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ORIGINAL ARTICLE

Prevalence and Predictors of Compliance with Discontinuation of Airborne Isolation in Patients with Suspected Pulmonary Tuberculosis

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OBJECTIVE. Examine the use of airborne isolation by identifying reasons for nontimely discontinuation and predictors of compliance with Centers for Disease Control and Prevention (CDC) guidelines. Compliance with guidelines should result in timely (within 48 hours) discontinuation of isolation in patients without infectious pulmonary tuberculosis (TB).

DESIGN. Retrospective, observational study.

SETTING. A private, university-affiliated, tertiary-care medical center.

PATIENTS. All patients in airborne isolation for suspected pulmonary TB from June through December 2011.

METHOD. Chart reviews were performed to identify airborne isolation practices and delayed (greater than 48 hours) or very delayed (greater than 72 hours) discontinuation. We used descriptive statistics and logistic regression to determine independent predictors of nontimely discontinuation of isolation.

RESULTS. We identified 113 patients (mean age \pm standard deviation, 59.8 \pm 17.7 years; male sex, 75.2%; white race, 15.9%; mean collection interval \pm standard deviation, 21.4 \pm 12.9 hours). Delayed and very delayed isolation discontinuation was noted in 81% and 49% of patients, respectively. No significant differences in demographic characteristics and clinical characteristics were identified between groups. Predictors of timely (within 48 hours) airborne isolation discontinuation included use of alternate diagnosis for discontinuation of isolation ($P = .02$), early infectious diseases (ID) consultation ($P = .03$), pulmonary consultation ($P = .02$), average sputum collection interval less than 24 hours ($P = .03$), and need for more than 1 induced sputum specimen ($P = .05$). Adjusting for potential confounders, pulmonary consultation (odds ratio [OR] [95% confidence interval (CI)], 0.14 [0.03–0.58]), alternate diagnosis for discontinuation of isolation (OR [95% CI], 4.5 [1.3–15.8]), and early ID consultation (OR [95% CI], 4.0 [1.1–14.8]) were independently associated with timely discontinuation.

CONCLUSIONS. Timely airborne isolation discontinuation occurs in only 18.6% of cases and is an opportunity for cost savings, improved efficiency, and potentially patient safety and satisfaction.

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The incidence of tuberculosis (TB) is significantly higher in Hawaii than in other parts of the United States. Data reported by the Centers for Disease Control and Prevention (CDC) for the state of Hawaii indicate a case rate of approximately 8.8 cases per 100,000 persons for 2010, more than double the national rate of 3.6 cases per 100,000 persons.¹

Prompt, appropriate triage is necessary in all settings but is especially important in areas with a high prevalence of pulmonary TB.² Use of a highly sensitive, standard isolation guideline can greatly enhance early detection of cases of pulmonary TB and thus mitigate the risk to health care workers; however, many patients will be unnecessarily isolated.

Physical isolation (whether it be contact, droplet, or airborne isolation) imposed on patients impacts their safety,^{3,4}

satisfaction,^{3,5} and psychological wellbeing.⁶⁻⁸ Prompt discontinuation of isolation once infectious pulmonary TB has been ruled out is essential to minimizing these risks in addition to limiting costs.

We conducted this study to examine the practice patterns of airborne isolation use at a large, tertiary care medical center. We sought to identify reasons for nontimely discontinuation of airborne isolation as well as predictors of compliance to the CDC guidelines.

METHODS

The Queen's Medical Center (Honolulu, Hawaii) is a 533-bed university-affiliated, private tertiary care medical center

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that is a primary referral center for the Pacific Basin. We identified all patients who were placed in airborne isolation for TB from June 1 through December 31, 2011. Patients were excluded if they were greater than 18 years of age or died while under airborne isolation.

