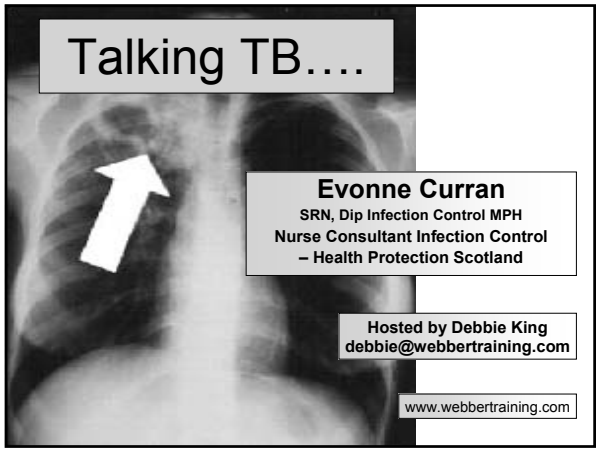


Why ask me?

- I do not consider myself to be a **TB** expert
- But I do consider it my role to:
  - Ensure that the environment is safe for practitioners to practice – and that includes when TB is suspected or known to be present.
- I have written several articles on respiratory protection from the practitioners perspective

I have been asked to consider respiratory protection when caring for TB patients

In this presentation today

- ***Optimising care*** of patients with TB to make the ***environment safe*** for practitioners
- Understanding the science, the ***gaps in the science*** and implications for recommendations

What we have to consider the international context

- The **international context** in which we practice healthcare
  - Post SARS
  - Pre next pandemic
  - Potentially (but hopefully never) in a bioterrorism response
  - CA-MRSA – wear masks for intubation + physio
  - An ever evolving world of organisms
  - MDR-TB in an unknown number of patients
  - *In a world where we cannot always identify for some considerable time the risk posed by patients with a respiratory infection.*

Hazard Warning

It is complicated!

For TB care - one size does not fit all!

It is not black and white

there are many many many

shades of grey

Think globally – act locally

You must understand your
local context
What you should do / recommend depends on the risks presented in your establishment and the resources you have to negate them.

The Basics

- *Mycobacterium tuberculosis* causes pulmonary TB.
- *M. tuberculosis* is disseminated on small (<5 microns) airborne droplet nuclei that can remain suspended in the air.
- These airborne droplet nuclei are inhaled into the alveoli of susceptible individuals.
- In some people infection develops.

Progression to TB infection

- **Usually** 2 – 12 weeks later an immune response develops and suspends disease development
  - At this point the patient will **test positive** and be **infected** but will not be infectious and not have TB disease.
  - Viable MTB **can** remain life-long in these patients which can be reactivated.
  - 5-10% progress at some point in their lives to TB disease. [**Most** within the first 5-10 years]

It is important to recognise the difference between TB infection and TB disease.

- **TB infection**: A condition in which living tubercle bacilli are present in the body but the disease is not clinically active. Infected persons usually have positive tuberculin reactions, but they have no symptoms related to the infection and are not infectious.
- **TB disease**: A clinically active symptomatic disease usually caused by the organism *Mycobacterium tuberculosis*.

TB infection & TB disease

- **TB Infection**
  - Asymptomatic
  - Not infectious
  - Can progress to TB disease
- **TB Disease**
  - Symptomatic
  - Infections (how infectious varies)

The probability that a person **exposed** to TB gets **TB infection** depends primarily on

- Concentration of infectious droplet nuclei in the air
- Duration of exposure
- The closer the proximity and the longer the duration the greater the risk

Those at higher risk of **infection**

- Close contacts: family (might not be a traditional family – might be a 'pub family')
- *'HCWs who serve populations at high risk'*
- *'HCWs with unprotected exposure to a patient with TB disease before precautions are instigated.'*
- Those living in overcrowded/poor facilities
- Infants and children of adults with TB disease.
- Source CDC.gov

The probability that a patient with **TB infection** gets **TB disease** depends on

- How exposed +
- Immune system function: HIV, infants & children <4 years, diabetes mellitus, renal failure, haematological disorders, prolonged steroid or other immune suppressant drug use, etc., etc

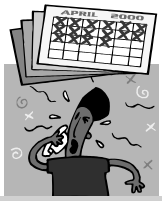
Understanding results.

