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Standards of care for patients with invasive fungal infections within the United Kingdom: A national audit

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Summary *Objective:* The objective of this study was to audit the compliance and implementation of the British Society for Medical Mycology standards of care for patients with invasive infections in UK hospitals.
Methods: A multidisciplinary audit questionnaire regarding the processing of microbiology and histopathology specimens, radiology imaging and clinical management of patients with invasive fungal infections was distributed to UK hospitals.
Results: The study has shown that speciation of *Candida* and *Aspergillus* isolates from sterile sites was performed in 42–98% of hospitals. Microscopy of bronchoscopy specimens was not undertaken in 13 of 62 (21%) laboratories. Cryptococcal culture and antigen were undertaken routinely in abnormal CSF in 40–75% and 31–83% of at-risk patients but only in 12% of abnormal CSFs in patients without risk factors. Detailed fungal morphology was provided by <50% of histopathology departments. Most hospitals provided a timely HRCT or MRI on patients suspected to have an invasive fungal infection, but early treatment failed to occur in 15% of hospitals. In patients presenting with candidaemia, central venous catheters (CVC) were not changed routinely within 48 h in 15%.
Conclusion: Improvement in microbiology and histopathology specimen processing as well as rapid interventions such as initiation of anti-fungal therapy or CVC line removal could improve diagnostic rates and clinical outcomes of invasive fungal infections.

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Introduction

Invasive fungal infections such as candidaemia and invasive aspergillosis remain a significant cause of morbidity and mortality.[1–3] Recent surveillance data confirms the year-on-year increase of candidaemia cases with an incidence of 3.1 per 100,000 population in England, Wales and Northern Ireland and 4.8 per 100,000 population in Scotland (i.e. around 2000 cases annually, a 40% rise over 5 years).[4,5] Although the development of new anti-fungal agents has improved treatment options, the outcome of such serious infections remains poor, especially for candidaemia (32–50% morality)[1,6,7] and invasive aspergillosis in non-haematology settings such as in ICU (>50%)[8] and COPD patients (95%).[9] Improvements in outcome will greatly depend on early diagnosis and appropriate multidisciplinary management.[6,7,10–13]

In 2003 the British Society for Medical Mycology (BSMM) published a set of proposed standards of care for patients with invasive fungal infections that included best practice guidance for microbiology and histopathology laboratories, radiology and clinical specialists (Table 1).[14] This national audit is the first multidisciplinary United Kingdom (UK) wide survey involving key specialties (microbiology, histopathology, radiology and specialist clinical units) to measure the quality of care provided for patients with invasive fungal infections. The aim was to assess the laboratory and clinical aspects of services provided to manage such infections and to identify problem areas.

Methods

In April 2007 the BSMM, jointly with the Royal College of Pathologists (RCPath), invited members to participate in a national audit to assess the compliance with the published standards of care for patients with invasive fungal infections.[14] A questionnaire based on the four main specialty standards was piloted in hospitals in East Anglia. The questionnaire (Fig. 1) was subsequently published in the RCPath Bulletin, the RCPath website (www.rcpath.org/index.asp?PageID=1321) and, in addition, an invitation was sent via e-mail to UK RCPath members and regional RCPath chairmen including 200 registered microbiology laboratories.[15]

The questionnaire requested basic information on the type of hospital, presence of specialist units (HIV/infectious disease unit (ID), intensive care unit (ICU), special care baby unit (SCBU), burns unit, bone marrow (BMT)/stem cell (SCT) or solid organ transplant unit (SOT)) and awareness of the published standards. The core of the audit form contained standards of care questions for the four main areas namely microbiology, histopathology, radiology and clinical medicine requiring a yes or no answer. An option for free text feedback was also provided. In brief, the microbiology section required information on microscopy, culture and fungal speciation from a number of different specimens (blood, intra-vascular (IV) line tips, continuous ambulatory peritoneal dialysis (CAPD) fluid, bronchoscopy specimens, urine and cerebrospinal fluid (CSF)) as well as information on

Table 1 Summary of BSMM 2003 standards recommendations.

Microbiology standards
- Yeasts and moulds from sterile sites and line tips should be identified to species level
- Fungi from urine of patients in ITU, SCBU, burns unit and transplant patients should be speciated
- Bronchoscopy fluids from patients suspected of infection should have microscopy to look for hyphae and be cultured on specialized media
- Clinical isolates of *Aspergillus* should be speciated
- CSF from immunocompromised, HIV, transplant and sarcoidosis patients or those with abnormal CSF glucose, protein or lymphocytes should be tested for cryptococcal antigen and cultured for *Cryptococcus* (30 °C for 21 days), and bacteria (5 days).

Histopathology standards
- Tissues from immunocompromised patients with suspected infection should have fungal stains and positive results telephoned immediately
- A report should describe fungal presence/absence and morphology (fungal structures, presence of septae, melanin, relative size, cellular location)

Radiology standards
- Profound neutropenic haematology patients with new cough, chest pain, haemoptysis, abnormal chest X-ray, new mould culture, hyphae seen in sterile specimens or unresolved fever should receive a high resolution CT within 48 h
- Transplant patients with new mould culture should receive CT within 48 h
- Immunocompromised patients with new neurological features (including signs of meningitis) should have a CT or MRI scan of the brain

Clinical standards
- Request cards should state whether patient is immunocompromised
- Patients with candidaemia should have their central line removed within 48 h of diagnosis and be treated systemically with an anti-fungal agent at an appropriate dose
- Transplant or profoundly neutropenic patients with new mould culture, pulmonary or cerebral abnormalities consistent with fungal infection should receive a systemic anti-fungal agent active against moulds within 6 h of diagnosis/culture
- Cryptococcal meningitis should be treated with conventional amphotericin B(>0.7 mg/kg/d) or lipid based formulation (≥4 mg/kg/d) plus flucytosine (75–100 mg/kg/d)