

Review

Outbreaks of Fungal Infections in Hospitals: Epidemiology, Detection, and Management

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Abstract: Nosocomial clusters of fungal infections, whilst uncommon, cannot be predicted and are associated with significant morbidity and mortality. Here, we review reports of nosocomial outbreaks of invasive fungal disease to glean insight into their epidemiology, risks for infection, methods employed in outbreak detection including genomic testing to confirm the outbreak, and approaches to clinical and infection control management. Both yeasts and filamentous fungi cause outbreaks, with each having general and specific risks. The early detection and confirmation of the outbreak are essential for diagnosis, treatment of affected patients, and termination of the outbreak. Environmental sampling, including the air in mould outbreaks, for the pathogen may be indicated. The genetic analysis of epidemiologically linked isolates is strongly recommended through a sufficiently discriminatory approach such as whole genome sequencing or a method that is acceptably discriminatory for that pathogen. An analysis of both linked isolates and epidemiologically unrelated strains is required to enable genetic similarity comparisons. The management of the outbreak encompasses input from a multi-disciplinary team with epidemiological investigation and infection control measures, including screening for additional cases, patient cohorting, and strict hygiene and cleaning procedures. Automated methods for fungal infection surveillance would greatly aid earlier outbreak detection and should be a focus of research.

Keywords: fungi; nosocomial; outbreak; whole genome sequencing; genotyping; yeast; mould; infection prevention



Citation: Douglas, A.P.; Stewart, A.G.; Halliday, C.L.; Chen, S.C.-A. Outbreaks of Fungal Infections in Hospitals: Epidemiology, Detection, and Management. *J. Fungi* **2023**, *9*, 1059. <https://doi.org/10.3390/jof9111059>

Academic Editor: Ivana Manekovic

Received: 17 September 2023

Revised: 17 October 2023

Accepted: 26 October 2023

Published: 29 October 2023



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1. Introduction

Invasive fungal diseases (IFDs) are recognized as a global health concern by the World Health Organization (<https://www.who.int/publications/i/item/9789240060241> [accessed on 7 July 2023]) and are caused by an increasing breadth of yeast, filamentous fungi, and dimorphic fungi pathogens. As fungi are ubiquitous in nature, clusters of infection can and have occurred, not only in the community but as nosocomial infection when there is transmission or acquisition of fungi in the healthcare environment. Some yeast pathogens, such as *Candida* spp., tend to colonize the skin and gastrointestinal and genitourinary systems in normal hosts and have not often been as readily recognized as nosocomial pathogens as moulds. However, with the advent of *Candida auris* infections and with more sophisticated pathogen identification and typing methods, the ability of other

Epidemiology Of Hospitalassociated Infections

James R. Hupp, Elie M. Ferneini



Epidemiology Of Hospital-associated Infections:

Epidemiology of Hospital-associated Infections Peter C. Fuchs, 1979 *Epidemiology of Healthcare-Associated Infections in Australia* Ramon Z. Shaban, Brett G. Mitchell, Philip Russo, Deborah Macbeth, 2021-02-26 Endorsed by the Australasian College for Infection Prevention and Control ACIPC ACIPC is the peak body for infection prevention and control professionals in the Australasian region Healthcare associated Infections HAIs are a major threat to patient safety and the quality of healthcare globally Despite this Australia does not have a nationally coordinated program for the surveillance and reporting of HAIs Epidemiology of Healthcare associated Infections in Australia is Australia's first peer reviewed evidence based assessment of the epidemiology of HAIs using publicly available data from hospital acquired complications HACs state based surveillance systems and peer reviewed and grey literature sources This important work has been compiled by some of Australia's leading infection control professionals and researchers It will build national consensus on definitions surveillance methodology and reporting of the incidence of HAIs In doing so it provides hospitals and those working in infection prevention and control an opportunity to benchmark and evaluate interventions to reduce infections and ensure transparency on reporting methods that will strengthen Australia's efforts to prevent and control HAIs Here is a great article published in Sydney Morning Herald on the publication of Epidemiology of Healthcare associated infections in Australia Collated publicly available HAI surveillance definitions from jurisdictions across Australia Collated publicly available national HACs HAI data derived from the associated surveillance programs Identification of the gaps in both publicly available HAI data from different sources and the lack of publicly available HAI surveillance data in one serialised title Supporting video summarising key content

