DELAYS IN SUSPICION AND TREATMENT OF PULMONARY TUBERCULOSIS: A RETROSPECTIVE STUDY OF A TERTIARY HEALTH SERVICE IN WESTERN MELBOURNE, 2011-2014

Williams E[1, 2], Guy SD[1], Cheng A[2], Lane G[1]. **1** Western Health, Melbourne, Australia **2** Alfred Health, Melbourne, Australia

Introduction

Tuberculosis (TB) is a major global health problem. Delayed diagnosis may worsen the severity of disease, increase the risk of death and increase TB transmission in the community[1]. Australia has maintained a low annual incidence rate of TB since the mid-1980s of between 5 and 6 cases per 100,000 persons.[2] This study aims to investigate current delays in diagnosis of pulmonary TB (PTB) in a low incidence setting.

Methods

A retrospective study was conducted in a tertiary teaching hospital in Melbourne, Victoria, Australia. Patients ≥ 18 years with a new diagnosis of symptomatic PTB (including patients with contiguous or disseminated disease) that were commenced on treatment between 1st December 2011 and 1st December 2014 were included. Patients were identified for enrolment via Victorian Department of Public Health notification data and hospital Australian Discharge Related Group (A-DRG) discharge codes. Patient medical records were reviewed and data collected onto a standardised case record form to document demographic, clinical, radiological, microbiological and outcome variables.

Primary outcome

Length of patient delay, health system delay, hospital and total delay in diagnosis of PTB. Definitions used;

- **Patient delay** was the time from onset of symptoms suspicious for PTB until initial health care service contact (primary, secondary or tertiary health care service).
- **Health system delay** was the time from first health care service contact until commencement of anti-tuberculous treatment.
- **Total delay** was the sum of patient delay and health system delay.
- **Hospital delay** was the time from hospital admission until commencement of anti-tuberculous treatment.

Primary outcome results were calculated in days.

Secondary outcome

Association between demographic, clinical, radiological and microbiological factors and prolonged patient or health system delay.

A prolonged patient delay was set as >35 days (based on a median delay of 28 days). **A prolonged health system delay** was set as >21 days (based on a median delay of 18 days).

Univariate and multivariate regression analyses were performed to determine factors associated with prolonged delay. Univariate analyses were performed first, and factors with p<0.2 were considered for further analysis in the multivariate analysis. For final model selection, a modified backwards stepwise selection process was used, checking the effect of dropping variables to obtain a parsimonious model. For all tests, two-sided p-values with alpha = <0.05 level of significance were used.

Results

331 patient records were assessed for eligibility. 133 patients were included in the study. 131 of 219 possible patients identified via the Victorian Department of Health database were included; the main reasons for exclusion being diagnosis outside the time period of the study (n=39) or being asymptomatic (n=37). Two additional patients were included from 112 patients identified using the hospital A-DRG discharge codes.

Patient Characteristics and Demographics

Patient characteristic information is displayed in Table 1 and Figures 1-3.

Table 1; Patient demographics.

Demographic	All
Age	35 [26-57]
Male sex	89(67%)
Employed	47 (35%)
Born outside Australia	122 (92%)
≥ 6 years since migration	63 (47%)

Data are number (%) , median [IQR]

Figure 1; WHO Region of Birth

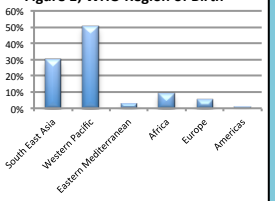


Figure 2; Patient comorbidities

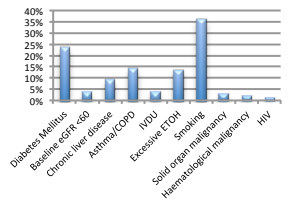
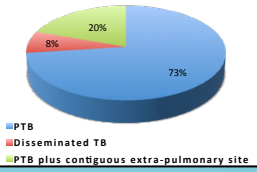


Figure 3: Location of disease



Primary outcome

Location of delay from symptoms to initiation of PTB therapy is shown in Table 2.

Table 2. Primary Outcome; Delays

Delay (days)	Median [IQR]	Range
Patient delay	28 [13, 90]	0-610
Health system delay	18 [7, 53]	0-357
Hospital delay	4 [2, 9]	0-159
Total delay	89 [33, 151]	2-730

Secondary outcomes

Factors associated with prolonged patient delay are shown in Tables 3 (univariate) and 4 (multivariate), and those with prolonged heath system delays in Table 5 (combined univariate and multivariate).

