

Assessment of airborne infection control practices in the pulmonary medicine ward in a tertiary-care hospital of south Gujarat

Deenadayalan Chandran, Mohamed Anas M Patni

Department of Community Medicine, Government Medical College, Surat, Gujarat, India.
Correspondence to: Deenadayalan Chandran, E-mail: dhinamedico@gmail.com

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Abstract

Background: Airborne transmission of infectious diseases is a major public health concern. This airborne transmission becomes even more prevalent in health-care settings because of overburdened hospitals and the presence of patients with immune suppression.

Objective: To assess the administrative, environmental infection control, and standard precaution practices in the pulmonary medicine ward.

Materials and Methods: A hospital-based cross-sectional study was conducted to assess the airborne infection control practices by observation and predesigned semi-structured questionnaire, in the pulmonary medicine ward of a tertiary-care hospital of south Gujarat during May–June 2014.

Result: The number of respondents in the study was 184. Among them, only 40% of patients with tuberculosis (TB) and 10% of patients without TB were using mask. Only one-third of the patients admitted in the TB ward and one-fourth of the patients without TB were properly disposing the sputum according to the standard precaution guidelines. When administrative services were assessed, only two in TB ward and four in directly observed treatment, short-course (DOTS) plus ward of the 13 services were according to the guidelines. In the environmental control measures, of six services, only one in TB ward and three in DOTS plus ward were fulfilling the guidelines. The personal protective equipments were not used by health-care providers.

Conclusion: There was an operational gap in following the administrative and environmental airborne infection control measures in the pulmonary medicine ward.

KEY WORDS: Tuberculosis, Directly Observed Treatment short-course, airborne infections

Introduction

Exposure of human beings to different airborne pathogens has resulted in the emergence of epidemics of respiratory

infections. This airborne transmission becomes even more prevalent in health-care settings because of overburdened and overcrowded hospitals and the presence of patients with immunosuppression.^[1] Hospital administration plays a key role in creating the necessary conditions at the institutional level to prevent spread of health-care-associated pathogens. The physical separation of patients with TB or people suspected of having TB requires rational design, construction or renovation, and use of buildings.^[2] Controls aimed at reducing the transmission of TB in health-care settings include triage, physical separation of patients with TB or people suspected of having TB, cough etiquette and respiratory hygiene, and minimize time spent in health-care facilities.^[3] Facility

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Infection Control Committee should have a facility infection control/biomedical waste management plan in place. Thus, this study had been conducted to assess the guideline practices of airborne infection control measures which include a three-pronged approach, namely administrative control, environmental control, and personal respiratory protection measures in the ward of Department of Pulmonary medicine of a tertiary-care hospital in south Gujarat.

Objective

1. To assess the administrative and environmental infection control practices in the pulmonary medicine ward.
2. To assess the material and manpower in the ward for the health services provided by Department of Pulmonary Medicine.
3. To assess the practices of standard precautions for infection control in the pulmonary medicine ward.

Materials and Methods

A hospital-based cross-sectional study was done during May–June 2014. Pulmonary medicine ward of New Civil Hospital, Surat, Gujarat, India, where predominantly the chance of airborne infection was more, was selected for this study purposively. Both TB and Directly Observed Treatment, short-course (DOTS) plus wards were assessed for the administrative and environmental airborne infection control

measures with the checklist made from the National Airborne Infection Control Guidelines 2010. All the TB, multidrug-resistant tuberculosis (MDR-TB), extensively drug-resistant tuberculosis (XDR-TB), and other patients with chest disease admitted during May–June 2014 were included in the study to assess the standard precaution practices such as usage of mask and sputum bin for disposal of sputum among them; all the health-care workers (HCWs) who worked during the same period were also included to assess the standard precaution practices. Data on administrative measures, environmental measures, and practice of standard precautions were collected by observational methods (three observations). Data were entered and analyzed by using Microsoft Excel 2010.

Result

Of the 13 administrative services, only two in TB wards and four in DOTS plus wards were adequate; rest of them were not adequate. The safety precautions and linen management were adequate in both the wards; other things that were adequate in DOTS plus wards were respiratory hygiene, cough etiquette, and record maintenance [Table 1].

In environmental measures, only ventilation was adequate in the TB ward according to guidelines, but in DOTS plus ward, all the three things, type of ventilation, cross ventilation, and optimal arrangement of the patients, were adequate [Table 2].

Table 1: Administrative services in TB ward (Cat I and II) and DOTS plus ward

S. No	Guidelines	TB ward	DOTS plus ward
1	Hand hygiene	Not adequate	Not adequate
2	Availability of personal protective equipment in wards	Not adequate	Not adequate
3	Respiratory hygiene and cough etiquette	Not adequate	Adequate
4	Prevention of injury from needles and other sharp objects	Adequate	Adequate
5	Cleaning of the patient care environment	Not adequate	Not adequate
6	Linen and waste management	Adequate	Adequate
7	Facility of biomedical waste management protocol	Not adequate	Not adequate
8	Procedures for decompression of crowded areas	Not available	Not available
9	Regular assessment of TB in all facility staffs	Not assessed	Not doing assessment
10	Infection control training of HCWs	No training conducted	No training conducted
11	Quality of record maintenance	Not adequate	Adequate
12	Use of IEC for service promotion and patient education	Not available	Not adequate
13	Restriction of visitors	Not restricted	Not restricted

