	The Johns Hopkins Hospital Interdisciplinary Clinical Practice Manual Infection Control	<i>Policy Number</i>	IFC013
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Keywords: TB, TB control, tuberculosis, tuberculosis control, isolation, airborne precautions, sputum, PAPR

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I. OBJECTIVE


The objective of this policy is to prevent the spread of tuberculosis (TB) to patients, visitors and healthcare workers through standardized, evidence-based practices.

II. INDICATIONS FOR USE

This policy is intended to guide the practitioner in the use of isolation for patients with suspected or known tuberculosis in the healthcare setting. It shall not be used to establish a definitive diagnosis of tuberculosis. The diagnosis of pulmonary tuberculosis shall not be excluded based only on negative sputum smears for acid fast bacilli and/or negative culture results. Hospital Epidemiology and Infection Control (HEIC) has the authority to maintain Airborne Precautions despite negative laboratory findings based on overall assessment.

TB prevention and control measures are required for all patients who have a potentially transmissible laryngeal or pulmonary TB. The specific isolation category to be used is Airborne Precautions (also known as Airborne Infection Isolation). This policy also applies to extrapulmonary TB in situations in which aerosolization of the organism can occur, e.g. irrigation or debridement of tissues.

Patients who have only a positive tuberculin skin test (TST) or an old calcified lung lesion but no evidence of active pulmonary TB do NOT require isolation for TB.


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III. ABBREVIATIONS

AFB	Acid Fast Bacillus	MTD	Mycobacterium Tuberculosis Direct Test
CXR	Chest X-Ray, Radiograph	MDR-TB	Multi-Drug Resistant TB (TB resistant to at least INH plus rifampin)
HEIC	Hospital Epidemiology and Infection Control	NTM (MOTT)	Non-tuberculous Mycobacteria (formerly known as Mycobacteria Other Than Tuberculosis- MOTT)
HSE	Health Safety and Environment Department	N 95	Respirator approved for use for Airborne Precautions. Requires fit-testing prior to use and annually thereafter
HCW	Health Care Worker	PAPR	Powered Air Purifying Respirator; approved for use for airborne precautions
ID	Infectious Diseases	PFT	Pulmonary Function Testing
HEPA	High-Efficiency Particulate Air filter; portable HEPA units are placed in rooms without negative pressure as needed	TB	Tuberculosis
TST	Tuberculin Skin Test		

IV. RESPONSIBILITY

Clinical and Support Personnel	1. Follow the requirements of this policy
Supervisors/Managers of all Departments	<ol style="list-style-type: none"> 1. Ensure employee compliance with this policy. 2. Require employees to have TST/screening at an interval consistent with CDC guidelines. 3. Upon notification by HEIC, identify staff exposed to patient with infectious TB and direct them to appropriate follow-up care.
Department of Hospital Epidemiology and Infection (HEIC)Control	<ol style="list-style-type: none"> 1. Address questions pertaining to this policy. 2. Assist with prioritization of patients requiring negative pressure rooms. 3. Authorize discontinuation of Airborne Precautions. 4. Conduct exposure investigations in conjunction with unit managers and the Occupational Health Service.
Microbiology Laboratory	<ol style="list-style-type: none"> 1. Inform HEIC of positive AFB smears and cultures, positive MTD tests and cultures growing Mycobacterium tuberculosis. 2. Coordinate the sending of specimens to the State Laboratory for MTD testing. 3. Address questions pertaining to specimen procurement, transport and result interpretation.


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Pathology Laboratory	1. Inform HEIC of a patient with histological evidence suggestive of tuberculosis.
Respiratory Therapy	1. Place expiratory filters on ventilators of patients with suspected or known TB. 2. Obtain induced sputum specimens if requested for ICU patients
Occupational Health Service	1. Perform pre-employment and annual TST and/or screening of health care workers. 2. Provide an annual summary of TST results and conversions in nursing units, ancillary departments and in groups unassociated with specific units including attending physicians, residents, fellows, and other involved populations. 3. Perform TST and screening of health care workers identified by HEIC as potentially exposed to a case of TB. 4. Report employees who have suspected active TB immediately to HEIC.
Adult/Pediatric Infectious Disease Fellow	1. Assess suspect cases, provide information related to TB assessment and treatment and initiate Airborne Precautions. 2. Notify HEIC when patients are placed on Airborne Precautions.
Health, Safety and Environment Department	1. Maintain portable HEPA units and PAPRs and assist with questions concerning their use, operation, and repair. 2. Educate staff on proper use of N95 respirators and fit test employees as necessary. 3. Provide Train-the-Trainer classes for fit-testing N95 respirators.
Central Supply (X 5-8357)	1. Maintain an adequate supply of N 95 respirators, PAPRs and PAPR hoods. 2. Distribute PAPRs and HEPA units and maintain adequate supplies within 30 minutes of request. 3. Clean PAPRs and HEPA units upon return to the Central Supply Department.
Facilities	1. Document the routine and special monitoring and maintenance of the negative pressure rooms used for Airborne Precautions.
Medical Shift Coordinators	1. Assign negative pressure rooms; work with HEIC and charge nurses to prioritize room assignments.


