



Hospital-Acquired Infections: Challenges, Causes, and Prevention Strategies in Healthcare

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ARTICLE REVIEW

ABSTRACT

Hospital-acquired infections represent one of the greatest challenges to patient safety and the quality of healthcare due to their direct association with increased morbidity and mortality, longer hospital stays, and higher healthcare costs. This study aims to identify, through a literature review, the main challenges, causes, and prevention strategies for hospital-acquired infections in the contemporary hospital setting. The adopted methodology was an integrative literature review, with a search conducted in the Virtual Health Library – VHL using controlled descriptors combined with Boolean operators. Articles included were those available in full, focusing on the clinical, organizational, and strategic aspects of hospital infections. At the end of the screening and analysis process, nine studies comprised the final sample. Results indicated that the main challenges related to hospital-acquired infections include failures in hand hygiene, inappropriate use of antimicrobials, improper management of invasive devices, and lack of adherence to institutional protocols. Effective prevention strategies include continuous staff training, implementation of disinfection routines, rational use of antibiotics, and active surveillance by hospital infection control committees. The role of the intensive care nurse, clinical pharmacist, and nursing staff is also highlighted as key elements in mitigating risks. The study concludes that, although the challenges of hospital-acquired infections are widely recognized, the gap between theory and practice remains significant. Effective prevention requires interdisciplinary actions, ongoing education, continuous surveillance, and institutional engagement. Investing in applied research and more robust methodologies may strengthen the evidence base and guide best practices in addressing hospital-acquired infections.

Keywords: hospital-acquired infection, prevention, nursing, hospital health, epidemiological surveillance.

INTRODUCTION

There is a constant concern among healthcare professionals to promote adequate conditions for patient treatment and recovery in hospital settings, aiming to minimize the risks of hospital-acquired infections (HAIs). A hospital-acquired infection is defined as one that is contracted after a patient's admission and manifests during hospitalization or after discharge. It is associated with procedures carried out during the hospital stay and typically manifests within 72 hours of admission, according to the Brazilian Ministry of Health Ordinance No. 2,616, dated May 12, 1998 (BRASIL, 1998). Hospital-acquired infections increase mortality and morbidity rates, length of stay, occupancy rates, and treatment costs in hospitals (MAZIERO et al., 2012).

For a hospital-acquired infection to occur, there must be an interaction between an infectious microorganism, a mode of transmission, and a susceptible host. Predisposing factors for HAIs are related either to the patient's own health condition or to invasive procedures and environmental exposures.

In hospitals, the main sources of infection include the patient themselves, visitors or companions, healthcare professionals, handling and cleaning of medical equipment, and the physical structure. One of the main causes of HAIs is cross-infection, which results from the transmission of a microorganism from one patient to another. This transmission often occurs through the hands of healthcare workers, companions, and visitors. Hand hygiene practices help prevent the spread of pathogens and are especially effective in reducing the incidence of healthcare-associated infections (HCAIs). Although simple, these practices are highly significant (RIBEIRO, 2016).

Healthcare-associated infections, whether in hospitals, outpatient clinics, or even home care, present a serious challenge to the services responsible for these types of care and pose a constant threat to the quality and safety of healthcare delivery (TURRINI; SANTO, 2002).

HAIs are transmitted to susceptible individuals mainly through direct or indirect contact, droplets, aerosols, common vehicles, and vectors. These infections result from the interaction between the microorganism, the transmission mechanism, and the host (CORREA, 2005 apud GONZAGA; BELENTANI, 2013). Cross-infection is one of the leading

causes of HAIs and occurs when a microorganism is transmitted from one patient to another, mainly via the hands of companions, visitors, and healthcare professionals (FREIBERGER et al., 2011 apud GONZAGA; BELENTANI, 2013).

The costs of treatment—whether direct, indirect, or preventive—are associated with investments aimed at preventing, reducing, and controlling HAIs. As such, they require the implementation and maintenance of a dedicated service, such as the Hospital Infection Control Committee (CCIH) (ANDRADE, 2005).

