Review Article

Infection control in healthcare facilities of Kazakhstan: current realities, challenges, and integration of international best practices

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ABSTRACT

Background

Healthcare-associated infections (HAIs) remain a global patient safety challenge, with prevalence rates ranging from 3.5–7% in high-income countries to over 15% in resource-limited settings. In Kazakhstan, ongoing healthcare reforms face barriers to effective infection prevention and control (IPC), particularly in maternity facilities where postpartum sepsis accounts for up to 18% of maternal deaths.

Objective

To assess the current state of IPC in Kazakhstan, compare it with international best practices, identify systemic gaps, and propose targeted recommendations to strengthen IPC programs.

Methods

A mixed-methods approach was used, combining literature review, analysis of national regulations, review of WHO, CDC, and ECDC guidelines, and comparative evaluation of IPC programs in selected countries using the WHO Infection Prevention and Control Assessment Framework (IPCAF).

Results

Kazakhstan demonstrates partial implementation of WHO IPC core components, with significant deficits in digital surveillance, trained IPC personnel, and antimicrobial stewardship. HAI prevalence in Kazakhstan (10–15%) exceeds rates in high-income countries (<7%). Comparative analysis shows that robust governance, continuous staff training, and integration of digital monitoring systems are key to achieving sustained HAI reduction.

Conclusion

Strengthening Kazakhstan's IPC requires integrated measures, including development of a national digital HAI surveillance platform, mass training and certification of IPC specialists, adaptation of WHO guidelines to local contexts, and prioritization of infection control in maternity care to reduce postpartum sepsis-related mortality.

Keywords

infection prevention and control; healthcare-associated infections; Kazakhstan; postpartum sepsis; WHO IPC core components; antimicrobial stewardship; maternity safety

INTRODUCTION

Healthcare-associated infections (HAIs) are infections that patients acquire during their hospital stay, which were neither present nor incubating at the time of admission. They remain one of the most pressing global health concerns. In high-income countries, HAIs affect an estimated 3.5–7% of hospitalized patients, while in low-income and resource-constrained settings, this figure rises to more than 15%[1].

The impact of HAIs extends far beyond the initial infection. They typically prolong hospitalization by 7–10 days (Zimlichman et al., 2013), significantly increasing healthcare costs. Moreover, they contribute to the growing

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challenge of antimicrobial resistance and are associated with higher mortality rates, particularly among vulnerable groups such as newborns, mothers, and patients with chronic conditions.

Kazakhstan, as a country undergoing healthcare transformation, faces several distinctive challenges in infection prevention and control (IPC). These include limited resources for modern equipment, isolation wards, and digital monitoring systems; uneven implementation of international IPC standards across facilities; and a shortage of qualified personnel—only about 76% of IPC staff have formal certification [2]. The burden of HAIs in Kazakhstan remains high, with prevalence estimates ranging from 10% to 15%. The situation is especially concerning in maternity hospitals, where postpartum sepsis continues to be a major contributor to maternal mortality[3].

Recognizing that the World Health Organization (WHO) has identified IPC as a cornerstone of patient safety, it is crucial for Kazakhstan to strengthen its IPC system. Aligning national policies and practices with international standards will be essential not only to reduce HAI rates but also to enhance overall patient outcomes and trust in the healthcare system.

Global and Kazakhstan Context of HAIs

Healthcare-associated infections (HAIs) remain a persistent challenge for health systems worldwide, exerting a substantial impact on patient safety, quality of care, and healthcare economics. According to the World Health Organization (WHO), the prevalence of HAIs ranges from 3.5% to 7% among hospitalized patients in high-income countries, while in low- and middle-income countries the prevalence often exceeds 15% due to deficiencies in healthcare infrastructure, limited access to sterilization and disinfection equipment, and shortages of adequately trained personnel. The consequences of HAIs are far-reaching, leading to prolonged hospital stays—on average by seven to ten days—significant economic losses measured in billions of US dollars annually, acceleration of antimicrobial resistance through irrational antibiotic use, and increased mortality, particularly among neonates, elderly patients, and immunocompromised individuals.

