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Procedure for Control of Aspergillosis During Construction/Renovation Activities Procedure No. 209					
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## INTRODUCTION

Certain types of construction activities can result in increased incidence of invasive aspergillosis among immunosuppressed patients. Because of the high mortality rate associated with invasive aspergillosis in these patients, it is essential to minimise these risks. While construction activities are taking place it is necessary that immunosuppressed patients be protected over that period.

The purpose of this document is to act as guidance for healthcare staff to ensure that construction/renovation activities in hospital providing for at-risk patients are undertaken in a safe and appropriate manner to reduce the risk of infection in these patients. The document outlines the risk factors contributing to nosocomial invasive aspergillosis and identifies the at-risk patients. Recommendations are made as to the measures that can be undertaken to reduce these health risks.

#### Scope

Each hospital, which provides service to high-risk patients, should have procedures and policies in place to ensure that all relevant personnel are aware of the risks of invasive aspergillosis in these patients and the preventative measures required to minimise that risk; and should develop and adopt risk management and infection control policies in this regard that are regularly monitored for compliance and effectiveness.

#### Responsibility

Technical Service staff should be aware of the risks posed by construction activity to at-risk patients (Groups 2-4) and should consult with the Clinics and Infection Control team in advance of all minor or major construction or renovation activities.

Medical and nursing staff should be aware of patient populations at risk, potential hazards that construction/renovation projects pose to patients, and the preventative measures required. The infection control team should collaborate with medical and nursing staff to identify patients at risk, and to monitor the effectiveness of preventive measures taken throughout the project.

#### PROCEDURE

#### General

#### 1.0 Classification of at-risk Patients

At-risk patients may be categorized as follows:

#### **Group 1 – No evidence of risk**

- 1. Staff members, Service Providers and Contractors
- 2. All patients not listed in Groups 2 -4 below

#### Group 2 – Increased Risk

- 1. Patients on prolonged courses of high dose steroids particularly those hospitalized for prolonged periods.
- 2. Severely immunosuppressed AIDS patients
- 3. Patients undergoing mechanical ventilation
- 4. Patients having chemotherapy who are neutropenic
- 5. Dialysis patients

# Group 3 – High Risk

- 1. Neutropenia for less than 14 days following chemotherapy
- 2. Adult acute lymphoblastic leukaemia (ALL) on high dose steroid therapy
- 3. Solid organ transplantation
- 4. Chronic Granulomatous Disease of Childhood (CGDC)
- 5. Neonates in intensive care units (ICU)

# Group 4 – Very high risk

- 1. Allogeneic bone marrow transplantation
  - a) during the neutropenic period
  - b) with graft versus host disease
- 2. Autologous bone marrow transplantation ie. during the neutropenic period
- 3. Peripheral stem cell transplantation i.e. during the neutropenic period
- 4. Non-myeloablative transplantation
- 5. Children with severe combined immuno-deficiency syndrome (SCIDS)
- 6. Prolonged neutropenia for greater than 14 days following chemotherapy or immunosuppressive therapy
- 7. Aplastic anaemia patients

It is the responsibility of Clinicians to categorize their patients in accordance with these tables so that the necessary measures can be put in place.

# 2.0 PREVENTATIVE MEASURES TO CONTROL INVASIVE ASPERGILLOSIS

Preventative measures can be considered under the following headings: (i) construction and ventilation measures; (ii) infection control measures and (iii) chemoprophylaxis.

# 2.1. Construction and Ventilation Measures

A number of measures may be implemented by hospital construction designers and maintenance personnel to protect at-risk patients during building activities on hospital sites. The measures identified in the available literature on the subject vary from basic minimal precautions and good housekeeping to major mechanical services intervention involving dedicated HEPA filtered installation systems to protect the areas in which the at-risk patients are housed.

These measures may be divided into:-

• Measures to reduce dusk emission from construction area

• Measures to physically protect at-risk patients

Measures to reduce dust emission from construction area:-

- The construction areas should be sealed fully during the construction period. A dust barrier should be created from the floor to slab (true ceiling) and edges sealed. For short-term minor projects this may be plastic sheeting, however for more long-term projects this should be solid sealed barrier. It may be necessary to create a lobby (anteroom) if the barrier is the entrance/egress for construction workers.
- 2. All windows, doors, vents, plumbing penetrations, electrical outlets and any other sources of potential air leak should be sealed in the construction zone.
- 3. Air pressure in the construction zone should be negative compare with adjacent areas. An extract fan may be used for this purpose. Air from the construction zone should be exhausted directly to the outside and this is the most appropriate option. If this is not possible then the air should be filtered through HEPA filters (that have been properly fitted and strictly monitored) before being re-circulated to the hospital.
- 4. Dust reduction techniques should be used for cutting and hold boring.
- 5. Debris should be removed from the construction area at the end of each working day. Debris should be removed in covered containers preferably through window openings. A chute may be necessary if the construction is above ground floor level. In addition, normal good housekeeping procedures should prevail during the operation in particular, holding skips and other containers should be kept moistened and/or covered. The construction area should be vacuumed on a daily basis or more frequently if required, to maintain an environment as free from dusk as possible.
- 6. A mat with a sticky surface or moist carpet should be placed inside the exit from the construction zone to trap dust. This should be vacuumed/changed daily or more frequently when visibly soiled.
- 7. Construction workers should wear protective clothing, which should be removed before leaving the construction zone.

