**Healthcare Infection Society**

**Prevention and control of aspergillosis - draft scope**

**Background**

The incidence of invasive fungal infections has increased in the last few years.1 These infections are a major cause of morbidity and high mortality in susceptible populations worldwide. Aspergillosis is a particular concern for immunocompromised patients who, when affected, often develop pulmonary infections that may rapidly progress into invasive and/or disseminated disease.2 *Aspergillus* spores are ubiquitous in a wide range of environments including soil and organic matter and can be easily dispersed via air.3 Their widespread presence in healthcare settings and the threat they pose to health is well described in the literature.4 Early diagnosis remains challenging,1 and with the emergence of resistance to some anti-fungal therapies,3 prevention of these infections is essential. Currently, there is little authoritative advice given on this topic. The National Guidelines for the Prevention of Nosocomial Aspergillosis produced for Ireland in 20184 and the French guidelines developed by the French Society of Medical Mycology and the French Society of Hospital Hygiene in 20115 are the only sources of advice on this topic, which, based on new evidence are now due for an update.

**Objectives**

To systematically review evidence on the effectiveness, costs and impacts of Infection Prevention and Control (IPC) practices to prevent aspergillosis in healthcare settings.

**Remit**

*Geographical relevance:* These guidelines will be developed by an international group of experts from Europe, Northern America and Asia. It is proposed that the advice will be relevant to the settings and populations internationally.

*Population*: all individuals at risk of aspergillosis. It has been recognised that the incidence of invasive aspergillosis, has increased in recent years and new groups of at-risk patients and other individuals have emerged, necessitating a review to establish new risk factors for acquiring these fungal infections.

*Setting*:any healthcare setting, including hospitals, residential care facilities and any other facility in which health care is given. It is recognised that the health care is sometimes provided to the patients beyond these settings (e.g. when a person is discharged home) and, when appropriate, the remit for some of the proposed questions may extend to include these other settings.

*Microorganisms to be covered***:** the initial proposal was to include only *Aspergillus* species. Following further discussion, it is proposed that *Fusarium* and *Mucor* should also be included and that the title should be changed to “Prevention and control of mould-related infections in healthcare facilities”. The rationale for expanding the scope is that:

* There are currently no established IPC guidelines on the topic of *Fusarium* and *Mucor* but the incidence of infections due to these moulds has increased in recent years and is expected to increase due to new viral threats as well as climate change and subsequent extreme conditions caused by these changes.
* These three pathogens typically cause invasive lung infections following inhalation of fungal spores and can progress into systemic infections mostly affecting severely immunocompromised patients. Therefore, the pathogenesis, the routes of transmission and the affected populations are similar.
* It is expected that, other than for aspergillosis, the volume of the evidence (i.e. the number of studies for inclusion) will be low. However, due to the similarities between these fungi, it is possible that the evidence on the effectiveness of some IPC measures for one micro-organism can be extrapolated to provide stronger recommendations.

*Types of infection*: Except for the first question (Appendix), which aims to identify new risk factors for fungal diseases, the scope will focus on invasive forms of the disease.

**Excluded from the remit**

Upon an initial review of the existing published guidelines, it was determined that appropriate and up-to-date advice is given for the topics of antifungal prophylaxis, diagnosis and treatment. These topics, which sometimes are considered to fall into the remit of IPC, were excluded from the scope of the proposed guidelines.

**Methodology**

The guidelines will be developed using the Society’s NICE-accredited process, which uses systematic review methodology and GRADE framework for gathering all available evidence and using it for formulating evidence-based recommendations.6 Evidence will be limited to English language papers and no date limits will be applied.

**Questions for scoping consultation**

1. Is the proposed list of questions (listed in the Appendix) comprehensive?
2. Are all outcome measures appropriate?
3. Is the proposal to extend the scope to *Fusarium* and *Mucor* reasonable?
4. Is the remit appropriate?
5. Is it appropriate to exclude prophylaxis, diagnosis and treatment from the review questions?