In Kazakhstan, the estimated prevalence of HAIs is between 10% and 15%, which is consistent with rates observed in other resource-limited healthcare settings. Several systemic factors contribute to this high burden. The availability of medical equipment for sterilization and disinfection remains insufficient, and many healthcare facilities operate with overcrowded wards and a lack of dedicated isolation rooms. The national system for HAI monitoring is underdeveloped, with data collection remaining fragmented and often unintegrated into a centralized digital platform. Furthermore, a considerable proportion of infection prevention and control (IPC) staff—approximately 24%—lack formal certification in the field. Maternal health outcomes are of particular concern, as postpartum sepsis accounts for up to 18% of maternal deaths, underscoring a critical gap in IPC practices within maternity care. Strengthening IPC systems in Kazakhstan is therefore imperative to address these challenges, reduce preventable morbidity and mortality, and align the national healthcare system with international standards.

Figure 1. Comparative HAI Prevalence by Country Income Level

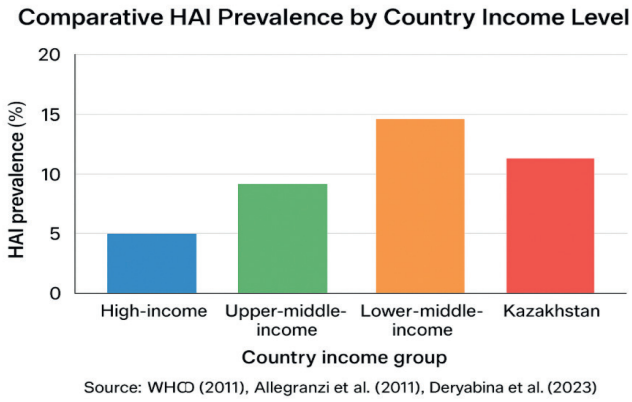


Figure 1 illustrates the comparative prevalence of healthcare-associated infections (HAIs) across countries grouped by income level, including a specific bar for Kazakhstan.

High-income countries show the lowest HAI prevalence, ranging between 3.5% and 7%, indicating well-established infection prevention systems.

Upper-middle-income countries experience higher prevalence levels, between 8% and 12%, reflecting some gaps in IPC infrastructure.

Lower-middle-income countries have the highest reported HAI rates, from 12% to 18%, pointing to significant challenges in infection control and health system resources. Kazakhstan, with an HAI prevalence of 10% to 15%, falls between upper- and lower-middle-

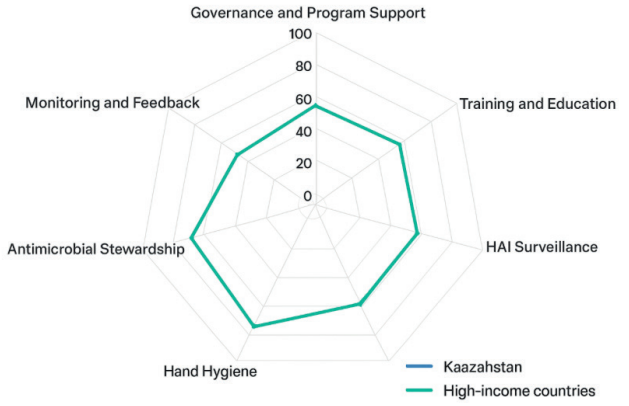
income averages, suggesting its IPC performance lags behind high-income countries and aligns more closely with transitional economies.

The data highlight the strong link between income level and HAI prevalence, emphasizing the need for increased investment and stronger IPC implementation in countries like Kazakhstan to reduce infection rates and improve patient outcomes.

