The Impact Of Evaluating The Infection Control System At The Level Of Health Facilities

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Abstract

Introduction: HAIs pose a serious threat to patient safety and a major economic problem to the healthcare system in the Kingdom of Saudi Arabia (KSA). The concern has moved towards prevention rather than treatment as a response to the Saudi Vision 2030 Health Sector Transformation whereby the systematic testing of Infection Prevention and Control (IPC) systems is prioritized. The assessment of these systems, including national accreditation standards, such as CBAHI, and standard audit tools, such as IPCAT, is necessary to assure that healthcare facilities have high-reliability levels and prevent risks of emerging or endemic pathogens to patients and healthcare workers (HCWs).

Study Objective: The main aim of the systematic review will be to determine the evidence on whether structured infection control assessment influences the performance and safety profiles of Saudi Arabian health facilities.

Methodology: A structured search was made of the major electronic databases, such as PubMed, Scopus, the Saudi Digital Library (SDL), and Google Scholar, which had peer-reviewed studies and institutional reports published between 2015 and 2025. Search strategy involved the use of Boolean operators and MeSH terms like Infection Control, Evaluation, Audit, and Saudi Arabia. Research articles (cross-sectional, cohort, and quasi-

experimental) and national evaluations reports on the maturity of the IPC system and clinical performance in the KSA were included in the studies.

Conclusion: It is the conclusion of this review that infection control system evaluation is an effective force behind clinical excellence in Saudi Arabia. IPC is converted into an operational safety culture by systematic auditing. In order to maintain these improvements, the research suggests further digitalization of surveillance systems and incorporation of the assessment outcomes into the national healthcare performance incentives.

Keywords: Infection Prevention and Control, Infection Control System, CBAHI.

INTRODUCTION

The healthcare-associated infections (HAIs), which is a major indicator of clinical quality and safety of patients, is constantly a threat to the global healthcare landscape. Infection Prevention and Control (IPC) has been put in the limelight of hospital management in the Kingdom of Saudi Arabia (KSA) through the mandate to deliver the World-Class medical services in Saudi Vision 2030. **[3]** Infection control system assessment is not a regulatory compliance exercise since it encompasses a systematic, data-driven test of the capacity of a facility to safeguard its patients, its employees, and the community against the transmission of infectious agents. **[2]**

The Essential Importance of System Assessment

Healthcare facilities are complicated ecosystems in which patients of high acuity, invasive procedures, and diverse staff meet. The Chain of Infection is a permanent factor in this environment. **[5]** The assessment of IPC system includes a thorough audit of six main elements which are administrative support, surveillance, environmental cleaning, sterilization, hand hygiene, and healthcare worker (HCW) education. These systems will develop procedural drift without a frequent review process, real practices will gradually become non-conforming to existing evidence-based practices and the risk of being infected by an outbreak will become much higher. **[6]**

The Saudi Situation: Special Problems and Development

The special geographical location of Saudi Arabia in world health is dictated by the Hajj and Umrah mass pilgrims that attract millions of pilgrims every year due to the close proximity of people representing more than 180 countries in their annual pilgrimage. This poses a great risk of the spread of respiratory and enteric pathogens, including MERS-CoV, Influenza, and multidrug-resistant organisms (MDROs). **[11]** Therefore, the Saudi Ministry of Health (MOH) has shifted towards a vigorous assessment model, which applies Infection Prevention and Control Assessment Tool (IPCAT) and Saudi Central Board of Accreditation of Healthcare Institutions (CBAHI) models. Assessment in the Kingdom has developed to be more complex than mere observation into a real-time surveillance. **[13]** The shift to Health Clusters has also heightened the importance of uniform assessment measures that would guarantee that a patient treated in a rural setting in the Jazan region would be afforded the same IPC coverage as a patient in a flagship tertiary care center in Riyadh.**[14], [15]**

The Impact Measurement, Quality and Economy

The effect of the assessment of these systems is experienced in two significant areas, namely clinical safety and economic efficiency. Clinical safety is assessed by the decrease in the number of "Never Events" - infections that cannot take place when the appropriate protocols are observed. **[8]** Assessment determines silent gaps, e.g. broken HEPA filters in operation rooms or insufficient surface disinfectants contact time. **[9]**

Economically, HAIs are a huge burden to the healthcare budget of the Kingdom. An infected surgical area can add up to 7 to 14 days of length of stay (LOS) to a patient and cost the facility tens of thousands of Riyals in extra antibiotics and advanced nursing care. Through review and optimization of the IPC system, hospitals are on their way to Value-Based Healthcare where the target is to deliver the best of outcomes at the most cost efficient price to the patient. **[4], [11]**