Andrade (2005) also highlights the immeasurable costs, such as the pain and suffering experienced by the patient and their family, which affect quality of life and can lead to serious consequences, including limb impairment, organ dysfunction, or even death resulting from the hospital-acquired infection.

A wide variety of microorganisms, especially bacteria, are present in the hospital environment. Many of these bacterial agents, although not normally pathogenic, can quickly take advantage of the weakened immunity of immunocompromised patients, leading to clinical manifestations (SANTOS, 1991 apud CUNHA, 2002).

Knowledge about HAIs dates back to the medieval period, but to this day, there are still gaps in awareness among those who circulate in hospital environments, particularly among patient companions. Therefore, appropriate guidance for this group is essential (FREIBERGER et al., 2011 apud GONZAGA; BELENTANI, 2013).

While the responsibility for patient care in hospitals lies with the healthcare team, family members and companions—who often lack specific healthcare knowledge—frequently assume this role. It is important to note that caregiving in a hospital setting differs significantly from care provided at home, a fact not always understood by companions (SOUZA; OLIVEIRA, 2010 apud GONZAGA; BELENTANI, 2013).

In the field of hospital infection control, prevention and control efforts emerged in the 19th century with Florence Nightingale, the matriarch of modern nursing. Through her pioneering work, she introduced practices such as individualized care, patient isolation, separation by levels of complexity, and reducing the number of beds in wards to decrease hospital contamination. Nightingale's interventions significantly reduced infection transmission rates and lowered the mortality rate of soldiers during the

Crimean War. She also laid the groundwork for hospital administrative statistics through her nursing expertise (MAZIERO et al., 2012; RABELO; SOUZA, 2009).

This study aims to analyze, through a literature review, the main causes of hospital-acquired infections, their impacts on healthcare, and the most effective prevention strategies adopted in hospital units. Accordingly, the following research question is posed: What are the main challenges, causes, and prevention strategies for hospital-acquired infections identified in recent scientific literature? The results may contribute to broader dissemination of the topic and inform future solutions based on the study's findings.

METHODOLOGY

This study is a Literature Review, aimed at identifying the main challenges, causes, and prevention strategies related to hospital-acquired infections, as evidenced in scientific publications from recent years. The review followed the steps recommended by Mendes, Silveira, and Galvão (2008), including: formulation of the guiding question, definition of inclusion and exclusion criteria, data collection, evaluation of the studies, interpretation of results, and presentation of the synthesized knowledge.

Search Strategy

The study search was conducted in the Virtual Health Library (Biblioteca Virtual em Saúde – BVS), using a combination of controlled descriptors and keywords, with Boolean operators applied to refine the results. The following search strategy was used: (“Infecção Hospitalar” OR “Infecção nosocomial”) AND (“prevenção” OR “controle”) AND (“desafios” OR “causas” OR “estratégias”).

The search was conducted in July 2025, without initial restrictions on language or publication date, in order to identify relevant and up-to-date scientific literature.

Articles included in the review were those that addressed discussions on the challenges, causes, and prevention strategies of hospital-acquired infections, were available in full-text open access, and were either original research studies, literature reviews, or reflective articles with relevant theoretical foundations. Exclusion criteria included duplicate articles, studies not directly related to the proposed topic, papers

with a narrow focus on laboratory microbiology or community-acquired infections, as well as event abstracts, editorials, and letters to the editor.

Selection Process

Initially, the search yielded 421 articles. The EndNote software was then used for organizing the references and identifying duplicates, resulting in the removal of 18 duplicate records. After reviewing the titles, 355 studies were excluded for not having a direct relationship with the research topic. The remaining 48 articles had their abstracts read, of which 39 were excluded for not meeting the inclusion criteria. At the end of the process, 9 articles composed the final sample of this integrative review.