- *Mycobacterium tuberculosis* grows very slowly.
- In the lab a smear test is done (result 30 mins) to distinguish infectious TB from TB which is not thought to be currently infectious.
- Culture results will follow 2-6 weeks later.
- The smear result determines infectiousness
- New tests are speeding up these times.

Smear positive = infectious

Smear negative but culture positive = low infectivity risk

What are the symptoms of TB disease

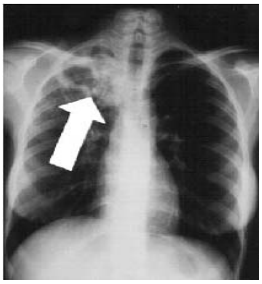


Unexplained cough lasting more than 3 weeks – with or without these other symptoms

Weight loss and anorexia

Haemoptysis

Pulmonary tuberculosis



Picture from CDC.gov

- Is a slowly progressive, chronic infection, usually of the lungs, but many other organs may be infected. Only pulmonary tuberculosis (disease) is considered infectious.

What increases the risk of infectiousness

- Cough
- Cavitation
- Smear positive
- Respiratory tract infection with involvement of the larynx
- Failure to comply with hand over mouth when coughing
- Previous poor anti-microbial therapy
- Aerosol generating procedures: sputum induction, aerosolised medications

Do patients with TB disease pose a risk to **other patients**?
Do patients with TB disease pose a risk to **healthcare workers**?
Do patients with TB pose a risk to **visitors**?

Do patients with TB disease pose a risk to **other patients**? **Yes**
Do patients with TB disease pose a risk to **healthcare workers**? **Yes**
Do patients with TB pose a risk to **visitors**? **Potentially**

If adequate care is not taken

A risk to other patients

- TB outbreak reports continue to be published in the literature – in the main involving nursing homes and long-term care places.
- Outbreak reports in wards caring for patients with HIV or other immune suppressing diseases.

A risk to visitors

- Two community outbreaks – one visitor diagnosed 2 years later
  - Ijiz K. et al Unrecognised tuberculosis in a nursing home causing death with spread of tuberculosis to the community. J Am Ger Soc 2002 1304 5

A risk to HCWs

- Post mortem staff (highest risk)
- Depends on how good the care
- Outbreaks common when
  - **TB not suspected**
  - **Basic care not taken**
  - **Treatment not started early**
  - **During 'high-risk' procedures** where the high risk was not identified, e.g. irrigating a wound

Why did outbreaks occur?

Failure to recognise the signs and symptoms of tuberculosis early, *and*,
sputum inducing procedures were done on the main ward.

Others

- Laboratory waste processing inadequate and 3 cases of TB were traced back to the lab via DNA.
- Transmission of tuberculosis from contaminated waste Johnson et al JAMA 2000

So what do we have to do to ***optimise care*** and make the ***environment safe***?

Action required

- Early **recognition**
- Early assessment for **drug resistance**
- Early **isolation**
- Sending specimens **ASAP**
- Asking for urgent **processing of specimens**
- Early instigation of **therapy**
- Early referral to a **respiratory physician**
- Early referral to a **TB liaison nurse**
- Early referral to **public health**
- **No sputum inducing procedures** on the main ward.
- Use of close fitting respiratory – not surgical - masks for prolonged care / aerosol generating procedures.

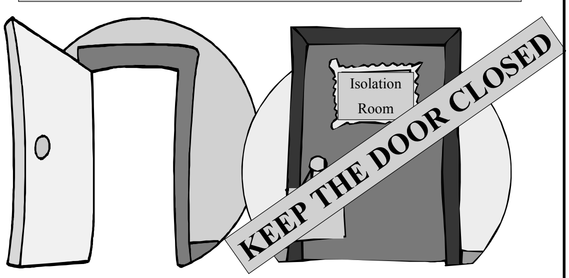
Early recognition

- All patients must be assessed for all infection risks
  - Do your pro formas do it?
  - **Looking for direct questions**: Cough, weight loss, night sweats, haemoptysis
  - Looking for follow-up:
    - previous treatment for tuberculosis?
    - contact with a person with known drug resistant disease?
    - been resident overseas?