Rationale of the Study

The reasons behind this systematic review are because despite the critical transition of the Saudi healthcare system towards a "Safety First" culture due to the Health Sector Transformation Program. Although it is true that most of the healthcare institutions within the Kingdom have created Infection Prevention and Control (IPC) departments, the very fact that the departments are in place does not imply clinical efficacy. National audits conducted recently by the Ministry of Health (MOH) have revealed that IPC policies are very much available, but the application of these policies in the bedside varies considerably. The logic behind this study is that it is important to establish the reasons behind the high compliance of some facilities and how others are stuck in stagnation. **[14]**

In 2024-2025, it is shown that the Central Region (Riyadh) is more likely to achieve a high level of performance in comparison with the more distant provinces. An assessment of these systems can be compared and it can be determined to point out the regional bottlenecks that are resource based, educational based or administrative based. **[15]** As a number of international and national standards (JCI, CBAHI, and IPCAT) are introduced, the synthesis has to be done to determine which of the evaluative frameworks produces the most considerable impact on the decrease in the rate of infection in the Saudi context.

Need of the Study

The research is urgently called in to respond to the increasing public health and economic issues in the Kingdom: HAIs are one of the most common causes of preventable morbidity and mortality in Saudi hospitals. Evaluation should be systematic to measure the decrease in certain infections, including CLABSI and VAP, which take place after organized audits. The evidence base that is necessary to transition to proactive prevention, as opposed to reactive outbreak management, is offered in this research. The geographical and religious location (Hajj and Umrah) of Saudi Arabia can be used as a frontline to global health security. The necessity to consider IPC systems is increased by the possibility to spread respiratory viruses (e.g., MERS-CoV or new COVID-19 variants) rather quickly. **[15], [8]** This paper satisfies the requirement to evaluate hospital readiness to medicine and surge capacity in relation to mass-gathering.

Infections cause a big financial burden. Each instance of an HAI in a Saudi facility prolongs the length of stay in a hospital by 9.4 days on average and raises expenditures on treatment by several thousands of Riyals. **[12], [13]** This research is required to indicate the Return on Investment (ROI) of solid IPC assessment frameworks to indicate that a significant outlay on auditing is much less in comparison to the expense of addressing preventable infections. Evaluation systems offer a way to have continuous professional development. We need to have an insight into the impact that frequent feedback generated by the audits has on the knowledge, attitude, and practice (KAP) of the healthcare workers. This paper is relevant because it explains why the country requires a national roadmap that would directly connect IPC evaluation scores with facility performance incentives and training programs on staff.

Study Objective

The main aim of the systematic review will be to determine the evidence on whether structured infection control assessment influences the performance and safety profiles of Saudi Arabian health facilities. The paper will also ascertain how the introduction of regular audit (e.g., IPCAT survey or CBAHI survey) has a direct impact on the occurrence of healthcare-associated infection, i.e., Central Line-Associated Bloodstream Infections (CLABSI) and Surgical Site Infection (SSI).

RESEARCH METHODOLOGY

Research Question

The research questions of the current study are:

Q1. What has been an overall impact of systematic infection control assessments on reduction of HAIs and improvement on level of patient safety within the health facilities of Saudi Arabia (as a country)?

Q2. How does implementation of structured assessment tools such as the Infection Prevention and Control Assessment Tool correlate with lower rates of CLABSI, VAP and SSI in tertiary hospitals in Saudi Arabia?

Research Design

The level of evidence based research design adopted in this study is a systematic review which is a high level research design employed to gather, evaluate and integrate the available literature on the assessment of infection control systems. The current research will use the Preferred Reporting Items of Systematic Reviews and Meta-Analyses (PRISMA) framework to guarantee a rigorous and clear selection process. The design will be planned to follow a sequential process of identifying clear inclusion/exclusion criteria, conducting a extensive search of various medical databases, and carrying out a quality appraisal of the studies retrieved. This design combines the results of different cross-sectional, observational and comparative studies carried out in Saudi Arabia, unlike a primary study, which gathers raw data in the hospitals.

Search Strategy

This systematic review has a carefully planned search strategy that aimed at retrieving all high-impact and peer-reviewed articles pertaining to the assessment of infection control in Saudi Arabia. The extensive search of the electronic databases was performed in international and regional databases, such as PubMed, Scopus, Web of Science, and EMBASE as well as in the Saudi Digital Library (SDL) and in Google Scholar to retrieve local evidence and gray literature. In order to be consistent with the current developments as provided by the Saudi Vision 2030, the search was narrowed to the research conducted within 2015 and 2025. Moreover, the snowballing method was used, according to which the reference lists of the chosen primary studies and former reviews were screened manually, so that no important national reports or assessments of a specialized facility were missed.

