INFECTION CONTROL DURING CONSTRUCTION: FOCUS ON CDC/HICPAC RECOMMENDATIONS

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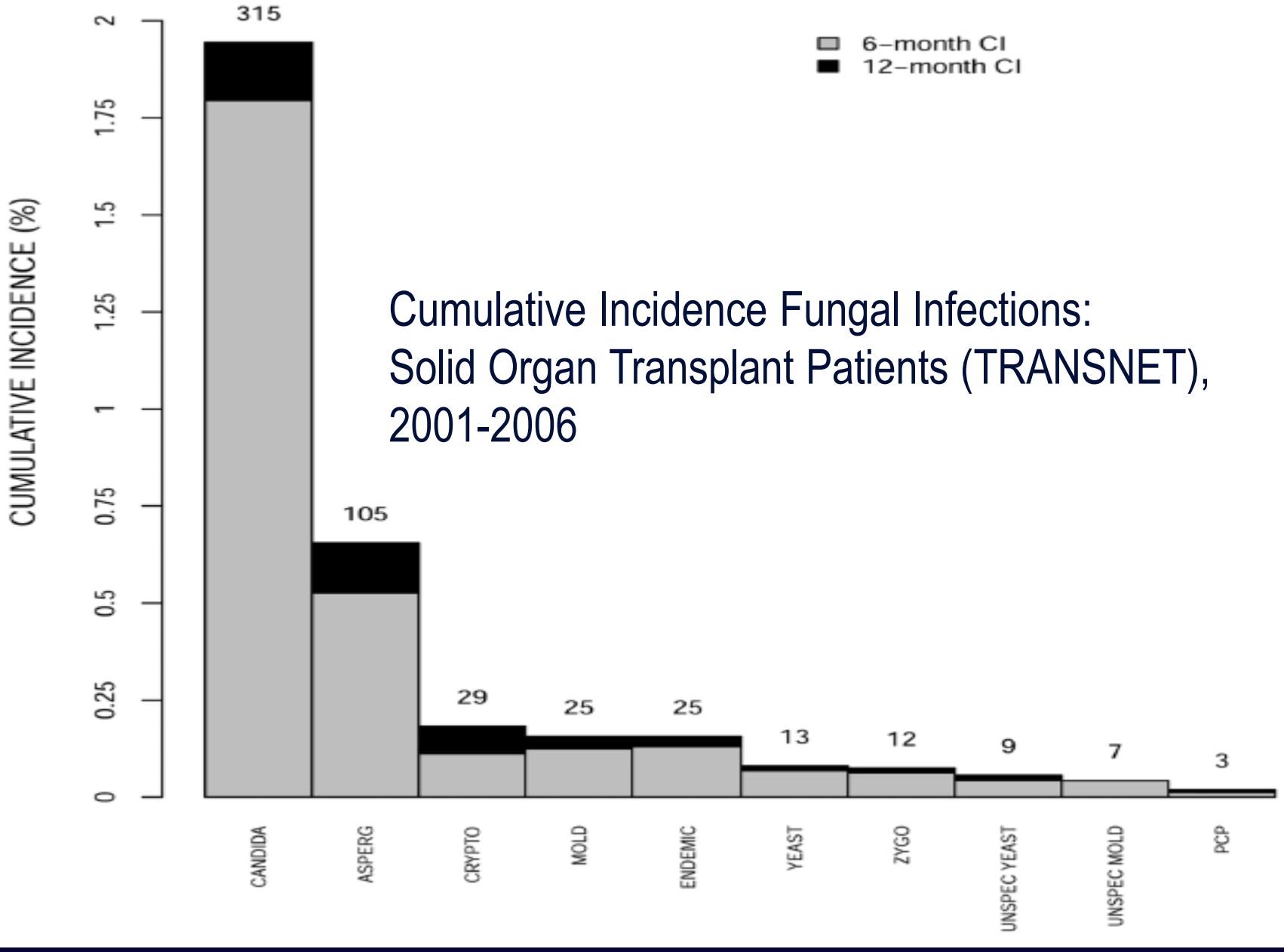
LECTURE TOPICS

- Examples of outbreaks
- *Aspergillus*: Epidemiology
- Construction and renovation guidelines
- Management of damage from water leaks