Early isolation

- Whilst assessment is ongoing
  - Don't keep in hospital unless necessary
  - Get them to the team (Resp phy + TB nurse)
- Isolation = a room with 4 walls, a door and a ceiling, with negative pressure ventilation.
- What facilities do you have?
- What facilities do you need?
- How do you know what state your facilities are in, e.g. does the negative pressure work

To prevent spread from patients with infectious TB



For how long must isolation precautions be applied?

- Until confirmed sputum negative or if sputum smear positive,
- 14 days therapy and definite clinical improvement.
- After this, provided there are no immunocompromised patients in the area where the patient is to be discharged to isolation may be discontinued.

You need a care plan for patients with TB

POTENTIAL PROBLEMS	AIM	INTERVENTION	ASSESSMENT
Unconfirmed diagnosis	Confirm diagnosis	Send three sputum specimens for AAFB at three different times – not all on the same day. **Send the specimens to the laboratory urgently and request urgent processing and reporting.** (If sputum specimens are unobtainable send faecal specimens.)	1 / / Sig. 2 / / Sig. 3 / / Sig.
Possibility of drug resistant TB	Assess the possibility.	etermine if the patient has had or has: *(If yes report to respiratory physician/ICN.)* previous treatment for tuberculosis? contact with a person with known drug resistant disease? been resident overseas? failure of clinical response, e.g. temperature remains elevated after 2 weeks;	/ / / / / / / / / / (day 7 & 14 post therapy)
Cross-infection to patients.	Minimise the risk.	Nurse the patient in a single room with, if available, negative pressure ventilation. Keep the door closed. Monitor the negative pressure gauge regularly. Encourage the patient to cover the mouth when coughing. Ensure that patient has fresh disposable sputum container and tissues. Discard the sputum container and tissues into clinical waste (yellow) bag. On instruction to end isolation ensure patient is not nursed next to immunocompromised or HIV-infected patients. Ensure that the patient wears a surgical mask whenever they may need to leave their room.	/ / Sig. / / Sig. Daily Ongoing Daily Ongoing Ongoing / / Sig. Ongoing
Patient understanding of disease process, mode of spread, and need for medication.	Educate the patient and provide support.	Contact the TB liaison nurse. (TB liaison nurse where possible to do the following) Explain to the patient how the disease is contracted and how it is spread. Explain the need for infection control precautions. Ask the patient for co-operation & adherence to infection prevention precautions & treatment.. Explain the importance of taking the medication as prescribed. Assess the patient's understanding of his/her condition and his/her role in recovery.	/ / Sig. / / Sig. / / Sig. / / Sig. / / Sig. / / Sig.
Failure to comply with therapy.	Establish, monitor and promote adherence.	Directly Observe Therapy - watch patient swallow tablets. Explain the consequence of non-adherence. Give the patient the opportunity to express fears and anxieties regarding therapy. Explain to the patient side-effects of therapy.	Ongoing / / Sig. / / Sig. / / Sig.

