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Bradley Forssman

University of Notre Dame Australia, bforssman@nd.edu.au

Leena Gupta

University of Notre Dame Australia, Leena.Gupta@nd.edu.au

Kay Mills

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A TUBERCULOSIS CONTACT INVESTIGATION INVOLVING TWO PRIVATE NURSING HOMES IN INNER WESTERN SYDNEY IN 2004

Bradley Forssman and Leena Gupta
*Sydney South West Public Health Unit
Sydney South West Area Health Service*

Kay Mills
*Tuberculosis Services
Sydney South West Area Health Service*

Australia has one of the lowest incidence rates of tuberculosis (TB) in the world, approximately five per 100,000 per year¹, although in some parts of the country the incidence is considerably higher. In the former Central Sydney Area Health Service the incidence rate in 2003 was 14 per 100,000 per year.² The incidence is also higher in those aged 65 years and over¹, a population that has declining immunocompetence due to a variety of factors.³ Furthermore, the subpopulation of this group (and, indeed, of people of any age) living in residential institutions such as nursing homes and hostels are at even greater risk of TB infection and disease due to their chronic ill health and multiple medical problems.³ Despite this, there are no guidelines in NSW regarding TB screening of the elderly, either in response to potential exposure or with regard to screening at entry to a residential facility. There are also very few reports in the literature of TB contact investigations in residential facilities. Those that have been published come from the United States and are concerned with TB in hospitals or correctional facilities.^{3,4,5,6} There has been one report of TB transmission in a school setting in Sydney⁷, but there is a paucity of Australian literature that clarifies what is required for contact investigations in the local residential care setting.

This paper describes a contact investigation resulting from a case of active TB in a health care worker employed by a number of nursing homes in inner-western Sydney and highlights the need for policies with regard to TB screening of the elderly residing in nursing homes.

METHODS USED IN THE INVESTIGATION

The index case

The index case was an overseas-born female health care worker residing in Sydney. Prior to the woman's diagnosis of TB in January 2004 she was asymptomatic. She was diagnosed as a result of contact investigation of another case of TB infection. Microscopic examination of sputum demonstrated 1+ acid-fast bacilli, and polymerase chain reaction was positive for *Mycobacterium tuberculosis*. Sputum culture grew *M. tuberculosis* sensitive to all first-line anti-tuberculous medications. Chest CT scan demonstrated no pulmonary cavities but did show areas of consolidation and mediastinal lymphadenopathy with partial collapse of the left lower lobe, indicating significant lymph node disease. Because the sputum was direct-smear

positive, the woman was assessed by an expert panel as potentially having been infectious for at least one month prior to her diagnosis. We identified that she had worked as an assistant-in-nursing in two nursing homes in the inner western suburbs of Sydney during this period.

Screening of nursing home residents and staff

All staff and residents in both nursing homes were considered contacts and evaluated. It was considered too late by the time of notification to undertake baseline screening of either the residents or staff. All staff were given a screening questionnaire to obtain information regarding: their country of birth; previous Bacille Calmette-Guerin (BCG) vaccination and tuberculin skin testing ('TST'); any history of TB; previous contact with patients or others with TB; and overseas travel history. Staff then underwent TST on-site at the two residential facilities, which was administered by chest clinic staff. If the TST was positive for latent TB infection (greater than 10mm if no previous BCG or 15mm if previous BCG), the staff member was referred to their local area health service chest clinic for a follow-up chest x-ray and review by a respiratory physician to investigate for TB disease and infection.

After interviewing the management of both residential facilities to determine the infected health care worker's patient care schedules, it was concluded that all residents of both facilities had had significant contact with her and therefore should be screened. Initial screening included review of the residents' medical histories specifically for the presence of risk factors for TB, symptoms of TB and any previous chest x-ray or TST results. Residents then underwent TST and chest x-ray (regardless of the TST result). This was based on the assumption that some of the elderly residents with multiple medical conditions might have depressed cell-mediated immunity, and therefore might have a negative TST despite being infected with TB.⁸ The timing of screening was set at approximately five to six months following the diagnosis of TB in the health care worker, at which time her contact with the residents had ceased. Based on the little literature available⁹, this was the optimal time to detect TB disease by chest x-ray before infectivity set in.