UNDERLYING CONDITIONS IN PATIENTS WITH NOSOCOMIAL ASPERGILLOSIS

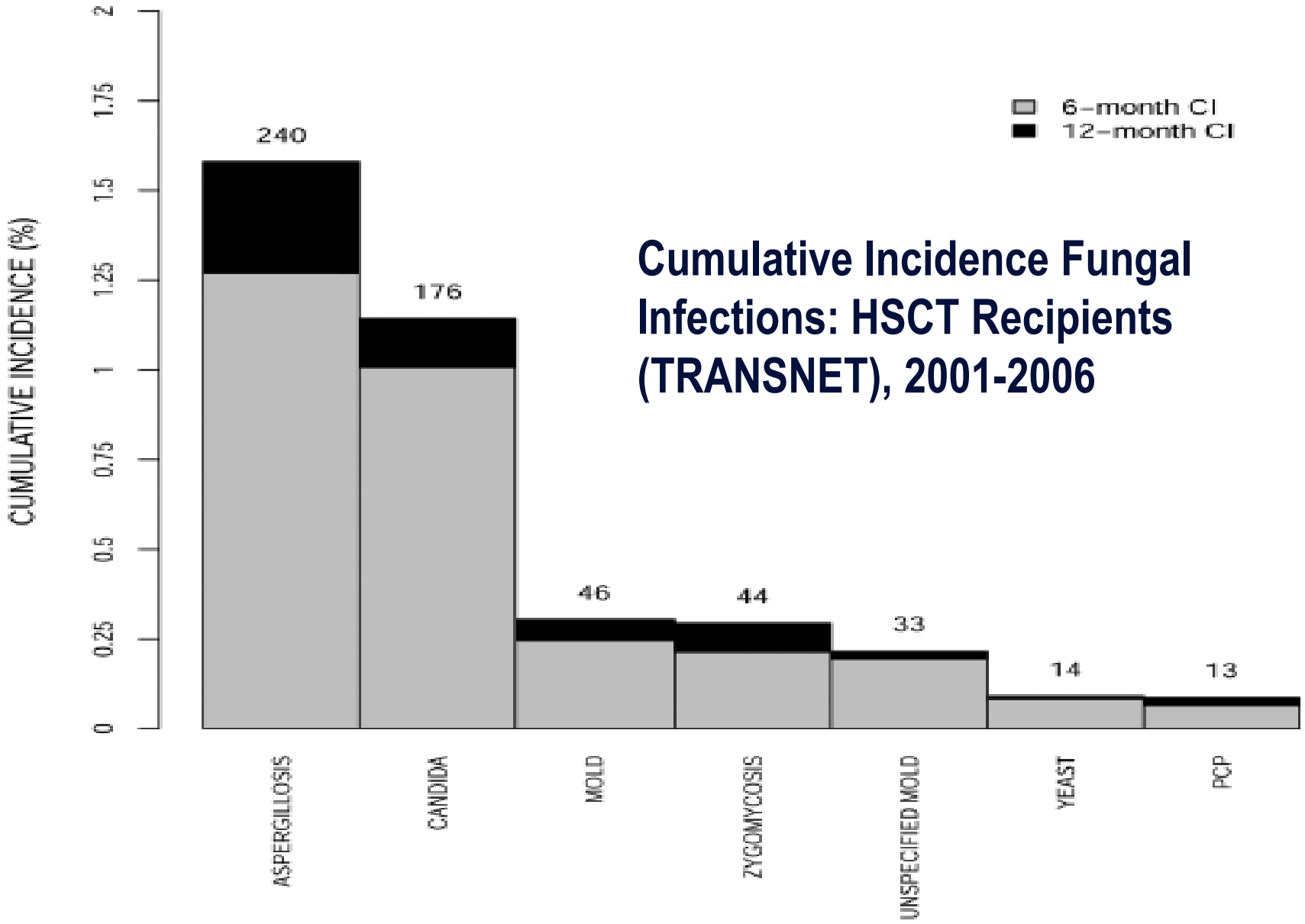
	No. of Patients	Mortality (%)
Hematologic malignancy	299	57.6
Solid organ transplant		55.9
• Renal transplant	36	
• Liver transplant	8	
Other immunocompromised		52.3
• High-dose steroid therapy	15	
• Neonates	5	
• Other malignancy	4	
• Chronic lung disease	2	
• ICU patients (“high-risk”)	2	
• No exact classification possible	49	
Patients without severe immunodeficiency		39.4
• Thoracic surgery	25	
• Cataract surgery	5	
• ICU patients (“low risk”)	5	
• Other surgery patients	3	
TOTAL	458	55.0



Cumulative Incidence Fungal Infections: Solid Organ Transplant Patients (TRANSNET), 2001-2006

Pappas P, et al. Clin Infect Dis 2010;50:1101, 1111

Cumulative Incidence Fungal Infections: HSCT Recipients (TRANSNET), 2001-2006



Kontoyiannis DP, et al. Clin Infect Dis 2010;50:1091-1100

TYPICAL CONSTRUCTION/RENOVATION SITE

RELEVANT GUIDELINES

- 2003: Guidelines for preventing health-care-associated pneumonia (HICPAC)
- 2003: Guidelines for environmental infection control in health-care facilities (CDC, HICPAC)
- 2000: Guidelines for preventing opportunistic infections among hematopoietic stem cell transplant recipients (CDC, IDSA, ASBMT)
- Guidelines for design and construction of Health Care Facilities. The Facility Guidelines Institute (FGI), 2010
- Construction and Renovation, 3rd Edition ,and Infection Prevention for Construction DVD, Association for Professionals in Infection Control and Epidemiology, 2007 ($173 member price) APIC store: www.apic.org/
- APIC Text of Infection Control and Epidemiology, 3rd ed. Association for Professionals in Infection Control and Epidemiology, 2009. www.apic.org/
- ASHRAE - American Society of Heating, Refrigeration and Air Conditioning Engineers

LIMITATIONS OF GUIDELINES

- Largely based on outbreak investigations
- Corollaries of above
  - **Focus is on preventing epidemic infections (rather than sporadic infection)**
  - **Recommendations often not based on randomized clinical trials**
  - **Focus on preventing infection in HSCT patients in protected environment**

SELECTED OUTBREAKS DUE TO CONSTRUCTION, RENOVATION, OR CONTAMINATED AIR HANDLING SYSTEMS

Year-Author	Organism	Population	Epidemiologic Factors	Remedial/ Preventive Measures
1990, Fox et al.	*Penicillum* sp. *Cladosporium* sp.	OR	Ventilation duct lined with contaminated fiberglass insulation	Decontamination of HVAC ductwork; filter replacement
1992, Hruszkewycz et al.	*Penicillum* sp. *Aspergillus* sp.	Laboratory pseudo-outbreak	Improper airflow during renovation near lab; false ceiling	Sealed ceilings; proper use of hoods and appropriate airflow controls
1994, Iwen et al.	*Aspergillus* sp. Mixed fungi	BMT unit	Improper airflow; suspected infiltration from windows	Sealed windows and balanced airflow; replaced HEPA filters
1995, Anderson et al.	*Aspergillus* sp.	Pediatric oncology unit	Improper airflow from clinical waste disposal room	Sealing of disposal room and use of HEPA filtered vacuum cleaners