The measures implemented to reduce dust emission from the construction area will vary depending on the construction/renovation activity. The measures required for the various types of construction activity are outlined in the Sample Construction Permit (Appendix 1).

#### Measures to physically protect at-risk patients

1. Patients who are at risk should be moved to an area away from the construction zone if the air quality cannot be guaranteed during construction.

At-risk patients (Groups 2-4) should wear protective masks if it is necessary to transport them through a construction area. These masks should be capable of filtering Aspergillus spores such as particulate-filter respirators (PFR 95) which give a >95% filtration efficacy of 0.3 um particle size and are used in association with the National Institute for Occupational Safety and health (NIOSH) regulations.

- 2. All windows, doors (apart from essential access points) and vents should be sealed in areas of the hospital containing patients who are most susceptible (Groups 2-4) if the construction or demolition work is considered likely to result in Aspergillus-contaminated air entering these areas. If the area is not served by a ventilation system, these precautionary measures may result in unacceptable environmental conditions within the area involved. Any fresh air introduced into this area must be HEPA filtered. If the area is connected to a central ventilation system, it is important that prior to construction works, the ventilation should be thoroughly check and if it is to remain functional, it should be fitted with HEPA filters if air from the construction zone may be drawn into the system.
- 3. For very high-risk patients (Group 4), it is recommended that an environment that is fully HEPA filtered and at positive pressure is provided. This involves the installation of dedicated remote air handling systems, which are ducted through supply systems to the at-risk area. The intake air handling unit is fitted with a combination of coarse bag and panel filters and finally a HEPA filtered section which is the only filter capable of trapping the 2.5 to 3.5 um size of the Aspergillus spore. Typically, these dedicated ventilation/filter units should provide an air exchange rate of >12 air changes per hour within the at risk area and a pressure differential for positive pressure areas of >2.5 pascals (ideal pressure differential of >8 PA).

## 2.2 INFECTION CONTROL MEASURES

Communication and education are two vital elements to the successful implementation of proactive infection control measures in the reduction and the attempt to eliminate the risk of nosocomial invasive aspergillosis in immunocompromised patients. Effective communication between all relevant parties; architects, engineers, technical services, sub-contractors, infection control, medical and nursing staff is of vital importance during all stages of construction work to implement effective infection control preventive measures. The hospital should designate education coordinators for each of the relevant parties.

#### Education

#### Healthcare workers should be educated on:-

- The risk of invasive aspergillosis in the categorized at-risk groups during construction work.
- The infection control measures to decrease its occurrence.

# Project managers, contractors, design teams and health & safety supervisors should be educated on:

- The preventative measures that should be implemented during construction and renovation activities.
- The importance of ensuring that this information is given to the construction workers and its significance understood in order to aid with compliance.

#### Supervisors of cleaning staff/contract cleaners should be educated on:-

- Basic principles of Aspergillus spore contamination of the environment
- Cleaning measures to prevent environmental contamination
- The importance of ensuring that this information is given to the operatives and its significance understood in order to aid with compliance.

# At risk-patients (Groups 2-4) and the relatives of these patients should be informed of:-

• The risks of nosocomial aspergillosis infection.

An information leaflet on aspergillosis should be provided (Appendix 2. The purpose of this leaflet is to inform patients, relatives of patients, health care workers and those involved in the activities of construction, of the risk of aspergillosis during construction work. This leaflet should be considered as introductory information only.

#### Dust containment

#### The objectives of dust containment measures are:-

- To minimize the dust generated during the work activity
- To prevent dust infiltration into adjacent patient care areas.

The categorization of the construction activity in conjunction with its geographical location will determine the controls required to achieve these objectives. The use of a construction permit will assist in achieving compliance with the requirements (Appendix 1).

#### Cleaning

In addition to minimising dust through measures outlined in the construction permit increasing the existing cleaning regimes to prevent dust accumulation on surfaces, ceilings and air duct grilles will be necessary. As the quantity of dust generated will vary depending on the type of building activity, the increased cleaning regimes need to be adjusted accordingly to minimize dust accumulation. Damp dusting not dry cleaning is recommended. Air filtration systems must be regularly checked. Where vacuum cleaners are used, in areas where high-risk and very high-risk patients are cared for an in adjacent areas, these should be equipped with HEPA filters and appropriately maintained to minimize dust dispersal. Filters in the air filtration systems and the vacuum cleaners need to be changed regularly and a record/log should be kept of these changes.

#### Traffic

- **Pedestrian** Pedestrian traffic from the construction area should be directed away from patient areas, with workmen having a separate entrance to the construction site as outlined in the construction permit. When possible and visitors should avoid entering the hospital adjacent to major construction/demolition sites, where debris or dust is being removed from the work area.
- Supplies Alternative routes, which avoid the construction site, through which inanimate items are transported throughout the hospital, may need to be identified during construction. Clean or sterile supplies or equipment should be transported to storage areas by a route that minimizes contamination risks from the construction site.
- In some critical areas in some instances where it may not be possible to alter traffic patterns consideration will have to be given to scheduling construction to off-hour period and weekends. Some areas may need to be relocated or closed temporarily.