**References**

1. Gaffney S, Kelly DM, Rameli PM, Kelleher E, Martin‐Loeches I. Invasive pulmonary aspergillosis in the intensive care unit: current challenges and best practices. Apmis. 2023 Nov;131(11):654-67.
2. Sigera LS, Denning DW. Invasive aspergillosis after renal transplantation. Journal of Fungi. 2023 Feb 15;9(2):255.
3. Verweij PE, Song Y, Buil JB, Zhang J, Melchers WJ. Antifungal resistance in pulmonary aspergillosis. Seminars in Respiratory and Critical Care Medicine 2024 Jan 9. Thieme Medical Publishers, Inc.
4. Health Protection Surveillance Centre (2018). National Guidelines for the Prevention of Nosocomial Aspergillosis. Available at: <https://www.hpsc.ie/a-z/microbiologyantimicrobialresistance/infectioncontrolandhai/guidelines/Aspergillus%20Guidelines%202018.pdf> Last accessed: June 2024.
5. French Society of Medical Mycology (SFMM) and French Society of Hospital Hygiene (SF2H) (2011). Risk of fungal infections, and construction work in hospitals. Available at: <https://www.eunetips.eu/fileadmin/pdf/spi.fr.sf2h-sfmm_fungal_infections_vdef.pdf>. Last accessed: June 2024.
6. Healthcare Infection Society (2020). Guideline Development Manual (V14). Available at: <https://his.org.uk/media/bn5pwiu4/his_guideline-methodology_v-14.pdf>. Last accessed: June 2024.

**Appendix: Review questions**

**Identification of the Risk Groups**

1. Which individuals in healthcare settings, except those who are currently recognised, are at risk of a. invasive aspergillosis, mucormycosis and fusariosis? b. allergic mycosis caused by *Aspergillus*, *Mucor* or *Fusarium*?

**Patient screening**

1. What is the cost and clinical effectiveness of screening patients a. at admission? b. repeat screening/testing for invasive aspergillosis, mucormycosis and fusariosis?

**Preventative measures in daily practice**

1. Should windows in clinical areas be opened or closed? Is ‘natural’ ventilation as effective as mechanical ventilation in controlling *Aspergillus*, *Mucor* or *Fusarium*?
2. What is the clinical- and cost-effectiveness of HEPA air filters in reducing environmental contamination by *Aspergillus*, *Mucor* or *Fusarium* and preventing related diseases?
3. What is the clinical- and cost effectiveness of different strategies in controlling *Aspergillus*, *Mucor* or *Fusarium* on healthcare linens?
4. Are positive/neutral pressure rooms (with and without lobbies) effective in controlling *Aspergillus*, *Mucor* or *Fusarium*?
5. What is the clinical- and cost-effectiveness of different cleaning strategies in controlling environmental *Aspergillus*, *Mucor* or *Fusarium* and preventing related diseases?
6. What is the clinical- and cost-effectiveness of controlling indoor environmental risk factors to control *Aspergillus*, *Mucor* or *Fusarium* and preventing related diseases?
7. What is the clinical- and cost- effectiveness of maintaining/controlling the outside environment of healthcare premises to prevent contamination with *Aspergillus, Mucor* or *Fusarium* inside the healthcare settings?

**Preventative measures in other circumstances**

1. What is the clinical- and cost-effectiveness of different management strategies to control *Aspergillus*, *Mucor* or *Fusarium* during unusual circumstances (e.g. building works and flooding)?
2. What are the important considerations for designing/planning new healthcare buildings for controlling environmental *Aspergillus*, *Mucor* or *Fusarium*?

**Patient management**

1. What kind of information should patients at risk of invasive aspergillosis, mucormycosis and fusariosis be given when they are: a. receiving care in hospital or in other healthcare institutions, b. discharged home?
2. What is the clinical- and cost-effectiveness of preventing aspergillosis, mucormycosis and fusariosis from food supplied in healthcare facilities?

**Clinical surveillance and outbreaks**

1. What is the evidence that local clinical surveillance is effective in preventing aspergillosis, mucormycosis and fusariosis a. in usual and b. in special circumstances (e.g. refurbishment or leaks)? When should an outbreak be declared?
2. How should outbreaks and periods of increased incidence of invasive aspergillosis, mucormycosis and fusariosis be managed?

**Environmental monitoring**

1. When should environmental sampling/monitoring be considered? How should environmental sampling be done? What are the acceptable levels of *Aspergillus*, *Mucor* or *Fusarium* in various healthcare environments (e.g. ICU, operating rooms, haematology, oncology)?

**Water systems**

1. What is the clinical- and cost- effectiveness of different strategies to control *Aspergillus*, *Mucor* or *Fusarium* in water systems?

