Original Article

Tuberculosis screening in an aged care residential facility in a low-incidence setting

Nompilo Moyo, James Trauer, Peter Trevan, Ann-Marie Baker, Joseph Musemburi, Kerry McGrath, Aine Nolan, Eamon McIntyre, Jane Hulls, Justin T. Denholm

Abstract

This is a retrospective cohort study of tuberculosis contact tracing and screening in an elderly residential facility in Victoria. In the absence of specific guidelines regarding an optimal test for this population, 18 residents were tested with both tuberculin skin test (TST) and interferon-gamma release assay (IGRA), and all underwent symptom assessment and chest x-ray (CXR).

Keywords: latent tuberculous infection; contact tracing; interferon-gamma release assays; tuberculin skin test

Introduction

Residents in long-term aged care residential facilities (ACRF) have previously been recognised as having higher incidence of tuberculosis (TB) than the general community.[1, 2, 3] This increased incidence is reflective of both extended lifetime potential for latent TB infection (LTBI) acquisition and increasing risk of TB reactivation caused by comorbidities and immune senescence.[4]

In other congregate settings, such as schools or childcare centres, notification of cases of tuberculosis prompts an assessment of transmission risk by jurisdictional authorities, including testing those at risk for TB disease and LTBI ("contact tracing"). Contact tracing serves two primary purposes; first to diagnose further patients with TB disease ("active case finding"), and secondly to identify individuals at risk of future progression to active TB by use of tests for LTBI, in order to provide treatment to prevent disease occurring.

Optimal approaches to contact tracing in elderly aged care facilities are not clear. While the elderly are at somewhat higher risk of LTBI reactivation, they are also at substantially higher risk of toxicity from preventive therapies, and risk/benefit considerations mean that preventive therapy may not be indicated. In addition, the performance of LTBI diagnostic tests, including tuberculin skin test (TST) and interferon-gamma release assays (IGRA) are less well described in the very elderly. We therefore describe an opportunistic contact tracing exercise in an ACRF in an Australian context, to assist in refining practical approaches to contact tracing in such environments.

Methods

In September 2015, a health care worker at an ACRF in Victoria, Australia was diagnosed with cavitatory, smear-positive, drug-sensitive pulmonary TB. Following assessment of potential infectivity, staff and residents were identified as being at risk of exposure, and eligible for contact tracing.

Both TST and IGRA are used for post-exposure contact testing in Victoria.[5] In the absence of specific guidelines regarding an optimal test for this population, residents were tested with both TST and IGRA (Quantiferon Gold In-Tube assay, Qiagen), and all underwent symptom assessment and chest x-ray (CXR). TST were defined as positive if induration of ≥10 mm was present at 48–72 hours, while IGRA were reported as per manufacturer's guidelines. Residents found to be positive by either test or with abnormalities on CXR, were referred to appropriate clinical services for assessment. TB testing and CXR were provided free of charge by the Victorian Tuberculosis Program.

In accordance with normal public health responses, demographic and clinical data were collected and recorded in an existing database (Public Health Events Surveillance System). Descriptive statistics were performed on de-identified data for this report, with analysis conducted in Stata version 14.0. TB Program clinical nurse consultants were also asked to provide qualitative feedback on testing and follow up, with thematic analysis of responses reported.

The data in this report were collected and used under the legislative authority of the Public Health and Wellbeing Act 2008 and therefore approval from a Human Research Ethics Committee was not required under the rules of our institutions.

Results

A total of 19 residents with epidemiological contact were identified for contact tracing, with 18 consenting to evaluation. Demographic details of residents are provided in Table 1.

In addition, 41 staff were identified for screening. Staff members were screened with TST and, IGRA was only used for staff who failed to attend the screening. 39 members of staff consented for screening, with four testing positive for TB test: two were Australian born with no known risk factors and the remaining two were born in high TB incidence countries. No TB disease was found among staff, who were referred for consideration of preventive therapy.

Table 1. Positivity on either TST or IGRA by participant characteristics

Variable	Number of residents	TST or IGRA positive	Percentage positive
Under 70	1	1	100%
70-79	5	1	20%
80-89	6	0	0%
≥ 90	6	3	50%
Male	6	2	33%
Female	12	3	25%
Australian born	11	3	27%
England born	7	2	29%
Independent for ADLs	6	2	33%
Dependent for ADLs	12	3	25%
All	**18**	**5**	**28%**

ADLs, activities of daily living. As per information provided by resident facility.

