Prevention and Control of
Healthcare-Associated Pulmonary Aspergillosis

Infection Control Practitioner’s Role

A. Staff Education and Infection Surveillance

1. Staff Education

Healthcare workers (HCWs) are educated about healthcare-associated pulmonary aspergillosis, especially with respect to immunocompromised patients, and about infection control procedures used to reduce its occurrence. Standard Precautions are used for all patients.

2. Surveillance

   a. A high index of suspicion is maintained for the diagnosis of healthcare-associated pulmonary aspergillosis in patients who are at high risk for the disease. Factors related to the host immune system as well as various environmental exposures, are associated with increased risk of IPA (Invasive Pulmonary Aspergillosis). Severe (absolute neutrophil count <1000 per cubic millimeter) and prolonged (1 week) neutropenia is the most important host risk factor for IPA particularly bone marrow transplant recipients. Patients who have received solid-organ transplants and patients who have hematologic malignancies and are receiving chemotherapy also are at high risk for acquiring the infection if they are severely granulocytopenic.

   b. Surveillance for cases of healthcare-associated pulmonary aspergillosis is maintained by periodically reviewing the hospital’s microbiological, histopathologic, and postmortem data.

   c. Periodic cultures of a) the nasopharynx of high-risk patients or b) devices, air samples, dust, ventilation ducts, and filters in rooms occupied by high-risk patients are not routinely performed.

B. Interrupting Transmission of Aspergillus

1. Review Physical Plant’s specific guidelines that reduce the risk of cross-infection.

2. Place patients who are severely immune compromised and at high risk for infection, such as allogeneic HSCT patients or patients with an absolute neutrophil count of less than 1000, where room air pressure is maintained above that of the corridor (positive pressure room).

3. Systematically review and coordinate infection control strategies with personnel in charge of hospital engineering, maintenance, central supply and distribution, and nutritional services.

4. An Infection Control Risk Analysis is developed in cooperation with Physical Plant, Nursing, Environmental Services, Safety, and other affected departments when construction and renovation activities are necessary. Methods to reduce the risk of exposure of susceptible individuals to aspergillus are developed and implemented before work begins, and continuously re-evaluated until the conclusion of the project.
5. If the ICRA indicates a need for dust barriers, they should be constructed of impermeable material (fire-rated plastic or drywall) and erected before renovation or construction activities begin.

C. The following procedures should be followed if a case of healthcare-associated aspergillosis occurs:

1. Follow Infection Control Policy, “Process for Investigating Outbreaks of Infectious Disease,” located in the Infection Control Department.

2. Begin a prospective search for additional cases in hospitalized patients and an intensified retrospective review of the hospital’s microbiologic, histopathologic, and postmortem records.

3. If evidence of continuing transmission is not present, continue routine maintenance procedures to prevent nosocomial aspergillosis. (See Sections B-1 through B-7 under “Nursing’s Role” section).

4. If evidence of continuing Aspergillus sp. infection is present, conduct an environmental investigation to determine and eliminate the source. If assistance is needed, contact the local or state health department.
   a. Collect environmental samples from potential sources of Aspergillus sp. especially those sources implicated in the epidemiological investigation, by using appropriate methods (e.g. use of a high volume air sampler rather than settle plates). Consult with the Infection Control Committee Chairman, Safety Department, and Microbiology to determine the best approach to collection, transportation and processing environmental samples.
   b. When environmental samples and patient specimens are available for comparison, perform the laboratory analysis on the recovered microorganisms down to the species level at a minimum, and beyond the species level if possible. Consult with Microbiology to determine availability and appropriate testing.
   c. If air-handling systems that supply air to areas in which high-risk patients are housed are not optimal, consider temporary deployment of portable HEPA filters until rooms with optimal air-handling are available for all patients at high risk for invasive aspergillosis.
   d. If an environmental source of exposure to Aspergillus sp. is identified, perform corrective measures as needed to eliminate the source from the environment of patients at high risk for infection.
   e. If an environmental source of exposure to Aspergillus sp. is not identified, review existing infection control measures, including engineering controls aspects, to identify potential areas that can be corrected or improved.

Nursing’s Role

A. Staff Education and Infection Surveillance
1. A high index of suspicion is maintained for the diagnosis of healthcare-associated pulmonary aspergillosis in patients who are at high risk for the disease (i.e., patients who have prolonged, severe granulocytopenia [less than 1,000 polymorphonuclear cells/mm3 for 1 week], particularly bone-marrow transplant recipients). Patients who have received solid-organ transplants and patients who have hematologic malignancies and are receiving chemotherapy also are at high risk for acquiring the infection if they are severely granulocytopenic.

2. Report suspected cases of aspergillus infection to Infection Control.

B. Interrupting Transmission of Aspergillus

1. Place patients who are at high risk for infection where room air pressure is maintained above that of the corridor.

2. Place patients who are at high risk for aspergillosis and who also have an infection (e.g., varicella or infectious tuberculosis) that necessitates negative air-room pressure in an isolation room that has an anteroom.

3. Minimize the length of time that patients who are at high risk for infection are outside their rooms for diagnostic procedures and other activities; when such patients leave their rooms, require them to wear submicron masks.

4. Assure that Environmental Services is aware of patients who are at high risk of infection. Contact Environmental Services supervisor and Infection Control if dust accumulation on horizontal surfaces, ceiling tiles, and air duct grates have not been adequately cleaned.