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| **Review question** | | | | |
| 1. Which individuals in healthcare settings, except those who are currently recognised, are at risk of a. invasive aspergillosis, mucormycosis and fusariosis? b. allergic mycosis caused by *Aspergillus*, *Mucor* or *Fusarium*? | | | | |
| **PFO Table** | | | | |
| Population | | **Risk Factor** | **Comparator** | **Outcomes** |
| Patients, HCWs, visitors, contractors in any healthcare setting | | Exposed to *Aspergillus*, *Mucor* or *Fusarium* | Not exposed | - Incidence: developed invasive aspergillosis, mucormycosis and fusariosis  - Incidence: developed allergic mycosis caused by *Aspergillus*, *Mucor* or *Fusarium* |
| **Exclusion criteria** | | | | |
| Exclude well established risk factors: post-transplant (solid, BMT, stem cell), haematological cancers, neutropenia, aplastic anaemia, immune deficiency, immunocompromised/ suppressed, COPD stage III/IV or in ICU/HDU, dialysis, CF, CGD, NICU. **Note:** existing risk factors will be mentioned in introduction and the final output (e.g. table, diagram, etc.) will include known and newly identified risk factors (e.g. newer treatments for diseases such as BMT using CAR T cell therapy, co-infections etc. | | | | |
| **Additional comments** | | | | |
| Including breakthrough IFD. | | | | |
| Language | English language only | | | |
| Study design | Any study design with control group | | | |
| Additional evidence section | Any other studies not meeting study design criteria (e.g. outbreaks, mathematical models, case series, case studies).  *Note: these studies will be included in the separate section and may be considered to form recommendations only if the evidence from the included studies is insufficient. When making recommendations based on these studies, the evidence will be regarded as very low quality.* | | | |
| Status | Published studies only | | | |
| Date restriction | No date | | | |
| Databases to cover | MEDLINE, Embase, Emcare | | | |
| Identified papers |  | | | |