Demographic data, medical comorbidities, admitting diagnoses, clinical features at presentation, radiographic findings, timing and method of collection of sputum specimens, timing of infectious disease and pulmonology consultations with respect to initiation of isolation, and total duration of isolation for each patient were collected. The SafetySurveillor Real-time Report (Premier) identified all specimens obtained for acid-fast bacillus (AFB) smear.

Guideline compliance was defined according to the CDC guidelines for removal of airborne isolation precautions.² Airborne isolation should be removed if either (1) another diagnosis is made that explains the clinical syndrome or (2) the patient has 3 consecutive negative sputum specimens (obtained every 8 to 24 hours) with at least 1 specimen collected in the early morning. Specimen collection may be obtained by expectoration, induction with hypertonic saline, aspiration, or bronchoscopic examination.

By following these guidelines, it is generally expected that the total duration of airborne isolation should be less than 48 hours, allowing for delays related to test ordering and processing of sputum samples. We assessed adherence at both 48 and 72 hours. Patients who were removed from isolation in violation of the appropriate CDC protocol were classified as noncompliant even if the total duration of isolation was less than 48 hours.

We reviewed each non-guideline-compliant case and determined the primary reason for lack of adherence or failure to discontinue airborne isolation in a timely manner. "Delayed action" was defined by slow turnaround time (more than 12 hours) from reporting of the third AFB smear result to the time information was acted on by the primary team. "Early nontuberculous mycobacterium" (NTM) was defined as the presence of a rapidly growing mycobacterium in sputum culture 3 days or less from collection of the first sample. "No sputum" was defined as an inability for the patient to produce a sputum sample, despite induction using hypertonic saline. "Bronchoscopy" was defined as a clear delay in discontinuation of airborne isolation due to performing bronchoscopic examination. "Unclear" cases were ones that did not fit into the above categories.

The impact of pulmonology and infectious diseases (ID) consultations was assessed. "Early" consultation was defined as 24 hours or less from when the order for airborne isolation was placed to when the consultant logged his or her initial note in the electronic medical record.

Statistical analyses were performed using STATA 8.0 statistical software. Categorical and continuous variables were compared using the Pearson χ^2 test, Fisher exact test, or Student *t* test as appropriate. Demographic and clinical variables associated with timely discontinuation of airborne isolation

on univariate analysis at $P < .25$ were considered potential confounders and were included in a multivariable logistic regression model to identify independent predictors of timely discontinuation. Adjusted odd ratios (ORs) and 95% confidence intervals (CIs) were computed. We used the variance inflation factor to confirm the absence of significant collinearity among the dependent variables, and the Hosmer and Lemeshow goodness-of-fit test was used to assess model fit. All *P* values were 2 tailed; *P* values of less than .05 were considered to indicate statistical significance.

RESULTS

Patients ($n = 115$) were placed in TB airborne isolation from June 1 to December 31, 2011. Two patients were excluded, including 1 patient who died while under isolation and another who was less than 18 years of age and was transferred to another facility. Among a total of 113 subjects, 75.2% were male. Their mean age (\pm standard deviation [SD]) was 59.8 ± 17.7 years. Subjects were mostly Asian (54.9%) and Pacific Islander (26.5%). There were no statistically significant differences in characteristics between the compliant and non-compliant groups (Table 1).

The prevalences of diabetes, congestive heart failure, and chronic lung disease (asthma, chronic bronchitis, chronic obstructive pulmonary disease, emphysema, and bronchiectasis) were 25.7%, 16.8%, and 37.2%, respectively. Excluding skin cancers, 8.0% of subjects were undergoing cancer treatment, whereas 8.8% had previously treated cancer. Autoimmune disease (2.7%), liver disease (4.4%), end-stage renal disease (4.4%), human immunodeficiency virus infection (5.3%), and previous NTM infection (4.4%) among patients with suspected pulmonary TB were low.

Risk factors for exposure to TB were assessed. Being foreign born (13.3%) and latent TB infection (9.7%) were the most common, whereas previous pulmonary TB (6.2%), known contact with a person with active TB (5.3%), prison (5.3%), and homelessness (4.4%) accounted for the remaining risk factors. No recognizable risk factor was identified in 62.8%.