Data Analysis

The data extracted from the selected articles were organized into an analytical framework containing: article title, authors, year of publication, identified challenges, and proposed prevention strategies. The analysis was conducted descriptively, aiming to highlight convergences, gaps, and contributions from the literature regarding hospital-acquired infections.

RESULTS AND DISCUSSION

Given the complexity and importance of hospital infection control for patient safety, it is essential to understand the main challenges faced by healthcare teams and the strategies used to prevent these infections. Several studies have contributed to identifying risk factors, inadequate practices, and effective solutions for addressing this issue. Table 1 presents the studies included in the literature review, each of which addresses, from different perspectives, the challenges and strategies related to the prevention of hospital-acquired infections within the context of healthcare delivery.

Table 1: Studies included in the final sample of the Literature Review

Título	Autores	Ano	Desafios	Estratégias
O papel do enfermeiro intensivista na prevenção das infecções na unidade de terapia intensiva	Melo et al.	2015	Alto risco de infecção em UTIs, contato direto com pacientes, necessidade de atenção constante dos profissionais.	Lavagem das mãos, uso de paramentação, vigilância contínua do quadro clínico do paciente.

Atuação do Profissional de Saúde no Controle e Prevenção das Principais Infecções Hospitalares	Silva et al.	2018	Falta de conscientização, risco elevado em procedimentos invasivos.	Assepsia das mãos, esterilização de materiais, cuidado com ambientes de procedimentos.
A Atuação do profissional farmacêutico no controle das infecções hospitalares	Guimarães et al.	2017	Uso indiscriminado de antimicrobianos, resistência bacteriana.	Uso racional de antimicrobianos, vigilância nas prescrições, ações educativas.
Atuação do enfermeiro na prevenção da infecção do trato urinário em pacientes com sonda vesical de demora	Silva et al.	2019	Riscos relacionados à inserção e manejo de sondas vesicais.	Escolha adequada do cateter, inserção cuidadosa, capacitação dos profissionais.
Excludentes de responsabilidade em casos de infecção hospitalar	Tonial e Schaefer	2015	Dificuldade em determinar responsabilidade jurídica em infecções hospitalares.	Adesão rigorosa aos protocolos de controle, documentação e registro adequado dos cuidados.
Infecção hospitalar por <i>S. aureus</i> e fatores de risco para o desenvolvimento da síndrome do choque tóxico	Dias e Zuccoli	2012	Gravidade clínica das infecções por <i>S. aureus</i> e resistência antimicrobiana.	Diagnóstico precoce, controle do uso de antimicrobianos, vigilância microbiológica.
Importância da higiene oral na prevenção da pneumonia associada à ventilação mecânica em UTI	Rodrigues et al.	2018	Alta incidência de pneumonia em pacientes sob ventilação mecânica.	Higiene oral sistemática, treinamento de equipe, implementação de protocolos.
Incidência de infecção relacionada à assistência à saúde na UTI de um hospital de médio porte	França et al.	2020	Presença de microrganismos resistentes, procedimentos invasivos prolongados.	Monitoramento microbiológico, educação continuada, higienização das mãos.
Contaminação de cassetes radiográficos em hospital privado: uma contribuição da enfermagem	Lara Mota Pereira et al.	2012	Falta de descontaminação de cassetes radiográficos, risco de contaminação cruzada.	Implantação de rotinas de desinfecção, papel ativo da enfermagem no controle.

Source: Prepared by the authors (2025).

A The analysis of the studies included in the final sample of the literature review highlights the complexity involved in the control and prevention of hospital-acquired infections (HAIs) within the healthcare setting. The challenges identified are multifactorial and span structural, organizational, behavioral, and microbiological aspects.

One of the main challenges identified concerns the role of the nursing team, especially in intensive care units (ICUs), where the risk of infection is high due to patient severity and the frequent use of invasive procedures. Melo et al. (2015) emphasize the importance of the critical care nurse in constantly monitoring patients' clinical status and strictly adhering to preventive practices, such as proper hand hygiene and the correct use of personal protective equipment.