Bennett & Brachman's Hospital Infections William R Jarvis, 2022-10-21 Written by the world's foremost leaders in the field of nosocomial infections Bennett Brachman's Hospital Infections 7th Edition is a must have text for preventing Hospital Acquired Infections HAIs in all inpatient and outpatient healthcare settings This comprehensive volume provides up to date authoritative coverage on all aspects of this vital topic with editor Dr William R Jarvis leading a team of notable contributors from the U S Centers for Disease Control and Prevention as well as additional authors who provide an international perspective on HAIs The newly revised and expanded seventh edition continues to be an invaluable resource for anyone working in infection prevention and control quality assurance or risk management in healthcare settings

Hospital Epidemiology and Infection Control C. Glen Mayhall, 2012-02-20 Thoroughly revised and updated for its Fourth Edition this highly acclaimed volume is the most comprehensive reference on hospital epidemiology and infection control Written by over 150 leading experts this new edition examines every type of hospital acquired nosocomial infection and addresses every issue relating to surveillance prevention and control of these infections in patients and in healthcare workers This new edition features new or significantly increased coverage of emerging infectious diseases avian influenza governmental regulation of infection control and payment practices related to hospital acquired infections molecular

epidemiology the increasing prevalence of community acquired MRSA in healthcare facilities system wide infection control provisions for healthcare systems hospital infection control issues following natural disasters and antimicrobial stewardship in reducing the development of antimicrobial resistant organisms **Hospital-Acquired Infection** Zsolt

Filetoth,2008-04-30 Hospital acquired infections HAI are complications of health care which affect on average 10 percent of patients admitted to hospital world wide They have serious public health implications by changing the quality of life of patients and sometimes causing disability or even death The purpose of this comprehensive text is to provide nurses and junior doctors with an understanding of the basics of infection control by explaining the methods employed and their purpose The book is based on lectures presented by the author at training courses for nurses and doctors and gives simple understandable and essential information that is vital knowledge for medical staff in hospitals Bennett & Brachman's

Hospital Infections John V. Bennett,William Robert Jarvis,Philip S. Brachman,2007 The most influential reference in the field for nearly thirty years Bennett and Brachman s Hospital Infections is in its thoroughly updated Fifth Edition Written by internationally recognized experts many affiliated with the Centers for Disease Control and Prevention the book is the most comprehensive up to date authoritative guide to the recognition management prevention and control of infections in all types of healthcare facilities More than half of this edition s chapters have new authors who are current experts in the field Important new chapters cover patient safety public reporting controlling antimicrobial resistant pathogens especially MRSA and VRE fungi and healthcare associated infections caused by newer treatments such as invasive cardiology This edition has a new two color design *Hospital Acquired Infections: Prevention & Control: Prevention and Control* Purva

Mathur,2010-01-01 The spread of infections associated with hospitals and clinics has increased dramatically in recent years and their prevention constitutes a major challenge for healthcare personnel This book highlights the growing threat from hospital acquired infections and thoroughly explains the relevant measures for their prevention Measures for control are also succinctly presented The book also focuses on local epidemiology relating to the spread of these infections in India and highlights appropriate measures for their prevention The text is presented in a clear and crisp style and important features and procedures are adequately highlighted in relevant boxes tables and flowcharts Physicians surgeons and microbiologists would find this book to be extremely useful Laboratory personnel and nursing staff would also benefit considerably from this book **Healthcare-Associated Infections in Children** J. Chase McNeil,Judith R. Campbell,Jonathan D.

Crews,2018-10-30 With advances in technology and medical science children with previously untreatable and often fatal conditions such as congenital heart disease extreme prematurity and pediatric malignancy are living longer While this is a tremendous achievement pediatric providers are now more commonly facing challenges in these medical complex children both as a consequence of their underlying disease and the delivery of medical care The term healthcare associated infections HAIs encompass both infections that occur in the hospital and those that occur as a consequence of healthcare exposure and