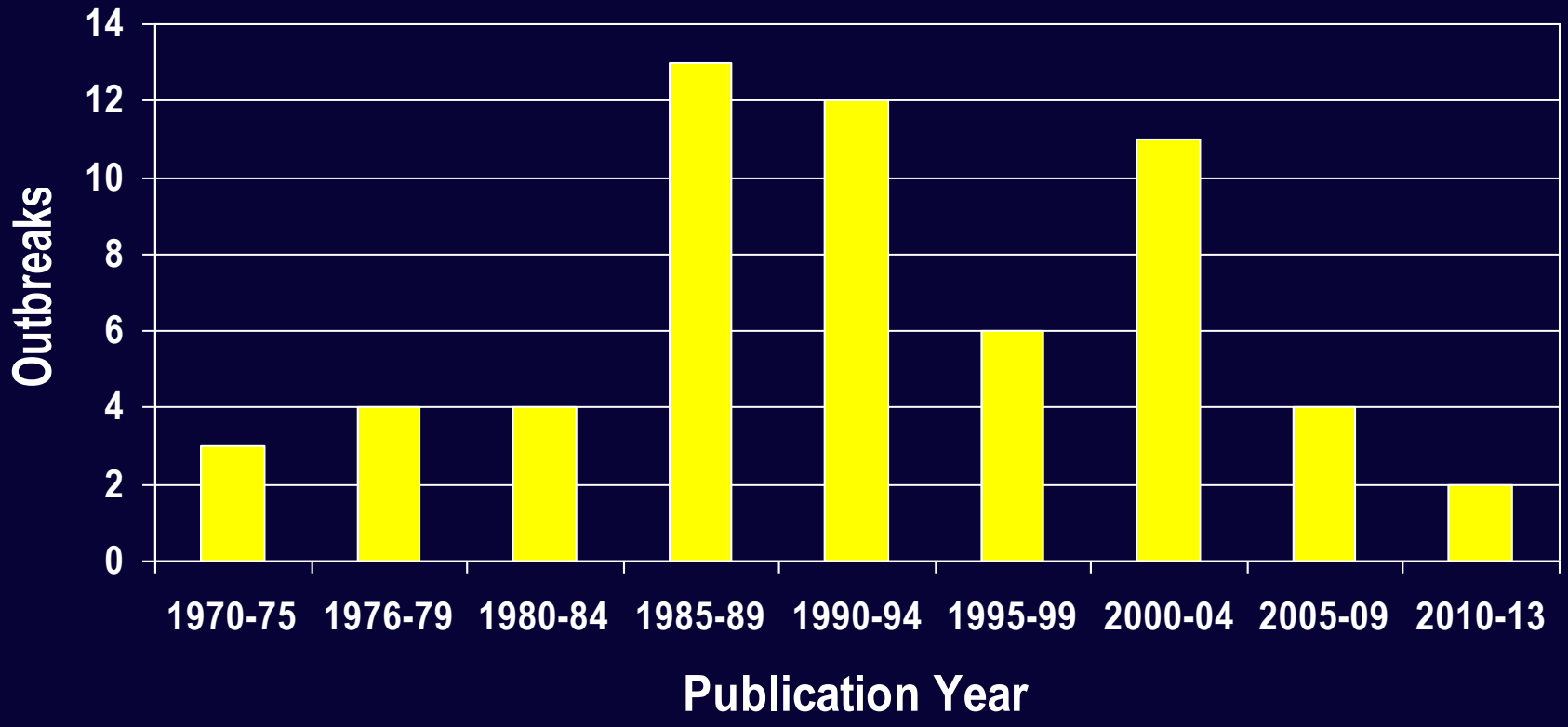
SELECTED OUTBREAKS DUE TO CONSTRUCTION, RENOVATION, OR CONTAMINATED AIR HANDLING SYSTEMS

Year-Author	Organism	Population	Epidemiologic Factors	Remedial/ Preventive Measures
1996, Pittet et al.	*Aspergillus* sp.	COPD	Air filter replacement	Monitor filter function; replaced filters
1997, Kumari et al.	MRSA	Orthopedic patients	Ventilation grills	Cleaned, maintained pressure relationships
1997, Fridkin et al.	*Acremonium kiliense*	Ambulatory surgery – system	Poorly designed HVAC; contaminated humidifier	Redesign; changed HEPA filters; proper HVAC maintenance
2002, Anaissie et al.	*Aspergillus* sp.	BMT	Concentration of airborne fungi on shower surfaces	Clean shower floor with detergent prior to use of shower

MOST COMMON PATHOGENS ASSOCIATED WITH CONSTRUCTION OR RENOVATION OUTBREAKS

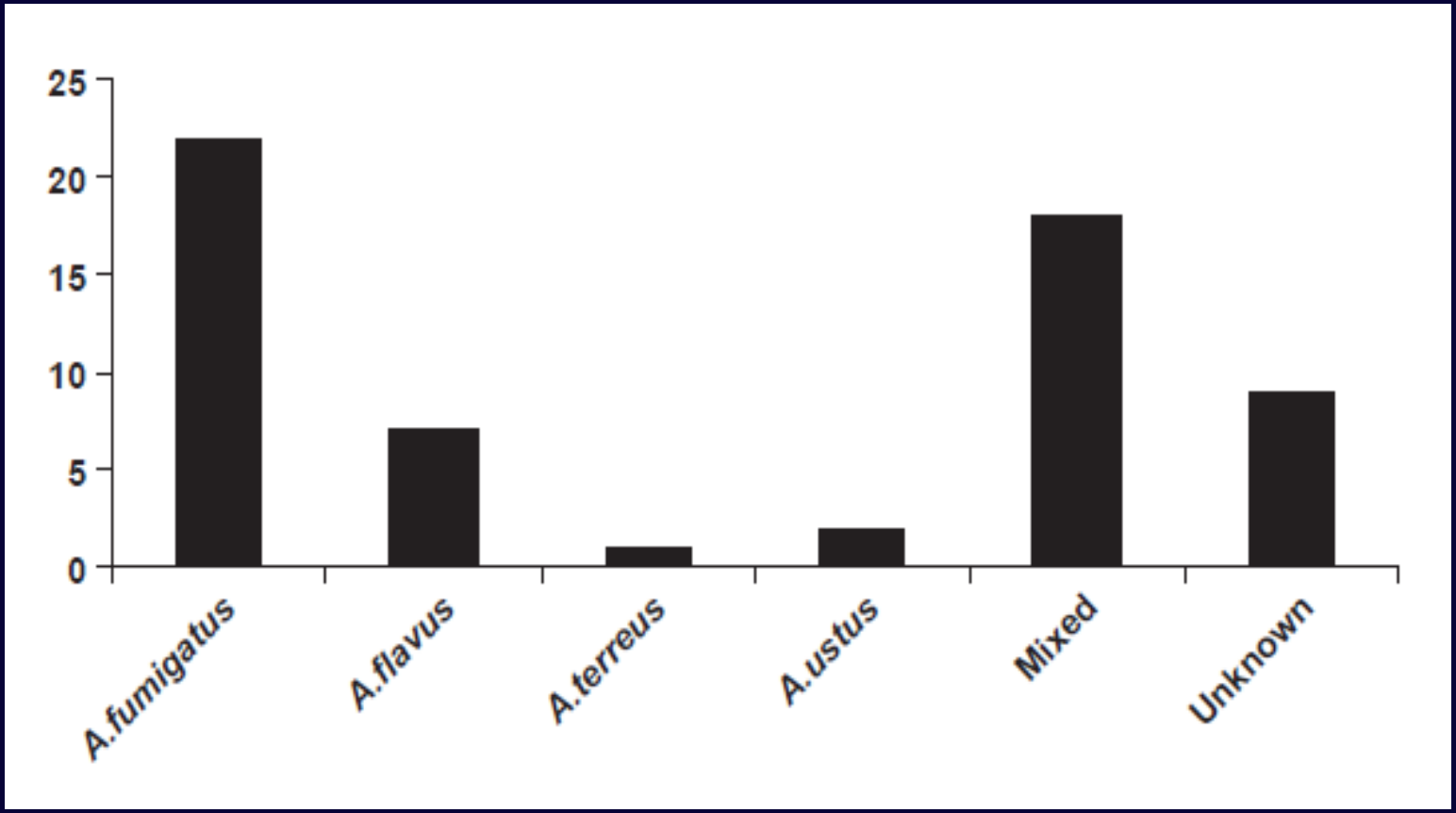
- *Aspergillus* spp. (by far most important)
- Zygomycetes
- Other fungi
- Miscellaneous