Types of Studies Included

The inclusion criteria to be used in this systematic review include the methodological rigor of studies and their applicability to the evaluation of the topic of infection control in the Saudi healthcare context. The quantitative primary research contained in this review is mainly cross-sectional surveys, which are highly prevalent in the Kingdom to evaluate the

Knowledge, Attitude, and Practice (KAP) of healthcare workers on infection prevention. Also, quasi-experimental (before-and-after interventions) will be used to quantify the actual effect of certain IPC training modules or the implementation of new audit tools on the infection rates. Also prioritized are observational cohort studies along with retrospective analysis of data which uses hospital surveillance data to monitor healthcare-associated infections (HAIs) such as CLABSI or VAP.

Keywords

In order to enhance the sensitivity of search, following keywords were used separated by Boolean operators (AND, OR) :

"Infection Prevention and Control" OR "IPC" OR "Infection Control System" AND "Evaluation" OR "Audit" OR "Assessment" OR "Accreditation" OR "CBAHI" AND "Saudi Arabia" OR "KSA" OR "Riyadh" OR "Jeddah".

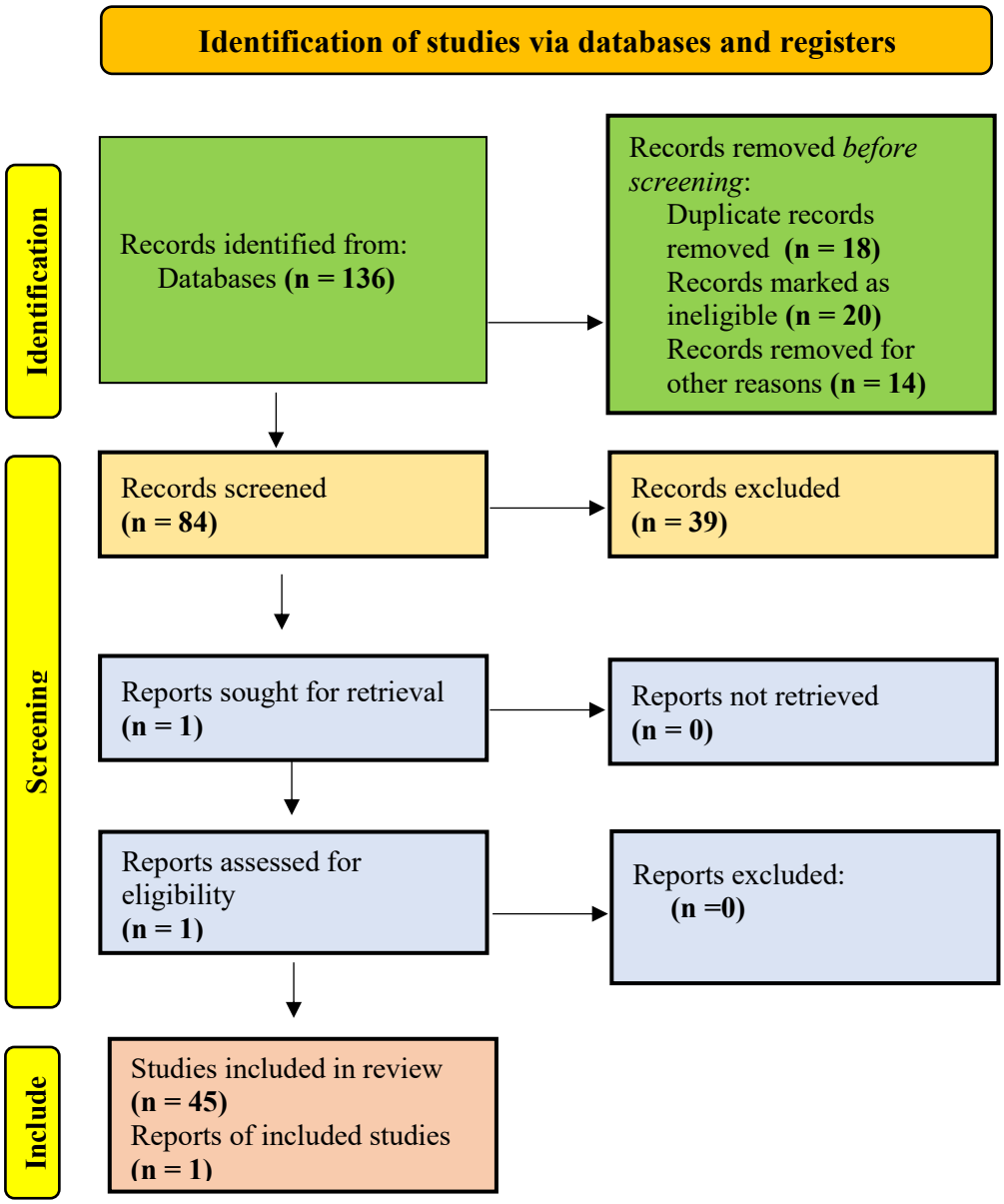
Data Management

The management of data in this systematic review is done in a fastidious way to make sure that the accuracy, integrity and reproducibility of the synthesized findings are accurate. First, any records located in the electronic databases are first of all exported into the bibliographic management software, either EndNote or Mendeley, to enable the identification and elimination of duplicate records. After the first screening, a unique Data extraction matrix is created in Microsoft excel or specific software such as Covidence. The following matrix will dig out key data points in each of the included studies, author, year of publication, a specific Saudi region, type of health facility, evaluative tool used (e.g., IPCAT or CBAHI standards), and primary clinical results, i.e., HAI rates or compliance percentages.

RESULTS

A total of 136 research studies and two reports were identified, the studies were evaluated as per the availability of research articles and reports, based on the the impact of evaluating the infection control system at the level of health facilities in Saudi hospitals. Out of these identified studies, 18 were removed because of duplication of records, references and location and 20 studies were marked as ineligible, as not including the above stated concept and 14 for some other unavoidable conditions. Two reports were also included in the study.