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| **Review question** | | | | |
| 2. What is the cost and clinical effectiveness of screening patents a. at admission? b. repeat screening/testing for invasive aspergillosis, mucormycosis and fusariosis? | | | | |
| **PICO Table** | | | | |
| Population | | **Intervention** | **Comparator** | **Outcomes** |
| Patients in healthcare setting suspected to have invasive aspergillosis, mucormycosis and fusariosis | | Screening at admission  Repeat screening | No screening | - Incidence: developed invasive aspergillosis, mucormycosis and fusariosis  - Incidence of other events e.g. mortality/ other when disease is recognised early  - Cost  - Carbon footprint (CO2e emissions)  - antifungal consumption |
| **Exclusion criteria** | | | | |
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| **Additional comments on PICO** | | | | |
| Including the frequency for re-screening/re-testing. Include information on how often patients arrive with the evidence of the disease before admission to distinguish between (healthcare and non-healthcare related disease). Within this question, capture any data about who makes diagnosis (e.g. fungal disease expert vs radiologist). Note: capture data on patients who may only be colonised with a mould in their airways at admission and this would represent a risk factor for later development of invasive aspergillosis. | | | | |
| Language | English language only | | | |
| Study design | Any study design with control group | | | |
| Additional evidence section | Any other studies not meeting study design criteria (e.g. outbreaks, mathematical models, case series, case studies).  *Note: these studies will be included in the separate section and may be considered to form recommendations only if the evidence from the included studies is insufficient. When making recommendations based on these studies, the evidence will be regarded as very low quality.* | | | |
| Status | Published studies only | | | |
| Date restriction | No date | | | |
| Databases to cover | MEDLINE, Embase, Emcare | | | |
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| **Review question** | | | | |
| 3. Should windows in clinical areas be opened or closed? Is ‘natural’ ventilation as effective as mechanical ventilation in controlling *Aspergillus*, *Mucor* or *Fusarium*? | | | | |
| **PICO Table** | | | | |
| Population | | **Intervention** | **Comparator** | **Outcomes** |
| - Patients in healthcare setting  - Rooms in healthcare environment (e.g. rooms and bays in wards, offices etc.) | | Any form of mechanical ventilation | Any form of natural ventilation | - Incidence of invasive aspergillosis, mucormycosis and fusariosis  - Presence of *Aspergillus*, *Mucor* or *Fusarium* in the environment  - Cost  - Other events (e.g. pollution, thermal inconsistencies etc.)  - Carbon footprint (CO2e emissions) |
| **Exclusion criteria** | | | | |
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| **Additional comments on PICO** | | | | |
| Capture additional information e.g. about mechanical ventilation not being maintained and structural components of natural ventilation (e.g. two windows on either side of the room vs one) | | | | |
| Language | English language only | | | |
| Study design | Any study design with control group | | | |
| Additional evidence section | Any other studies not meeting study design criteria (e.g. outbreaks, mathematical models, case series, case studies).  *Note: these studies will be included in the separate section and may be considered to form recommendations only if the evidence from the included studies is insufficient. When making recommendations based on these studies, the evidence will be regarded as very low quality.* | | | |
| Status | Published studies only | | | |
| Date restriction | No date | | | |
| Databases to cover | MEDLINE, Embase, Emcare | | | |
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| **Review question** | | | | |
| 4. What is the clinical- and cost-effectiveness of HEPA air filters in reducing environmental contamination by *Aspergillus*, *Mucor* or *Fusarium* and preventing related diseases? | | | | |
| **PICO Table** | | | | |
| Population | | **Intervention** | **Comparator** | **Outcomes** |
| - Patients in healthcare setting  - Rooms in healthcare environment (e.g. rooms and bays in wards, offices etc.) | | HEPA filtration in use | No HEPA filtration | - Incidence of invasive aspergillosis, mucormycosis and fusariosis  - Presence of *Aspergillus*, *Mucor* or *Fusarium* in the environment  - Cost  - Carbon footprint (CO2e emissions)  - Antifungal consumption |
| **Exclusion criteria** | | | | |
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| **Additional comments on PICO** | | | | |
| Include information about the effectiveness of portable HEPA filters and stratify into different types. Extract information on the number of days in a room with filtration if available. | | | | |
| Language | English language only | | | |
| Study design | Any study design with control group | | | |
| Additional evidence section | Any other studies not meeting study design criteria (e.g. outbreaks, mathematical models, case series, case studies).  *Note: these studies will be included in the separate section and may be considered to form recommendations only if the evidence from the included studies is insufficient. When making recommendations based on these studies, the evidence will be regarded as very low quality.* | | | |
| Status | Published studies only | | | |
| Date restriction | No date | | | |
| Databases to cover | MEDLINE, Embase, Emcare | | | |
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| **Review question** | | | | |
| 5. What is the clinical- and cost-effectiveness of different strategies in controlling *Aspergillus*, *Mucor* or *Fusarium* on healthcare linens? | | | | |
| **PICO Table** | | | | |
| Population | | **Intervention** | **Comparator** | **Outcomes** |
| - Patients in healthcare setting  - Linens handled in healthcare setting | | Any type of intervention which aims to reduce contamination of linen | No strategy or each other | - Incidence of aspergillosis, mucormycosis and fusariosis  - Presence of *Aspergillus*, *Mucor* or *Fusarium* on linen  - Cost  Carbon footprint (CO2e emissions) |
| **Exclusion criteria** | | | | |
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| **Additional comments on PICO** | | | | |
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| Language | English language only | | | |
| Study design | Any study design with control group | | | |
| Additional evidence section | Any other studies not meeting study design criteria (e.g. outbreaks, mathematical models, case series, case studies).  *Note: these studies will be included in the separate section and may be considered to form recommendations only if the evidence from the included studies is insufficient. When making recommendations based on these studies, the evidence will be regarded as very low quality.* | | | |
| Status | Published studies only | | | |
| Date restriction | No date | | | |
| Databases to cover | MEDLINE, Embase, Emcare | | | |
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| **Review question** | | | | |
| 6. Are positive/neutral pressure rooms (with and without lobbies) effective in controlling *Aspergillus*, *Mucor* or *Fusarium*? | | | | |
| **PICO Table** | | | | |
| Population | | **Intervention** | **Comparator** | **Outcomes** |
| - Patients in healthcare setting  - Rooms in healthcare environment (e.g. rooms and bays in wards, offices etc.) | | Positive pressure rooms  Neutral pressure rooms (PPVLR)  Lobbies | Standard rooms/wards  No lobbies | - Incidence of invasive aspergillosis, mucormycosis and fusariosis  - Presence of *Aspergillus*, *Mucor* or *Fusarium* in the environment  - Cost  - Carbon footprint (CO2e emissions)  - Antifungal consumption |
| **Exclusion criteria** | | | | |
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| **Additional comments on PICO** | | | | |
| Add information of negative pressure rooms a risk factor and how many days in the room. | | | | |
| Language | English language only | | | |
| Study design | Any study design with control group | | | |
| Additional evidence section | Any other studies not meeting study design criteria (e.g. outbreaks, mathematical models, case series, case studies).  *Note: these studies will be included in the separate section and may be considered to form recommendations only if the evidence from the included studies is insufficient. When making recommendations based on these studies, the evidence will be regarded as very low quality.* | | | |
| Status | Published studies only | | | |
| Date restriction | No date | | | |
| Databases to cover | MEDLINE, Embase, Emcare | | | |
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| **Review question** | | | | |
| 7. What is the clinical- and cost-effectiveness of different cleaning strategies in controlling environmental *Aspergillus*, *Mucor* or *Fusarium* and preventing related diseases? | | | | |
| **PICO Table** | | | | |
| Population | | **Intervention** | **Comparator** | **Outcomes** |
| - Patients in healthcare setting  - Rooms in healthcare environment (e.g. rooms and bays in wards, offices etc.) | | Any cleaning strategy  Any type of cleaning/disinfecting agent | Usual practice, each other | - Incidence of invasive aspergillosis, mucormycosis and fusariosis  - Presence of *Aspergillus*, *Mucor* or *Fusarium* in the environment  - Cost  - Carbon footprint (CO2e emissions)  - Chemical impact |
| **Exclusion criteria** | | | | |
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| **Additional comments on PICO** | | | | |
| Include any strategy including dusting and damp dusting, manual cleaning, anti-fungicidal cleaners, automated room decontamination devices, change in frequency. Include any particulars on methods e.g. frequency, duration etc. Capture data on appropriate disposal of disinfectants and cleaning agents. | | | | |
| Language | English language only | | | |
| Study design | Any study design with control group | | | |
| Additional evidence section | Any other studies not meeting study design criteria (e.g. outbreaks, mathematical models, case series, case studies).  *Note: these studies will be included in the separate section and may be considered to form recommendations only if the evidence from the included studies is insufficient. When making recommendations based on these studies, the evidence will be regarded as very low quality.* | | | |
| Status | Published studies only | | | |
| Date restriction | No date | | | |
| Databases to cover | MEDLINE, Embase, Emcare | | | |
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| **Review question** | | | | |
| 8. What is the clinical- and cost-effectiveness of controlling indoor environmental risk factors to control *Aspergillus*, *Mucor* or *Fusarium* and preventing related diseases? | | | | |
| **PICO Table** | | | | |
| Population | | **Intervention** | **Comparator** | **Outcomes** |
| - Patients in healthcare setting  - Rooms in healthcare environment (e.g. rooms and bays in wards, offices etc.) | | Any strategy | No strategy, each other | - Incidence of invasive aspergillosis, mucormycosis and fusariosis  - Presence of *Aspergillus*, *Mucor* or *Fusarium* in the environment  - Cost  - Carbon footprint (CO2e emissions) |
| **Exclusion criteria** | | | | |
| Food safety will be addressed in separate question  Building works will be covered in a separate question | | | | |
| **Additional comments on PICO** | | | | |
| Any strategy including controlling moisture, temperature, air treatment/disinfection, or removing plants and ornamental objects. Capture data on risks and benefits of plants. | | | | |
| Language | English language only | | | |
| Study design | Any study design with control group | | | |
| Additional evidence section | Any other studies not meeting study design criteria (e.g. outbreaks, mathematical models, case series, case studies).  *Note: these studies will be included in the separate section and may be considered to form recommendations only if the evidence from the included studies is insufficient. When making recommendations based on these studies, the evidence will be regarded as very low quality.* | | | |
| Status | Published studies only | | | |
| Date restriction | No date | | | |
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| **Review question** | | | | |
| 9. What is the clinical- and cost-effectiveness of maintaining/controlling the outside environment of healthcare premises to prevent contamination with *Aspergillus, Mucor* or *Fusarium* inside the healthcare settings? | | | | |
| **PICO Table** | | | | |
| Population | | **Intervention** | **Comparator** | **Outcomes** |
| - Patients in healthcare setting  - Rooms in healthcare environment (e.g. rooms and bays in wards, offices etc.) | | Any strategy addressing outside issues | No strategy, each other | - Incidence of invasive aspergillosis, mucormycosis and fusariosis  - Presence of *Aspergillus*, *Mucor* or *Fusarium* in the environment (indoors)  - Carbon footprint (CO2e emissions) |
| **Exclusion criteria** | | | | |
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| **Additional comments on PICO** | | | | |
| Include any strategy that mentions controlling e.g. bird droppings, leaves/plants rotting, fixing cracks and rooftops, maintaining air handling systems | | | | |
| Language | English language only | | | |
| Study design | Any study design with control group | | | |
| Additional evidence section | Any other studies not meeting study design criteria (e.g. outbreaks, mathematical models, case series, case studies).  *Note: these studies will be included in the separate section and may be considered to form recommendations only if the evidence from the included studies is insufficient. When making recommendations based on these studies, the evidence will be regarded as very low quality.* | | | |
| Status | Published studies only | | | |
| Date restriction | No date | | | |
| Databases to cover | MEDLINE, Embase, Emcare | | | |
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| **Review question** | | | | |
| 10. What is the clinical- and cost-effectiveness of different management strategies to control *Aspergillus*, *Mucor* or *Fusarium* during unusual circumstances (e.g. building works and flooding)? | | | | |
| **PICO Table** | | | | |
| Population | | **Intervention** | **Comparator** | **Outcomes** |
| - Patients in healthcare setting  - Any healthcare facility affected by unusual circumstances | | Any strategy | No strategy, each other | - Incidence of invasive aspergillosis, mucormycosis and fusariosis  - Presence of *Aspergillus*, *Mucor* or *Fusarium* in the environment  - Carbon footprint (CO2e emissions) |
| **Exclusion criteria** | | | | |
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| **Additional comments on PICO** | | | | |
| Include any strategy e.g. dust covers, filtration, masks/respirators for patients, increased frequency of cleaning, increased frequency of sampling, free-standing HEPA filters, dehumidifiers, sticky mats, audits, surveillance etc. Also include information on proximate vs distant events. | | | | |
| Language | English language only | | | |
| Study design | Any study design with control group | | | |
| Additional evidence section | Any other studies not meeting study design criteria (e.g. outbreaks, mathematical models, case series, case studies).  *Note: these studies will be included in the separate section and may be considered to form recommendations only if the evidence from the included studies is insufficient. When making recommendations based on these studies, the evidence will be regarded as very low quality.* | | | |
| Status | Published studies only | | | |
| Date restriction | No date | | | |
| Databases to cover | MEDLINE, Embase, Emcare | | | |
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| **Review question** | | | | |
| 11. What are the important considerations for designing/planning new healthcare buildings for controlling environmental *Aspergillus*, *Mucor* or *Fusarium*? | | | | |
| **PICO Table** | | | | |
| Population | | **Intervention** | **Comparator** | **Outcomes** |
| - Patients in healthcare setting | | Any design considerations | No strategy, each other | - Incidence of invasive aspergillosis, mucormycosis and fusariosis  - Presence of *Aspergillus*, *Mucor* or *Fusarium* in the environment  - Carbon footprint (CO2e emissions) |
| **Exclusion criteria** | | | | |
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| **Additional comments on PICO** | | | | |
| Include any considerations regarding ventilation, water systems, number of different types of rooms etc. | | | | |
| Language | English language only | | | |
| Study design | Any study design with control group | | | |
| Additional evidence section | Any other studies not meeting study design criteria (e.g. outbreaks, mathematical models, case series, case studies).  *Note: these studies will be included in the separate section and may be considered to form recommendations only if the evidence from the included studies is insufficient. When making recommendations based on these studies, the evidence will be regarded as very low quality.* | | | |
| Status | Published studies only | | | |
| Date restriction | No date | | | |
| Databases to cover | MEDLINE, Embase, Emcare | | | |
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| **Review question** | | | | |
| 12. What kind of information should patients at risk of invasive aspergillosis, mucormycosis and fusariosis be given when they are: a. receiving care in hospital or in other healthcare institutions, b. discharged home? | | | | |
| **PICO Table** | | | | |
| Population | | **Intervention** | **Comparator** | **Outcomes** |
| Patients in healthcare setting, high risk of invasive aspergillosis, mucormycosis and fusariosis | | Any strategy | No strategy or each other | - Incidence of invasive aspergillosis, mucormycosis and fusariosis during admission or after discharge  - Patient/carer experience  - Staff experience  - Carbon footprint of patient behaviours (CO2e emissions) |
| **Exclusion criteria** | | | | |
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| **Additional comments on PICO** | | | | |
| Any strategy e.g. leaflets, posters or any other communication about risk factors, environmental exposure, consequences, etc. Home includes nursing homes and other residential facilities. | | | | |
| Language | English language only | | | |
| Study design | Any study design with control group | | | |
| Additional evidence section | Any other studies not meeting study design criteria (e.g. outbreaks, mathematical models, case series, case studies).  *Note: these studies will be included in the separate section and may be considered to form recommendations only if the evidence from the included studies is insufficient. When making recommendations based on these studies, the evidence will be regarded as very low quality.* | | | |
| Status | Published studies only | | | |
| Date restriction | No date | | | |
| Databases to cover | MEDLINE, Embase, Emcare | | | |
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| **Review question** | | | | |
| 13. What is the clinical- and cost-effectiveness of preventing aspergillosis, mucormycosis and fusariosis from food supplied in healthcare facilities? | | | | |
| **PICO Table** | | | | |
| Population | | **Intervention** | **Comparator** | **Outcomes** |
| Patients in healthcare setting, high risk of invasive aspergillosis, mucormycosis and fusariosis | | Any strategy involving consumption of food and drinks (e.g. neutropenic diet) | No strategy or each other | - Incidence of invasive aspergillosis, mucormycosis and fusariosis  - Patient/carer experience  - Adverse events (e.g. undernutrition, dehydration, micronutrient deficiencies)  - Carbon footprint (CO2e emissions)  - antifungal consumption |
| **Exclusion criteria** | | | | |
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| **Additional comments on PICO** | | | | |
| Also extract data on the incidence of unknown origin fever | | | | |
| Language | English language only | | | |
| Study design | Any study design with control group | | | |
| Additional evidence section | Any other studies not meeting study design criteria (e.g. outbreaks, mathematical models, case series, case studies).  *Note: these studies will be included in the separate section and may be considered to form recommendations only if the evidence from the included studies is insufficient. When making recommendations based on these studies, the evidence will be regarded as very low quality.* | | | |
| Status | Published studies only | | | |
| Date restriction | No date | | | |
| Databases to cover | MEDLINE, Embase, Emcare | | | |
| Identified papers |  | | | |