3. WHO Core Components of IPC Programs

The World Health Organization (WHO), in its Core Components of Infection Prevention and Control Programs at the National and Acute Health Care Facility Level (2022), identifies six foundational elements essential for the effective implementation of infection prevention and control (IPC) measures within healthcare facilities. The first component, governance and program support, emphasizes the necessity of establishing an IPC committee, appointing dedicated IPC focal persons, allocating sufficient budgetary and administrative resources, and integrating IPC principles into the facility's overall management policies. The second component, training and education, focuses on ensuring that all healthcare workers receive continuous education supported by updated IPC protocols, with practical simulations and hands-on training in aseptic techniques forming an integral part of capacity building. The third component, surveillance of healthcare-associated infections (HAIs), requires systematic monitoring of infection rates, real-time data collection and analysis, and prompt investigation and containment of outbreaks. The fourth component, hand hygiene, is anchored in strict adherence to the WHO "Five Moments for Hand Hygiene" framework, coupled with the consistent availability of soap, antiseptics, and alcohol-based hand rubs, supported by visual reminders and regular compliance audits. The fifth component, antimicrobial stewardship, aims to promote rational prescribing of antibiotics, informed by regular reviews of antimicrobial resistance patterns and the application of restriction policies for high-risk antibiotics. The sixth component, monitoring and feedback, involves routine auditing of IPC practices, structured feedback sessions with healthcare workers, and public reporting of IPC performance indicators. In Kazakhstan, these WHO core components have been partially implemented, with adaptation occurring in many facilities; however, application remains inconsistent across different regions, leading to variable IPC effectiveness [2].

Figure 3 — WHO IPC Core Components Implementation Assessment



Source: Deryabina A, et al. 2023; World Health Organization. 2022

3.3

The reference line for high-income countries shows implementation levels consistently between 80–95% across all components, reflecting more advanced and integrated IPC systems. This contrast highlights a significant implementation gap between Kazakhstan and high-income countries, particularly in areas like surveillance and antimicrobial stewardship, which are critical to preventing the spread of resistant infections and maintaining patient safety. While Kazakhstan has established foundational IPC measures, there is room for substantial improvement, especially in surveillance, stewardship, and feedback mechanisms, to reach standards observed in higher-income settings.

4. Current State of Infection Prevention and Control in Kazakhstan

Regulatory and Policy Framework

Infection prevention and control in Kazakhstan is guided by national sanitary rules and ministerial orders that have been adapted from World Health Organization and U.S. Centers for Disease Control and Prevention guidelines. Key instruments include the Sanitary Rules and Norms on Infection Control, introduced in 2020, which specify facility-level IPC requirements, as well as national recommendations on maternal and neonatal infection control that align with WHO standards but do not mandate nationwide digital monitoring.

Organizational Structure and Human Resources

Most large healthcare facilities maintain IPC committees, yet a national survey has revealed persistent workforce

challenges. Only three-quarters of staff assigned to IPC roles have formal certification, and high turnover rates in rural and remote areas disrupt continuity of practice. In some facilities, IPC duties are delegated to clinicians as a secondary responsibility without adequate training, leading to inconsistent protocol adherence and reduced outbreak investigation capacity.

Surveillance and Monitoring Systems

The surveillance of healthcare-associated infections remains fragmented. While several urban tertiary hospitals operate pilot electronic case reporting systems, there is no unified national digital surveillance platform, and paper-based reporting continues to dominate in rural areas, delaying outbreak detection. Postpartum sepsis is likely underreported due to diagnostic limitations and the lack of standardized case definitions. This stands in contrast to high-income countries, where real-time automated surveillance linked to electronic health records is standard.

Infrastructure and Material Resources

There are significant disparities between urban tertiary hospitals and rural district facilities. Many facilities lack adequate isolation rooms for infectious patients and do not have sufficient modern sterilization equipment such as plasma sterilizers or autoclaves. The supply of personal protective equipment and alcohol-based hand rubs is inconsistent, while overcrowding and mixed patient flows often breach clean–dirty zoning principles. According to WHO, adequate infrastructure is essential for effective IPC; without it, even well-trained staff cannot maintain safe practices.

Antimicrobial Stewardship

Antimicrobial resistance is an emerging concern in Kazakhstan. The country has no centralized national antimicrobial stewardship program, and prescribing practices vary widely, often occurring without microbiological confirmation. Resistance rates for key pathogens such as Klebsiella pneumoniae and Staphylococcus aureus are rising, mirroring global trends in low- and middle-income countries. WHO regards antimicrobial stewardship as a critical core component of IPC, and its absence risks undermining infection control efforts.