RESULTS

Review of the medical records of the nursing home residents' revealed that none had a previous TST recorded. Some residents did have previous chest x-rays, however, and none of these were reported as having findings consistent with TB. The results of initial TST screening at nursing home 1 (NH1) and nursing home 2 (NH2) are presented in Table 1. There was a notable difference between the two nursing homes in the number of positive TST results for residents, with more at NH2, and the proportion of TST

TABLE 1

RESULTS OF TUBERCULIN SKIN TESTING (TST) SCREENING FOR THE STAFF AND RESIDENTS OF TWO NURSING HOMES IN SYDNEY IN 2004

	Nursing Home 1		Nursing Home 2	
	n	%	n	%
Staff				
Staff potentially exposed	30	100.0	40	100.0
Staff screened	26	86.7	40	100.0
Staff with positive TST*	15	58.0	22	55.0
Residents				
Residents potentially exposed	75	100.0	83	100.0
Residents screened	74	98.7	83	100.0
Residents with positive TST*	5	6.7	14	16.9

*positive TST = greater than 10mm if no previous BCG or 15mm if previous BCG

positive staff at both nursing homes was quite high (more than 50 per cent).

The infected woman had worked for the majority of the time in NH1. There were no changes indicative of TB or any other pathology found on follow-up chest x-ray of staff with positive TST. Of the four staff members who did not undergo TST, three did not attend for testing and the remaining person had a previous severe reaction with TST and therefore underwent chest x-ray only, which was negative for TB. One resident of NH1 refused to undergo TST but had a chest x-ray that was negative for TB, as were the chest x-rays for all other residents.

The TB-infected woman worked only six shifts at NH2 during the month in which she was determined to be infectious. Follow-up chest x-ray of NH2 staff with positive TST did not identify any who were likely to have acquired TB. Four (5 per cent) nursing home residents were found to have chest x-ray changes that required follow-up with a chest physician. On further investigation, one resident was diagnosed with carcinoma of the lung, two were discharged from follow-up after review by a chest physician (as chest x-ray changes were not consistent with TB) and one underwent follow-up chest x-rays to monitor for development of TB disease (now complete).

The sociocultural demographic characteristics were similar for both facilities in that the majority of the residents were of Anglo-Saxon descent and born in Australia. Therefore, one would expect a similar proportion of positive TST among the residents. NH2, however, had a disproportionate number of positive TST results, which were distributed throughout all three sections of the nursing home. As the TB-infected woman had only worked a small number of shifts at this facility, therefore it was hypothesised that there might be another staff member acting as a source case in NH2. According to NH2 management, only night shift and agency staff worked in all three sections of the facility. All night-shift staff had been screened (with

negative results), so after consultation with experts in the field (necessary because of the paucity of literature on the subject), screening was expanded to include casual agency staff who had worked three or more shifts at NH2 in the previous six months, to exclude the possibility of another source case. In consultation with the management of NH2, it was found that all these staff were employed through the one nursing agency. Only 47 per cent of staff from this agency attended for screening, and of these 80 per cent had positive TSTs. These agency staff all had previous BCG vaccination and none had chest x-ray findings consistent with active TB disease. All but one of the agency staff were born overseas in TB-endemic countries. Reasons for non-attendance at screening by other agency staff are unknown due to reluctance on the part of the nursing agency to co-operate.

DISCUSSION

Whilst no further cases of active TB disease were detected and a second source of infection within NH2 was not found, this screening is noteworthy for raising a number of issues for which there is no clear policy direction, or local or international literature, to support decision-making.

In this contact investigation, there were no baseline TST results available for the residents. In NSW, there is no requirement or recommendation that nursing home residents are screened for tuberculosis upon entry to a residential facility. In contrast, the Northern Territory Centre for Disease Control¹⁰ and the United States Centers for Disease Control (CDC)³ recommend that all residents in long-term residential care be screened for TB with TST upon entry to the facility. In Victoria it is recommended that new residents undergo a baseline chest x-ray and TST.¹¹ The Victorian guidelines state that TST has a low predictive value in the elderly.

Consideration could be given to formulating policy in NSW that is similar to that of these other Australian states and of the CDC. This may be made easier to implement with

the development of a new in-vitro test, QuantiFERON®-TB Gold (Cellestis Limited, Carnegie, Victoria, Australia), for the diagnosis of both latent TB infection and TB disease, which the CDC recommends can be used in all circumstances in which the TST is currently used, including contact investigations.¹² However, this novel test should be validated for use in the elderly, and its cost effectiveness evaluated, before widespread implementation.