medical complexity in the outpatient setting HAIs are associated with substantial morbidity and mortality for the individual patient as well as seriously taxing the healthcare system as a whole In studies from the early 2000s over 11% of all children in pediatric intensive care units develop HAIs and this figure increases substantially if neonatal intensive care units are considered While progress has been made in decreasing the rates of HAI in the hospital these infections remain a major burden on the medical system In a study published in 2013 the annual estimated costs of the five most common HAIs in the United States totaled 9.8 billion An estimated 648 000 patients developed HAIs in hospitals within the US in 2011 and children with healthcare associated bloodstream infection have a greater than three fold increased risk of death While a number of texts discuss HAIs in the broader context of infectious diseases or pediatric infectious diseases such as Mandell's Principles and Practice of Infectious Diseases or Long and Pickering's Principles and Practice of Pediatric Infectious Diseases no single text specifically focuses on the epidemiology diagnosis and management of HAI in children Many infectious diseases texts are organized based on the microbiology of infection and from this starting point then discussing the clinical syndromes associated with the organism of interest For instance a chapter on *Staphylococcus aureus* may contain a brief discussion of the role of *S. aureus* in surgical site infections in the wider context of all staphylococcal disease For clinicians caring for children at the bedside however the clinical syndrome is typically appreciated and intervention necessary prior to organism identification We propose a text that details both the general principles involved in HAIs and infection prevention but also provides a problem oriented approach Such a text would be of interest to intensivists neonatologists hospitalists oncologists infection preventionists and infectious diseases specialists The proposed text will be divided into three principle sections 1 Basic Principles of Infection Control and Prevention 2 Major Infectious Syndromes and 3 Infections in Vulnerable Hosts Chapters in the Major Infectious Syndromes section will include discussion of the epidemiology microbiology clinical features diagnosis medical management or surgical management as appropriate and prevention of the disease entity of interest Chapters will seek to be evidenced based as much as possible drawing from the published medical literature as well as from clinical practice guidelines such as those from the Infectious Diseases Society of America when applicable We intend to include tables figures and algorithms as appropriate to assist clinicians in the evaluation and management of these often complex patients Finally we intend to invite authors to participate in this project from across a number of medical specialties including infectious diseases infection control critical care oncology and surgery to provide a multidisciplinary understanding of disease It is our intent to have many chapters be co written by individuals in different subspecialties for instance a chapter on ventilator associated pneumonia may be co written by both infectious disease and critical care medicine specialists Such a unique text has the potential to provide important guidance for clinicians caring for these often fragile children

Healthcare-Associated Infections in Australia Ramon Z. Shaban, Brett G. Mitchell, Deborah Macbeth, Philip Russo, 2023-04-01 Infection prevention and control IPC is everybody's responsibility Healthcare associated Infections in

Australia is the first Australian text to address the challenges posed by infectious diseases and healthcare associated infections HAIs for all members of the multidisciplinary healthcare team Drawing on the expertise of a wide author team and based on current research this important and comprehensive text provides a clear pathway for the reader to increase their knowledge and understanding of IPC The text is designed for both students and practising clinicians and is presented in two sections Principles and Practice for ease of use With IPC principles and guidelines now embedded into all health related curricula and mandated by standards and guidelines across all areas of healthcare this is a book no health professional should miss Includes practice tips case studies and video based learning materials providing real life examples across more than 20 health professions Suitable for increasing IPC knowledge across all members of the multidisciplinary team Content is pitched at different levels with examples ranging from novice to expert Aligned to the Australian National Infection Control Guidelines 2019 and the NSQHS Standard Preventing and Controlling Healthcare Associated Infections as well as the nine hospital acquired complication HAC HAIs addressed in specific chapters Endorsed by the Australian College for Infection Prevention and Control ACIPC and the Australian Society for Infectious Diseases ASID Supported by a companion text Epidemiology of Healthcare associated Infections in Australia providing data on the epidemiology of healthcare associated surveillance in Australia Instructor and Student resources on Evolve Multiple Choice Questions Case Studies Abbreviations and Glossary Useful Websites Resources Video based learning materials

Epidemic of Medical Errors and Hospital-Acquired Infections William Charney, 2012-02-06 Medical error as defined in Epidemic of Medical Errors and Hospital Acquired Infections Systemic and Social Causes encompasses many categories including but not limited to medical error hospital acquired infections medication errors deaths from misdiagnosis deaths from infectious diarrhea in nursing homes surgical and post operative complica

Bennett & Brachman's Hospital Infections William R. Jarvis, 2013-10-17 For over three decades Bennett surveillance control programs antimicrobial stewardship antimicrobial resistance mechanisms of resistance sterilization and disinfection food borne diseases the role of the laboratory intensive care unit operating room dialysis and nursery settings and specific hospital acquired infections