POTENTIAL PROBLEM	AIM	INTERVENTION	ASSESSMENT
Cross-infection to visitors.	Minimise the risk.	Without breaking the confidentiality of the patient assess the risk for visitors. Advise only visitors who were in close contact with the patient before diagnosis to visit until therapy is established. Advise visitors not to bring children to the ward. Inform relatives of the planned follow-up by TB liaison nurse.	/ / Sig. / / Sig. / / Sig. / / Sig.
Cross-infection to staff.	Minimise the risk.	Only staff with known immunity should nurse the patient. Wear respiratory protection mask when entering the room for physiotherapy, if patient has a productive cough and when **prolonged care** is necessary, or if the patient is dependent. If the patient is smear positive, the nurse-in-charge will give the names of staff who have had close contact with the patient to Occupational Health for follow-up and complete.	/ / Sig. / / Sig. / / Sig.
Cross-infection to non-ward staff	Reduce the risk.	Inform porters, radiographer or other theatre staff of (possible) diagnosis. Inform physiotherapist if referral is necessary. If patient discharged via ambulance whilst still infectious –inform ambulance staff pre transfer.	/ / Sig. / / Sig. / / Sig
Possible family/close contact outbreak.	Inform proper authorities.	Ensure notification by medical staff to Department of Public Health/Health Protection Agency. Notify TB Liaison nurse – contact via switchboard.	/ / Sig. / / Sig.
Psychological problems as a result of airborne infection isolation.	Promote psychologica l well-being.	Ensure patient understands the need for segregation. Ensure the patient has sufficient sensory stimulation, e.g. TV, reading material, access to the phone. Encourage the patient to express fears and anxieties regarding the isolation. Provide the patient with a "Patients Requiring Isolation Leaflet". *NB the door remaining closed will increase the fears and anxieties of the patient.*	/ / Sig. / / Sig. / / Sig. / / Sig.
Continuation of care into the community.	Plan discharge.	Discuss and agree treatment plan between TB Liaison nurse, medical and nursing staff and the patient. Determine: who is going to observe therapy, if required, post discharge if the patient still considered infectious clinic follow-up & transport needs prescription:- payment, collection requirements. that the patient's GP has been informed if support services are necessary	/ / Sig.
Cleaning post discharge	Ensure hygienic standards are achieved.	If room is naturally ventilated and not negative pressure, open the windows with the door closed to disperse air from the room. Undertake normal post discharge cleaning. Take particular care – as always - with horizontal surfaces. Ensure all waste is discarded from the room as clinical waste.	/ / Sig. / / Sig. / / Sig.

Specimen

- Urgently taken
- Urgently processed
  - 30 minutes X 3 on the same day is ok not the same spit.
  - How long does it take in your facility?
  - How long does it take if a patient is admitted at 5pm on bank holiday Friday.

Therapy

- How long does it take for the first dose?
  - Should be (could be) a couple of hours.
- Urgent referral to a respiratory physician
- Urgent referral to a TB nurse

Danger 1

- Patient has no spit
- Get the physio
- Do a sputum induction
- Error assumption: No diagnosis of TB therefore no risk and no precautions required
- Question:
  - where is sputum induction done in your facility?
  - what air changes are available in this area?
  - Who is at risk as a consequence?

Danger 2

- Patient does not have recognised risk factors for MDR-TB but there is no improvement after 2 weeks therapy!

If we could guarantee optimal care – do HCWs need to wear masks for non MDR-TB?
Risk would be very low

Optimal care: = early diagnosis, isolation in neg pressure + indications of working, therapy, compliance

There are things we know we know and things we know we don't know. D. Rumsfelt (abridged)

What do we know

- The patient has (probably) TB

We do not know

- If its drug resistant
  - Until sensitivities back
  - Until no response to therapy
- How infectious the patient is
- If the ventilation in the room is optimal (unless continuously reading gauge)

To prevent outbreaks

- Administrative controls
  - What you do
  - What you have
  - QA
- Clinical controls
  - Time to isolation / therapy
- Engineering controls
  - Sufficient for patient population?
- Personal Protective Equipment

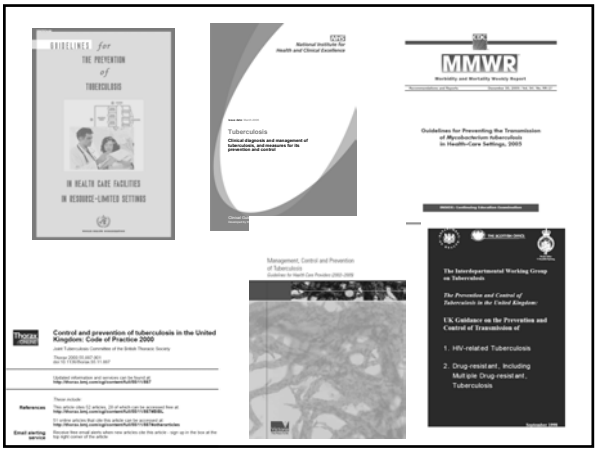
You must have a Respiratory Risk Assessment for your facility

For a respiratory assessment consider under 4 headings

- People: patients / family / members of the public healthcare workers
- Environment – controlled / uncontrolled
- Methods - procedures
- Equipment – decontamination, PPE
- Excellent examples of how in the guidelines

Should HCWs wear masks?