Radiographic findings typical of TB, including infiltrates or consolidations and/or cavities in the upper lungs, were seen in 43.4% of subjects. Intensive care unit admission was required for 16.8%, and 12.4% needed mechanical ventilation. Hospitalists (84.1%) and residents (53.1%) were involved in the care of most patients.

Among the 41.6% of patients placed under TB airborne isolation with an ID consultant, 63.8% were considered early. Similarly, pulmonology was consulted for 43.4% of patients, and 51.0% were considered early.

A diagnosis of pulmonary TB was made for 2.7% of subjects, and NTM were isolated from 15.9% of subjects. Overall, 8.0% died from their underlying condition.

TABLE 1. Baseline Characteristics of Patients Compliant and Noncompliant at 48 Hours after Initiation of Airborne Isolation

Variable	No. (%) of patients			P
	All	Compliant	Noncompliant	
Overall	113 (100)	21 (18.6)	92 (81.4)	
Race				
White	18 (15.9)	3 (14.3)	15 (16.3)	1.0
Japanese	17 (15.0)	2 (9.5)	15 (16.3)	.74
Chinese	10 (8.8)	2 (9.5)	8 (8.7)	1.0
Filipino	28 (24.8)	5 (23.8)	23 (25.0)	1.0
Pacific Islander	30 (26.5)	7 (33.3)	23 (25.0)	.42
Other	8 (7.1)	1 (4.8)	7 (7.6)	1.0
Diagnosis				
Diabetes	29 (25.7)	5 (23.8)	24 (26.1)	1.0
Congestive heart failure	19 (16.8)	4 (19.0)	15 (16.3)	.75
Lung disease	42 (37.2)	10 (47.6)	32 (34.8)	.32
History of treated cancer	10 (8.8)	0 (0.0)	10 (10.9)	.30
Currently treated cancer	9 (8.0)	1 (4.8)	8 (8.7)	1.0
Autoimmune disease	3 (2.7)	0 (0.0)	3 (3.3)	1.0
Liver disease	5 (4.4)	2 (9.5)	3 (3.3)	.23
End-stage renal disease	5 (4.4)	1 (4.8)	4 (4.3)	1.0
HIV infection	6 (5.3)	1 (4.8)	5 (5.4)	1.0
History of NTM infection	5 (4.4)	2 (9.5)	3 (3.3)	.23
Hospitalist service	95 (84.1)	18 (85.7)	77 (83.7)	1.0
Residents involved in care	60 (53.1)	13 (61.9)	47 (51.1)	.47
Infectious disease consulted	47 (41.6)	10 (47.6)	37 (40.2)	.63
Early (within 24 hours)	30 (63.8)	10 (100)	20 (54.1)	.03
Pulmonology consulted	49 (43.4)	4 (19.0)	45 (48.9)	.02
Early (within 24 hours)	25 (51.0)	4 (100)	21 (46.7)	1.0
Typical TB imaging	49 (43.4)	12 (57.1)	37 (40.2)	.22
NTM isolated	18 (15.9)	2 (9.5)	16 (17.4)	.52
Mechanical ventilation	14 (12.4)	1 (4.8)	13 (14.1)	.46
ICU admission	19 (16.8)	2 (9.5)	17 (18.5)	.52
Death	9 (8.0)	1 (4.8)	8 (8.7)	1.0

NOTE. HIV, human immunodeficiency virus; ICU, intensive care unit; NTM, nontuberculous mycobacteria; TB, tuberculosis.

Timing and Methods of Discontinuation of Isolation

Ninety-three subjects had at least 2 sputum samples collected, with an average interval of 13.5 ± 5.4 hours in the compliant group and 23.4 ± 13.1 hours in the noncompliant group ($P = .03$). Twenty patients do not have a calculable interval, because only 1 specimen was obtained secondary to death, bronchoscopic examination, or use of an alternate diagnosis.

