

	Version 4	Date April 1, 2009
Authors: Peter Hoffman Walter Popp Silvio Brusaferrero Ulrika Ransjö	IFIC Construction, Design and Renovation Interest Group Protection of immuno-compromised patients	

Introduction

The aim of this document is to provide practical, evidence based (where appropriate) written materials about construction, design and renovation in health care facilities, that can be used in the co-operation between Infection control personnel, building planners and engineers

SIG recommendations are given in three levels:

- **Basic** - Even with severely limited resources, this is what you should do as a minimum
- **Standard** – this is what you should aim for in less wealthy countries
- **Ideal** – if you have the resources, this is what you could do

There are many observations that some patients at increased risk of infection acquire fungal infection during building work. Such infection is usually, but not only, lung infection with *Aspergillus* species. Such building work can be either demolition, construction, maintenance, renovation or even inspection involving moving ceiling tiles or ventilation grilles. The critical event is probably re-dispersion of settled fungal spores from dust, so moving ceiling tiles inside a ward can be just as critical as demolition of a nearby building.

Risk assessment

In any risk assessment, there are three critical factors:

- There must be a system to inform the Infection Control Department about the work
- Information must be given in time for appropriate measures to be put in place
- Clinical staff in each speciality should advise on the susceptibility of each patient group to fungal infection

The strategy can be adapted to the perceived risk of the patient group involved; highly susceptible patients (e.g. bone marrow or solid organ transplantation, haematology / oncology) can be protected by **standard** or **ideal** methods, whilst less susceptible patients can be protected by **basic** methods.

Clinicians should be alerted to the possibility of fungal infections in their patients, and to consider this prominently in their diagnoses. Infection Control and the microbiology laboratory should investigate possible cases of fungal infection and act promptly on such cases. Communication with the ward and audit of the infection control measures (see below).are vital parts of that action.

All measures that are agreed and put in place must be continuously audited. The requirements of infection control in this area are outside the normal experience of builders and most healthcare staff and they are unlikely to implement them effectively without regular observations and feedback. Experience has shown that this is an essential component of successful infection control in this area.

Recommendations

Infection control to protect immuno-compromised patients has two equally important parts:

1. Reduce fungal dispersion by the work
2. Reduce the numbers of those fungal spores that are dispersed from reaching susceptible patients
3. (prophylaxis against Aspergillus infection may be considered)

Part 1: Reduce fungal dispersion

Basic	Standard	Ideal
Prevent fungal growth in areas occupied by or close to patients. Attend to water leaks promptly; minimise condensation.	Prevent fungal growth in areas occupied by or close to patients. Attend to water leaks promptly; minimise condensation.	Prevent fungal growth in areas occupied by or close to patients. Attend to water leaks promptly; minimise condensation.
Use demolition methods that do not cause massive spore dispersion (i.e. not explosive demolition).	Use demolition methods that do not cause massive spore dispersion (i.e. not explosive demolition).	Use demolition methods that do not cause massive spore dispersion (i.e. not explosive demolition).
Wet surfaces about to be demolished using water via a hose. Wet demolition rubble as it is removed from the site. Only wet surfaces immediately before demolition or rubble movement, to prevent this from increasing fungal growth,	Wet surfaces about to be demolished using water via a hose. Wet demolition rubble as it is removed from the site. Only wet surfaces immediately before demolition or rubble movement, to prevent this from increasing fungal growth	Wet surfaces about to be demolished using water via a hose. Wet demolition rubble as it is removed from the site. Only wet surfaces immediately before demolition or rubble movement, to prevent this from increasing fungal growth
Partition internal work off from susceptible patients.	Partition internal work off from susceptible patients..	Partition internal work off from susceptible patients. Ensure negative pressure in the workspace.
Have a barrier on scaffolding around the building work	Have a barrier on scaffolding around the building work	Have a barrier on scaffolding around the building work

Part 2: Prevent released spores from reaching susceptible patients

Basic	Standard	Ideal
Move patients to wards more distant from the building work.	Move patients to wards more distant from the building work	Move patients to other hospitals or do not admit them for the duration of risk.
For work inside a ward, that cannot be partitioned-off, move the patients to a more suitable ward for the duration of the work	For work inside a ward, that cannot be partitioned-off, move the patients to a more suitable ward for the duration of the work	For work inside a ward, that cannot be partitioned-off, move the patients to a more suitable ward for the duration of the work
If patients must be moved from protected ward areas for procedures, do it at a time when there is no, or minimal, building work	If patients must be moved from protected ward areas for procedures, they can be provided with a filtering respiratory-protective mask.	If patients must be moved from protected ward areas for procedures, provide them with a filtering respiratory-protective mask.
Increase air circulation by opening windows facing non-risk areas. If mechanical ventilation is used, do not recirculate air. Remove bird roosts and nests near air intakes.	Ensure the sealing of 1. windows, doors 2. intake and exhaust ports 3. walls above and below the ceiling Make sure that ceilings are smooth and free of open joints, and crevices.	Purpose build accommodation for highly susceptible patients with HEPA-filtered air supplied to positive pressure rooms and/or ward. Or provide local recirculating HEPA filter units in patient areas.
Check mechanical air supplies for leakage and seal windows, doors	Inspect mechanical air supplies to ensure that air cannot bypass filtration	Increase the filtration efficiency of existing sub-HEPA mechanical supplies to a higher (sub-HEPA) grade
	Monitor filters for capacity to pass air (normally assessed by measuring the pressure differential across the filters) more frequently.	Monitor filters for capacity to pass air (normally assessed by measuring the pressure differential across the filters) continuously.

Some literature:

1. IFIC: Basic concepts of infection control. 2007
2. Centers for Disease Control and Prevention. Guidelines for environmental infection control in health-care facilities: recommendations of CDC and the Healthcare Infection Control Practices Advisory Committee (HICPAC). MMWR 2003; 52 (No. RR-10): 1–48.. The full-text version of the guidelines appears as a web-based document at the CDC's Division of Healthcare Quality Promotion's Internet site at: http://www.cdc.gov/ncidod/dhqp/gl_environmentinfection.html
3. Eckmanns T, Rüden H, Gastmeier P. The influence of high-efficiency particulate air filtration on mortality and fungal infection among highly immunosuppressed patients: a systematic review. J Infect Dis. 2006 May 15;193(10):1408-18.. Comment in: J Infect Dis. 2006 Dec 1;194(11):1621-2; author reply 1622-3.

Examples

Plastic sheeting around demolition area



Erecting barrier around demolition work



Water hose for damping down demolition



Water damage in disinfection room



Solid barrier around internal renovation, seen from the clean side



Plastic sheeting on wooden support around internal renovation, negative pressure



Door in plastic sheeting