These systemic weaknesses directly affect maternal care and the prevention of postpartum sepsis. Overcrowding and the absence of dedicated postnatal isolation areas increase the risk of infection transmission, limited laboratory capacity delays the diagnosis and targeted treatment of obstetric infections, and inconsistent sterilization practices contribute to higher maternal infection rates compared with high-income countries.

5. IPC in Maternity Hospitals and Prevention of Postpartum Sepsis

Significance of IPC in Maternity Care Maternity hospitals and obstetric units represent some of the most vulnerable healthcare settings for healthcare-associated infections due to high patient turnover, frequent invasive procedures such as caesarean section and episiotomy, and early postnatal exposure of mothers and neonates to potential pathogens. Postpartum sepsis remains a severe complication that can progress to organ failure, septic shock, and death if untreated. Globally, it accounts for 10–15% of maternal deaths, while in Kazakhstan the proportion is higher, reaching 18%

Epidemiology and Trends[3]. National maternal health data from 2021–2022 indicate an overall maternal mortality rate of approximately 12–14 per 100,000 live births, with postpartum sepsis contributing to 18% of all maternal deaths. The highest burden is observed in rural areas where diagnostic capacity and intensive care services are limited. The decline in infection-related mortality is slower compared with mortality related to hemorrhage, reflecting persistent gaps in infection prevention and control and sepsis management.

Risk Factors for Postpartum Sepsis in Kazakhstan

Key contributing factors include breaches in aseptic technique during delivery or surgery, inadequate sterilization of surgical and obstetric instruments, prolonged rupture of membranes exceeding 18 hours, obstructed labor and traumatic deliveries, inconsistent prophylactic antibiotic use in high-risk deliveries, delayed diagnosis due to limited rapid testing in rural facilities, as well as overcrowding and insufficient separation of clean and contaminated zones in postnatal wards.

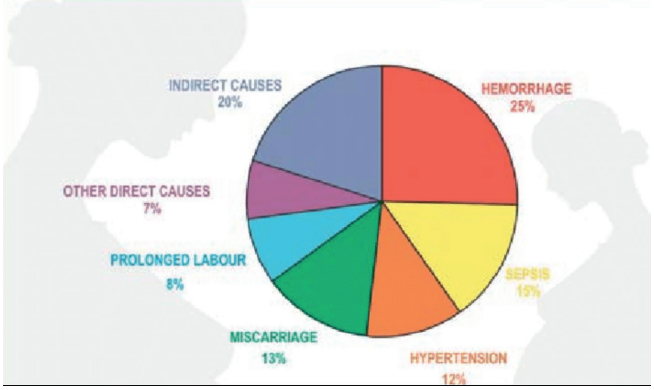
International Comparisons

High-income countries such as the United Kingdom, Sweden, and Japan report postpartum sepsis mortality rates below 5% due to strict adherence to IPC measures, real-time surveillance, and immediate access to intensive care. Upper-middle-income countries such as Georgia and Turkey have reduced their rates to 8–10% through targeted training programs and adaptation of

WHO protocols. In contrast, low-income countries often report postpartum sepsis accounting for more than 25% of maternal deaths, a situation largely driven by inadequate infrastructure and antibiotic shortages. The 18% rate in Kazakhstan reflects moderate progress but also underscores substantial opportunities for improvement.

Prevention Strategies

WHO guidelines (2021) recommend a bundled approach to maternal IPC. Pre-delivery measures include infection screening, administration of prophylactic antibiotics for caesarean sections, and strict adherence to aseptic technique. Intrapartum measures involve maintaining a sterile environment, using personal protective equipment appropriately, employing single-use instruments where feasible, and limiting unnecessary vaginal examinations. Postpartum care focuses on early infection detection, prompt treatment initiation, proper wound care hygiene, and separation of infected mothers and newborns to prevent transmission.



5.6 Figure 2 — Structure of Maternal Mortality in Kazakhstan

In Kazakhstan, hemorrhage remains the leading cause of maternal mortality, accounting for over one-third of cases. Hypertensive disorders contribute to nearly a quarter, while postpartum sepsis — highlighted in red — accounts for 18%, underscoring the need for targeted infection control and timely obstetric care interventions. Other causes, including embolism and cardiomyopathy, collectively make up a quarter of all maternal deaths.