NOSOCOMIAL ASPERGILLOSIS IN OUTBREAK SETTINGS, 1970-2007

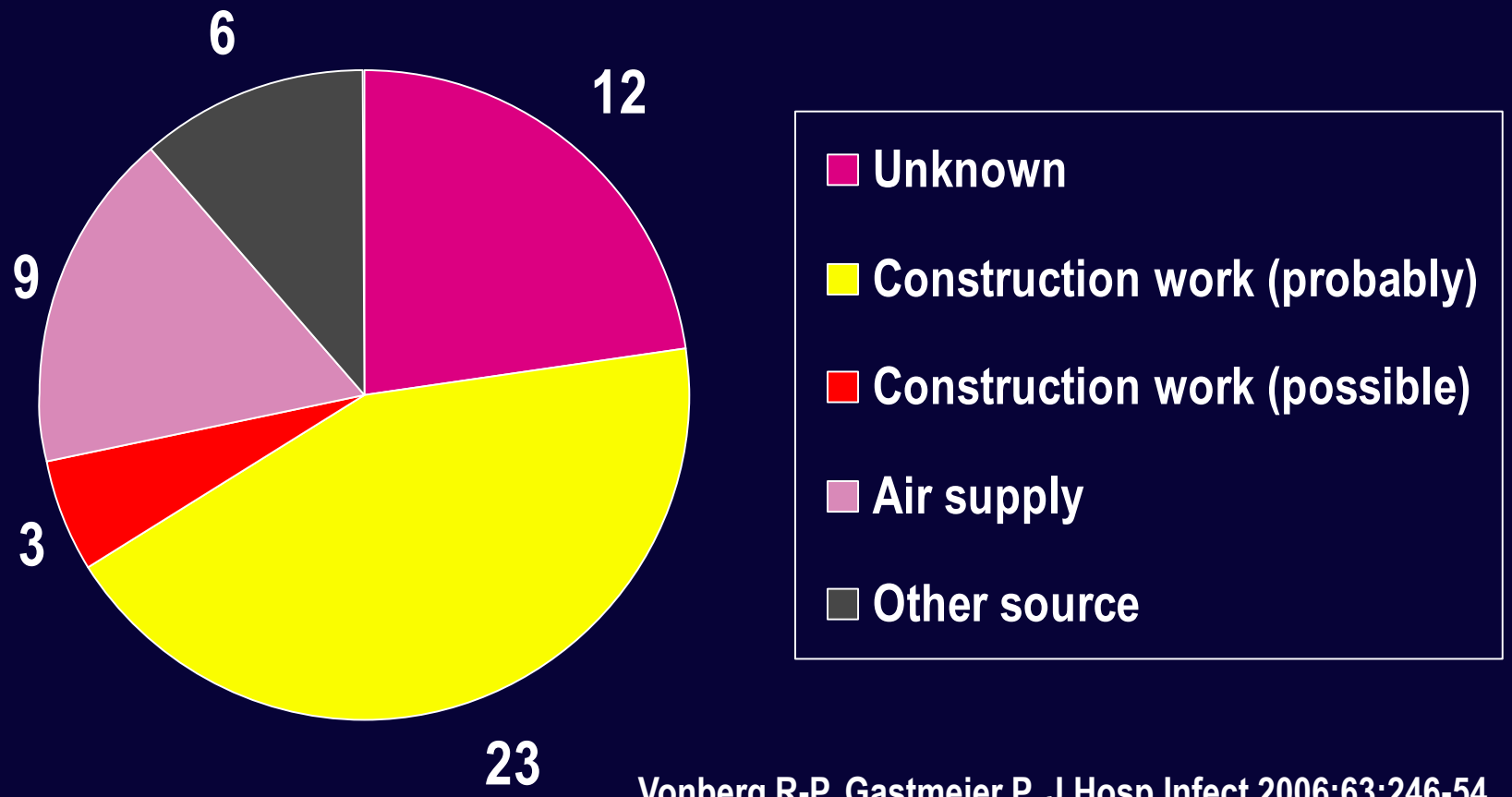


Adapted from Vonberg R-P, Gastmeier P. J Hosp Infect 2006;63:246-54

ASPERGILLUS SPECIES ASSOCIATED WITH OUTBREAKS



NOSOCOMIAL ASPERGILLOSIS IN OUTBREAK SETTINGS



Vonberg R-P, Gastmeier P. J Hosp Infect 2006;63:246-54

CDC/HICPAC RECOMMENDATIONS: GRADING OF RECOMMENDATIONS

- IA: Strongly recommended for implementation and strongly supported by well-designed experimental, clinical, or epidemiologic studies
- IB: Strongly recommended for implementation and supported by some clinical or epidemiologic studies and by strong theoretical rationale.
- IC: Required for implementation, as mandated by federal or state regulation or standard.
- II: Suggested for implementation and supported by suggestive clinical or epidemiologic studies or by strong theoretical rationale.
- No recommendation; unresolved issue: Practice for which insufficient evidence or not consensus exists about efficacy

SURVEILLANCE[1]

- Maintain a high index of suspicion for healthcare-associated pulmonary aspergillosis in severely immunocompromised patients (ANC <500/mm^3 for 2 weeks or <100/mm^3 for 1 week){IA}
- Surveillance cultures
  - **Do NOT perform routine, periodic cultures of nasopharynx {IB}**
  - **Do NOT perform routine, periodic cultures of equipment or devices used for respiratory therapy, PFTs, or dust in rooms of HSCT recipients {IB}**
  - **NO recommendation for routine microbiologic air sampling before, during, or after facility construction or renovation {Unresolved}**
- Perform routine surveillance of the ventilation status of PEs: room air exchanges, pressure relations, filtration efficacy {IB}