Results from LTBI testing are shown in Table 2. Of the 5 residents with a positive IGRA, 2 were TST positive. No resident with a negative IGRA was found to have a positive TST. CXR identified abnormalities in 4/18 (22%), with all of these individuals also having positive IGRAs (p=0.002). Both TST positives had abnormal CXRs and all but one positive IGRA had abnormal CXRs. Following specialist evaluation and additional diagnostic testing, none was considered reflective of active TB.

Table 2. IGRA versus TST results

	Positive TST	Negative TST
Positive IGRA	2	3
Negative IGRA	0	13

p=0.065, Fisher exact

Table 3. IGRA versus CXR results

	Positive CXR	Negative CXR
Positive IGRA	4	1
Negative IGRA	0	13

p=0.002, Fisher exact

All residents with positive TST or IGRA were referred for consideration of further management, including preventive therapy. Following specialist evaluation, all were considered to be poor candidates for LTBI therapy based on risk/benefit assessment, and none was treated. Residents were followed for 12 months post-exposure, with no additional cases of active TB identified within this cohort. Following this time, resident's general practitioners were provided with education on TB and recommendations for further investigations if symptomatic.

Qualitative feedback from clinical nurse consultants was collected and reviewed. Consistent themes were that TST administration was difficult due to fragile skin and loss of skin elasticity. It was noted that some residents were not able to cooperate with the procedure, most frequently due to behavioural issues secondary to dementia. Similarly, IGRA collection was also considered problematic due to requirement for phlebotomy. Nursing staff reported a range of additional issues, including challenges with identifying appropriate persons responsible for healthcare decision-making for those residents not able to independently provide consent to testing. We also note that CXR testing required transport of patients to an external radiology facility, which was problematic for some residents and families.

Discussion

This mixed-methods report provides insight into TB contact tracing in an Australian ACRF. While the size of this study is insufficient to draw robust conclusions regarding test performance characteristics in the elderly, our experience is illustrative of the challenges inherent in this setting and has led to changes in local policy and practice. Future contact tracing assessment in similar settings will focus on clinical and radiological assessment for active case finding, with recognition of the limited additional benefit of testing for LTBI in this cohort.

The association between IGRA and TST and the association of positive results with abnormal chest x-ray findings on simple univariate analysis suggest that the positive results may reflect true M. tuberculosis infection. However, this infection may well have been remotely acquired, which would also be consistent with the absence of reac-

tivation after twelve months of follow up. In our cohort, IGRA testing yielded more positive results compared to TST. This is opposite to what was found in a systematic review in which the proportion of positive results was significantly lower for the IGRA than the TST.[6] This may reflect immune senescence, although studies of anergy testing have suggested previously that most elderly people retain an adequate immune response.[7] We suggest that low skin tone may have contributed to the apparent poor performance of TST in this very elderly cohort.

While the investigation described arose following a case of TB occurring in a health care worker, transmission following TB disease in residents may also occur. In some jurisdictions, testing for LTBI/TB is required or recommended at the time of facility entry to minimise risk of exposures. For example in Ontario, Canada, legislation requires all long term care and retirement homes to screen residents for TB with chest x-ray within the 90 days prior to admission. In addition, TST is recommended for all residents aged under 65 years, although TST is not recommended for older residents.[8]Likewise, the US Centers for Disease Control and Prevention (CDC) also recommends that all residents in long-term residential care be screened for TB with TST upon entry to the facility.[9] However, in Victoria there is no recommendation that aged care residents should be screened for TB before admission.[5]

Appropriate policies and practices for preventing TB transmission in ACRF will continue to be explored.

The challenges illustrated in this report should also encourage alternative approaches to reducing the incidence and impact of TB in ACRF. Such strategies include optimising management of comorbidities which increase the risk of TB disease, including diabetes and cigarette smoking. ACRF should also consider strategies to limit the potential for TB exposure, which may include baseline LTBI/TB testing for staff or new residents.

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