- What does the evidence say
  - HCWs are at risk
  - Risk significantly reduced by optimal care (administrative, clinical, engineering)
  - Risk cannot be eliminated by these controls.



What do the guidelines say?

Pub	Author	General Care	Aerosol Generating Procedures	MDR TB	In addition
1999	WHO in healthcare with limited resources	Yes: isolation rooms for patients with TB	Yes	Yes	Autopsy rooms
2006	CDC	Yes: by all persons entering the room	Yes	Yes	
2006	NICE UK	No	Yes	Yes: for suspected or known as long as the patient is thought to be infectious	
2000	UK Thorax Code of Practice 2000	No	Yes	Yes	
1998	UK Dept of Health	Yes: by HCWs caring for any high dependency patient with known or suspected TB	Yes	Yes: by all persons entering the room of a patient with known or suspected MDR-TB	
2002	Australia	Yes: by all persons entering the room	Yes	Yes	

What respiratory protection?

Pub	Author	Respiratory Protection	Ref
1999	WHO in healthcare with limited resources	A protective device with the capacity to filter a 1 micron particle is needed. 'At least 95% filter efficiency for particles 0.3 micron in diameter are usually recommended'	Page 45-46
2006	CDC	Certified by CDC /NIOSH as a nonpowered particulate filter respirator (N-, R-, or P-95,99 or 100) including disposable respirators or PAPRs with high efficiency filters. (+ fitness + sizes)	Page 39
2006	NICE UK	Should meet the standards of the Health & Safety Executive European standard EN149:2001	Page 17 & Page 26
2000	UK Thorax Code of Practice 2000	Dust mist fume mask	Page 890
1998	UK Dept of Health	Hints:'FFP1 is more stringent than is required for TB'	Page 87
2002	Australia	The ability to filter particles 1 micron in size in the 'unloaded state', with the filter efficiency of 95% given flow rates of up to 50 litres per minute. The ability to obtain a face seal leak of 10%. The ability to fit different facila sizes and characteristics of healthcare workers.	Page 29

Why for sensitive TB and not MDR-TB?

- Is it anymore infections that drug sensitive?
- Is it acceptable for HCWs to get drug sensitive TB?
- Do they work for MDR-TB and not drug sensitive TB

Can of worms issues

- Masks where to put them
- Fit testing
- Training
- Beards
- Costs

Moving to the solution

- Quantify the size of the problem through a respiratory assessment.
- Bring it to the Risk Management – collectively, get it on the register (if required)
- (Are we where we were in the *should we all wear gloves debate for blood and body fluids* only this time is respiratory protection)
- Clear uniform guidance or better evidence– commission research.

Key points

- Optimal care is required for effective protection of staff
  - Early clinical care (assessment, diagnosis, therapy, isolation, public health)
  - Engineering controls (effective, obvious)
  - Respiratory protection until risk is negated.
- The Evidence Based Guidelines are not in agreement

Thank you for your attention

Useful resources

- http://www.hpa.org.uk/infections/topics_az/tb/links/guidelines.htm
- http://www.dh.gov.uk/assetRoot/04/11/52/99/04115299.PDF
- http://www.who.int/docstore/gtb/publications/healthcare/PDF/WHO99-269.pdf
- http://www.health.vic.gov.au/ideas/downloads/tb_mgmt_guide.pdf
- http://www.gfmer.ch/Guidelines/Tuberculosis/Tuberculosis_mt.htm
- http://www.dh.gov.uk/AboutUs/MinistersAndDepartmentLeaders/ChiefMedicalOfficer/Features/FeaturesArticle/fs/en?CONTENT_ID=4133761&chk=oW8s4w