[1]Tablan OC, et al. Guidelines for preventing health-care-associated pneumonia, 2003

NEW CONSTRUCTION: PROTECTED ENVIRONMENT FOR HSCT PATIENTS[1]

- Allogeneic HSCT recipients {IB, IC}
  - **HEPA filtration of incoming air**
  - **Directed room airflow**
  - **Positive air pressure in patient's room in relation to corridor**
  - **Well-sealed room**
  - **High (≥12) air changes per hour**
- Autologous HSCT and solid organ-transplant {unresolved}
  - **No recommendation for constructing PE**

[1]Tablan OC, et al. Guidelines for preventing health-care-associated pneumonia, 2003

EXISTING FACILITIES WITH HSCT UNITS: NO CASES OF HAI WITH *ASPERGILLUS*[1]

- Placement of patients in PE
  - **Place allogeneic HSCT recipient in PE that meets conditions outlined in previous slide {IB}**
  - **No recommendation regarding autologous recipient {unresolved}**
- Maintain air-handling systems in PE according to recommendations {IB, IC}
- Develop a water-damage response plan {IB}
- Use proper dusting methods {IB}
- Do not use carpeting in hallways and rooms {IB}
- Avoid using upholstered furniture in rooms {II}

[1]**Tablan OC, et al. Guidelines for preventing health-care-associated pneumonia, 2003**

EXISTING FACILITIES WITH HSCT UNITS: NO CASES OF HAI WITH *ASPERGILLUS*[1]

- Minimize length of time patients in PE are outside their rooms {II}
  - **Have patient wear N-95 when they leave PE during periods of construction or renovation in or around the healthcare facility {II}**
  - **No recommendation for specific type of respiratory protection (e.g., mask vs N-95) for patient who leaves PE when there is no construction {unresolved}**
- Do not allow fresh or dried flowers or potted plants in patient-care areas for severely immunocompromised patients {II}

[1]**Tablan OC, et al. Guidelines for preventing health-care-associated pneumonia, 2003**

EXISTING FACILITIES WITH HSCT UNITS: CASE OF HAI WITH *ASPERGILLUS*[1]

- Assess whether the infection is healthcare-associated or community-acquired
  - **Obtain and use the following information: background rate of disease in facility; presence of concurrent or recent cases; length of patient's stay at, visit, of, or transfer from, other healthcare facilities or other locations within the facility, and period of time patient was exposed outside the healthcare facility after onset of immunosuppresson and before onset of aspergillosis {II}**
  - **Determine if any ventilation deficiencies exists in the PEs {IB}**

EXISTING FACILITIES WITH HSCT UNITS: CASE OF HAI WITH *ASPERGILLUS*[1]

- If no evidence exists that the patient's aspergillosis is facility-acquired, continue routine maintenance to prevent aspergillosis {IB}
- If evidence of possible facility-acquired infection with *Aspergillus* exists, conduct an epidemiologic investigation and an environmental assessment to determine and eliminate the source of *Aspergillus* {IB} [if assistance is needed, contact the local or state health department]
- Use an antifungal biocide (e.g., copper-8-quinolinolate) that is registered with the EPA for decontamination of structural materials {IB}

ANTIFUNGAL PROPHYLAXIS

American Society for Blood and Marrow Transplantation (HSCT)[A]

- HSCT patients at high risk for mold infections should be considered for prophylaxis with mold-active drugs during periods of risk (B-I)

Infectious Disease Society of America (Neutropenic patients)[B]

- Prophylaxis against *Aspergillus* infections with posaconazole should be considered for selected patients ≥13 years of age who are undergoing intensive chemotherapy for AML or myelodysplastic syndrome in whom the risk of aspergillosis without prophylaxis is substantial (B-I)
- HSCT patients (pre-engraftment allogenic or autologous recipients) should only be considered for a prophylactic mold-active agent if they have had prior invasive aspergillosis (A-III), or anticipated prolonged neutropenia of ≥2 weeks (C-III), or a prolonged period of neutropenia prior to HSCT (C-III)

[A]Tomblyn M, et al. Bio Blood Marrow Transplant 2009;15:1143-1238; [B]Freifeld A, et al. Clin Infect Dis 2011;52:e55-e93

ANTIFUNGAL PROPHYLAXIS

American Society for Clinical Oncology[A]

- Limit antifungal prophylaxis (for decreasing IFIs) to patients receiving chemotherapy expected to cause profound neutropenia (ANC <100/μL) for >7 days, which confers substantial risk (>6-10%) for IFI
- Antifungal prophylaxis is not recommended for patients with solid tumors receiving conventional-dose chemotherapy with or without biologic (e.g., trastuzumab, bevacizumab, cetuximab)
- A mold-active triazole is recommended in environments with a substantial risk (>6%) for invasive aspergillosis

[A] Flowers CR, et al. J Clin Oncol 2013;31:794-810

ANTIFUNGAL PROPHYLAXIS

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Prevention of invasive fungal infections in solid organ transplant recipients

Type of Transplant	Target population	Antifungal drug	Duration
Liver	High-risk liver transplant recipients: 1) hemodialysis, retransplantation, fulminant hepatic failure; or 2) Cr CL<50 ml/min, >40 transfusion blood products, Y de Roux, >3 + survey cultures *Candida* spp., re-exploration after transplantation	Caspofungin (BII); Lip-AB 3 mg/kg IV (BII); micafungin (CIII); or anidulafungin (CIII)	Determined by the presence of risk factors
Pancreas	All	Fluconazole (BII);	1-2 weeks
Intestinal	All	fluconazole (BII);	3-4 weeks
	High-risk pancreas or intestinal transplant recipients: Acute rejection and poor initial allograft function, hemodialysis, laparotomy after transplantation, bacterial or CMV co-infection, anastomotic problems, overimmunosuppression	Lip-AB 3 mg/kg IV (CIII); caspofungin (CIII); micafungin (CIII); or anidulafungin (CIII)	Determined by the presenceof risk factors
Kidney	No prophylaxis (DIII)		
Heart	High-risk heart transplant recipients: Acute rejection hemodialysis, re-exploration after transplantation, CMV disease, excessive *Aspergillus* spp. air colonization	Itraconazole; voriconazole; posaconazole or equinocandins (CIII)	3 months or more, Determined by the presence of risk factors
Lung	All	Nebulized lip-AB B 25 mg Nebulized amphotericin B lipid complex 50 mg Three times weekly until resolution of bronchial suture Once a week from 2 to 6 months	Lip-AB once every two weeks Amphotericin B lipid complex once a week Indefinite or for a minimum of 12 months
		Voriconazole 200 mg/12 h O	4 months minimum, determined by the presence of risk factors
Not lung or kidney SOT	High-risk late invasive aspergillosis Chronic rejection, allograft dysfunction due to VHC (liver transplant), hemodialysis, overimmunosuppression	Nebulized lip-AB B 25 mg Nebulized amphotericin B lipid complex 50 mg Initially, three times weekly	Lip-AB once every two weeks Amphotericin B lipid complex once-a-week Determined by the presence of risk factors