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| **Review question** | | | | |
| 14. What is the evidence that local clinical surveillance is effective in preventing aspergillosis, mucormycosis and fusariosis a. in usual and b. in special circumstances (e.g. refurbishment or leaks)? When should an outbreak be declared? | | | | |
| **PICO Table** | | | | |
| Population | | **Intervention** | **Comparator** | **Outcomes** |
| Patients in healthcare setting, high risk of invasive aspergillosis, mucormycosis and fusariosis | | Surveillance | No surveillance | - Incidence of invasive aspergillosis, mucormycosis and fusariosis  - Any evidence that shows that the results of the surveillance drive QI activities  - Any negative events that occur when outbreak is declared too late |
| **Exclusion criteria** | | | | |
|  | | | | |
| **Additional comments on PICO** | | | | |
| Include any actions which were undertaken based on the results of the surveillance e.g. increased cleaning/monitoring of the environment, patient screening etc. | | | | |
| Language | English language only | | | |
| Study design | Any study design with control group | | | |
| Additional evidence section | Any other studies not meeting study design criteria (e.g. outbreaks, mathematical models, case series, case studies).  *Note: these studies will be included in the separate section and may be considered to form recommendations only if the evidence from the included studies is insufficient. When making recommendations based on these studies, the evidence will be regarded as very low quality.* | | | |
| Status | Published studies only | | | |
| Date restriction | No date | | | |
| Databases to cover | MEDLINE, Embase, Emcare | | | |
| Identified papers |  | | | |