## 3.0 PROTECTIVE MEASURES FOR AT-RISK PATIENTS

Patients deemed to be at risk of systemic mould infection should be stratified on the basis of their underlying disease, its treatment and the area in the hospital in which they are being treated in relation to the proposed building programme.

Environmental Measures Very high-risk patients (Group 4)

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Patients at very high risk (Group 4) should receive maximum protection irrespective of the type/size of the building programme. All very high-risk patients should be nursed in HEPA filtered positive pressure rooms during the neutropenic period. If they are subsequently transferred to a ward the windows should be sealed and suitable air quality provided (see section 4.2.2, Point 2)

#### High-risk patients (Group 3)

Patients at high risk (Group 3) should receive protection if the area of treatment is juxtaposed or near the hospital construction area or if it is otherwise likely that Aspergillus-contaminated air may enter the area. High-risk patients should be nursed in a ward with sealed windows and suitable air quality (See Section 4.2.2, Point 2).

#### Increased-risk patients (Group 2)

Patients at increased risk (Group 2) are usually dispersed throughout the hospital and therefore physical protection may be impractical. Consideration should be given to moving patients away from the construction area.

#### Chemoprophylaxis

Antifungal chemoprophylaxis should be considered in at-risk patients in line with current guidelines and hospital policy.

#### **REFERENCES** :

ISBN 0-9540177-3-0: National Guidelines for the Prevention of Nosocomial Invasive Aspergillosis During Construction/Renovation Activities

**APPENDICES :** Construction Permit

# Appendix 1: Sample Construction Permit

CONSTRUCTION PER	ИТ	
Permit No:	Permit Expiration Date:	Project Start Date:
Location of Constructio	n: E	Estimated Duration:
Contractor:	Contact Person:	Tel:
CEO Approval:		
Name	Signed:	Tel:
Hospital Technical Serv	ices Manager Approval:	
Name:	Signed:	Tel:
Infection Control Perso	nnel Approval:	
Name:	Signed:	Tel:

Construction/Renovation Activity	Population Risk Groups
<ul> <li>Type A - Minor Internal Containable Activities</li> <li>Inspection and non-invasive activities and small-scale activities that create minimal dust. These include, but are not limited to, activities that require removal of ceiling tiles for visual inspection (limited to 1 tile per 5m<sup>2</sup>), painting (no sanding), wall covering, electrical trim work, minor plumbing and other maintenance activities that do not generate dust or require cutting of walls or access to ceilings other than for visual inspection. Activities that require access to conduit spaces, cutting of walls or ceilings where dust migration can be controlled for installation or repair of minor electrical work, ventilation components, telephone wires or computer cables. It also includes minor plumbing.</li> <li>Type B - Major Internal Containable Activities</li> <li>Any work that generates a moderate level of dust or requires demolition or removal of any fixed building components or assemblies (e.g. counter tops, cupboards sinks). These include, but are not limited to, activities that require sanding of walls for painting or wall covering, removal of floor-covering, ceiling tiles and stud work, new wall construction, minor duct work or electrical work above ceilings, major cabling activities, and any activity that cannot be completed within a single work shift. This type of activity includes extensive plumbing work. It also includes demolition or removal of a complete cabling system or plumbing and new construction that requires consecutive work shifts to complete.</li> <li>Type C - Minor External Non-Containable Activities include digging trial pits and minor foundations, trenching, landscaping and minor construction and demolition work.</li> <li>Type D - Major External Non-Containable Activities include digging trial pits and minor foundations, trenching, landscaping and minor construction and demolition work.</li> <li>Type D - Major External Non-Containable Activities include digging trial pits and minor foundatio</li></ul>	Group 1 - No Evidence of Risk • Staff Members/Service Providers/Contractors • All patients not listed in Groups 2-4 below Group 2 - Increased Risk • Patients on prolonged courses of high dose steroids • Severely immunosuppressed AIDS patients • Patients undergoing mechanical ventilation • Non-neutropenic patients on chemotherapy • Dialysis patients Group 3 - High Risk • Neutropenic patients (<14 days) following chemo- therapy • Adult acute lymphoblastic leukaemia (ALL) on high dose steroid therapy • Solid organ transplantation patients • Patients in neo-natal intensive care units (ICUS) • Chronic Granulomatous Disease of Childhood • Laboratories (prevent contamination of microbiological specimens and thereby avoid pseudo-diagnosis) Group 4 - Very High Risk • Allogeneic bone marrow transplantation patients • During the neutropenic period • With graft versus host disease • Autologous bone marrow transplantation patients, i.e. during neutropenic period • Peripheral stem cell transplantation patients • Children with severe combined immunodeficiency syndrome (SCIDS) • Patients with prolonged neutropenia (>14 days) following chemotherapy or immunosuppressive therapy • Aplastic anaemia patients