Three negative expectorated AFB smears (57.5%) was the most common reason for discontinuation of isolation, followed by an alternate diagnosis to explain the clinical syndrome (20.4%). In some patients, it was necessary to obtain specimens by means other than patient self-expectoration. Specimens were obtained by aspiration when a patient received mechanical ventilation (9.7%), induction with hypertonic saline by respiratory therapy (2.7%), and bronchoscopic examination (7.1%).

Guideline Compliance and Timely Discontinuation of Isolation

Overall, guideline compliance was seen 95.6% of the time with the failures ($n = 5$) due to collecting specimens at less than an 8-hour interval. Appropriately, patients who were diagnosed with pulmonary TB remained in isolation throughout their hospitalization ($n = 3$). Timely discontinuation of airborne isolation occurred in 18.6% of patients at 48 hours and 51.3% of patients at 72 hours.

Independent Predictors of Timely Discontinuation and Reasons for Delay

After adjusting for potential confounders (history of liver disease, typical TB imaging, previous atypical TB, and immunocompromised state), the presence of an alternate diagnosis for the clinical syndrome and early ID consultation

TABLE 2. Independent Predictors of Timely Discontinuation among Patients Isolated for Suspected Pulmonary Tuberculosis

Variable	Adjusted OR	95% CI
Pulmonary consultation	0.14	0.03–0.58
Alternate diagnosis for discontinuation of isolation	4.5	1.3–15.8
Early infectious disease consultation	4.0	1.1–14.8

NOTE. CI, confidence interval; OR, odds ratio.

were independently associated with timely discontinuation, whereas pulmonary consultation was associated with nontimely discontinuation (Table 2). Delayed action was the main reason for nontimely discontinuation of isolation (23.9%; Figure 1). Patient inability to produce a sputum sample (15.2%) was also a relatively common finding. In a majority of cases (43.5%), the reason for the delayed discontinuation was unclear.

DISCUSSION

The CDC TB guidelines were developed to standardize the appropriate management of patients with suspected TB, thereby preventing healthcare-associated outbreaks, curbing delays in diagnosis and treatment, and averting the appearance and transmission of multidrug-resistant TB strains.² Much has been written about the implementation of algorithms to appropriately identify and isolate high-risk patients with suspected pulmonary TB and the examination of factors that lead to delayed initiation of isolation^{9–14}; however, there are no previous studies to examine our efficiency in removing patients from isolation appropriately. The issue is not only one of resource utilization and cost, because airborne isolation rooms are typically in short supply and high demand at many hospitals, but evidence suggests that isolation leads

to problems with patient safety and patient satisfaction.⁴ Isolated patients are less likely to receive the same level of nursing care as nonisolated patients and are less likely to be examined by physicians during rounds.^{15,16} Importantly, preventable adverse events occur twice as frequently among isolated patients compared with nonisolated patients.³

Our study highlights several important findings. Although we do a fairly good job of following the guidelines to discontinue airborne isolation, there is certainly room for improvement, because 5 patients were removed from isolation, violating the appropriate CDC protocol. Ultimately, none of these patients had pulmonary TB; however, this represents an unnecessary risk to other patients and to hospital personnel. Failures attributable to collecting specimens at less than an 8-hour interval, some without an early-morning sputum sample, represent both knowledge deficiencies and systems-based problems.