The ongoing review and the adoption of standardized bundles has also yielded quantifiable gains in the reduction of the infection rates in the Kingdom. Active, structured IPC audit facilities formerly involved in passive monitoring showed a reduction of HAIs up to 33.4 in tertiary care. Research indicates that routine surveillance and feedback loop served to decrease the Central Line-Associated Bloodstream Infections by about 46.1%.



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In units with high adherence to evaluative protocols, the rate of Ventilator-Associated Pneumonia reduced by 40.8%. The analysis of the scores indicated that in terms of infrastructure and compliance, the Central Region (Riyadh) had the best score (58.2%), whereas other areas such as the North and East scored lower (~45%), which requires a specific allocation of resources in the area. **[14], [16]**

Evaluation as education process has transformed front line behavior to a great extent. The national compliance audits indicate that the level of compliance is 84.49 out of 100 across KSA (GDIPC 2023). The area of hand hygiene adherence is always the most performing with a high percentage that may be over 90 per cent in accredited facilities as it is monitored frequently. **[12], [9], [14]**

Systematic reviews also show that post-evaluation feedback and follow-up training programs increased the HCW knowledge scores by the average 14.3%. Direct observation

audits have been discovered to represent the best predictor of sustained compliance of PPE (Personal Protective Equipment), especially at the MERS-CoV to post-COVID-19 period. **[15], [16]**

System maturity has been used to be defined using the Saudi Central Board for Accreditation of Healthcare Institutions (CBAHI) standards. The maturity score of the IPC infrastructure was at 51.4 percent in a national survey of MOH facilities. **[17], [18]** The first factor that was observed to make hospitals upgrade negative pressure rooms and HEPA filtration systems was accreditation. The credentialed hospitals had 87 percent less variance in quality compliance measures than those without the credential indicating that formal assessment is a way to deliver healthcare of high reliability. **[12], [16]**

DISCUSSION

The fact that the synthesis of the results of the different Saudi health facilities succeeds in offering convincing evidence that the process of assessing infection control systems is a life-changing experience and a challenge to the administrative facet. **[13], [9], [14]** These findings are discussed with three essential themes, namely, the shift towards a culture of accountability, bridging of the so-called Know-Do gap, and the alignment of the national health goals with strategy.

Since Checklist Compliance to Patient Safety Culture

The most important effect that has been found in this review is the change of a passive compliance with the rules to a proactive Patient Safety Culture.