6. Comparative Analysis of International Practices

Purpose of the Comparative Analysis

The comparative review of Kazakhstan's infection prevention and control (IPC) system against international benchmarks serves three principal objectives: (i) to identify best practices from diverse health system contexts; (ii) to evaluate their feasibility of adoption within Kazakhstan's socio-economic and healthcare landscape; and (iii) to highlight structural and operational gaps amenable to targeted policy reform and strategic resource allocation.

The World Health Organization Infection Prevention and Control Assessment Framework (WHO IPCAF) was selected as the evaluation instrument. This standardized tool enables structured assessment of facilities and national IPC programs across six core components, facilitating direct, cross-country comparisons of IPC performance and capacity [5,6].

Key Observations from the International Context

1. Governance and Political Commitment

High-income countries consistently demonstrate strong ministerial-level oversight of IPC, with dedicated budget lines ensuring program stability and sustainability. In contrast, in many low- and middle-income countries (LMICs), donor-supported projects serve as the primary driver of IPC improvements. While such initiatives often yield rapid gains, they may lack the mechanisms necessary for long-term sustainability once external funding ceases [5,6].

2. Digital Surveillance Systems

Austria, Singapore, and South Korea operate fully integrated, real-time healthcare-associated infection (HAI) reporting platforms linked to national health information systems. Georgia has adopted WHO IPCAF nationally and, with donor support, has introduced electronic surveillance in major referral hospitals. Kazakhstan remains at a pilot stage in digital HAI surveillance, with implementation limited to select tertiary facilities in urban centers [5,6].

3. Workforce Capacity

In Austria, IPC certification is mandatory for all infection control nurses and physicians, ensuring uniform competency standards nationwide. Bangladesh, faced with physician shortages, has expanded nurse-led IPC interventions as a pragmatic and cost-effective approach. In Kazakhstan, 24% of IPC-designated personnel remain uncertified, reflecting uneven training coverage and potential competency gaps [6].

4. Antimicrobial Stewardship

High-performing health systems implement multidisciplinary antimicrobial stewardship programs

that integrate pharmacists, microbiologists, and infectious disease specialists to optimize antimicrobial use and mitigate resistance. In Kazakhstan, antimicrobial stewardship efforts remain fragmented, with no unified national strategy or coordinated implementation mechanism.

Table 6 — Comparative Summary of IPC Practices

Country/Region	Key Features of IPC	WHO IPCAF Application	Strengths	Gaps/Challenges	Key Lessons for Kazakhstan
Kazakhstan	Emerging IPC programs, updated sanitary rules, partial WHO adaptation	Partial, pilots in urban centers	Regulatory framework exists; urban tertiary hospitals show good compliance	No national e-surveillance; uneven staff training; rural infrastructure gaps	Scale digital systems, certify all IPC staff, target rural facilities
Georgia	IPC reforms supported by international donors; adapted WHO protocols	Full IPCAF at national level	Rapid policy adoption; early e-surveillance pilots	Sustainability without donor funding; rural coverage	External technical support accelerates reforms
Austria	Nationwide IPC program, mandatory certification, e-monitoring	High compliance across facilities	Real-time data systems; strong training culture	Minor — focus on continuous improvement	Make certification mandatory and integrate IPC into quality metrics
Bangladesh	Resource-limited, nurse-led IPC interventions, donor-driven projects	IPCAF in selected facilities	Empowerment of nurses; low-cost solutions	Limited equipment; high staff turnover	Task shifting and low-cost training can work in LMIC settings
China	Gradual digitalization, regional disparities	Literature-based assessments	Large-scale health IT integration in urban centers	Uneven rural access; diverse regulations	National health IT policy crucial for scaling IPC

6.4 Analytical Insights

Cross-country comparisons underscore that the effectiveness of infection prevention and control (IPC) systems is closely tied to the interplay between governance, workforce capacity, and surveillance infrastructure.

High-income settings, exemplified by Austria, demonstrate that the combination of mandatory IPC training, real-time digital surveillance, and strong central governance yields consistently high compliance scores—exceeding 90% on the WHO Infection Prevention and Control Assessment Framework (IPCAF) [5, 7].

