Information for staff on *Aspergillus* spp.

Outbreak Prevention and Management

The purpose of this information is to provide an aid-memoire for clinical staff and Infection Prevention and Control Teams (IPCT), who may be involved in the outbreak prevention and management of *Aspergillus* spp.

All staff should be familiar with Standard Infection Control Precautions (SICPs) and Transmission-Based Precautions (TBPs).

The following advice is supplementary and provides details of specific actions necessary to prevent and manage *Aspergillus* outbreaks.

Outbreak Prevention

What types of infections do *Aspergillus* spp. cause?

Although *Aspergillus* spp. are known to cause a variety of infections and allergic syndromes, HAI outbreaks are typically associated with invasive aspergillosis. Invasive pulmonary aspergillosis is the most common form, but other single-organ invasive forms as well as disseminated aspergillosis are also known to occur.[1;2] *A. fumigatus* is the most commonly isolated species, followed by *A. flavus*, *A. niger* and *A. terreus*.[1-3]

Which patient groups are considered high risk for infection?

Typically, severely immunocompromised patients including those with prolonged neutropenia, advanced HIV infection and those who have undergone allogeneic hematopoietic stem cell transplantation (HSCT) or solid organ transplantation.[1-4]

How is a potential Aspergillus outbreak identified?

As a guide; a single healthcare-associated case in a high risk patient will require appropriate investigations and should be considered as part of 'alert organism' IPCT actions. An outbreak may be suspected if the incidence of infection is higher than normally expected, and where there is a potential link in time and place.

During construction activities, the Microbiology Department should be notified and be alert to an increase in numbers of *Aspergillus* spp. as an early indicator of a possible outbreak. (Good Practice Point)

How can Aspergillus outbreaks be prevented?

Depending on local guidance; antifungal prophylaxis with one of the triazole antifungals may be recommended for patients at high risk of developing invasive aspergillosis, e.g. HSCT recipients with graft-versus host disease (GVHD) and neutropenic patients with acute myelogenous leukaemia (AML) or myelodysplastic syndrome (MDS).[1;2]

Highly immunosuppressed patients should be managed in a HEPA-filtered environment, where available.[1;4-7] HEPA filters should be capable of removing particles of 0.3 µm in diameter for supply (incoming) air (sufficient to be effective against air-borne *Aspergillus* spp. spores, which are considered to be < 2 µm in size).[5;6]

Specific additional guidance for HSCT patients includes: Daily wet-dusting of horizontal surfaces using cloths moistened with a healthcare approved disinfectant/detergent, avoidance of flowers (fresh or dried) or potted plants within the protective environment and use of vacuum cleaners equipped with HEPA filters.[8]

High risk units should be included in a Planned Preventive Maintenance (PPM) programme that includes pressure/air flow monitoring equipment.[9] As a minimum, ventilation systems should be inspected/tested annually and will require cleaning as necessary.[10]

What are the specific considerations for planned construction/renovation activity?

IPCTs should be notified prior to any construction/renovation activities in the healthcare facility. Multiple disciplines and stakeholders should be involved in pre-emptive planning.[3;4;6;9] The Healthcare Associated Infection System for Controlling Risk in the Built Environment (HAI-SCRIBE) tool should be used to assess and manage the risk of infection in the built healthcare environment.

Best practice measures should be employed to reduce patients' exposures to dust, stagnant water and damp areas.[6] The following list provides key points for consideration, but is not exhaustive:

- placing adhesive floor strips outside the door to the construction area to trap dust;
- sealing windows, doors and roof-space to control dust;
- installation of temporary sealed partitions where appropriate.[9]

If possible, severely immunocompromised patients should avoid all hospital construction/renovation areas. These patients should wear surgical fluid resistant masks when outside of inpatient rooms, in order to reduce potential exposure to spores.[4;11;12]

Targeted environmental sampling in and around high-risk areas may be employed as a measure of enhanced surveillance during any hospital building works.[3;5;6] The frequency of this should be determined by the IPCT and clinical teams. Although there are no nationally agreed standards relating to fungal air sampling; an exposure level of < 5 CFU/m^3 of *Aspergillus* spp. in high-risk areas and < 0.1 CFU/m^3 in HEPA-filtered environments, with limits of 15 CFU/m^3 for total colony counts of all fungal organisms, have been previously recommended.[5;6] (N.B. A number of outbreaks report that air-monitoring resulted in no detectable fungal counts.[3;6] Negative results should therefore be interpreted with caution due to the possible sporadic release of spores).

Outbreak Management

How should an Aspergillus outbreak be managed?

If there is epidemiological evidence of ongoing transmission of fungal disease, an environmental assessment should be conducted to determine and eliminate the source. Air-samples should be collected from all suspected areas/environments.[5;6] If possible, molecular subtyping of *Aspergillus* spp. isolated from patients and the environment to establish strain identities should be performed.[5] If air-supply systems to high-risk areas are not optimal, portable, industrial-grade HEPA filters should be used on a temporary basis until rooms with optimal air-handling systems become available.[3;5]

Early initiation of therapy is warranted in patients strongly suspected of invasive *Aspergillus* infection, while diagnostic evaluations are conducted. The choice of treatment is dependent on various factors including the site of infection, extent of disease and level of immunosupression. Typically oral or intravenous triazoles are indicated as first-line therapy.[1;2] Duration of therapy varies (generally a minimum of 6 weeks) and will typically be guided by resolution of clinical and radiological findings. Following successful treatment, it may be necessary for certain groups of immunocompromised patients to resume prophylactic treatment.[2]

Supporting Outbreak Literature

The scientific and nursing literature was searched for reports of *Aspergillus* outbreaks in health and social care settings. A total of 11 outbreaks (and 3 multi-centre prevalence studies), spanning the last 10 years were evaluated. A summary of the results is presented below.

Background: The majority of recent outbreaks were associated with construction/renovation activities within healthcare settings. The remainder of outbreaks were linked to isolated contamination incidents. A reported high mortality was typically attributed to the immunocompromised status of affected patients.

Population/setting: The majority of outbreaks occurred in immunocompromised patients including those in intensive care[7;13;14] as well as solid organ transplant[12;15] and haematology patients.[11;16] In a number of cases, outbreaks were described in other settings, including a maternity unit[17] and following eye surgery.[18]

Transmission: The majority of infections were associated with likely air-borne transmission of the fungus. Direct infection via inhalation[11-16;19;20] or contamination of medical surfaces/devices[7;13;17;18;21-23] was reported in all cases.

Outbreak control measures: In most instances, limited information on infection prevention measures was provided. Enhanced disinfection,[7;11;21] installation of HEPA filters in areas where they were previously absent[7;13;15] and changes in local policy relating to routine antifungal prophylaxis were most commonly reported.[11;12] In addition, studies also reported use of PPE (caps, gowns and masks) for all HCWs and visitors to the areas affected by the outbreak,[11] changing ventilation filters,[11] ward closure to new admissions[7] and HEPA-filter vacuuming.[21]

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