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Completeness of Tuberculosis Case Reporting, San Juan and Caguas Regions, Puerto Rico, 1992

SYNOPSIS

COMPLETENESS OF TUBERCULOSIS case reporting in Puerto Rico was assessed. Cases diagnosed among hospitalized, tuberculosis, and human immunodeficiency virus clinic patients during 1992 were retrospectively reviewed. Hospital discharge diagnoses, pharmacy listings of patients receiving anti-tuberculous medications, laboratory and acquired immunodeficiency syndrome registry data were used for case finding in selected hospitals and clinics. Identified cases were matched to the health department TB case registry to determine previous reporting through routine surveillance. Records of unreported cases were reviewed to verify tuberculosis diagnoses.

Of 159 patients with tuberculosis, 31 (19.5%) were unreported. A case was defined according to the Centers for Disease Control and Prevention definition. Unreported cases were less likely than previously reported cases to have specimens that were culture positive for *M. tuberculosis*, 14 of 31 (45.2%) compared with 111 of 128 (86.7%). Excluding the laboratory, tuberculosis diagnoses in acquired immunodeficiency syndrome registry patients had the highest predictive value of finding tuberculosis (94.1%), followed by tuberculosis clinic records (71.7%), and pharmacy listings (45.6%). Tuberculosis discharge diagnoses, however, yielded the largest number of unreported cases (14). Health care providers should be educated regarding the importance of promptly reporting all suspected TB cases regardless of results of laboratory testing.

Although the increase in reported tuberculosis (TB) cases has received attention in recent years, there have been no recent studies evaluating completeness of TB case reporting in this country. Throughout the United States (including Puerto Rico) current public health law requires TB case reporting to the health department by health care providers or laboratories, or both. The Centers for Disease Control and Prevention (CDC) is collaborating with state health departments to evaluate completeness of reporting of TB cases. We report the results of the first such evaluation, conducted in Puerto Rico, one of the reporting areas of the United States.

Methods

All TB cases reported by the Puerto Rico Department of Health to CDC in 1992 were considered the reference case list. Two of the eight health care regions in Puerto Rico were selected for study. The regions of San Juan (TB case rate 15.7 per 100,000) and Caguas (8.3 per 100,000) represent the metropolitan and nonmetropolitan regions with the largest number of reported TB cases in 1992. There were 136 reported cases in San Juan and 36 in Caguas of the 312 total reported cases in Puerto Rico.

Eleven of the 16 hospitals in the San Juan region were included in the study: all seven public hospitals and four of nine private hospitals. In the Caguas region, the only public and two of the four private hospitals in this region were included. Private hospitals in the study did not differ from private non-study hospitals in size (number of beds) or in number of TB cases reported from these hospitals.

In the study hospitals, three different sources were used for case ascertainment: (a) lists of patients with a discharge diagnosis of TB (International Classification of Diseases [ICD]-9 codes 010-018), or the combination of HIV-AIDS (ICD-9 codes 042-044.9) with unspecified pneumonia (ICD-9 codes 482.9, 484.8, 485, and 486); (b) pharmacy records to identify patients prescribed two or more first-line anti-tuberculous medications (isoniazid, rifampin, pyrazinamide, ethambutol, and streptomycin); and (c) records from the hospital laboratory (and all other laboratories to which hospitals sent clinical specimens) of patients who were culture positive for *M. tuberculosis*.

In addition to the hospitals, we reviewed the largest of the two TB clinics in San Juan and the only TB clinic in the Caguas region. In each TB clinic, records of all patients presenting to the clinic in 1992 with suspected or confirmed TB were reviewed. Because the HIV clinic located in the Caguas region evaluates and treats patients with suspected or confirmed TB, records of all patients evaluated in the clinic in 1992 with suspected and confirmed TB were also reviewed. The AIDS registry was reviewed to identify patients who had TB or wasting syndrome diagnosed in 1992 at any of the study facilities. Lastly, records of the mycobacteriology laboratories serving the study facilities were reviewed. This included six laboratories, two in hospitals and three commercial (one in the continental United

States, the other two in Puerto Rico) and one state reference laboratory.

A total of 172 TB cases were reported in 1992 from the two regions included in this study. Of these 172 cases, 128 (74.4%) were reported from the study hospitals and clinics. All possible TB cases identified by these sources were matched to the Puerto Rico TB case registry to determine if they had been previously reported. Patients who were previously reported through routine surveillance and unreported patients with positive cultures identified through laboratory searches were assumed to represent true TB cases and their records were not reviewed. Records of all persons *not* previously reported were reviewed to verify the diagnosis of TB. A TB case was defined according to the TB case definition published by CDC.¹

Unreported cases were compared with reported cases by sex, age, site of disease, source of care, and diagnostic criteria. Differences in proportions were assessed with the Chi square statistic or Fisher exact test for categorical variables. Continuous variables were compared with the Student's t-test using Epi info version 5.01b.² To estimate the completeness of the health department TB registry, the number of reported cases was divided by the total number of reported and unreported cases identified from the study facilities. The predictive value (PV) of case ascertainment sources for identi-

fying TB cases was estimated by dividing the number of reported and unreported TB cases by the number of potential cases identified from each data source.³ The yield for unreported TB cases was estimated by dividing the number of unreported TB cases by the number of potential cases reviewed after excluding previously reported TB cases.