5. Report to Infection Control and Physical Plant supervisor if barriers between patient-care and construction that were erected during renovation or construction to prevent dust from entering patient care areas are compromised; these barriers (e.g., plastic or drywall) should be impermeable to Aspergillus sp., well sealed, and intact at all times.

6. Eliminate exposures of patients at high risk of aspergillosis to activities that might cause spores of Aspergillus sp. and other fungi to be aerosolized (e.g., floor or carpet vacuuming).

7. Eliminate exposures to patients at high risk for aspergillosis to potential environmental sources of Aspergillus sp. (e.g., potted plants or flower arrangements.)

Physician’s Role

A. Interrupting Transmission of Aspergillus

1. In order to modify host risk for infection, administration of cytokines, including granulocyte-colony-stimulating factor and granulocyte-macrophage-stimulating factor, to increase host resistance to aspergillosis by decreasing the duration and severity of chemotherapy-induced granulocytopenia are recommended.

2. No recommendation for administration of intranasal Amphotericin B or oral antifungal agents (including Amphotericin B and diazole compounds) to high risk patients as prophylaxis against aspergillosis.
Physical Plant

A. Planning New Specialized-Care Units for Patients At High Risk for Infection

1. When constructing new specialized-care units for patients at high risk for infection, ensure that patient rooms have adequate capacity to minimize fungal spore counts via maintenance.

   a. **Air filtration.** Install, either centrally or at the point of use (i.e., at the room-air intake site), HEPA filters that are 99.97% efficient in filtering particles greater than or equal to 0.3 µm in diameter.

   b. **Directed room airflow.** Place air-intake and exhaust ports such that room air comes in from one side of the room, flows across the patient's bed, and exits on the opposite side of the room.

   c. **Well-sealed room.** Construct windows, doors, and intake and exhaust ports to achieve complete sealing of the room against air leaks.

   d. **Room-air pressure.** Ensure that room-air pressure can be maintained continuously above that of the corridor (e.g., as can be demonstrated by performance of the smoke-tube test) unless contraindicated by clinical-care or infection control considerations.

      1) To maintain positive room-air pressure in relation to the corridor, supply air to the room at a rate that is 10-20% greater than the rate of air being exhausted from the room.

      2) For placement of patients who are at high risk for aspergillosis and who also have an infection (e.g., varicella or infectious tuberculosis) that necessitates negative room air pressure in relation to the corridor, provide optimal condition to prevent the spread of the airborne infection from and acquisition of aspergillosis by the patient (e.g., by providing anterooms with an independent exhaust).

   e. **Room air changes.** Ventilate the room to ensure greater than or equal to 12 room-air changes per hour are maintained.

2. No recommendation for the preferential installation of a particular system, such as one with ultra-high air change rates (i.e., 100-400 air changes per hour) (e.g., laminar airflow), over other systems that meet the conditions listed above.

3. No recommendation for prophylactic use of copper-8-quinolinolate biocide in fireproofing material.

4. Assure construction areas are cleaned daily and after completion of construction (before patients enter the area.)

B. In Existing Facilities With No Cases of Healthcare-Associated Aspergillosis

1. Routinely inspect air handling systems in hospital areas in which patients at high risk for infection are housed, maintain adequate air exchanges and pressure differentials, and eliminate air leakage. Coordinate repairs of the system with the relocation of patients who are at high risk for infection to other hospital areas that have optimal air-handling capabilities.
2. Systematically review and coordinate infection control strategies with personnel.

3. When planning hospital construction and renovation activities, develop a plan to prevent such exposures with the infection control team.

4. During construction or renovation activities:
   a. Construct barriers between patient-care and construction areas to prevent dust from entering patient care areas; these barriers (e.g., plastic or drywall) should be impermeable to Aspergillus sp.
   b. In construction/renovation areas inside the hospital, create and maintain negative air pressure relative to that in adjacent patient-care areas unless such a pressure differential is contraindicated (e.g., if patients in the adjacent patient-care areas have infectious tuberculosis).
   c. Direct pedestrian traffic from construction areas away from patient-care areas to limit the opening and closing of doors or other barriers that might cause dust dispersion, entry of contaminated air, or tracking of dust into patient-care areas.
   d. Terminally clean newly constructed areas before allowing patients to enter the areas.

5. Prevent birds from gaining access to hospital air-intake ducts.

6. If an environmental source of exposure to Aspergillus sp. Is identified, perform corrective measures as needed to eliminate the source from the environment of patients at high risk for infection.

C. **Interrupting Transmission of Aspergillus**

1. Room-air changes. Ventilate the room to ensure greater than or equal to 12 room-air changes per hour are maintained.

2. Routinely inspect air handling systems in hospital areas in which patients at high risk for infection are housed, maintain adequate air exchanges and pressure differentials, and eliminate air leakage. Coordinate repairs of the system with the relocation of patients who are at high risk for infection to other hospital areas that have optimal air-handling capabilities.

3. If air-handling systems that supply air to areas in which high-risk patients are housed are not optimal, consider temporary deployment of portable HEPA filters until rooms with optimal air-handling are available for all patients at high risk for invasive aspergillosis.

Written: 6/98
Reviewed: 6/00
Revised: 6/04, 5/06, 5/08, 9/10, 6/13
Reference:


