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Derleme/Review

Sürveyanstan Önlemeye Giden Yol: Sağlık Hizmeti İlişkili Enfeksiyonların Kontrolünde Kanıta Dayalı Uygulamalar ve Güncel Stratejiler

The Path from Surveillance to Prevention: Evidence-Based Practices and Current Strategies in Healthcare-Associated Infection Control

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Özet: Bu derleme, sağlık hizmeti ilişkili enfeksiyonların (SHİE) küresel yükünü, başlıca türlerini ve kanıta dayalı önleme stratejilerini ele alarak, enfeksiyon kontrolünde sürveyans odaklı yaklaşımdan proaktif bir önleme paradigmasına geçişi incelemektedir. Çalışma, SHİE'nin hastalar, sağlık sistemleri ve ekonomiler üzerinde yarattığı ciddi morbidite, mortalite ve finansal yükü ortaya koymakta; bu yükün özellikle yoğun bakım üniteleri ve hemodiyaliz merkezleri gibi yüksek riskli alanlarda, cerrahi alan enfeksiyonları, kateter ilişkili enfeksiyonlar, ventilatör ilişkili pnömoni ve Clostridioides difficile enfeksiyonları gibi temel enfeksiyon türleri üzerinden yoğunlaştığını göstermektedir. Ayrıca etkili sürveyansın vazgeçilmez olmasının yanı sıra, enfeksiyon oranlarını azaltmada tek başına yeterli olmadığı görülmektedir. Anlamlı ve kalıcı ilerlemenin; sürveyans verilerinin el hijyeni, invaziv cihaz bakım protokolleri, çevresel temizlik uygulamaları ve cerrahi bakım paketleri gibi kanıta dayalı uygulamalara dönüştürüldüğü çok bileşenli stratejilerin hayata geçirilmesiyle mümkün olacaktır. Antimikrobiyal direnç, bu mücadelede merkezi bir tehdit olarak ele alınmakta ve antimikrobiyal yönetim programlarının enfeksiyon önleme girişimleriyle bütünleştirilmesinin stratejik önemi özellikle görülmektedir. Bunun yanı, bu stratejilerin koordinasyonunda, sağlık çalışanlarının eğitiminde ve uygulamaların sürdürülebilirliğinin sağlanmasında enfeksiyon kontrol hemşireleri ve ekiplerinin kilit rolünü ortaya koymaktadır. Çalışma; klinik uygulama, kurumsal yönetim ve sağlık politikaları olmak üzere üç düzeyde somut öneriler sunarak, standartlaştırılmış protokoller, güçlü liderlik ve sürekli iyileştirme kültürüne dayalı bir önleme sistemine geçiş için kapsamlı bir yol haritası önermektedir. Sonuç olarak, SHİE kontrolünün ancak teknik müdahaleleri, davranış değişimini ve örgütsel bağlılığı bir arada ele alan bütüncül bir yaklaşımla etkili biçimde sağlanabileceğini göstermektedir.

Anahtar Kelimeler: Çapraz enfeksiyon, Enfeksiyon Kontrolü, Enfeksiyon Kontrol Hemşireliği, Hasta Güvenliği, Sağlık Hizmeti İlişkili Enfeksiyonlar.

Abstract: This review examines the global burden, major types, and evidence-based prevention strategies for healthcare associated infections (HAIs), analyzing the shift in infection control from a surveillance-focused approach to a proactive prevention paradigm. The study highlights the significant morbidity, mortality, and financial strain HAIs impose on patients, healthcare systems, and economies, emphasizing that this burden is concentrated in high-risk areas such as intensive care units and hemodialysis centers through major infection types including surgical site infections, catheter-associated infections, ventilatör associated pneumonia, and Clostridioides difficile infections. The core argument posits that while effective surveillance is necessary, it is insufficient alone to reduce infection rates. Meaningful progress is achievable through implementing multifaceted strategies where surveillance data is translated into evidence-based practices such as hand hygiene, invasive device care protocols, environmental cleaning, and surgical care bundles. Antimicrobial resistance is addressed as a central threat in this struggle, underscoring the strategic importance of integrating antimicrobial stewardship programs with infection prevention efforts. Furthermore, the analysis explores the pivotal role of infection control nurses and teams in coordinating these strategies, providing education, and ensuring sustainability. The article offers concrete recommendations across three levels—from clinical practice to institutional management and health policy proposing a roadmap for transitioning to a prevention system built on standardized protocols, strong leadership, and a culture of continuous improvement. In conclusion, it demonstrates that HAI control can only be achieved through a holistic approach that combines technical interventions, behavioral change, and organizational commitment.

Keywords: Cross Infection, Infection Control, Infection Control Nursing, Patient Safety, Healthcare-Associated Infections.

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INTRODUCTION

Healthcare-associated infections (HAIs) are one of the most serious patient safety challenges facing modern healthcare systems. In its 2024 global report, the World Health Organization (WHO) emphasized that healthcare-associated infections affect millions of people worldwide each year and represent a significant source of morbidity and mortality in all healthcare facilities, primarily hospitals (World Health Organization, 2024). HAIs are reported to place a serious burden on health systems not only in terms of clinical outcomes but also in their economic, social, and organizational dimensions; as they are largely preventable, they are considered among the core indicators of healthcare quality and patient safety (Andersen, 2019; Yokoe et al., 2014). This burden is not limited to high-income countries, as infection rates and adverse outcomes are observed to be considerably higher in low- and middle-income countries (Allegranzi et al., 2011).

Healthcare-associated infections encompass infections that develop during the process of diagnosis, treatment, or care in hospitals, long-term care facilities, rehabilitation centers, and other healthcare institutions. Surgical site infections (SSIs), catheter-associated bloodstream infections (CLABSIs), catheter-associated urinary tract infections (CAUTIs), ventilator-associated pneumonia (VAP), and Clostridioides difficile infections are among the principal components of the HAI spectrum (Anderson et al., 2008; Sartelli, 2022). The incidence of these infections is reported to be significantly higher in clinical areas with intensive use of invasive procedures, such as intensive care units (Miccolis et al., 2023). Neonatal intensive care units and hematology-oncology wards are cited among the highest-risk units due to their immunocompromised patient populations (Weinstein et al., 2023).

The global burden of HAIs is immense. A comprehensive epidemiological modeling study conducted in European Union countries revealed that HAIs affect millions of patients annually and result in millions of disability-adjusted life years (DALYs) lost (Cassini et al., 2016). Meta-analyses from the United States indicate that the annual excess cost of HAIs to the healthcare system amounts to billions of dollars, and that effective prevention programs can yield significant clinical and economic benefits (Zimlichman et al., 2013). This economic burden is not limited to direct treatment costs; it also encompasses indirect costs such as prolonged hospital stays, readmissions, loss of productivity, and increased mortality rates (Nelson et al., 2022). A recent systematic review confirms that the length of hospital stay increases by an average of 10-20 days in patients who develop HAIs, creating enormous financial pressure on health systems (Monegro et al., 2023).

Infection Types and High-Risk Areas

The primary types of healthcare-associated infections include surgical site infections (SSIs), central and peripheral venous catheter-associated bloodstream infections, urinary catheter-associated infections, and ventilator-associated pneumonia (Anderson et al., 2008). Surgical site infections arise from the proliferation of microorganisms in the sterile surgical field during or after a procedure, increasing postoperative morbidity, length of hospital stay, and mortality risk. The guideline-based study by Anderson et al. (2008) demonstrated that the implementation of standardized preventive measures, including appropriate antimicrobial prophylaxis, surgical site preparation, gentle tissue handling, and perioperative care bundles, significantly reduces the incidence of surgical site infections. Factors such as operating room ventilation systems, use of chlorhexidine gluconate for skin antisepsis, and glycemic control are also emphasized as playing a critical role in preventing SSIs (Ban et al., 2017).

Invasive medical devices like central venous catheters and urinary catheters facilitate microbial colonization and infection development, potentially leading to serious bloodstream infections, sepsis,

and urosepsis. The high frequency of device use, particularly in intensive care units, increases the incidence of these infections (Miccolis et al., 2023). For preventing catheter-associated urinary tract infections (CAUTIs), the efficacy of fundamental measures such as maintaining closed drainage systems, daily assessment of catheter necessity, and prompt removal as soon as possible is well established (Meddings et al., 2014). Clostridioides difficile infections represent a significant problem that emerges following healthcare-associated antibiotic use, presenting with severe diarrhea, pseudomembranous colitis, and recurrent infections. The comprehensive scoping review by Okeah et al. (2021) revealed that the combined implementation of antimicrobial stewardship and environmental disinfection interventions significantly reduces the frequency of C. difficile infections (Okeah et al., 2021).

The inadequacy of conventional cleaning products against C. difficile spores necessitates the use of hypochlorite-based disinfectants (Rutala & Weber, 2019). Hemodialysis patients are at particularly high risk for HAIs due to frequent healthcare contact, impaired immune systems, and repeated invasive procedures. The recurrent vascular access via arteriovenous fistulas or central venous catheters during dialysis sessions leads to continuous breaches of the skin barrier and facilitates pathogen entry. In this patient group, bloodstream infections are reported to occur significantly more frequently compared to the general population, with central venous catheters carrying the highest risk (Nelson et al., 2017).

Furthermore, the prevalence of multidrug-resistant pathogens is higher in hemodialysis patients, and treatment of infections is more challenging due to pharmacokinetic alterations and polypharmacy. Infection control in these patients requires strict monitoring of dialysis water quality, promotion of arteriovenous fistula use, and strict adherence to catheter care protocols (Karkar et al., 2020).

Antimicrobial Resistance and Healthcare-Associated Infections

Antimicrobial resistance (AMR) is one of the greatest global threats encountered in controlling healthcare-associated infections. The WHO defines AMR and HAIs as two fundamental, interconnected global threats that reinforce each other, highlighting that the spread of resistant pathogens severely complicates both prevention and treatment strategies (World Health Organization, 2024). Methicillin-resistant Staphylococcus aureus (MRSA), carbapenem-resistant Enterobacterales, and multidrug-resistant gram-negative bacteria are associated with increased morbidity, mortality, and cost burdens on health systems (Bajaj & Bajaj, 2024). The ability of resistant gram-negative bacilli to survive for extended periods on environmental surfaces, particularly in ICUs, further complicates their control (Ramos et al., 2021).

The national observational cohort study conducted by Nelson et al. (2017) demonstrated that HAIs caused by multidrug-resistant pathogens lead to significantly higher attributable mortality compared to infections caused by susceptible organisms (Nelson et al., 2017). This rise in antimicrobial resistance not only complicates infection treatment but also necessitates the restructuring of prophylactic and therapeutic approaches. In this context, the use of rapid molecular diagnostic tests can reduce mortality and resistance development by enabling earlier initiation of appropriate antibiotic therapy (Barlam et al., 2016).

Antimicrobial stewardship programs play a fundamental role in preventing resistance development by reducing unnecessary antibiotic use, ensuring appropriate antibiotic selection, and optimizing treatment durations. Ranji et al. (2007) emphasize that for these programs to be effective, they must be implemented in an integrated manner with preventive practices such as hand hygiene, environmental cleaning, patient isolation, and

surveillance (Ranji et al., 2007). Core components of an effective antimicrobial stewardship program include prospective audit and feedback, antimicrobial restriction policies, and education of healthcare personnel (Dellit et al., 2007). Furthermore, the "de-escalation" strategy is an important approach to reducing selective pressure for resistance by narrowing the antibiotic spectrum based on culture results after empirical therapy has been initiated (Garnacho-Montero et al., 2020).

Prevention Strategies: From Surveillance to Multifaceted Approaches

In the context of HAI control, surveillance and prevention are related but conceptually distinct functions. Surveillance is primarily descriptive and diagnostic: it detects events, quantifies incidence, identifies trends and clusters, and enables benchmarking through standardized case definitions and data quality procedures. Prevention, in contrast, is interventional and transformative: it translates surveillance signals into targeted actions—such as bundles, protocol standardization, behavioral interventions, audit-and-feedback cycles, and system redesign—aimed at reducing exposure and interrupting transmission pathways. Therefore, surveillance becomes impactful only when embedded in a feedback loop that triggers, monitors, and sustains preventive interventions over time.

Surveillance systems are indispensable tools for identifying high-risk areas and monitoring infection trends in preventing HAIs. However, the literature clearly establishes that merely collecting data is insufficient; these data must be translated into evidence-based, multifaceted prevention strategies (World Health Organization, 2016). Effective surveillance requires standardization of infection definitions, data quality, and timely feedback of results to clinicians (Harbarth et al., 2003).

Hand hygiene, isolation precautions, environmental cleaning, adherence to sterile techniques, and prompt removal of invasive devices are among the fundamental evidence-based practices in HAI prevention. The WHO's (2016) guidelines on core components of infection prevention and control programs emphasize that successful national and institutional programs require the combined provision of surveillance, continuous education, audit and feedback mechanisms, and adequate human and financial resources (World Health Organization, 2016).

Numerous studies show that improving hand hygiene compliance leads to significant reductions in HAI incidence (Houghton, 2019). Multimodal interventions, such as ensuring bedside accessibility of alcohol-based hand rub, education programs, and direct observational feedback, have proven effective in increasing hand hygiene compliance (Sickbert-Bennett et al., 2016). Additionally, care bundles and checklists developed for surgical site infections and ventilator-associated pneumonia are reported to reduce infection rates by improving adherence to practices (Anderson et al., 2008).

For example, "ventilator-associated pneumonia (VAP) prevention bundles" typically include practices such as elevating the head of the bed to 30-45 degrees, sedation vacations, assessment of gastric residual volume, and oral care (Klompas et al., 2014). Environmental cleaning and disinfection emerge as critical factors, particularly in controlling C. difficile and resistant gram-negative pathogens. The increasing use of innovative technologies such as ultraviolet light, hydrogen peroxide vapor, and electrostatic spraying in this field is reported to contribute to reducing infection rates (Okeah et al., 2021).

However, more research is needed regarding the cost-effectiveness and integration of these technologies into routine practice (Boyce, 2016). Contact precautions, including isolation of carriers of resistant organisms and use of gowns/gloves, are also fundamental methods for preventing transmission (Siegel et al., 2007).

The Role of Infection Control Nurses and Teams

Infection control nurses (ICNs) and infection control teams are central to the transition from surveillance to prevention. Core responsibilities of ICNs include conducting routine surveillance, performing risk assessments, developing infection control protocols, educating healthcare personnel, and operating audit and feedback mechanisms (El-Saed et al., 2020). El-Saed et al. (2020) reported that effective integration of nursing practices into infection prevention programs reduced HAI rates, although effectiveness showed heterogeneity across institutions (El-Saed et al., 2020). The ratio of infection control nurses to patients and the resources allocated to these teams are important determinants directly influencing program success (Stone et al., 2022).

The systematic review and meta-analysis by Thandar et al. (2022) revealed that healthcare institutions with active infection control teams experienced significant reductions in HAI rates, although the magnitude of this effect varied by institution type and scope of interventions implemented (Thandar et al., 2022). These findings indicate that, alongside technical measures, behavioral and organizational factors are also crucial in HAI control. Organizational culture, leadership support, and safety climate are fundamental elements shaping staff adherence to infection control practices (Saint et al., 2010). Furthermore, encouraging patient and family participation in prevention practices, such as hand hygiene ("patient empowerment"), can create an additional supportive layer for prevention efforts (Longtin et al., 2011).

Controversies and implementation challenges

Despite broad consensus on core IPC measures, several areas remain debated and context-dependent. For example, the effectiveness of contact precautions and isolation policies—particularly for endemic multidrug-resistant organisms—may vary by baseline compliance, staffing capacity, and local epidemiology, and may introduce unintended consequences such as reduced patient contact or workflow disruption. Similarly, advanced environmental disinfection technologies (e.g., UV-C systems or hydrogen peroxide vapor) show promise in reducing bioburden and transmission in selected settings, yet their incremental benefit over optimized manual cleaning can be inconsistent and strongly influenced by implementation fidelity; moreover, acquisition and operational costs raise concerns regarding scalability and cost-effectiveness, especially in resource-limited environments. These uncertainties reinforce the need for local risk assessment, implementation science approaches, and economic evaluations when scaling complex interventions, ensuring that investments translate into measurable and sustainable reductions in HAI burden.

METHOD

Literature Search Strategy

This narrative review was informed by a structured literature search of PubMed/MEDLINE, Scopus, and Web of Science. We screened studies published between January 2010 and December 2024 in English. The search combined keywords and Medical Subject Headings (MeSH) related to healthcare-associated infections and infection prevention and control, including: “healthcare-associated infection” OR “hospital-acquired infection” OR “nosocomial infection,” “infection prevention and control” OR “IPC,” “surveillance,” “prevention bundle,” “hand hygiene,” “device-associated infection” (CLABSI, CAUTI, VAP), “surgical site infection,” “Clostridioides difficile,” “environmental cleaning,” “disinfection,” “antimicrobial stewardship,” and “antimicrobial resistance.”

Eligible records included international guidelines (e.g., WHO), systematic reviews, meta-analyses, and high-quality observational or interventional studies focusing on acute care hospitals and high-risk settings (e.g., ICUs, hemodialysis units). We excluded non-healthcare settings, case reports, and

studies lacking relevance to infection prevention strategies or surveillance-to-prevention translation. Additional references were identified through manual screening of reference lists of key articles.

CONCLUSION

Healthcare-associated infections (HAIs) persist as one of the most critical challenges to patient safety and care quality within contemporary healthcare systems. The evidence presented in this review demonstrates that HAIs impose a severe economic and organizational burden, not only through clinical outcomes (morbidity, mortality, prolonged length of stay) but also via direct and indirect costs to healthcare systems (Cassini et al., 2016; Nelson et al., 2022; Zimlichman et al., 2013). The burden of HAIs is particularly pronounced in intensive care units, hemodialysis centers, and clinical areas with high invasive procedure intensity; conditions such as catheter-associated infections, surgical site infections, ventilator-associated pneumonia and Clostridioides difficile infections emerge as predominant components of this burden (Anderson et al., 2008; Miccolis et al., 2023; Sartelli, 2022). Consequently, HAI control must be addressed not through limited practices confined to specific clinical units, but via an institution-wide, standardized, sustainable, and multifaceted infection prevention and control (IPC) program approach (WHO, 2016).

Review findings establish that "surveillance" is an indispensable foundation for HAI control; however, it is insufficient alone for reducing infection rates. Effective surveillance systems enable the targeting of preventive strategies by detecting infection trends, high-risk procedures, and unit-based risk clustering; yet, real impact is achieved through evidence-based prevention components informed by surveillance outputs (WHO, 2016). The evidence-based literature indicates that when hand hygiene and isolation precautions, environmental cleaning and disinfection, invasive device care protocols, and antimicrobial stewardship programs are implemented as a complementary whole, they yield significant reductions in HAI incidence (Okeah et al., 2021; Ranji et al., 2007). This approach further underscores that HAI control is not merely a technical process but also a domain of behavioral-organizational transformation, where institutional culture, leadership support, and compliance behavior are as determinative as clinical protocols (Houghton, 2019).

Antimicrobial resistance (AMR) stands out as one of the most critical contemporary "multipliers" in HAI control. The spread of methicillin-resistant Staphylococcus aureus (MRSA), carbapenem-resistant Enterobacterales, and multidrug-resistant gram-negative pathogens both limits treatment options and necessitates the restructuring of prophylactic and preventive strategies (Bajaj & Bajaj, 2024; Nelson et al., 2017). Current WHO reports emphasize that AMR and HAIs are two synergistic global threats that concurrently strain health systems; thus, they define the integrated implementation of infection prevention programs with antimicrobial stewardship as a strategic imperative (WHO, 2024). This integrated approach holds the potential to reduce the mortality and cost burden caused by resistant infections while simultaneously slowing resistance development by curbing unnecessary antibiotic use (Okeah et al., 2021; Ranji et al., 2007).

Another key conclusion highlighted by this review is the central role of infection control nurses (ICNs) and infection control teams in transforming HAIs from surveillance to prevention. ICNs are key actors in coordinating surveillance execution, risk analysis, protocol standardization, education, audit, and feedback processes (El-Saed et al., 2020). Meta-analyses on the effectiveness of infection control teams indicate that institutions with active teams can achieve significant reductions in HAI rates; however, effectiveness may show heterogeneity depending on institution type, team capacity, and implementation scope (Thandar et al., 2022). Therefore, mere "team presence" is not a sufficient indicator for HAI control; it is essential

to clarify team role definitions, strengthen their competencies, and integrate them into institutional decision-making processes (Houghton, 2019; WHO, 2016). In this regard, infection control nursing should be regarded not merely as a role supporting clinical practices, but as a strategic professional field central to the processes that determine healthcare quality (El-Saed et al., 2020; Thandar et al., 2022).

In conclusion, the burden and contemporary challenges of HAIs necessitate shifting infection control from a surveillance-focused "monitoring" approach to an evidence-based, multifaceted, institutionally-owned, and sustainable "prevention" approach. This transformation, when built upon standardized protocols, robust education and audit mechanisms, antimicrobial stewardship programs, effective environmental cleaning strategies, institutional culture and leadership support, and the active coordination of infection control nursing, appears feasible for reducing HAI incidence and strengthening patient safety (Houghton, 2019; Okeah et al., 2021; WHO, 2016; WHO, 2024).

RECOMMENDATIONS

The following recommendations are structured according to the evidence-based literature and international guidelines included in the review, targeting clinical practice, institutional management, and health policy/system levels.

1. Recommendations at the Clinical Practice Level

- Systematic Monitoring and Strengthening of Hand Hygiene Compliance through Feedback: Improving hand hygiene compliance is the fundamental step in HAI prevention. It is recommended that hand hygiene be supported not only through education but also via observation, performance feedback, reminder systems, and unit-based targets. Employing behavior change approaches and motivational strategies is crucial for the sustainability of compliance.
- Standardization of Invasive Device Care Protocols and Reduction of Unnecessary Device Use: Devices such as central venous catheters, urinary catheters, and ventilators are critical risk factors for HAIs. The principles of device insertion indication assessment, aseptic placement, daily necessity review, and prompt removal should be standardized across the institution. Auditing these processes using checklists is recommended.
- Implementation of Perioperative Care Bundles for Surgical Site Infections: To reduce surgical site infections, bundle applications encompassing components such as timing of perioperative antibiotic prophylaxis, skin antisepsis, normothermia, glycemic control, and appropriate surgical technique should become mandatory standards. Multidisciplinary monitoring involving surgical teams is recommended.
- Strengthening Environmental Cleaning Strategies for C. difficile and Resistant Pathogens: Environmental disinfection protocols for pathogens with high environmental persistence, like C. difficile, should be standardized; training and supervision of cleaning staff must be strengthened. Cost-effectiveness evaluations regarding the use of adjunct technologies, such as UV light or hydrogen peroxide vapor in high-risk areas where appropriate, should be conducted.
- Targeted Infection Prevention Bundles for Special Risk Groups such as Hemodialysis: Given the high infection risk in hemodialysis patients, standardization of catheter care, adherence to aseptic technique, staff training, and protocol auditing should be regularized. As quality improvement (QI) strategies have been shown to improve adherence to IPC protocols and reduce infection rates in some contexts, structured QI initiatives should be implemented in these units.

2. Recommendations at the Institutional Management Level

- Institutionalization of Infection Control Programs Aligned with WHO Core Components: Institutions should structure their infection control programs not merely at the level of "committee meetings" but as a holistic management system

encompassing surveillance, education, audit-feedback, and resource allocation (WHO, 2016). Institutional infection control targets should be monitored through quality indicators and integrated into management performance processes.

- Empowerment of Infection Control Nurses and Clarification of Role Definitions: The roles of ICNs should be clearly defined to include surveillance, education, protocol standardization, and audit processes; their access to clinical decision-making processes within infection control teams should be strengthened. Planning ICN numbers considering bed count, unit risk profile, and workload is recommended.
- Sustainability of Education and Audit Mechanisms: Educational initiatives should not be one-off events but planned, periodic, and evaluation-based. The translation of training into clinical practice should be carried out in conjunction with an audit and feedback cycle. Compliance issues should be analyzed at the system level, not merely individually.
- Integration of Antimicrobial Stewardship Programs with Infection Control: Antimicrobial stewardship teams and infection control teams should collaborate; antibiotic use data, resistance trends, and infection surveillance should be monitored in an integrated manner. This integration holds potential for reducing the burden of both AMR and HAIs.

3. Recommendations at the Health Policy and System Level

- Strengthening National Surveillance Systems and Generating Comparable Data: Sustainable HAI control requires standardized definitions, national data collection infrastructure, and comparable indicators across institutions. Health authorities should adopt an approach linking surveillance data with quality improvement mechanisms.
- Strengthening Patient Safety Culture and Leadership Accountability: Institutional culture and leadership support are determinants in HAI control. Therefore, policies and incentive mechanisms that strengthen patient safety culture should be supported by accountability systems at senior management levels. Flexible planning to ensure the sustainability of infection control, particularly during crises like pandemics, is essential.
- Strengthening Research and Evidence Generation: As findings on the effectiveness of infection control teams can show heterogeneity, there is a continuing need for studies with high methodological quality where intervention components are standardized and contextual factors are measured. Implementation research and cost- effectiveness analyses evaluating the impact of ICN roles are particularly important.

IMPLICATIONS FOR PRACTICE

This review addresses HAI control along a transformative continuum "from surveillance to prevention," synthesizing core infection types and high-risk areas with current evidence, and positions the structural threat posed by AMR as a central determinant of HAI control. Furthermore, by evaluating the role of infection control nursing and teams not merely as implementers but as strategic carriers of sustainable infection prevention programs, it provides a practical framework for clinical practice and institutional management. In this regard, the study offers a roadmap with practical value for healthcare professionals and administrators in the areas of prioritization, program design, and sustainability in HAI control.

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