V. PROCEDURE

A. Assessment of the Indications for Airborne Precautions


1. A high index of suspicion shall be maintained for possible TB disease. Symptomatic patients shall be assessed promptly for TB and the need for Airborne Precautions. Such patients include:
 - a. Patients with a persistent cough (> 2 weeks duration) and a pulmonary infiltrate or cavity suggestive of TB. This includes patients with a previous diagnosis of NTM (MOTT). See Appendix A for details.
 - b. Patients diagnosed with TB who have been non-compliant with medical therapy or are considered to be a potential medical therapy failure.
 - c. Patients with extrapulmonary TB who have respiratory symptoms and/or infiltrates and/or cavitory lesions.

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- d. Children with cavitary lung lesions or abscesses. Airborne Precautions must be considered for these children. Pediatric ID shall be consulted to help determine the need for Airborne Precautions.
 - e. Patients previously diagnosed with TB who have cavitary lung disease or other suggestive new findings on CXR.
 - f. Patients with risk factors for TB such as those who are infected with HIV, prisoners, homeless persons, or those who came from a country with endemic TB within the previous five (5) years, AND who have symptoms suggestive of TB.
 - g. Patients who have been exposed to a person with TB AND who have a pulmonary infiltrate.
 - h. Patients who have a negative AFB smear but who are culture positive for AFB. Such patients must be assessed by HEIC to determine the need for continued isolation.
- B. Health Care Worker (HCW) Protection
1. All HCWs shall follow Standard Precautions while evaluating patients.
 2. All HCWs shall wear an approved respirator when entering Airborne Precautions rooms or when examining patients with suspected or confirmed TB. Surgical staff in the operating room, bronchoscopists, and technicians including those performing sputum induction or autopsies are included in this requirement.
 3. PAPRs and N95 respirators provide acceptable respiratory protection for TB. PAPRs are available on units with negative pressure rooms and are available from Central Supply. N95 respirators are available from Central Supply. Staff shall be fit tested prior to wearing a N95 respirator and annually thereafter. Prior to each use, staff shall ensure they have the correct size mask, shall don the respirator correctly and shall perform a fit check.
- C. Procedures to Implement Precautions
1. Any prescriber, registered nurse or HEIC staff may place a suspected TB patient on Airborne Precautions as directed in this policy.
 2. HEIC, the attending physician and the medical shift coordinator shall be notified of any patients placed on Airborne Precautions.
 3. Appendix B lists the negative pressure rooms designated by Facilities as appropriate for use for Airborne Precautions.
 4. Patients requiring Airborne Precautions who are on units without negative pressure rooms shall be transferred to a unit with a negative pressure room when medically permissible. When transfer is not possible, HEIC shall be notified immediately. A portable HEPA filter unit shall be placed in the patient's room between the patient and the door. The patient shall be transferred to a negative pressure room as soon as possible.
 5. In the unusual circumstance that all negative pressure rooms are occupied, HEIC shall be consulted to prioritize room placement. Patients with confirmed or suspected TB shall take priority for negative pressure rooms over patients with Varicella zoster virus.
- D. Management of Patients on Airborne Precautions
1. Nursing staff shall assess negative pressure monitors for proper negative air flow when placing a patient in Airborne Precautions and daily thereafter for the duration of Airborne Precautions.
 - a. The status of the air flow shall be documented on the Airflow Monitoring Form. The form shall be placed on the isolation cart outside the patient's room.