Table 2: Environmental measures in TB ward (Cat I and II) and DOTS plus ward

S. No	Guidelines	TB ward	DOTS plus ward
1	Type of ventilation	Adequate	Adequate
2	Cross ventilation	Not adequate	Adequate
3	Optimal arrangement of patient and staffs	Present in between wards	Present away from wards
4	Directional control of airflow	Infective air crossing the HCP's room	Infected air enters the other rooms easily
5	Space between adjacent beds should be at least 6 feet	Space available but not adequate	Space is less than 6 feet
6	Availability of separate wards for TB and non-TB cases	Both TB and non TB cases are admitted in the same ward	Both TB and non-TB cases are admitted in same ward

Table 3: Standard precaution practice by patients

S. No	Patients	Usage of mask, n (%)	Usage of sputum disposal bin, n (%)
1	TB	26 (30)	46 (40)
2	MDR-TB	22 (100)	22 (100)
3	XDR-TB	4 (100)	4 (100)
4	Other chest diseases	6 (25)	4 (10)

Table 3 shows that all the patients with MDR- and XDR-TB were using the mask and sputum disposal bin. Only 30% of patients with TB were using mask, and less than 50% of them were using sputum bin. Among other chest diseases, 25% of the patients were using mask and only 10% of them using sputum bin.

Table 4 shows that only medical officer in the ward was using the mask and gloves at the time of patients contact. Resident doctors and staff nurses were not using mask always, and they were using the same gloves for all the patients. Ward boys working in the ward were not using both gloves and mask.

Discussion

Airborne transmission of infectious disease is a major public health concern. The multiple tuberculosis outbreaks in 1980s and early 1990s found lapses in administrative, environmental, and respiratory control measures in hospital settings. So, guidelines and regulations were formulated for safe TB control measures. The guidelines were designed to provide up-to-date information about the methods of reducing the risk of airborne infections in health-care facilities. There is a need to assess the true contribution of airborne transmission to infection rates periodically so that the hospital administrators can implement appropriate control measures to keep respiratory infections under check. Department of Pulmonary Medicine in New Civil Hospital, Surat, is a tertiary-level care for the respiratory disease patients of south Gujarat and surrounding regions with an average number of 250 indoor patients. The airborne infection control practices had been assessed in three pronged approach.

At this facility level, administrative controls play a major role in reducing the risk of TB transmission and are essential for the implementation of other controls (i.e., environmental controls and personal protective equipment). Of the 13 administrative services, only linen waste management and

preventive measures of needle or sharp injuries were adequate in both TB and DOTS plus wards; in addition to these services, cough etiquette and record maintenance in DOTS plus were satisfactory. There was no hand wash facility. The patients' environment was cleaned once a day but not frequently, and the biomedical waste management protocol was not followed. The infective sputum was disposed off in the toilet; personnel protective equipments such as mask and gloves were present but not adequate; and HCWs were not trained for the infection practices or assessed for respiratory infections periodically. There was no display of information, education and communication (IEC) material, no restriction of visitor, or no decompression procedure to prevent infections. The inadequate administrative services will lead to the transmission of infection to healthy people or HCWs.

In environmental measures, only the natural ventilation in TB ward was adequate according to guidelines, but in DOTS plus ward, all the three requirements, (1) type of ventilation, (2) cross ventilation, and (3) optimal arrangement of patients, were adequate. In TB ward, there was no cross ventilation because the HCP room was present in between the male and female wards, which prevented the flow of air between the windows, and the infective air from the patients was directly entering the HCPs rooms, which will prevent the dilution of infective materials. The space between the beds was less than 6 feet; so, it made the ward congested, leading to an environment with high concentration of infective material. There was no separate ward for patients with TB and other chest disease, and no separate ward for patients with MDR-TB and XDR-TB, which leads to the transmission of infection to each others.

In standard precaution practices, all patients with MDR-TB and XDR-TB were using the mask and sputum bin; but, in TB wards, around 30% of patients with TB were using sputum bin and mask. Among patients with other chest diseases, around 25% of them were using. The reason for the disparity was the lack of counseling of patients with TB and inadequate supply of mask and sputum bin. The mask provided for use was also not of N95 mask. The HCWs were not using a mask or using the same gloves for all the patients because of the work load and lack of knowledge about the infection severity. The results will be discussed with the infection control team of the hospital to strengthen the airborne infection control practices in pulmonary medicine wards. The limitations of the study were that the results cannot be generalized, because every hospital setting and airborne practices are different from each other.

Table 4: Standard precaution practice by health-care workers

S. No	Patients	Usage of mask, n (%)	Remarks for mask	Usage of gloves, n (%)	Remarks for gloves
1	Medical officer	1 (100)	Only during sample collection	1 (100)	Only during sample collection
2	Resident doctors	3 (100)	Not always	3 (100)	Same gloves for all because of work load
3	Staff nurses	8 (100)	Not always	8 (100)	Same gloves for all because of work load
4	Ward boys	0 (0)	Available but not using	0 (0)	Available but not using

Conclusion

There was an operational gap in following the administrative and environmental airborne infection control measures in the pulmonary medicine ward.

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