Results

Evaluation of completeness of reporting. A total of 159 confirmed TB cases were identified from the study facilities; 128 (80.5%) were reported and 31 (19.5%) were unreported. Reported cases were significantly more likely than unreported cases to be of younger median age, have only pulmonary disease, and have clinical specimens that were culture positive for *M. tuberculosis* (Table 1). Among unreported cases, 25.8% had no laboratory evidence of disease but met the clinical criteria for a TB case, while all of the reported cases had laboratory evidence of disease. Eight

Reported cases were significantly more likely than unreported cases to be of younger median age, have only pulmonary disease, and have clinical specimens that were culture positive for *M. tuberculosis*.

Table 1. Characteristics of TB patients, San Juan and Caguas regions, Puerto Rico, 1992

Characteristic	Reported N=128		Unreported N=31	
	Number	Percent	Number	Percent
Male	100	78.1	21	67.7
Median age (years and range) ¹	42	9-92	59	39-89
Disease site:				
Pulmonary only ¹	112	87.5	20	64.5
Extra pulmonary only	13	10.2	7	22.6
Both	3	2.3	1	3.2
Unknown	0	0	3	9.7
Source of care:				
Public hospital or clinic	118	92.2	25	80.6
Private hospital	10	7.8	6	19.4
Case definition criteria:				
Culture positive ¹	111	86.7	14	45.2
Smear positive ²	17	13.3	9	29.0
Clinical criteria	0	0	8	25.8

¹P<.01²AFB smear positive; culture not done or result unknown, P<.03.

(25.8%) of the 31 unreported cases were known to the health department as suspected TB cases. The information on these cases in the health department records was insufficient to make them reportable as verified TB cases; however, additional data were found on medical record reviews to support the diagnosis of TB.

In addition to the 31 unreported TB cases, 28 cases that did not meet the CDC case definition criteria¹ were diagnosed and treated as TB by the medical provider. Twelve were tuberculin skin test (TST) positive and did not meet the case definition either because there was no evidence in the medical record of a follow-up chest radiograph to detect worsening or improvement or the follow-up radiograph was stable. The remaining 16 did not meet the case definition because they were TST negative or had unknown TST status. Because these 28 did not meet the TB case definition criteria they were not considered unreported cases.

Evaluation of TB case ascertainment sources. A total of 187 patients were identified from TB ICD-9 discharge diagnoses from all hospitals; 51 patients were previously reported. Of the remaining 136 records, 122 (89.7%) were located and reviewed; 14 unreported TB cases were identified.

HIV-unspecified pneumonia ICD-9 discharge data were available for nine hospitals and identified 352 patients. A random sample of records of 140 patients from the largest three hospitals and all patients (N=72) from the remaining six hospitals were selected for review; 193 (91%) of these records were available. Four TB cases were identified; all had been reported.

Pharmacy records of patients receiving two or more first-line anti-TB medications were available in three San Juan hospitals. Fifty-seven patients were identified; 22 had been

previously reported to the health department. Thirty five (97%) of the remaining 36 records were available for review; among these, three additional unreported TB cases were identified. The remaining patients had been given anti-TB medications until the diagnosis of TB was excluded.

The records for all 92 patients with suspected or confirmed TB in the two TB clinics and all 50 patients in the HIV clinic were reviewed. Among TB clinic patients, 60 cases were previously reported; among HIV clinic patients, five TB cases were reported. Six unreported TB cases were found in the TB clinics, and no unreported cases were found in the HIV clinics.

Table 2. Predictive Value (PV) for TB of case ascertainment sources, San Juan and Caguas regions, Puerto Rico, 1992

Sources	Number of		
	potential cases	TB cases ¹	(PV)
ICD 9 codes:			
TB (14 sites)	173	65	37.6
HIV, unspecified pneumonia (9 sites)	193	4	2.1
Pharmacy (3 sites)	57	25	43.9
AIDS registry:			
TB	17	16	94.1
Wasting syndrome	110	2	1.8
TB clinic	92	66	71.7
HIV clinic	50	5	10.0

¹Cases may be found in more than one source.

NOTE: PV = number of TB cases divided by number of potential cases reviewed.

Table 3. Yield of unreported TB cases by ascertainment source, Puerto Rico, 1992

Sources	Number of potential cases reviewed	Unreported TB Cases ¹	Yield
ICD 9 codes:			
TB (14 sites).....	122	14	11.5
HIV, unspecified pneumonia (9 sites).....	189	0	0.0
Pharmacy (3 sites).....	35	4	11.4
AIDS registry:			
TB.....	2	1	50.0
Wasting syndrome.....	109	1	0.9
TB clinic.....	32	6	18.8
HIV clinic.....	45	0	0.0

¹Cases may be found in more than one source.