Among middle-income countries, Georgia illustrates that rapid IPC reform is feasible when supported by international donors; however, sustained improvements require the development of long-term financing and governance mechanisms to avoid regression once external support diminishes [6].

Resource-constrained contexts such as Bangladesh highlight that low-cost, targeted interventions—notably nurse-led IPC programs—can achieve measurable reductions in healthcare-associated infection (HAI) rates even in the absence of advanced technology [6].

China's incremental approach to digital health integration, beginning with pilot programs and progressively scaling to rural and peri-urban facilities, offers a pragmatic blueprint for bridging Kazakhstan's rural–urban IPC capacity gap [5].

6.5 Implications for Kazakhstan

Drawing on these insights, Kazakhstan's IPC strategy could be strengthened through the following policy and operational measures:

1. Legislative reform — enactment of national legislation mandating IPC certification for all healthcare personnel.
2. Centralized surveillance — development of an interoperable, real-time electronic HAI reporting

platform to enhance outbreak detection and response.

3. Task shifting — formal empowerment of nurses to assume IPC leadership roles in rural and underserved areas, supported by targeted training and supervision.
4. Sustainable financing partnerships — structured donor–government collaborations to support capacity building while embedding sustainability mechanisms.
5. Integration into quality frameworks — embedding IPC performance indicators within national hospital accreditation and quality assurance metrics.

Such an approach would align Kazakhstan with global best practice, accelerate progress toward WHO IPC benchmarks, and reduce inequities in infection control capacity across the health system.

DISCUSSION

General Trends

Global comparisons show that healthcare-associated infections (HAIs) remain a persistent challenge for health systems worldwide. Their prevalence and severity are closely tied to the strength of infection prevention and control (IPC) programs, the effectiveness of governance structures, and the availability of resources [8–14].

High-income countries have managed to keep HAI rates relatively low, typically below 7%, by adopting comprehensive and coordinated strategies. These include:

- Legally mandated IPC programs that ensure accountability at institutional and national levels,
- Ongoing professional training and capacity building for healthcare workers,
- The use of advanced digital platforms for real-time infection surveillance, and
- Robust antimicrobial stewardship programs to curb resistance and promote responsible antibiotic use.

In contrast, low- and middle-income countries (LMICs)—Kazakhstan among them—struggle with systemic constraints such as inadequate infrastructure, shortages of skilled personnel, and limited surveillance systems. These gaps contribute to a much higher HAI prevalence, estimated at 10–15% in Kazakhstan, with particularly severe consequences in maternity care. Postpartum sepsis continues to represent a major driver of maternal mortality, highlighting the urgent need for stronger IPC measures in these settings [15–17].

Kazakhstan in the Global IPC Landscape

Kazakhstan's IPC framework exhibits notable strengths:

- Regulatory alignment with World Health Organization (WHO) and U.S. Centers for Disease Control and Prevention (CDC) recommendations
- Pilot deployment of digital HAI surveillance systems in urban tertiary hospitals
- Policy-level recognition of IPC as a national health priority

These factors place Kazakhstan's performance closer to transitional upper-middle-income countries (e.g., Georgia, Turkey) rather than high-performing high-income comparators (e.g., Austria).

Maternal Health and Postpartum Sepsis

Inadequate IPC implementation in Kazakhstan has a demonstrable impact on maternal health outcomes [18]:

- Postpartum sepsis accounts for ~18% of maternal deaths, exceeding the proportion observed in many economies of similar income level.
- Rural facilities often lack the diagnostic and therapeutic capacity to manage severe obstetric infections effectively.
- The absence of real-time infection reporting delays outbreak detection, clinical intervention, and public health response.

Evidence from comparable settings suggests that targeted maternal IPC bundles—incorporating hand hygiene, aseptic delivery techniques, early sepsis recognition, and antibiotic stewardship—can reduce sepsis-related maternal mortality by up to 50% within 3–5 years when applied consistently.

