Factors Associated with Failure to Diagnose Acute Pulmonary Tuberculosis in a Public Emergency Department

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Objective

Emergency department presentation of active pulmonary tuberculosis (TB) can be highly variable and atypical. Appropriate patient stratification may require the integration of clinical and epidemiological data. The aim of this study was to determine unique presentation, risk factors and outcomes in the population of TB patients that present to a public emergency department (PED), as well as to identify those factors associated with ED discharge without a diagnosis of TB during a potentially contagious visit.

Methods

Epidemiological characteristics were determined for every patient diagnosed with TB in Arizona for 2000-2008. From these, the 1501 presenting in Maricopa County, Arizona for 2000-2008 were selected for further analysis. Presentation at the only PED in the county was determined by retrospective chart review. Potentially contagious TB patients presenting at the PED were analyzed on the basis of the absence or presence of a TB diagnosis during a potentially contagious visit.

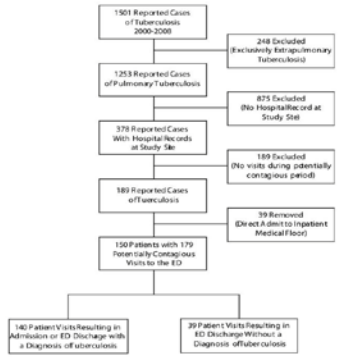

Figure 1. Derivation of study population

Results

Of the study population, 150 (12.0% of pulmonary TB patients) presented to the PED over 179 visits within one month of a verified diagnosis of active pulmonary TB. Patients presenting to the public emergency department were more likely to be male, Hispanic, homeless, HIV-positive, current resident of a correctional facility or a long-term care facility, or to have a recent history of substance abuse or unemployment. Furthermore, PED patients were more likely to have multidrug resistant TB and to die before completion of treatment. Comparison of potentially contagious TB patient visits demonstrated that patients were significantly less likely to receive a diagnosis of TB when presenting with a traumatic or orthopedic chief complaint, denying cough, dyspnea, fever or chills, having a normal pulmonary exam and/or chest x-ray, being unresponsive during questioning, or reporting a recent history of both homelessness and excess alcohol use. Baseline sensitivity for the diagnosis of TB during a potentially contagious visit was 78.2%. Modeling revealed an increase in sensitivity to 97.9% if patients were assessed for altered mental status, pulmonary or infectious chief complaint, abnormal vital signs, or history of substance abuse or foreign birthplace.

Table 1. Baseline characteristics of public emergency department patients

Characteristics	PED TB patients (n=150)	Control TB Patients (n=1064)	p-value
Age, years (SD)	43 (17.9)	41.8 (23.3)	0.5526
Male	112/150 (74.7)	657/1064 (61.7)	0.0021
Hispanic	95/150 (63.3)	579/1064 (54.4)	0.0397
Foreign Born	92/149 (61.7)	619/1050 (59.0)	0.5161
Mean years in US before TB dx (SD)	9.70 (12.9)	9.19 (11.4)	0.7502
Previous dx of TB	10/150 (6.67)	81/1053 (7.69)	0.6567
HIV positive	28/129 (21.7)	58/805 (7.20)	<0.0001
Homeless within year before TB dx	48/145 (33.1)	98/1033 (9.49)	<0.0001
Incarcerated at time of TB dx	12/150 (8.00)	40/1059 (3.78)	0.017
Resident of LTC facility at time of TB dx	8/150 (5.33)	24/1064 (2.26)	0.0276
Injecting drug use within past year	9/138 (6.52)	20/1006 (1.99)	0.0015
Non-injecting drug use within past year	22/138 (15.9)	68/1007 (6.75)	0.0002
Excess alcohol use within past year	39/134 (29.1)	143/1005 (14.2)	<0.0001
Not employed within past year	120/151 (79.5)	675/1064 (63.4)	<0.0001
MDR-TB	4/124 (3.23)	7/757 (0.92)	0.0324
Death before completion of TB therapy	17/130 (13.1)	60/916 (6.55)	0.0077

Table 2. Epidemiological factors associated with failure to diagnose TB during a potentially contagious visit

Characteristics	Received TB Dx (n=140)	Lack of TB Dx (n=39)	p-value
Age, years (SD)	42.0 (16.7)	43.8 (18.9)	0.5635
Male	105/140 (75.0)	32/39 (82.1)	0.3581
Hispanic	87/140 (62.1)	19/39 (48.7)	0.1314
Foreign Born	81/140 (57.9)	19/39 (48.7)	0.3094
Previous dx of TB	9/140 (6.43)	1/39 (2.56)	0.3527
HIV positive	27/118 (22.9)	9/36 (25.0)	0.7926
Homeless within year before TB dx	44/136 (32.4)	16/39 (41.0)	0.3145
Incarcerated at time of TB dx	14/140 (10.0)	4/39 (10.3)	0.9624
Resident of LTC facility at time of TB dx	6/140 (4.29)	2/39 (5.13)	0.8281
Injecting drug use within past year	11/128 (8.59)	3/34 (8.82)	0.9662
Non-injecting drug use within past year	24/128 (18.8)	6/34 (17.6)	0.8830
Excess alcohol use within past year	38/123 (30.9)	14/35 (40.0)	0.3118
Not employed within past year	84/139 (60.4)	29/39 (74.4)	0.1104
Homeless + alcohol abuse within past year	20/129 (15.5)	12/35 (34.3)	0.0129

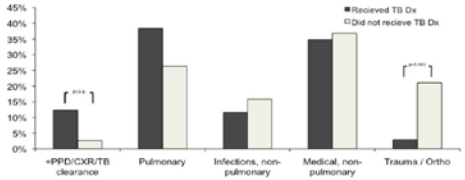

Figure 2. Chief complaint of TB patients during a potentially contagious visit.

Table 3. Clinical factors associated with failure to diagnose TB during a potentially contagious visit

Characteristics	Received TB Dx (n=140)	Lack of TB Dx (n=39)	p-value
Temperature	37.4 (0.1)	37.3(0.2)	0.50
Hear Rate	103.1 (1.9)	97.6 (3.4)	0.18
Respiratory Rate	20.6 (0.7)	17.9 (0.3)	0.06
O2 Sat	95.5 (0.5)	97.2 (0.6)	0.11
Cough	94/125 (75.2)	10/25 (40.0)	0.0008
Hemoptysis	26/86 (30.2)	0/5 (0)	0.17
Dyspnea	60/109 (55.0)	4/19 (21.0)	0.005
Subjective Fever	80/125(64.0)	11/28 (39.3)	0.014
Chills	68/117 (58.1)	8/22 (36.4)	0.049
Night Sweats	47/ 86 (54.7)	1/5 (20.0)	0.14
Weight loss	70/100 (70.0)	6/8 (75.0)	0.56
Abnormal lung exam	72/129 (55.8)	6/31 (19.4)	0.0002
Lymphadenopathy	13/72 (18.1)	0/9 (0)	0.18
Abnormal CXR	112/123 (91.1)	10/17 (58.9)	0.0007
--Infiltrate	75/112 (67.0)	7/10 (70.0)	0.57
--Cavitation	49/112 (43.8)	1/10 (10.0)	0.03
--Other	2 /112 (1.8)	2/10 (20.0)	0.03
Altered mentation	11/140 (7.9)	9/39 (23.1)	0.01
Left without treatment	1/140 (0.7)	2/39 (5.1)	0.12

Conclusions

In this study, TB patients presenting to the public emergency department were significantly more likely to have many of the known risk factors for TB, be diagnosed with MDR-TB and die before completion of therapy. Patients with a history of alcohol abuse and homelessness, or lack of signs and symptoms classical for TB were less likely to be diagnosed with TB during a potentially contagious visit. This study adds evidence to the belief that public emergency departments disproportionally care for TB patients and that these patients have a more precarious health status and greater risk for mortality than those who are diagnosed by other facilities.

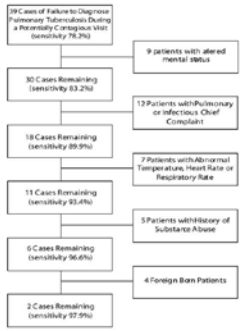

Figure 3. Derivation of a decision tool for identification of patients at very low risk for active pulmonary TB

Limitations

- The epidemiological patient characteristics were not obtained with this study in mind and therefore may not have the validity of a prospective study.
- The retrospective nature of the medical record review limited the ability to acquire missing data.
- This study did not have a control group of non-TB patients in the public emergency department.
- This was a single-site study, therefore these results may not reflect the state in emergency departments with different patient populations.
- Our definition of "potentially contagious" could lead to inclusion of some cases that were not actually contagious. (It is important to note that the CDC uses the less generous definition of 90 days).
- The analysis of predictors of receiving the diagnosis of TB in the public emergency department was conducted by visit, rather than by patient. Thus patients who made multiple visits to the ED will have a greater effect on this analysis than those who presented only once.
- The proposed decision tool was derived from a very small sample and should be validated in a larger study with a different patient population.

Acknowledgements

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