First and foremost, discontinuing airborne isolation at a safe juncture should be the primary objective. Timeliness of isolation discontinuation should be considered a secondary target. An important finding in our study is the difficulty in achieving timely discontinuation of isolation, with only 18.6% of patients out of isolation at 48 hours and 51.3% at 72 hours. A number of systems-related issues, such as communication,

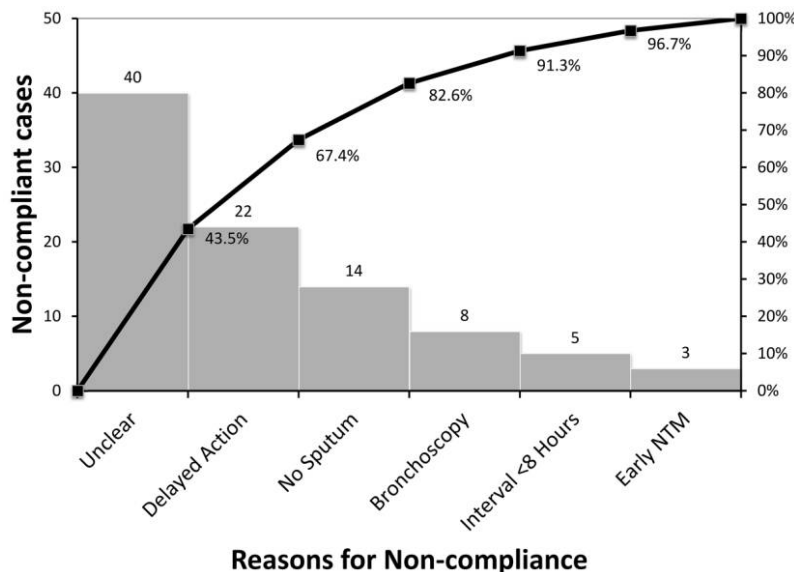


FIGURE 1. Pareto chart of reasons for nontimely discontinuation of airborne isolation. NTM, nontuberculous mycobacteria.

timing of rounds, and information turnaround time, contribute to the delays. Not surprisingly, because of the retrospective nature of the study, identifying a clear reason for delay was difficult in most cases. However, a slow response from the time of reporting an AFB smear to an action by a physician (ie, entering an order for discontinuing isolation) represented the most frequent reason for a delay. Improved communication of the results of AFB smears can occur on multiple levels. Nursing staff may notice results and should promptly notify the physician should an action need to be taken. Physician and resident awareness of the known harms from isolation may increase the motivation to get patients out of isolation in a timely fashion. Additionally, with the use of electronic medical records, best practice alerts could be implemented to raise awareness; this could prompt an action to be taken on a daily basis when patients are in isolation.

The manner in which specimens are ordered and collected contributed to delays in a number of instances. Computerized order entry of daily AFB sputum specimens makes it very difficult to collect an adequate number of specimens in a timely fashion. Anecdotally, from personal query, very few residents and hospitalists are aware of the fact that specimens can be collected every 8 hours (with 1 early morning specimen). Improved education in this area would greatly enhance timely discontinuation of isolation.

The fact that ID physicians efficiently discontinued isolation perhaps speaks to a better understanding of systems issues and a better understanding of the guidelines. The finding that an ID subspecialist does a better job of managing their own disease-specific problems is in line with findings from other studies.^{17,18} For unclear reasons, pulmonary consultation was associated with a delay in airborne isolation discontinuation (OR [95% CI], 0.14 [0.03–0.58]). One might hypothesize that a pulmonologist may be more likely to recommend procedures, such as bronchoscopic examination, which may result in delays because of timing and availability of staff; however, we did not observe bronchoscopic examination as an independent predictor of nontimely discontinuation. This could be the result of our small sample size.

Although less common than contact isolation, the unquestionably more isolated nature of airborne isolation should be the focus of future work on patient safety and satisfaction. Limitations include our single-center, retrospective, observational design and the quality of documentation available to identify reasons for delay. Additionally, our study was performed in a setting with a high case rate of TB; therefore, physicians' may isolate for a longer time, because concern regarding TB is at the forefront of physicians' minds when patients present with respiratory illnesses.