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- b. The form shall be faxed to HEIC at 410-614-0888 for record-keeping upon discontinuation of Airborne Precautions or discharge of the patient.
 - c. Nursing staff shall contact Facilities immediately in the event that the monitor indicates positive air flow, if the monitor is not working, or if there are questions about the air flow.
 2. The door of the room shall remain shut except for entry and exit.
 3. A cart for supplies shall be placed outside of the patient's room, an Airborne Precautions sign shall be placed on the door, and an Airborne Precautions label shall be placed on the patient's chart.
 4. Nursing staff and other HCWs shall help ensure patient and staff adherence to Airborne Precautions.
 5. All healthcare workers entering an Airborne Precautions room shall wear a Health Safety and Environment (HSE) approved respirator (N95 or PAPR). Appendix C outlines use and care of the respirators.
 6. Airborne Precautions shall be maintained during respiratory procedures such as intubation, suctioning, bronchoscopy and sputum induction.
 7. Patients on Airborne Precautions shall not leave their room except for essential tests and procedures. Patients shall wear a surgical mask for transport and for the duration of the stay outside the negative pressure room.
 8. Nurses shall communicate with procedure sites prior to sending the patient in order to ensure their awareness of Airborne Precautions and to avoid exposures of patients, visitors and staff in waiting rooms and hallways.
 9. Procedure sites without negative pressure rooms shall place a HEPA filter unit in the room between the patient and the door.
- E. Management of Suspected or Confirmed TB Patients in Specific Health Care Settings
1. General Requirements:
 - a. Airborne Precautions shall be initiated as soon as pulmonary or laryngeal TB is suspected. This applies to all areas of the hospital, inpatient and outpatient, as specified below.
 - b. Patients with known or suspected TB shall not wait in common areas.
 - c. If immediate placement in a negative pressure room is not feasible, then the patient shall be placed in a room with the door shut and a portable HEPA unit shall be placed between the patient and the door.
 - d. Patients with known or suspected TB shall wear a surgical mask when outside a negative pressure room or a room with a portable HEPA filter.
 - e. Non-urgent procedures on patients with known or suspected TB shall be postponed until the patient is determined to be non-infectious or is determined not to have TB.
 - f. A minimum of 45 minutes shall elapse with negative pressure or HEPA running in a room before other patients are placed in the room or HCWs enter without respiratory protection.
 - g. When possible, the patient with known or suspected TB will be scheduled at a time when a minimum of HCWs and other patients are present in the area. Traffic in the area of a patient with known or suspected TB shall be minimized.
 - h. All cough-inducing and aerosol-generating procedures shall be performed in a negative pressure room or in a sputum induction booth for patients requiring Airborne Precautions). Refer to Appendix D. If a negative pressure room is not available for a procedure, the patient shall be placed in a room with a portable HEPA unit and the door shall be closed.
- F. Additional Requirements for Specific Areas (not specified elsewhere):

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1. Intensive Care Units (ICUs)
 - a. A bacterial filter shall be placed on the patient's endotracheal tube or at the expiratory side of the breathing circuit of a ventilator by Respiratory Therapy. The bacterial filter shall filter particles 0.3 micron in size in both loaded and unloaded states with a filter efficacy of > 95%.
2. Surgical Suites
 - a. HCWs shall wear respirators. If a PAPR is used, a surgical mask shall also be worn to protect the sterility of the surgical field.
 - b. Patients shall have the procedure in Room 1 of the Weinberg Operating Rooms which is equipped with negative pressure. Patients shall recover in the negative pressure operating room or in a negative pressure room that has been equipped and staffed appropriately. Suspect TB patients shall not be placed in the Post Anesthesia Recovery Room (PACU).
 - c. If it is not feasible to perform the procedure in Weinberg OR Room 1, HEIC shall be consulted to determine if it is possible to use another Operating Room with a HEPA filter.
 - d. The surgeon shall contact HEIC immediately (from the operating room if the patient is still there) when evidence of tuberculosis, such as a caseating granuloma, is found during surgery in order to assess the need for Airborne Precautions.
3. Bronchoscopy
 - a. Bronchoscopy for the diagnosis of TB shall be performed in the Endoscopy Suite Room 2 which has negative pressure.
 - b. If bronchoscopy to obtain specimens for the diagnosis of TB is performed in a room without negative pressure, a portable HEPA filter unit shall be placed in the room between the patient and the door.
 - c. Patients shall recover in the same procedure room with Airborne Precautions maintained.
4. Sputum induction and inhalation therapy rooms
 - a. Procedures for patients on Airborne Precautions shall be performed in an approved negative pressure room environment such as the patient's negative pressure room or in an approved room with a certified, reverse flow, exhausted, clean air bench with the fan running and the door closed.
 - b. Patients shall remain in the negative pressure room or in front of the reverse flow bench until coughing subsides.
5. Autopsy Suites
 - a. Autopsies on patients with suspected or confirmed TB shall be performed in a negative pressure room.
6. Emergency Departments (EDs)
 - a. As soon as TB is suspected, patients shall be placed in Airborne Precautions.
 - b. Priority for use of the negative pressure room shall be given to the patient suspected for TB. Patients already occupying the negative pressure room shall be moved if medically permissible to accommodate the patient suspected of TB.
7. In clinic areas, including Johns Hopkins Outpatient Center (JHOC); JH clinics at Greenspring Station; White Marsh, Odenton, Harriet Lane Clinic, Weinberg, Psychiatric Day Hospitals, 911 Broadway Building and the Moore Clinic.
 - a. No surgical procedures shall be performed on suspected or active TB cases an outpatient area nor shall cough-inducing procedures be performed in such locations.
8. TB clinics e.g. Infectious Disease Clinic or Pulmonary Clinics