NOTE: Yield of unreported cases = unreported cases divided by number of potential cases reviewed (excludes previously reported cases)

Seventeen AIDS patients diagnosed with TB at the study facilities in 1992 were found on the AIDS registry. Fifteen (88%) were previously reported to the TB registry. Medical records for the remaining two were reviewed. One of these patients was receiving isoniazid preventive therapy and did not have a diagnosis of TB; the other had TB and was unreported.

A total of 136 persons were diagnosed with wasting syndrome in 1992 in the study facilities; one was previously reported as a TB case to the health department. Of the remaining 135, 109 (81%) records were available for review; one unreported TB case was found. The PV and yield of the various case ascertainment sources are shown in Tables 2 and 3.

Laboratory review for the study facilities identified 118 persons with cultures positive for *M. tuberculosis*. Seven (5.9%) hospitalized patients were unreported; one of these seven was also found by TB ICD-9 discharge diagnosis.

Discussion

The completeness of TB case reporting has not been evaluated in the United States in 15 years. Although it is recognized that, for all reportable diseases, not all cases are reported,⁴⁻¹⁹ some measure of the completeness of case

reporting is required for accurate interpretation of surveillance data.

At least 19.5% of TB cases in the study facilities were unreported. We also found a number of cases diagnosed with TB by the health care provider that did not meet the CDC case definition. CDC accepts TB cases reported by states that do not meet all the criteria of the case definition but who are diagnosed with TB by their health care provider. In 1993, 7.5% of TB cases in the United States reported to the CDC were verified by provider diagnosis.²⁰ If we include provider verified cases identified in our study, the proportion of unreported cases is 31.6%. In addition, since we did not assess reporting of TB cases in office-based physician practices, our findings likely underestimate the number of unreported cases in the study regions.

Our results are consistent with the findings of the few studies that have evaluated underreporting of TB. One such study, a review of discharge records in 11 Washington, DC, hospitals in 1977, found that 37% of persons with TB discharge codes had not been reported to the health department.⁴ Another study, using pharmacy prescription data in Maryland in 1976, found that 19% of patients receiving two or more anti-TB drugs had not been reported (according to unpublished data from David Glasser, MD, Baltimore City health department). However, neither study reviewed the patient's medical record to verify a diagnosis of TB. A study of patients admitted to two London hospitals between 1985 and 1989 identified possible TB patients from laboratory, death certificate, and discharge diagnosis listings. Diagnoses were verified by medical record review. This study found that

27% of TB cases were unreported to health authorities.⁵

Reasons for not reporting TB cases included underreporting of clinical cases, assuming the case was reported by someone else, and staff turnover. The number of cases and the number of records reviewed to find a TB case varied by source (Tables 2 and 3). After excluding the laboratory, the AIDS registry listing of persons with TB diagnoses had the highest PV, followed by

TB clinic records and pharmacy listings. However, TB hospital discharge diagnoses yielded the largest number of unreported cases, followed by TB clinic records and pharmacy listings. In our study, wasting syndrome in the AIDS registry, discharge diagnoses of HIV and unspecified pneumonia, and HIV clinic records were not useful sources for finding unreported TB cases.

In Puerto Rico, only 45.2% of unreported cases had TB that was culture positive, while 86.7% of reported TB cases were culture positive. The proportion of TB cases culture

Eight (25.8%) of the 31 unreported cases were known to the health department as suspected TB cases.

positive for *M. tuberculosis* among reported TB cases varies widely in different areas of the United States.²¹ Our study suggests that the clinical case definition published by CDC was underutilized in Puerto Rico.¹ We did not assess whether positive *M. tuberculosis* cultures represented true TB cases; laboratory contamination of clinical specimens resulting in false positive cultures has been reported elsewhere.²²⁻²⁵

Puerto Rico law on TB reporting requires reporting from physicians, nurses, and midwives. Laboratories, however, are not specified in the reporting requirement. Seven unreported cases with cultures positive for *M. tuberculosis* were identified from laboratory listings. During the study period, a continental United States commercial laboratory receiving specimens from Puerto Rico reported positive culture results not to Puerto Rico but instead to the state TB control program in which the laboratory was geographically located.

As a result of this evaluation, the Puerto Rico health department has begun to address new strategies to deal with underreporting of TB cases, including increasing use of high yield ascertainment sources for active surveillance and education of health care practitioners on the importance of reporting all suspected TB cases. Additionally, modification of TB reporting laws is planned so that public and private mycobacteriology laboratories processing specimens from Puerto Rico will be required to report AFB positive smears and cultures positive for *M. tuberculosis* to the Puerto Rico health department. Other states should evaluate reporting of TB cases in their areas and, if necessary, take similar actions to improve completeness of reporting.

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