Gavalda J, et al. Enferm Infecc Microbiol Clin 2012;30(suppl 2):27-33

Table 2 ECIL 3 Guidelines on antifungal primary prophylaxis in hematology patients (the items in bold italic have been introduced at ECIL 3)

Antifungal drug	*Grading*	*Comments*
Leukemia patients, induction chemotherapy		
Fluconazole (50–400 mg/day)	CI	Azoles should not be used empirically in case of prevoius azole prophylaxis Combined with a mould-directed diagnostic approach for centers not having HEPA-filtered rooms and/or having a high baseline incidence of mould infections
Itraconazole oral solution (2.5 mg/kg b.i.d.)	CI	May be limited by drug interactions and/or patient tolerability Azoles should not be used empirically in case of prior azole prophylaxis It is recommended to monitor serum drug concentrations
Posaconazole (200 mg t.i.d.)	AI	Azoles should not be used empirically in case of previous azole prophylaxis It is recommended to monitor serum drug concentrations
Echinocandins IV	Insufficient data	
Polyenes IV	CI	Includes low doses of conventional ampho B and lipid formulations
Aerosolized liposomal ampho B combined with oral fluconazole	***BI***	***The ECIL recommendation for aerosolized amphotericin B deoxycholate is DI***
Allogeneic HSCT recipients, initial neutropenic phase		
Fluconazole (400 mg q.d. i.v. or oral)	AI	Azoles should not be used empirically in case of previous azole prophylaxis Combined with a mould-directed diagnostic approach for centers not having HEPA-filtered rooms and/or having a high baseline incidence of mould infections
Itraconazole (200 mg i.v. followed by oral solution 200 mg b.i.d.)[a]	BI	May be limited by drug interactions and/or patient tolerability Azoles should not be used empirically in case of previous azole prophylaxis It is recommended to monitor serum drug concentrations
Posaconazole	No data	
Voriconazole (200 mg b.i.d. oral)	***Provisional AI***	***Grading pending the publication of the full paper***
Micafungin (50 mg q.d. i.v.)	CI	
Polyenes i.v.	CI	Includes low doses of conventional ampho B and lipid formulations
Aerosolized liposomal ampho B combined with oral fluconazole	***BII***	***The ECIL recommendation for aerosolized ampho B deoxycholate is DI***
Allogeneic HSCT recipients, GVHD phase		
Fluconazole (400 mg q.d. i.v. or oral)	CI	Azoles should not be used empirically in case of previous azole prophylaxis
Itraconazole (200 mg i.v. followed by oral solution 200 mg b.i.d.)[a]	BI	May be limited by drug interactions and/or patient tolerability Azoles should not be used empirically in case of prior azole prophylaxis It is recommended to monitor serum drug concentrations
Posaconazole	AI	Azoles should not be used empirically in case of previous azole prophylaxis It is recommended to monitor serum drug concentrations
Voriconazole (200 mg b.i.d. oral)	***Provisional AI***	***Grading pending the publication of the full paper***
Echinocandins i.v.	Insufficient data	
Polyenes i.v.	CI	Includes low doses of conventional ampho B and lipid formulations
Aerosolized liposomal ampho B combined with oral fluconazole	***Insufficient data***	

European Guidelines (ECIL) Maertens J, et al. Bone Marrow Transplant 2011;46:709-718

CONSTRUCTION OR RENOVATION[1]

- When planning construction, demolition, and renovation activities in and around the facility, assess whether patients at high-risk for aspergillosis are likely to be exposed to high ambient-air spore counts of *Aspergillus* spp., and if so develop a plan to prevent such exposure {IA}
- During construction, demolition, or renovation activities construct impermeable barriers between patient-care and construction areas to prevent dust from entering the patient-care areas {IB]
- Direct pedestrian traffic that come from construction areas away from patient-care areas to limit the opening and closing of doors or other barriers that might cause dust dispersion {IB}

[1]Tablan OC, et al. Guidelines for preventing health-care-associated pneumonia, 2003

CONSTRUCTION OR RENOVATION[1]

- Establish a multidisciplinary team that includes infection-control staff to coordinate demolition, construction and renovation {IB, IC}
- Educate construction and healthcare staff in immunocompromised patient-care areas regarding airborne infection risks associated with construction and preventive measures {IB}
- Incorporate mandatory adherence agreements for infection control into construction contracts {IC}
- Establish and maintain surveillance for airborne environmental disease (e.g., aspergillosis) as appropriate during construction {IB}

[1]Guideline for environmental infection control in health-care facilities, 2003

CONSTRUCTION OR RENOVATION[1]

- Implement infection-control measures during construction, renovation, maintenance, demolition, and repair {IB, IC}
  - Before the project gets underway, perform an ICRA to define the scope of the project and need for barrier measures {IB, IC}
    - **Determine if immunocompromised patients may be at risk for exposure and develop a contingency plan to prevent exposures**
  - Implement infection-control measures for external demolition and construction {IB}
    - **Determine if facility can operate on recirculated air; if feasible, seal off adjacent air intakes**
    - **If not feasible, check and replace low-efficiency filters as needed**
    - **Seal windows and reduce outside air intrusion**

[1]**Guideline for environmental infection control in health-care facilities, 2003**

CONSTRUCTION OR RENOVATION[1]

- Implement infection-control measures during construction, renovation, maintenance, demolition, and repair {IB, IC}
  - Implement infection-control measure for internal construction {IB, IC}
    - **Construct barriers to prevent dust from entering patient-care areas**
    - **Block and seal off return air vents (if needed)**
    - **Implement dust control measures; divert pedestrian traffic**
    - **Relocate patients adjacent to work zone (depending on their immune status)**