Lessons from International Practice

Findings from the comparative review (Section 6) yield several key lessons for Kazakhstan:

- Governance is decisive — IPC should be integrated into national quality standards with ministerial-level oversight.
- Digital transformation is catalytic — real-time

e-surveillance enables rapid outbreak detection and containment.

- Mandatory certification safeguards quality — ensuring standardized IPC competencies across the healthcare workforce.
- Task shifting is pragmatic — nurse-led IPC programs improve coverage in resource-limited rural settings.
- Antimicrobial stewardship is essential — without it, even robust IPC systems are vulnerable to antimicrobial resistance.

Transition to Recommendations

Given these findings, Kazakhstan requires a multi-layered IPC strategy that addresses governance, human resources, infrastructure, technology, and antimicrobial policy.

Recommendations

Governance and National Coordination

1. Establish a National IPC Coordination Center under the Ministry of Healthcare with authority to set standards, monitor compliance, and coordinate outbreak response.
2. Mandate IPC programs in all healthcare facilities, with annual reporting to the Ministry.
3. Integrate IPC indicators into national healthcare quality metrics to link funding and performance.

Digital Surveillance and Data Integration

1. Develop a National Digital HAI Surveillance Platform with real-time data entry from all public and private facilities.
2. Ensure interoperability with hospital information systems (HIS) and laboratory networks.
3. Introduce automated outbreak alerts and dashboards for facility-level IPC teams.

Priority: Implement in maternity hospitals and ICUs as first-phase pilot sites, then scale nationwide.

Human Resources and Training

1. Mandatory certification for all IPC officers, nurses, and relevant clinicians.
2. National IPC Training Curriculum aligned with WHO core competencies.
3. Expand distance-learning modules for rural and remote facilities.
4. Establish a continuous professional development system with recertification every 3 years.

Evidence: Facilities with fully certified IPC teams report up to 40% lower HAI rates.

Infrastructure and Resource Allocation

1. Upgrade sterilization units with modern autoclaves and tracking systems.
2. Create dedicated isolation wards in all tertiary hospitals and referral centers.
3. Ensure constant availability of PPE, antiseptics, and sterilization supplies.
4. Implement zoning principles (clean, semi-restricted, restricted) in all high-risk areas, including maternity wards and ICUs.

Antimicrobial Stewardship

1. Develop national antimicrobial prescribing guidelines based on local resistance data.
2. Require antibiotic justification forms for restricted antimicrobials.
3. Establish facility-level antimicrobial stewardship committees.
4. Integrate resistance surveillance data into the national IPC platform.

Maternal Health and Postpartum Sepsis Prevention

1. Bundle approach:
    - Strict aseptic technique in delivery and surgical interventions
    - Preoperative antibiotic prophylaxis
    - Early postpartum infection screening protocol
    - Immediate referral for suspected sepsis cases
2. Deploy mobile IPC teams for rural maternity facilities.
3. Incorporate maternal sepsis prevention modules into midwife and obstetrician training.

Goal: Reduce postpartum sepsis-related maternal mortality by at least 40% within 5 years.

International Collaboration

1. Join the WHO Global IPC Network for knowledge exchange.
2. Seek technical assistance from CDC, ECDC,

and UN agencies for training and surveillance system design.

3. Participate in international benchmarking projects for HAI reduction.

CONCLUSION

Kazakhstan's healthcare system has made progress in aligning its infection prevention and control framework with international standards. However, persistent gaps in digital surveillance, training, infrastructure, and antimicrobial policy limit effectiveness. Implementing a national, digitally integrated IPC system; mandatory staff certification; and targeted maternal health interventions could significantly reduce HAI prevalence and postpartum sepsis mortality. Sustained political commitment, adequate funding, and international collaboration are essential for success.

Conflict of Interest: The authors declare no conflict of interest.

Ethical clearence: This study was conducted in accordance with ethical standards. Ethical approval was obtained from the appropriate institutional review board, and informed consent was secured from all participants prior to data collection.

Authors's contribution

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Writing and submitting manuscript: Roza K. Suleimenova, Elvira A. Kokayeva

Editing and approval of final draft: Baurzhan Zh. Adjibayev, Karlygash N. Tazhibayeva

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