Despite limitations, our finding that timely airborne isolation discontinuation occurs in only 18.6% of cases represents an opportunity for improved efficiency and, potentially, improved patient satisfaction and safety. Increasing awareness and standardizing protocols, as well as promptly securing an

alternative diagnosis to pulmonary TB and early ID consultation, may improve timely CDC guideline adherence.

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REFERENCES

- Centers for Disease Control and Prevention. Trends in tuberculosis—United States, 2010. *MMWR Morb Mortal Wkly Rep* 2011;60:333–337.
- Jensen PA, Lambert LA, Iademarco MF, Ridzon R; Centers for Disease Control and Prevention. Guidelines for preventing the transmission of *Mycobacterium tuberculosis* in health-care settings, 2005. *MMWR Recomm Rep* 2005;54(RR-17):1–141.
- Stelfox HT, Bates DW, Redelmeier DA. Safety of patients isolated for infection control. *JAMA* 2003;290:1899–1905.
- Abad C, Fearday A, Safdar N. Adverse effects of isolation in hospitalized patients: a systematic review. *J Hosp Infect* 2010;76:97–102.
- Gasink LB, Singer K, Fishman NO, et al. Contact isolation for infection control in hospitalized patients: is patient satisfaction affected? *Infect Control Hosp Epidemiol* 2008;29:275–278.
- Wilkins EG, Ellis ME, Dunbar EM, Gibbs A. Does isolation of patients with infections induce mental illness? *J Infect* 1988;17:43–47.
- Catalano G, Houston SH, Catalano MC, et al. Anxiety and depression in hospitalized patients in resistant organism isolation. *South Med J* 2003;96:141–145.
- Gammon J. Analysis of the stressful effects of hospitalisation and source isolation on coping and psychological constructs. *Int J Nurs Pract* 1998;4:84–96.
- Greenaway C, Menzies D, Fanning A, Grewal R, Yuan L, Fitz-Gerald JM. Delay in diagnosis among hospitalized patients with active tuberculosis—predictors and outcomes. *Am J Respir Crit Care Med* 2002;165(7):927–933.
- Rozovsky-Weinberger J, Parada JP, Phan L, et al. Delays in suspicion and isolation among hospitalized persons with pulmonary tuberculosis at public and private US hospitals during 1996 to 1999. *Chest* 2005;127:205–212.
- Wu YC, Hsu GJ, Chuang KY, Lin RS. Intervals before tuberculosis diagnosis and isolation at a regional hospital in Taiwan. *J Formos Med Assoc* 2007;106:1007–1012.
- Tsai TC, Hung MS, Chen IC, Chew G, Lee WH. Delayed di-

- agnosis of active pulmonary tuberculosis in emergency department. *Am J Emerg Med* 2008;26:888–892.
13. Hsieh MJ, Liang HW, Chiang PC, et al. Delayed suspicion, treatment and isolation of tuberculosis patients in pulmonology/infectious diseases and non-pulmonology/infectious diseases wards. *J Formos Med Assoc* 2009;108:202–209.
 14. Lin CY, Lin WR, Chen TC, et al. Why is in-hospital diagnosis of pulmonary tuberculosis delayed in southern Taiwan? *J Formos Med Assoc* 2010;109:269–277.
 15. Kirkland KB, Weinstein JM. Adverse effects of contact isolation. *Lancet* 1999;354:1177–1178.
 16. Saint S, Higgins LA, Nallamotheu BK, Chenoweth C. Do physicians examine patients in contact isolation less frequently? a brief report. *Am J Infect Control* 2003;31:354–356.
 17. Shrestha NK, Bhaskaran A, Scalera NM, Schmitt SK, Rehm SJ, Gordon SM. Contribution of infectious disease consultation toward the care of inpatients being considered for community-based parenteral anti-infective therapy. *J Hosp Med* 2012;7:365–369.
 18. Honda H, Krauss MJ, Jones JC, Olsen MA, Warren DK. The value of infectious diseases consultation in *Staphylococcus aureus* bacteremia. *Am J Med* 2010;123:631–637.