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| **Review question** | | | | |
| 15. How should outbreaks and periods of increased incidence of invasive aspergillosis, mucormycosis and fusariosis be managed? | | | | |
| **PICO Table** | | | | |
| Population | | **Intervention** | **Comparator** | **Outcomes** |
| Patients and healthcare workers in healthcare setting, affected by an outbreak caused by *Aspergillus*, *Mucor* or *Fusarium* | | Any outbreak strategy | No strategy or each other | - Number of patients affected  - Length of an outbreak  - Cost  - Patient/staff experience  - Carbon footprint (CO2e emissions)  - antifungal consumption |
| **Exclusion criteria** | | | | |
|  | | | | |
| **Additional comments on PICO** | | | | |
| Any strategy including prophylaxis, closures, case finding, identification of environmental source, risk assessment etc. | | | | |
| Language | English language only | | | |
| Study design | Any study design with control group | | | |
| Additional evidence section | Any other studies not meeting study design criteria (e.g. outbreaks, mathematical models, case series, case studies).  *Note: these studies will be included in the separate section and may be considered to form recommendations only if the evidence from the included studies is insufficient. When making recommendations based on these studies, the evidence will be regarded as very low quality.* | | | |
| Status | Published studies only | | | |
| Date restriction | No date | | | |
| Databases to cover | MEDLINE, Embase, Emcare | | | |
| Identified papers |  | | | |