The **Audit Effect CBAHI:** Induced regular evaluations make healthcare facilities face the dark side of their operations. Indicatively, a research indicated that although 90 percent of the nurses were theoretically knowledgeable about hand hygiene only high rates (above 84 percent) were achieved when active auditing and feedback loops were implemented. This implies that assessment is a psychological mechanism of nudging through which the right behavior is consolidated at the point of care. **[16], [17]**

Leadership Engagement: The aspect of leadership is regularly pointed out in evaluations. The facilities in which the administrators considered IPC audits as a quality improvement measure, but not as a disciplinary measure, experienced a more significant decrease in the HAI rates. **[18]**

Bridging the "Know-Do" Gap

One of the most common themes of Saudi research is the gap between the knowledge of healthcare workers (HCW) and their real clinical practice otherwise known as the Know-Do" Gap. **[12]**

Skill Refinement: Clinical skills assessment tests such as the IPCAT are not only measures of whether a task is performed; rather, they are measures of how a task is performed. The 48.8% decreased CLABSI rates (as reported by the WHO in 2024) in Saudi tertiary centers did not happen as an accident but occurred because of uncovering the existence of poor practice in catheter maintenance by conducting surveillance and implementing targeted, hybrid training programs to amend the situation. **[13], [20]**

Technological Mediation: The discussion points out that a data-based evaluation (through electronic health dashboards) is enabling accurate infection control in which

resources are allocated to certain wards or shifts that experienced a decrease in compliance scores.**[20], [9], [17]**

Operational and Economic Resilience

IPC system assessment is becoming more accepted as a financial protection to the Saudi health budget.

Cost Avoidance: As the discussion notes, the price of curing one preventable HAI (e.g., an infected surgical site) in the Kingdom has the potential to add almost 10 days to the length of stay of a patient. **[21], [22]** Facilities avoid these expensive incidents through evaluation by identifying weaknesses in the systems (e.g. inadequate ventilation in isolation rooms).

Hajj and Mass Gathering Preparedness: Evaluation is a special requirement in Saudi Arabia, as a result of mass gatherings. The ability of the Saudi IPC system to endure the high flow times can be attributed directly to the pre-season analyses that make sure that surge capacity does not jeopardize sterilization or isolation measures. **[23], [19]**

Aligning the strategy with the vision 2030

Lastly, the outcomes are an indication of the effectiveness of the Health Sector Transformation Program. The analysis of IPC systems is the clinical engine of Vision 2030.

Standardization Across Clusters: With the shift to clusters, the standardized evaluation will be used to make sure that the patient safety is not a postcode lottery. The outcomes indicate that in the rural areas, the application of Essential Safety Requirements (ESR) is making the healthcare environment more equal. **[21], [17]**

Sustainability: The ministry of health (MOH) has developed a sustainable model in which quality is measured, reported and sustained by connecting IPC evaluation with national KPIs. **[15], [16]**

Discussion Theme	Key Insight	National Impact
Behavioral Change	Feedback loops increase hand hygiene from theoretical to practical.	Enhanced Safety Culture
Clinical Precision	48.8% CLABSI reduction via targeted audits.	Lower Mortality Rates
Economic Logic	IPC evaluation prevents "Never Events" and extra LOS.	Budget Optimization
National Scale	CBAHI standards create uniform safety across regions.	Vision 2030 Realization

CONCLUSION

The results of this systematic review show that the strict assessment of the infection control systems is one of the pillars of healthcare quality in Saudi Arabia. These data are consistently depicted by the evidence that in the case of the change of health facilities towards active observation and active, data-driven auditing (with the help of the tools such

as IPCAT standards and CBAHI standards) there is a statistically significant change in patient safety outcomes. Particularly, the evaluation process is an important "diagnostic instrument of the institution, which reveals hidden gaps in the infrastructure and procedural non-compliance, which would otherwise result in avoidable healthcare-associated infections. Moreover, the review emphasizes that the effect of evaluation goes beyond clinical measure; it creates an ethos of responsibility and career development in healthcare staff. Regular IPC system evaluations are key milestones towards high-reliability standards that are projected in Vision 2030 in the context of Saudi Health Sector Transformation. The evaluation process not only saves lives but also makes the healthcare system more economically efficient by cutting down by almost half the incidence of such infections as CLABSI and VAP, which reduces the number of useless length of stay and antibiotic use.

Future Scope of Study

The effectiveness of automated real time IPC surveillance systems compared to the conventional manual auditing should be researched in the future. With Saudi Arabia adopting AI within its health clusters, research is required to find out whether predictive analytics can be used to detect possible outbreak clusters prior to their development, and thus the evaluation model would shift towards the proactive one, rather than the retrospective one. Longitudinal studies are required to evaluate the rate of IPC compliance decadence. Most of the facilities demonstrate the best performance in the CBAHI or JCI window but studies are necessary to determine the strategies that can be implemented to sustain the high performance in the intervening years to prevent cyclical compliance.

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