[1]**Guideline for environmental infection control in health-care facilities, 2003**


CONSTRUCTION
AREA
DO NOT ENTER
CHECK WITH
SUPERINTENDENT
BEFORE ENTERING

CONSTRUCTION OR RENOVATION[1]

- Implement infection-control measures during construction, renovation, maintenance, demolition, and repair {IB, IC}
  - Perform engineering and work-site related infection control measures as needed for internal construction and renovations
    - **Ensure proper operation of the air-handling system**
    - **Create and maintain negative pressure in work zones**
    - **Monitor negative air flow inside of rigid barriers**
    - **Monitor barriers; repair gaps and breaks in barriers**
    - **Direct pedestrian traffic away from work zones**
    - **Provide designated travel routes for construction crew**
    - **Clean work zones daily**
    - **Clean and replace air filters**

[1]Guideline for environmental infection control in health-care facilities, 2003

CONSTRUCTION OR RENOVATION[1]

- No recommendation is offered on routine microbiologic air sampling, before, during, or after construction {unresolved}
- If a case of healthcare-acquired aspergillus airborne fungal infection occurs during construction, implement appropriate measures {IB}
- If there is epidemiologic evidence of ongoing transmission of fungal disease, conduct an environmental assessment to determine and eliminate the source {IB}
- If air-supply systems to high-risk areas are not optimal use portable, industrial-grade HEPA filters on temporary basis {II}

UNC INTERVENTIONS TO PREVENT *ASPERGILLUS* IN HIGH-RISK PATIENTS

- UNC policies
  - **Bone marrow transplant unit**
  - **Environmental services**
  - **Isolation precautions**
  - **Plant engineering and maintenance**
- Other preventive interventions
  - **Approval of construction and renovation projects**
  - **Construction rounds**
- NC Health Department policies (developed by UNC)
  - **Water damage**

INFECTION CONTROL RISK ASSESSMENT (ICRA)

- ICRA is an multidisciplinary, organizational, documented process that after considering the facility's patient population and program:
  - **Focuses on reduction of risk from infection**
  - **Acts through phases of facility planning, design, construction, renovation, facility maintenance and**
  - **Coordinates and weights knowledge about infection, infectious agents, and care environment permitting the organization to anticipate potential impact**

STEP 1:
IDENTIFY TYPE OF CONSTRUCTION PROJECT

TYPE A	**Inspection and Non-Invasive Activities.** Includes, but is not limited to: ▪ removal of ceiling tiles for visual inspection only, e.g., limited to 1 tile per 50 square feet ▪ painting (but not sanding) ▪ wallcovering, electrical trim work, minor plumbing, and activities which do not generate dust or require cutting of walls or access to ceilings other than for visual inspection.
TYPE B	**Small scale, short duration activities which create minimal dust** Includes, but is not limited to: ▪ installation of telephone and computer cabling ▪ access to chase spaces ▪ cutting of walls or ceiling where dust migration can be controlled.

http://www.premierinc.com/quality-safety/tools-services/safety/topics/construction/downloads/ICRA-MatrixColorRevised-091109.pdf

STEP 1:
IDENTIFY TYPE OF CONSTRUCTION PROJECT

TYPE C	**Work that generates a moderate to high level of dust or requires demolition or removal of any fixed building components or assemblies** Includes, but is not limited to: ▪ sanding of walls for painting or wall covering ▪ removal of floorcoverings, ceiling tiles and casework ▪ new wall construction ▪ minor duct work or electrical work above ceilings ▪ major cabling activities ▪ any activity which cannot be completed within a single workshift.
TYPE D	**Major demolition and construction projects** Includes, but is not limited to: ▪ activities which require consecutive work shifts ▪ requires heavy demolition or removal of a complete cabling system ▪ new construction.

STEP 2:
IDENTIFY PATIENT RISK

Low Risk	Medium Risk	High Risk	Highest Risk
▪ Office areas	▪ Cardiology ▪ Echocardiography ▪ Endoscopy ▪ Nuclear Medicine ▪ Physical Therapy ▪ Radiology/MRI ▪ Respiratory Therapy	▪ CCU ▪ Emergency Room ▪ Labor & Delivery ▪ Laboratories (specimen) ▪ Medical Units ▪ Newborn Nursery ▪ Outpatient Surgery ▪ Pediatrics ▪ Pharmacy ▪ Post Anesthesia Care Unit ▪ Surgical Units	▪ Any area caring for immunocompromised patients ▪ Burn Unit ▪ Cardiac Cath Lab ▪ Central Sterile Supply ▪ Intensive Care Units ▪ Negative pressure isolation rooms ▪ Oncology ▪ Operating rooms including C-section rooms

STEP 3:
MATCH RISK GROUP WITH CONSTRUCTION TYPE

Patient Risk Group	Construction Project Type			
	TYPE A	TYPE B	TYPE C	TYPE D
LOW Risk Group	I	II	II	III/IV
MEDIUM Risk Group	I	II	III	IV
HIGH Risk Group	I	II	III/IV	IV
HIGHEST Risk Group	II	III/IV	III/IV	IV

Note: Infection Control approval will be required when the Construction Activity and Risk Level indicate that Class III or Class IV control procedures are necessary.

INFECTION CONTROL BY CLASS

	During Construction Project	Upon Completion of Project
CLASS I	1. Execute work by methods to minimize raising dust from construction operations. 2. Immediately replace a ceiling tile displaced for visual inspection	1. Clean work area upon completion of task.
CLASS II	1. Provide active means to prevent airborne dust from dispersing into atmosphere. 2. Water mist work surfaces to control dust while cutting. 3. Seal unused doors with duct tape. 4. Block off and seal air vents. 5. Place dust mat at entrance and exit of work area 6. Remove or isolate HVAC system in areas where work is being performed.	1. Wipe work surfaces with cleaner/disinfectant. 2. Contain construction waste before transport in tightly covered containers. 3. Wet mop and/or vacuum with HEPA filtered vacuum before leaving work area. 4. Upon completion, restore HVAC system where work was performed.