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| **Review question** | | | | |
| 16. When should environmental sampling/monitoring be considered? How should environmental sampling be done? What are the acceptable levels of *Aspergillus*, *Mucor* or *Fusarium* in various healthcare environments (e.g. ICU, operating rooms, haematology, oncology)? | | | | |
| **PICO Table** | | | | |
| Population | | **Intervention** | **Comparator** | **Outcomes** |
| - Patients in healthcare setting  - Rooms in healthcare environment (e.g. rooms and bays in wards, offices etc.) | | Any strategy related to sampling of the environment | No strategy or each other | - Incidence of invasive aspergillosis, mucormycosis and fusariosis  - Presence of *Aspergillus*, *Mucor* or *Fusarium* in the environment  - Diagnostic accuracy  - Turnaround times  - Carbon footprint (CO2e emissions) |
| **Exclusion criteria** | | | | |
|  | | | | |
| **Additional comments on PICO** | | | | |
| Include information on frequency or triggers for sampling, using settle plates or air sampling, water sampling etc. Also include any information which mentions acceptable levels in general or stratified by different patient groups. | | | | |
| Language | English language only | | | |
| Study design | Any study design with control group | | | |
| Additional evidence section | Any other studies not meeting study design criteria (e.g. outbreaks, mathematical models, case series, case studies).  *Note: these studies will be included in the separate section and may be considered to form recommendations only if the evidence from the included studies is insufficient. When making recommendations based on these studies, the evidence will be regarded as very low quality.* | | | |
| Status | Published studies only | | | |
| Date restriction | No date | | | |
| Databases to cover | MEDLINE, Embase, Emcare | | | |
| Identified papers |  | | | |