The lack of knowledge and awareness among healthcare professionals also emerges as a recurring obstacle. Silva et al. (2018) point out that, despite technical knowledge regarding equipment and precautions, there are failures in the practical application of preventive measures, particularly in situations requiring aerosol isolation. This gap between theory and practice calls for ongoing educational initiatives.

Another critical issue is the inappropriate use of antimicrobials, which contributes to the emergence of multidrug-resistant bacteria, as observed by Guimarães et al. (2017). In this context, the role of the pharmacist becomes essential to ensure the rational use of these medications and to strengthen the monitoring of medical prescriptions.

Infections related to invasive devices, such as urinary catheters and central lines, were also widely addressed. Silva et al. (2019) and França et al. (2020) emphasize that preventing these infections depends directly on the team's training regarding the appropriate selection and management of such devices, as well as adherence to institutional protocols.

Regarding infections caused by specific microorganisms, such as *Staphylococcus aureus*, Dias and Zuccoli (2012) highlight the risk of progression to severe conditions such as toxic shock syndrome, reinforcing the need for early diagnosis and microbiological surveillance strategies.

Institutional responsibility is also discussed by Tonial and Schaefer (2015), who emphasize the legal limits of liability in cases of HAIs, particularly when hospitals can demonstrate compliance with established infection control protocols. This perspective highlights that HAI prevention is a collective effort requiring not only the implementation of best practices but also thorough documentation of such practices. Moreover, simple interventions, such as oral hygiene in intubated patients, have proven

effective in preventing ventilator-associated pneumonia, according to Rodrigues et al. (2018), reinforcing the importance of standardized protocols for basic care.

In this context, the lack of surface and equipment disinfection protocols—as noted by Pereira et al. (2012) in the case of radiographic cassettes—illustrates how seemingly minor oversights can represent significant cross-contamination risks, an area in which nursing can play a transformative role.

In summary, the studies analyzed converge on the need for continuous professional training, standardization of practices, constant surveillance, and the active engagement of different healthcare team members in preventing HAIs. The literature makes it clear that, although many of the challenges are well-known, the gap between knowledge and practice still persists, demanding interdisciplinary actions, systematic monitoring, and ongoing investment in continuing education.

FINAL CONSIDERATIONS

As infecções hospitalares representam um desafio persistente nos serviços de saúde, impactando diretamente na segurança do paciente, na duração da internação e nos custos hospitalares. Esta revisão de literatura evidenciou que os principais fatores associados à ocorrência dessas infecções incluem falhas na adesão às práticas de prevenção, uso inadequado de antimicrobianos, manuseio incorreto de dispositivos invasivos e ausência de protocolos institucionais bem estruturados. Por outro lado, também foi possível identificar estratégias eficazes adotadas em diferentes contextos, como a capacitação contínua das equipes, implementação de rotinas de higiene e vigilância ativa por parte de comissões de controle.

Entre as limitações deste estudo, destaca-se a abrangência temporal e temática dos artigos, uma vez que a revisão não foi sistemática e dependeu da disponibilidade e acesso a fontes específicas, podendo restringir a profundidade da análise. Além disso, muitos estudos incluídos se baseiam em revisões narrativas ou experiências locais, o que pode limitar a generalização dos resultados. A ausência de estudos com metodologias robustas, como ensaios clínicos ou revisões sistemáticas com meta-análise, também limita a força das evidências aqui apresentadas.

Diante disso, recomenda-se que pesquisas futuras avancem na produção de

estudos empíricos, com desenhos metodológicos mais rigorosos, que avaliem a efetividade de diferentes estratégias de prevenção de infecções hospitalares em diversos níveis de complexidade da assistência. Também é importante investigar a percepção e a participação de acompanhantes, pacientes e profissionais não especializados nesse processo, visando à construção de práticas mais integradas e seguras no ambiente hospitalar.

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