ORIGINAL ARTICLE

# Delayed Suspicion, Treatment and Isolation of Tuberculosis Patients in Pulmonology/ Infectious Diseases and Non-Pulmonology/ Infectious Diseases Wards

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**Background/Purpose:** Delayed diagnosis and isolation increases the risk of nosocomial transmission of tuberculosis (TB). To assess the risk of delayed management of TB, we analyzed the risk factors of prolonged delay in isolation of smear-positive TB patients in pulmonology/infectious diseases and other wards in a tertiary teaching hospital.

**Methods:** We enrolled smear-positive TB patients aged > 16 years with delayed respiratory isolation following hospitalization. Medical records were reviewed retrospectively. Time intervals between admission, order of sputum acid-fast staining, initiation of anti-tuberculous treatment and isolation were compared between pulmonology/infectious diseases wards (PIWs) and other wards. Risk factors were analyzed in patients with prolonged isolation delay of > 7 days in individual groups.

**Results:** Isolation was delayed in 191 (73.7%) of 259 hospitalized smear-positive TB patients. Median suspicion, treatment and isolation delays were 0, 3 and 4 days in PIWs and 1, 5 and 7 days in other wards. For patients admitted to non-PIWs, atypical chest radiographs, symptoms without dyspnea or not being admitted from the emergency department (ED) were risk factors for prolonged isolation delay exceeding 7 days. The only risk factor for delayed isolation in patients admitted to PIWs was age ≥ 70 years.

**Conclusion:** Delays in suspicion, treatment and isolation of TB patients were longer in non-PIWs. Clinicians should be alert to those admitted to non-PIWs with atypical chest radiographs, atypical symptoms, or not admitted from the ED. [*J Formos Med Assoc* 2009;108(3):202–209]

**Key Words:** cross infection, emergency service, hospital, infection control, tuberculosis

Minimizing transmission of tuberculosis (TB) in health care facilities is vital for controlling tuberculosis. Outbreaks of nosocomial TB have been reported frequently.[1–4] TB is endemic in Taiwan. In 2004, 24,161 TB cases were notified, 17,142 were confirmed, and 957 TB-related deaths occurred.[5,6] The notification rate of TB in that year was 75.6 per 100,000 population, a rate 15.1 times higher than in the United States.[7] In 2003, an outbreak of nosocomial transmission of *Mycobacterium*



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*tuberculosis* was discovered through screening for severe acute respiratory syndrome (SARS) in a hospital in northern Taiwan.[8]

Guidelines for TB infection control published by the US Center for Disease Control and Prevention (CDC) have been implemented widely in health care facilities in the United States.[9] The results have been readily apparent in the decreased number of TB outbreaks and transmission of *M. tuberculosis* to patients and health care workers (HCWs) in health care facilities.[10–12] The CDC guidelines recommend calculating the time intervals from admission to suspicion, diagnostic procedures, isolation and initiation of effective anti-tuberculous chemotherapy as an important part of infection control programs.[9,10]

The risk of exposure to TB is thought to be higher in pulmonology/infectious diseases wards (PIWs) because of the larger number of contagious patients managed in these departments. In addition, infectious disease specialists and pulmonologists are more familiar with the symptoms of TB, and are more alert to its radiographic findings. As a result, TB patients are more likely to be diagnosed earlier in PIWs. We therefore hypothesized that delayed diagnosis, treatment and isolation may be shorter in these departments.

Here, time intervals were calculated, and risk factors for delayed isolation of adult TB patients with positive sputum acid-fast staining (AFS) were analyzed to evaluate the risk of unprotected exposure to TB in a tertiary hospital in northern Taiwan. The computed intervals in PIWs and non-PIWs were compared, and risk factors for prolonged isolation delay in these two groups were analyzed.

## Methods

### *Patients*

At Linkou Chang-Gung Memorial Hospital (CGMH), a 3500-bed tertiary teaching hospital in northern Taiwan, 800–1000 cases of TB are reported annually. Hospitalized smear-positive TB patients aged > 16 years with delayed isolation were included in this study. The patient list was obtained from the Committee for Infection Control of CGMH. Medical records were retrospectively reviewed. There were 1880 patients reported with TB at CGMH between July 2002 and September 2004. As a result of the limited number of available negative-pressure isolation rooms, most of the reported TB patients were not hospitalized and were managed in the outpatient clinics. Only 259 (13.7%) patients with positive sputum AFS and cultures were hospitalized. Delayed isolation was defined as patients with positive AFS and *M. tuberculosis* cultures in respiratory tract specimens who were not transferred to negative-pressure isolation rooms immediately after admission. Prolonged isolation delay was defined as patients with delayed respiratory isolation that exceeded 7 days after admission.

We classified all patients as PIW (pulmonology and infectious diseases wards) and non-PIW (other hospital wards including non-pulmonary/infectious diseases medical wards or non-medical wards). This study was approved by the Ethics Committee of CGMH.

### *Data collection*

The collected demographic data included gender, age, comorbidity, initial symptoms and ward of admission. Chest radiographs at admission were reviewed for the existence of predominant upper lobe lesions, cavitations or miliary lesions. Atypical chest radiographs for TB were defined as those with none of the above findings. Comorbidity included diabetes mellitus, chronic renal insufficiency (serum creatinine > 2.0 mg/dL) or end-stage renal disease, cancer, hematologic diseases, autoimmune diseases, neurologic disorders, and use of immunosuppressive drugs or corticosteroids. The initial symptoms including cough, sputum, fever, shortness of breath, hemoptysis, body weight loss, or fatigue were recorded. Dates of available chest radiograph after admission, ordering of sputum AFS, initiation of anti-tuberculous chemotherapy and date of isolation in negative-pressure room were also collected. The intervals between admission and ordering of AFS, admission