Table 3. Risk Factors for Prolonged Patient Delay: Univariate Analysis

Variable	n (%)	Univariate analysis OR (95% CI)	p
Weight loss			
Yes	37/75 (49%)	2.16 (1.06, 4.43)	0.03
No	18/58 (31%)	1.00	
Fatigue			
Yes	8/31 (26%)	0.78 (0.16, 0.99)	0.05
No	47/102 (45%)	1.00	

Table 4. Risk Factors for Prolonged Patient Delay: Multivariate Analysis

Variable	n (%)	Multivariate analysis OR (95% CI)	p value
Time since migration			
<6 years	29/59 (49%)	1.00	
≥6 years	24/63 (38%)	0.30 (0.12, 0.74)	0.01
No migration	2/11 (18%)	0.03 (0.00, 0.33)	<0.01
TB risk in country of migration*			
High risk	47/113 (42%)	1.00	0.03
Low risk	6/9 (67%)	5.98 (1.19,29.98)	
No migration	2/11 (18%)	-	
Diabetes Mellitus			
Yes	12/21 (57%)	3.02 (1.04, 8.78)	0.04
No	43/112 (38%)	1.00	
Current smoking			
Yes	24/48 (50%)	2.27 (0.99, 5.18)	0.05
No	31/85 (64%)	1.00	

*TB risk in country of migration; High risk = Annual TB incidence ≥50/100,000, low risk = incidence <50/100,000

Table 5. Risk Factors for Prolonged Health System Delay

Variable	n (%)	Univariate analysis OR (95% CI)	p	Multivariate analysis OR (95% CI)	p
Age					
<65	43/109 (39%)	1.00	0.02	1.00	0.01
≥65	16/24 (67%)	3.07 (1.21, 7.79)		4.29 (1.55, 11.89)	
Cough					
Yes	51/124 (41%)	0.09 (0.01, 0.72)	0.01	0.09 (0.01, 0.79)	0.03
No	8/9 (89%)	1.00		1.00	
Fatigue					
Yes	9/31 (29%)	1.41 (0.19, 1.01)	0.05		
No	50/102 (47)	1,00			
Emergency Department Review					
Yes	27/80 (34%(	0.33 (0.16, 0.69)	<0.01		
No	32/53 (60%)	1.00			
Outpatients Review					
Yes	39/54 (72%)	7.67 (3.51, 16.77)	<0.001		
No	20/79 (25%)				
Hospital Admission					
Yes	39/107 (36%)	0.17 (0.06, 0.46)	<0.001	0.28 (0.09, 0.92)	0.04
No	20/26 (77%)	1.00		1.00	
Current smoking					
Yes	16/48 (33%)	0.49 (0.23, 1.01)	0.05		
No	43/85 (51%)	1.00			
Cavitating changes on Chest X-Ray					
Yes	6/29 (21%)	0.25 (0.09, 0.67)	<0.01		
No	53/104 (51%)	1.00			
Sputum AFB smear positive (n=110)					
Yes	8/39 (21%)	0.23 (0.09, 0.56)	<0.01		
No	38/71 (54%)	1.00			
Sputum Gene Xpert MTB/RIF ® positive (n=58)					
Yes	13/47 (28%)	0.14 (0.03, 0.62)	0.01		
No	8/11 (73%)	1.00			

Conclusions

This study found the predominant delay from symptom onset until commencement of TB treatment is patient delay (i.e. time until presentation to health care).

- Similar time delays in diagnosis of PTB in this high income, low risk setting in Melbourne are demonstrated between 2011-2014 as have previously been described in Australia[3].
- The median duration of delays found in this study align with those found in an international systematic review of the topic in 2009.[4]

Prolonged patient delays were more likely in persons from low-risk countries, persons resident in Australia <6 years, smokers and those with diabetes, and associated with the presence of weight loss.

Prolonged health system delays were more likely in older patients (>65 years), as well as those reviewed in an outpatient setting compared with those admitted to the emergency department or hospital ward. Patients who present with cough and cavitating changes on chest X-ray appeared less likely to have a prolonged health system delay. Several of these features may be confounded according to the level of patient symptomatology and extent of radiographic change.

Sputum Gene Xpert appears to be associated with reduced time to diagnosis, even in this high resource setting (where cross-sectional radiology and AFB smear and culture are universally available).

This study is limited by its retrospective, single-centered design, however is strengthened by a detailed review of clinical notes for each case based on contemporaneously recorded clinical data.

Output;

The biggest impact in reducing delay from PTB symptom onset to therapy initiation in our setting is likely to be achieved by reducing patient delays; health literacy programs for new migrants, public health messaging and raised awareness in primary health care may help achieve this.

References:
1. TB CARE I. International Standards for Tuberculosis Care (3rd edition). The Hague: TB Care I. 2014.
2. Bamja C, Waring J, Stapledon R, et al and the National Tuberculosis Advisory Committee, for the Communicable Diseases Network Australia. Annual report: Tuberculosis notifications in Australia, 2011. CDI. 2014. 38(4): E356-368.
3. Ward J, Siskind V, Kostantinos A. Patient and health care system delays in Queensland tuberculosis patients, 1985-1998. International Journal of Tuberculosis and Lung Disease. 2001, 5(11): 1021-1027
4. Sreeramareddy CT, Panduru KV, Menten J, Van den Ende J. Time delays in diagnosis of pulmonary tuberculosis: a systematic review of the literature. BMC Infectious Diseases. 2009. 9:91-101

Contact; dreloisewilliams@gmail.com