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- a. Patients with suspected or confirmed infectious TB shall be promptly identified, evaluated, and separated from other patients and shall be promptly placed into a negative pressure room. If a negative pressure room is not available, the patient shall be placed in a room with a HEPA unit with the door closed. The patient shall wear a surgical mask for the duration of the visit.
 - b. When possible, appointments shall be scheduled to avoid exposing HIV-infected or otherwise severely immunocompromised persons to TB.
9. Dialysis Units
- a. Hemodialysis on patients on Airborne Precautions shall be performed in a negative pressure room. If this is not possible, HEIC shall be contacted prior to scheduling.
10. Dental-Care Settings
- a. Dental HCWs shall routinely document if the patient has symptoms or signs of TB disease. Patients with suspected TB who require urgent dental care must receive care in a negative pressure room such as Weinberg OR #1.
- G. Transportation
1. When possible, patients on Airborne Precautions shall have tests and procedures performed in their rooms.
 2. A patient on Airborne Precautions who travels outside negative pressure rooms shall wear a surgical mask. The transporting staff does not need to wear a mask during transport.
- H. Visitors
1. Visitors shall report to the nurses station to obtain instructions before entering an Airborne Precautions room.
 2. Visitors to patients on Airborne Precautions shall be limited to immediate adult household members who have had previous recent contact with the patient.
 3. Prior to permitting the visitor to enter the room, the visitor will be shown by a nurse how to wear an N-95 respirator. Visitors shall wear the N-95 respirator at all times while in the room. Fit testing of visitors is not required.
 4. The patient's nurse will consult HEIC in the event that visitors (especially those with cardiac or respiratory disease) cannot tolerate the N95 respirator.
 5. Visitors who are coughing shall wear a surgical mask when in the facility and shall be encouraged to avoid public areas. They shall be encouraged to be evaluated for TB by the health department or their private physician or as soon as possible. Until infectious TB is ruled-out, they may not enter JHH except as a patient. HEIC shall be informed of this circumstance.
- I. TB exposures
1. TB screening procedures for HCWs, both annually and in follow-up to exposures to TB, shall be performed according to Occupational Health Services (OHS) policy.
 2. HEIC shall investigate all active pulmonary TB cases and perform a contact investigation.
 3. A list of exposed healthcare workers shall be compiled by HEIC and the involved departments/areas and forwarded to OHS. Employees shall be evaluated by OHS. Appendix F is the Exposure Form.
 4. HEIC shall notify the attending physicians of patients exposed to tuberculosis of the details of the exposure and recommend interventions.
 5. All JHH/JHU employee/student/medical staff follow-up shall be coordinated by OHS, who shall report all cases of TB immediately to HEIC.

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J. Ventilation


1. The Facilities Department is responsible for all routine and special monitoring and maintenance of the ventilation system of negative pressure rooms. Reports shall be sent to HEIC and HSE quarterly.
2. As JHH areas are renovated or under construction, HEIC, HSE, and Facilities shall assess the need for negative pressure rooms and make recommendations accordingly.

K. Laboratory Reporting

1. The Mycobacteriology Lab shall promptly report all positive AFB smears, positive MTD tests, cultures growing AFB and cultures growing M. tuberculosis to HEIC and to the provider.
2. HEIC shall review the Mycobacteriology final laboratory reports to identify active TB cases.
3. The Pathology Laboratory shall report to HEIC cases in which the histologic findings are suggestive of tuberculosis.