Reducing healthcare associated infections in hospitals in England Great Britain: National Audit Office, 2009-06-12 The Department of Health introduced a target to reduce MRSA across all NHS trusts by 50 per cent by 2008 and C difficile by 30 per cent by 2010 11 MRSA had been reduced by 57 per cent by the end of March 2008 and C difficile by 41 per cent While a quarter of trusts have reduced MRSA by more than 80 per cent in 12 per cent of trusts there has been an increase in MRSA infections Twenty nine per cent of trusts have reduced C difficile by more than 50 per cent but in 19 per cent of hospital trusts the numbers of C difficile infections have increased Since the introduction of the targets the Department has spent some 120 million tackling healthcare associated infections There have also been unquantifiable administrative costs and local expenditure on the drive to reduce infection rates These initiatives have led to savings on treatment of between 141 million and 263 million as well as

reducing discomfort disability and for some death that might have been caused by these avoidable infections There has also been a perceptible change in trust leadership on tackling infections The impact has not however been the same in all trusts or for other infections Following the Department s intervention to improve recording on death certificates where MRSA or C difficile was the underlying cause or a contributory factor in 2007 around 9 000 people were reported as having died in such circumstances There is still no national information on deaths from other healthcare associated infections such as urinary tract infections and pneumonia and blood stream infections due to other causes may be increasing Public Health Service Publication ,1969 **Emerging Infectious Diseases** ,2018-07 Hospital-Acquired Infections in Intensive Care Unit and their Management Raja Chakraverty,Asim Kumar Kundu,2025-02-10 This book comprehensively addresses all aspects of hospital acquired infections HAIs in the ICU emphasizing their control and management This book emphasizes the immense value of practicing robust infection control measures which minimize the morbidity and mortality associated with HAIs and prove cost effective Preventing healthcare associated infections remains an ongoing and challenging task in India s medical care settings With numerous hospital infection control guidelines available this book encompasses various topics catering to healthcare workers at all levels It provides unique features that set it apart including comprehensive coverage of basic principles of infection control the pivotal role of healthcare workers bio waste management and antimicrobial stewardship It is extensively updated to reflect current clinical understanding and management practices The book provides the latest guidelines for preventing and managing nosocomial infections in healthcare facilities It represents the first ever writing from the Indian context incorporating ICMR and governmental study project data and findings It provides easy to follow algorithms for the management of clinical scenarios Additionally this book offers practical guidance on establishing effective infection control units in hospitals complete with quality control and quality assurance measures It serves as a valuable resource drawing from the latest research and evidence based practices while incorporating the specific needs and context of the Indian healthcare system This book aligns with the UN Sustainable Development Goal 3 Good Health and Well being and equips readers with the knowledge and tools to combat HAIs effectively It is an essential reference for clinicians healthcare professionals including nurses ICU technicians allied caregivers medical technologists microbiologists pharmacists policymakers and governmental agencies NABL labs NABH accredited nursing homes hospital infection control committees and students facilitating the implementation of robust infection control practices and ultimately improving patient outcomes in ICU settings *Healthcare-associated Infections* United States. Congress. House. Committee on Oversight and Government Reform,2009 *Infectious Disease Epidemiology* Ibrahim Abubakar,Helen R. Stagg,Ted Cohen,Laura C. Rodrigues,2016-04-07 Infectious Disease Epidemiology is a concise reference guide which provides trainees and practicing epidemiologists with the information that they need to understand the basic concepts necessary for working in this specialist area Divided into two sections part one comprehensively covers the basic principles and methods relevant to the study of

infectious disease epidemiology It is organised in order of increasing complexity ranging from a general introduction to subjects such as mathematical modelling and sero epidemiology Part two examines key major infectious diseases that are of global significance Grouped by their route of transmission for ease of reference they include diseases that present a particular burden or a high potential for causing mortality This practical guide will be essential reading for postgraduate students in infectious disease epidemiology health protection trainees and practicing epidemiologists