There were also no baseline TB screening results for staff of the nursing homes. The screening identified a reasonably high proportion of TST-positive staff, most likely related to the high level of staff born in TB-endemic countries. It is NSW Health policy that all health care workers in public health facilities must be screened for infectious diseases, including TB.¹³ However, this policy is not mandatory for private health care facilities, though it is strongly recommended. There is a need for the introduction of strategies that will assist in the screening and management of TB contacts in private health care facilities in the future.

Because there was no baseline data, much consideration was required to decide on the most appropriate time, after potential exposure, for screening, especially in the elderly. During these deliberations it was found there was a paucity of literature, either international or Australian, addressing this question. There were also few reports of contact investigations following potential exposure to TB in the elderly. Reports such as these, with relevant outcome data, would assist in decision-making at the local level during future screenings as well as in formulating policy.

In addition, there are few published studies on the best means of screening in the elderly (TST versus chest x-ray), and the literature that is available is contradictory. International guidelines vary depending on the jurisdictions they cover. The CDC has no specific guidelines on the most appropriate course of action in the event of exposure to TB within the nursing home.^{3,14} Even within the United States there are widely differing policies and practices regarding contact investigations.¹⁵ The British Thoracic Society recommends chest x-ray to investigate for TB disease in nursing homes in the United Kingdom but does not recommend screening upon entry to a residential facility.¹⁶ There are no national guidelines in Australia.

Consideration should be given to addressing this gap in policy, particularly in NSW. These policies and guidelines need to be produced using sufficient levels of evidence as outlined by the National Health and Medical Research Council.¹⁷ A possible reason for not having specific guidelines for TB screening in the elderly is that this issue could be addressed on a case-by-case basis, through the use of an expert panel. However, if this were to occur (and be established in policy), published reports of the results of such contact investigations should be made available to assist with decision-making for future screenings.

CONCLUSION

While this particular TB contact screening did not result in further cases being found, the relevant and recurring issues described above were highlighted. These should be addressed through further research to collect process and outcome data on TB screenings in those aged 65 years and over, and that guidelines based on expert opinion (in the absence of available literature) be developed and uniformly applied, with continuous monitoring and evaluation. In this way, the best outcomes for the elderly put at risk of TB infection will be achieved through evidence-based best practice.

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NEW 'AIR POLLUTION ALERTS' WARN OF HEALTH RISKS

Vicky Sheppard
Environmental Health Branch
NSW Department of Health

Research has shown for some time that high levels of air pollution can exacerbate illness. More recently, evidence has emerged about how air pollution at much lower levels can also affect the health of susceptible people, such as those with asthma, chronic obstructive pulmonary disease or coronary artery disease. NSW Health and the Department of Environment and Conservation have started Australia's most comprehensive air quality warning system to ensure residents of Sydney, the Illawarra and the lower Hunter can take action to stay healthy at times of low, medium and high air pollution.

As different patient groups are sensitive to different types of air pollution, the warnings are tailored to draw attention to this – for example, people with asthma can be affected by several pollutants such as ozone and nitrogen dioxide from car exhaust and industry, whilst people with heart disease may be more affected by fine particle pollution.

The air quality alerts are based on information routinely collected by the Department of Environment and Conservation. In Sydney, where routine air pollution forecasting is also in place, an alert will be issued when high air pollution days are forecast. Alerts are distributed to the media and posted on the Department of Environment and Conservation's website. In the Illawarra and lower Hunter high monitored air pollutant levels will trigger the alert system.

The alert predicts the level of risk to sensitive individuals and suggests simple ways to reduce exposure and manage

impacts. Under the new system, people are able to ring a free-call help line for all the latest information on air pollution levels, forecasts and alerts.

It is anticipated that the Air Pollution Health Alerts will be used by primary care providers to help reduce the effects of air pollution on sensitive individuals with chronic disease.¹ The brochures inserted into this edition of the *Bulletin* support this and provide broader advice about reducing the adverse impacts of air pollution.

In much the same way we look at the daily weather forecast and plan our day, the air quality alerts will help sensitive people plan activities around expected air pollution levels and take action to minimise health impacts.

The NSW Department of Health has established a web page with information about the alert system at the following address: www.health.nsw.gov.au/living/airpollution.html. This webpage provides a link to any current air pollution health alerts; information about air quality and health; and information brochures for the general public as well as health professionals.

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