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| **Review question** | | | | |
| 17. What is the clinical- and cost-effectiveness of different strategies to control *Aspergillus*, *Mucor* or *Fusarium* in water systems? | | | | |
| **PICO Table** | | | | |
| Population | | **Intervention** | **Comparator** | **Outcomes** |
| - Patients in healthcare setting  - Water systems in healthcare environment | | Any intervention controlling *Aspergillus*, *Mucor* or *Fusarium* in water systems | No strategy or each other | - Incidence of invasive aspergillosis, mucormycosis and fusariosis  - Presence of *Aspergillus*, *Mucor* or *Fusarium* in the environment  - Cost  - Carbon footprint (CO2e emissions)  - Chemical impact  - antifungal consumption |
| **Exclusion criteria** | | | | |
|  | | | | |
| **Additional comments on PICO** | | | | |
| Interventions e.g. chlorination, other disinfection, filtration etc. | | | | |
| Language | English language only | | | |
| Study design | Any study design with control group | | | |
| Additional evidence section | Any other studies not meeting study design criteria (e.g. outbreaks, mathematical models, case series, case studies).  *Note: these studies will be included in the separate section and may be considered to form recommendations only if the evidence from the included studies is insufficient. When making recommendations based on these studies, the evidence will be regarded as very low quality.* | | | |
| Status | Published studies only | | | |
| Date restriction | No date | | | |
| Databases to cover | MEDLINE, Embase, Emcare | | | |
| Identified papers |  | | | |