L. Discontinuing Isolation

1. In all cases, only HEIC can give approval to discontinue Airborne Precautions.
2. HEIC will consider discontinuation of Airborne Precautions for patients suspected of having tuberculosis (i.e., no AFB smears or cultures positive) under the following circumstances:
 - Two AFB smear negative expectorated sputa (One shall be a first morning sputum and shall be obtained at least 8 hours apart)
OR
 - One AFB smear negative induced sputum
OR
 - One AFB smear negative sputum obtained from bronchoscopy
OR
 - One AFB smear negative sputum obtained from an endotracheal tube or tracheotomy
OR
 - Three negative AFB smear gastric aspirates obtained on different days from pediatric patients only. These specimens are not acceptable from adult patients. Gastric aspirates are recommended for pediatric patients who are unable to cooperate with obtaining sputum. Consult with the Microbiology Laboratory for appropriate instructions on collection and transport.
OR
 - One or more specimens are AFB smear positive but the MTD probe is negative
3. HEIC will consider discontinuation of Airborne Precautions for patients who are AFB smear positive in the following circumstances:
 - If MDR-TB is not suspected, isolation shall be discontinued if there has been adequate response to 14 days of empiric therapy with four drugs. An adequate response is defined as resolution or improvement of both respiratory symptoms and fever. HEIC will require three consecutive negative AFB smears collected at least 8 hours apart (at least one being an early morning specimen). The Microbiology Laboratory and HEIC shall be consulted regarding the frequency of specimen submission for patients who are repeatedly smear positive. If the patient has a known positive NTM culture within the recent past and no CXR changes, HEIC shall be contacted to consider discontinuation of Airborne Precautions.

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- If MDR-TB is suspected, Airborne Precautions shall continue until discharge or smear conversion. The patient shall receive at least 14 days of therapy and have at least 3 negative AFB smears or 3 negative gastric aspirates or one adequate bronchoscopy or induced sputum specimen.

VI. REPORTABLE CONDITIONS

- When a patient with proven or suspected MDR-TB is admitted or diagnosed, the provider shall contact HEIC immediately by telephone (410-955-8384).
- Any employee/student who has been diagnosed with TB shall report this immediately to Johns Hopkins University Health (410-955-3250) or the JHH Occupational Health Service (410-955-6211).
- Any employee who has had a work-related exposure to TB shall follow the JHH occupational guidelines for exposure to TB.
- Physicians shall report patients with known or suspected TB to the Baltimore City Health Department in accordance with Maryland law. Baltimore City Health Department Telephone: 410-396-9413. (Internet site: www.edcp.org)
- OHS shall report active cases of TB to HEIC immediately.

VII. SUPPORTIVE INFORMATION

See Also:

The Johns Hopkins Hospital, Interdisciplinary Clinical Practice Manual


- [Isolation Precautions IFC023](#)

The JHHS Health Safety and Environment Manual

- [Respiratory Protection Program, the Johns Hopkins Hospital, Safety Manual HSE008A](#)
- [Addendum A: Respiratory Protection Devices for Airborne Infectious Agents and Aerosolized Hazardous Drugs Protocol HSE008A](#)

References:

- Guideline for Preventing the Transmission of M. tb in Health-Care Facilities (December 2005) MMWR, Vol. 54 No. RR.-17. <http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5417a1.htm>
- Guideline for the investigation of contacts of persons with infectious tuberculosis (December 2005) MMWR, Vol.54. RR-15. <http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5415a1.htm>
- Maryland TB Guidelines for Prevention and Treatment of Tuberculosis 2007 <http://www.edcp.org/tb/tbguidelines.pdf>
- Transmission of Mycobacterium tuberculosis from patients smear-negative for acid-fast bacilli. M.A. Behr, S.A. Warren, H. Salamon, P.C. Hopewell, A. Ponce de Leon, C.L. Dailey, P.M. Small. The Lancet, Vol 353, February 6, 1999.

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Communication & Education:

1. This policy shall be communicated through Johns Hopkins Hospital publications.
2. This policy shall be placed on-line in the Interdisciplinary Clinical Practice Manual on the JHH Intranet site <http://www.insidehopkinsmedicine.org/icpm> and on the HEIC web site www.hopkinsmedicine.org/heic.
3. Paper distributions shall be made to the clinical units and departmental nursing offices for use in the event of web access difficulties.

Sponsor:

- Medcal Care Evaluation Committee

Developer:

- Department of Hospital Epidemiology and Infection Control

Review Cycle - Three (3) years

Medical Board - Approval Date: 2/24/09 ; Effective Date: 5/1/09

Vice President for Nursing & Patient Services

Vice President for Medical Affairs

Date:

Date: