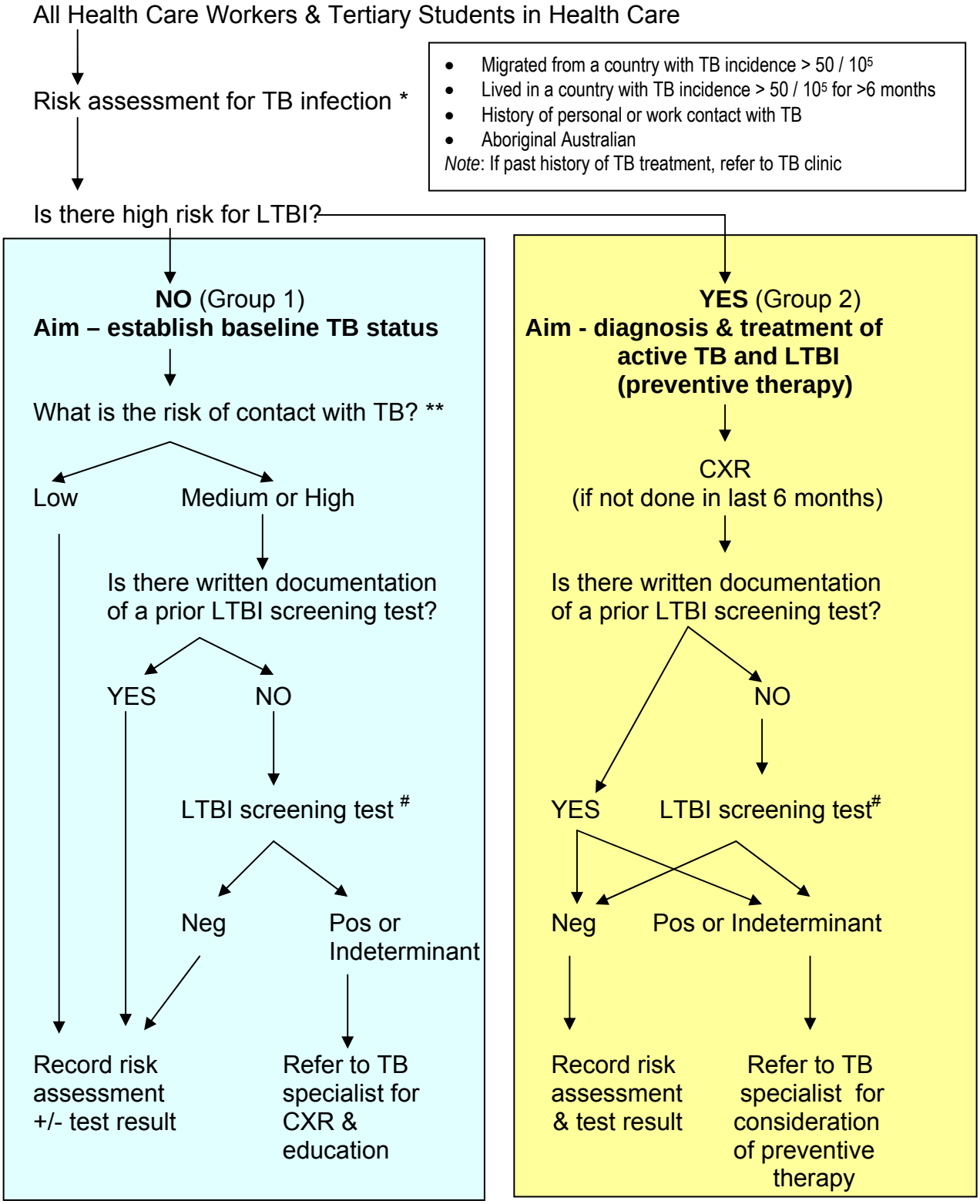
Test used: □ TST – result: _____ mm

□ QuantiFERON GOLD – result: _____

Chest x-ray done? □ No □ Yes Result: _____

Referred to TB specialist? □ No □ Yes Where: _____

Appendix B: Algorithm for Management of TB risk in HCWs



Notes:

* See text of *"Tuberculosis & Health Care Workers"* document and Appendix A

** See text of *"Tuberculosis & Health Care Workers"* document

LTBI Latent TB Infection

CXR chest x-ray

TST or Interferon Gamma Release Assay