INFECTION CONTROL BY CLASS

	During construction	After construction
CLASS III	1. Remove or Isolate HVAC system in area where work is being done to prevent contamination of duct system. 2. Complete all critical barriers i.e. sheetrock, plywood, plastic, to seal area from non work area or implement control cube method (cart with plastic covering and sealed connection to work site with HEPA vacuum for vacuuming prior to exit) before construction begins. 3. Maintain negative air pressure within work site utilizing HEPA equipped air filtration units. 4. Contain construction waste before transport in tightly covered containers. 5. Cover transport receptacles or carts. Tape covering unless solid lid.	1. Do not remove barriers from work area until completed project is inspected by the owner's Safety Department and Infection Prevention & Control Department and thoroughly cleaned by the owner's Environmental Services Department. 2. Remove barrier materials carefully to minimize spreading of dirt and debris associated with construction. 3. Vacuum work area with HEPA filtered vacuums. 4. Wet mop area with cleaner/disinfectant. 5. Upon completion, restore HVAC system where work was performed.

INFECTION CONTROL BY CLASS

	During construction	After construction
CLASS IV	1. Isolate HVAC system in area where work is being done to prevent contamination of duct system. 2. Complete all critical barriers i.e. sheetrock, plywood, plastic, to seal area from non work area or implement control cube method (cart with plastic covering and sealed connection to work site with HEPA vacuum for vacuuming prior to exit) before construction begins. 3. Maintain negative air pressure within work site utilizing HEPA equipped air filtration units. 4. Seal holes, pipes, conduits, and punctures. 5. Construct anteroom and require all personnel to pass through this room so they can be vacuumed using a HEPA vacuum cleaner before leaving work site or they can wear cloth or paper coveralls that are removed each time they leave work site. 6. All personnel entering work site are required to wear shoe covers. Shoe covers must be changed each time the worker exits the work area.	1. Do not remove barriers from work area until completed project is inspected by the owner's Safety Department and Infection Prevention & Control Department and thoroughly cleaned by the owner's Environmental Services Dept. 2. Remove barrier material carefully to minimize spreading of dirt and debris associated with construction. 3. Contain construction waste before transport in tightly covered containers. 4. Cover transport receptacles or carts. Tape covering unless solid lid. 5. Vacuum work area with HEPA filtered vacuums. 6. Wet mop area with cleaner/disinfectant. 7. Upon completion, restore HVAC system where work was performed.

OTHER STEPS

4. Identify areas surrounding the project area, assess impact
5. Indentify the specific sites of activity (e.g., patient rooms)
6. Identify issues related to: ventilation, plumbing, electrical in terms of possible outages
7. Identify containment measures using prior risk assessment
8. Consider possible water damage
9. Work hours: Can work be done during non-patient care hours?
10. Develop plans for the proper handwashing sinks
11. Develop plans for use of clean and soiled utility rooms
12. Communicate with project team: traffic flow, housekeeping, debris removal

SUMMARY

- Outbreaks of aspergillosis and other fungi continue to occur in US healthcare facilities
- Highly immunocompromised patients are at highest risk
- Most are related to construction and renovation
- Appropriate implementation of CDC/HICPAC guidelines can prevent healthcare-associated infection
- Use of ICRA is a logical method to plan for construction and renovation projects

SUPPLEMENTAL SLIDES ON MANAGEMENT OF WATER DAMAGE

A Systematized Approach for Remediating Water Problems in Buildings

- Floods
- Roof leaks
- Potable water leaks
- Sewage backup
- Steam leaks
- Ground water infiltration

Health Problems from Mold

Skin irritation – rash, redness, itching

Allergic responses – watery eyes, sneezing, congestion, tiredness

Hypersensitivity diseases – Reactive airway disease

Water Damage Checklist

- Inventory – all damaged areas, walls, floors, furniture (moisture meter)
- Ceiling tile – remove and dispose of all wet tiles within 24-48 hours (only exception small steam leak)
- Drywall – remove and replace within 24 hours – cut sheetrock at least 12” above moisture mark
- Wet lathe/plaster will leak minerals and form chalky surface, need to remove under controlled conditions after the surface has been allowed to dry.

Water Damage Checklist

- Block walls – scrub with a mild detergent followed by a rinse of the surface using a solution of ¼ to ½ cup of bleach per gallon. Dry area. Controls include: negative air pressure, appropriate respiratory protection, excellent personal hygiene, handwashing and showering after work in the area
- Furniture upholstered – steam or drinking → water air dry and monitor. If other water damage → discard
- Hardwood or intact laminate – appropriately clean

Water Damage Checklist

- Electrical – have checked by building inspector or electrician. Turn power off and discard wet electrical circuit breakers, fuses, switches, outlets, electrical motors, and light fixtures need to be opened, cleaned and air-dried by qualified person. (If in doubt → throw out)
- Particle board/pressed waterboard
  - If steam → air dry and monitor other water damage → discard

Water Damage Checklist

- Delaminated furniture/cabinets
  - If steam → air dry and monitor
  - If other water damage → discard
  - Fiberglass → discard and replace
  - Books and papers → nonvaluables discard, photo copy, freeze, Joy
  - Subflooring → must also be cleaned and dried

Water Damage Checklist

- Carpet – wet from floods, roof leaks, steam, potable and ground water
  - If wet less than 48 hours → remove all materials and extract as much water as possible per wet vacuums → shampoo with dilute surfactant → soak with ¼ to ½ cup bleach solution (do not use a biocide – people are sensitive and does not kill spores). Rinse and extract with clean water → or commercial steam cleaning may be used in lieu of bleach → dry carpet within 12-24 hours

Containment Tips

- Limit release of mold into air
- Always maintain negative air pressure
- Exhaust fans to outdoors, air makeup is available, block return air vents
- Barriers (airlock and tested)
- Limited polyethylene sheeting to floor, slit entry and cover flap
- HEPA units/change filter/used in well-sealed plastic bags

Personal Protective Equipment

- Minimum: Gloves, N-95 respirator, goggles/eye protection
- Limited: Gloves, N-95 respirator or half-face respirator with HEPA filter, disposable overalls, goggles/eye protection
- Full: Gloves, disposable full body clothing, head gear, foot coverings, full-face respirator
- Use professional judgment to determine prudent levels of PPE and containment.

Guidelines for Selecting Clean-up, Remediation and Containment

- Small – total surface area affected less than 10 square feet
- Medium – total surface area affected between 10 and 100 square feet
- Large – total surface area affected greater than 100 square feet or potential for increased occupant or Remediator Exposure during remediation estimated to be significant

Summary

- Acute and chronic health problems known to be associated with indoor air pollution
- Importance of managing moisture infiltration and indoor air pollution into health care buildings has become critical