Head, Neck and Orofacial Infections - E-book James R. Hupp, Elie M. Ferneini, 2024-06-07 Providing full color coverage of best practices Head Neck and Orofacial Infections An Interdisciplinary Approach 2nd Edition is an authoritative resource offering in depth guidelines to the diagnosis and management of pathology due to severe infections Comprehensive evidence based coverage presents both cutting edge and time tested approaches to recognizing and handling infections From well known academia and clinical educator James Hupp and accomplished surgeon Elie Ferneini with chapters authored by expert contributors this book is ideal for use as a clinical resource for a wide array of healthcare providers as well as to prepare for licensure examination and board certification NEW Cutting edge content covers microbiologic nomenclature anti microbial agents understanding of viruses and anti viral drugs the management of patients during pandemics and the team approach to managing infections of unknown origin or resistant to the usual treatment strategies NEW Full color clinical images enhance understanding of key concepts in the text NEW eBook version included with print purchase provides access to all the text figures and references with the ability to search customize content make notes and highlights and have content read aloud UPDATED Appendices include illustrative case reports Comprehensive easy to read coverage addresses the basic science clinical diagnosis and holistic management of a broad range of head neck and orofacial infections with both time tested and cutting edge approaches to patient management More than 500 photographs radiographs and illustrations demonstrate pathologies procedures and outcomes World class authors and contributors share their expertise from the disciplines including infectious disease head and neck surgery oral and maxillofacial surgery plastic surgery and otolaryngology as well as other disciplines involving severe infections of the head neck and orofacial regions State of the art guidance reflects extensive experience with current techniques as well as technological advances in managing head neck and orofacial infections A logical sectioned approach to the content includes three sections I issues that are common to all infections of the head and neck region II infections of specific parts of the region and III infections related to certain procedures types of patients unusual organisms and medical legal implications

Infectious Disease Epidemiology Kenrad E. Nelson, Carolyn Masters Williams, 2014 Now in its third edition this comprehensive volume is recognized as the most authoritative review of the epidemiology of infectious disease Divided into five sections that cover methods in infectious disease epidemiology airborne transmission diarrheal diseases blood and body fluid as a reservoir of infectious diseases vectorborne and parasite disease the book includes state of the art chapters on methodological issues pathogenesis and comprehensive reviews of

virtually all known infectious diseases New to the Third Edition 1 All chapters updated with significant new information 2 HIV chapter completely updated including results of trials of Male Circumcision HIV vaccines female condoms Microbicides and new drugs 3 New chapter on Infectious Disease Eradication e g Smallpox Polio Measles 4 New chapter on Pneumococcal Disease with material on S pneumonia moved from the ARI and Vaccine chapters 5 Influenza chapter updated with new material on H1 N1 and control prevention of Influenza during a pandemic 6 Consolidation of material from the chapters on Outbreaks and Surveillance 7 Nosocomial Infection chapter is shortened and updated with a new section on nosocomial community MRSA 8 Malaria chapter updated with new information on bed nets prophylactic therapy of pregnant women and other high risk populations as well as new detailed examination of the organization implementation and accomplishments of the WHO Roll Back Malaria program and a new description of the 5th Human Malaria parasite P knowlesi and its Epidemiology 9 STD chapter is updated with new information on the rapid diagnosis of STDs using urine PCR methods as well as new information on partner prophylactic treatment of STDs 10 New information in Chickengunya virus Enterovirus 71 Nipah and Hendra virus infections to the Emerging infections chapter 11 Hepatitis chapter is revised with new information on HEV virus 12 New brief chapter discussing the various models of behavioral change that are useful in Infectious Diseases research e g Health Belief model etc

Practical Healthcare Epidemiology Ebbing Lautenbach, Preeti N. Malani, Keith F. Woeltje, Jennifer H. Han, Emily K. Shuman, Jonas Marschall, 2018-04-19

Practical Healthcare Epidemiology takes a hands on approach to infection prevention for physicians healthcare epidemiologists infection preventionists microbiologists nurses and other healthcare professionals Increased regulatory requirements and patient knowledge and involvement has elevated patient safety healthcare associated infections antibiotic stewardship and quality of care to healthcare wide issues This fully updated new edition brings together the expertise of leaders in healthcare epidemiology to provide best practice expert guidance on infection prevention for adult and pediatric patients in all types of healthcare facilities from community hospitals and academic institutions to long term care and resource limited settings Written in clear straightforward terms to address prevention planning and immediate responses to specific situations this is the go to resource for any practitioners in medicine or public health involved in infection prevention regardless of their current expertise in the field

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