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The Role of Total Quality Management Systems in Enhancing Patient Safety and Infection Control: A Systematic Review

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ABSTRACT

Introduction: The Saudi Vision 2030 has encouraged the healthcare sector in the Kingdom to embrace Total Quality Management (TQM) as a philosophy of transformation in order to be in tandem with the worldwide safety and quality standards of clinical services. This strategy focuses on organization change of culture, leadership dedication and continuous process enhancement to reduce the harm that can be prevented.

***Study Objective*:** This systematic review aims to evaluate the importance of TQM systems for improving patient safety and preventing infection within Saudi Arabian health care organizations. This review will also look at synthesizing the current evidence for the adoption of TQM frameworks within Saudi Arabian hospitals and healthcare facilities.

***Methodology*:** The systematic review consolidated the information about the application of Saudi Central Board for Accreditation of Healthcare Institutions (CBAHI) standards, the Essential Safety Requirements (ESR) and specialized quality strategies such as Lean Six Sigma (DMAIC). The contribution of digital surveillance platforms, including the Health Electronic Surveillance Network (HESN), to the achievement of data-driven safety outcomes.

Conclusion: The evidence suggests that the introduction of TQM is strongly linked to better hospital performance, which has resulted in clinical success (a 48.8% decrease in central line-associated bloodstream infections, or CLABSI) and major decreases in medication errors.6Although national accreditation has standardized safety processes, high staff turnover, resource limitations, and challenges in engaging clinical staff often disrupt sustained excellence. .

Keywords: Total Quality Management, Patient Safety, Safety Culture, Infection Control, Healthcare-Associated Infections

1. INTRODUCTION

Strategic Imperative

The high-quality healthcare is embedded in the promise of a high-quality healthcare in Saudi Arabia as it is stated in the Basic Law of Governance, namely in Article 31, which provides free healthcare to all citizens, and the state has the duty to safeguard the health of the people. **[1], [4]**Nevertheless, the current form of this commitment was institutionalized with the creation of the Saudi Central board of Accreditation of Healthcare Institutions (CBAHI) in the year 2005. The development of CBAHI was a shift in the previous model of decentralized quality assurance (QA) systems to a national standardized model aimed at assessing and certifying the levels of quality and safety in healthcare facilities in the public and the private sector. **[3]**

In 2013, the requirement to have quality became national when a decree was issued by the Council of Ministers that all healthcare facilities in the Kingdom should have CBAHI accreditation. **[5]** This policy change brought TQM into the framework of Saudi health system. The strategic aim was to stop the discrepancy between anticipated and delivered medical services by lowering clinical variance and systemic inefficiencies. TQM offers the structure required to shift the haphazard, short-term improvement programs in the contemporary global environment characterized by escalating costs and growing patient demands to long-term excellence. **[11],[6]**

The TQM Total Quality Management Philosophy

The principle of TQM in the Saudi context can be explained as a holistic strategy that involves the inclusion of all persons within an organization, including the executive team and the frontline workers, in an ongoing process of enhancing the system instead of blaming the worker as incompetent. The leadership commitment is the key part of the TQM framework; it is the primary driver of the cultural change as opposed to the traditional management styles focusing on the performance of the individual worker or the outcome of the failure of the system. **[7], [12]**

A systemic approach is operationalized in terms of eight essential practices that have been identified to be critical in the overall performance of a hospital as seen in the case of Tabuk region, namely, leadership, employee management, information analysis, training, customer focus, continuous improvement, process management, and supplier management, showed significant positive correlation with overall hospital performance. **[8]**

The Saudi Central Board of Accreditation of Healthcare Institutions (CBAHI) is the main institution in the country that aims at institutionalizing the TQM principles. CBAHI does not solely evaluate; it is the builder of quality in healthcare and comes up with global and local standards. **[4], [15]** These standards are developed in a very strict nine-stage structure, which is aimed at providing a complete representation of the stakeholders and scientific soundness.

Clinical Performance Accreditation

The shift of pre-accreditation to post-accreditation of Saudi hospitals is linked to the ability to gain measurably in a number of quality indicators. Pieces regression analysis has revealed that the report of incidents, the rate of reduction of medication errors, and the rate of nosocomial infections improve significantly after the adoption of CBAHI standards. **[13], [15]** In particular, accreditation gives the organization a well-organized environment that compels the organization to concentrate on the hard aspects of TQM, which include information analysis and standardization of processes.

Studies show that hospitals in Saudi Arabia that are accredited use TQM practices more uniformly than the non-accredited ones. It implies that the very process of accreditation is a learning and transformational experience that propels organizations to the state of constant learning and improvement. Nevertheless, certain studies have reported that care procedures and documentation are immediately improved, but that hard clinical outcomes such as post-admission mortality can require time to be responsive to accreditation benefits. **[9], [16]** The global healthcare system is under pressure to provide safe, effective, and patientcentered care with the minimal harm risk linked to medical errors and healthcareassociated infections (HAIs). Infection control and patient safety have thus come out as important measures of healthcare quality. The surge in the development of healthcare services in Saudi Arabia due to the reforms of the Kingdom vision 2030 has necessitated the strong requirement of the quality management systems that can guarantee the consistency, accountability and the continuous improvement of the hospitals and clinics. **[12], [8]**

Need of Study

TQM is a holistic organizational philosophy that focuses on the daily evolution, executive dedication, employee engagement, and processes standardization. TQM was initially intended to serve the industrial field, but it has been extensively modified

to serve the healthcare industry to deal with issues like inconsistency in clinical practice, elasticity in infection control, and have-hazard safety culture. Incorporating quality principles into the day-to-day activities, TQM systems are set to create a proactive environment with the minimal errors, enhancement of the infection control adherence, and the improvement of patient outcomes. The use of TQM frameworks by healthcare institutions in Saudi Arabia has progressively been in line with international standards of accreditation including the Joint Commission International (JCI) and the Saudi Central Board of Accreditation of Healthcare Institutions (CBAHI). These frameworks focus on the prevention measures of infections, staff development, and monitoring systems that are crucial in minimizing HAIs. Nevertheless, even in the case of the breadth of improvement, there are still issues related to the consistent application of improvement, the distribution of resources, and maintaining the culture of safety in various healthcare facilities.

The proposed systematic review will summarize the evidence regarding the application of TQM systems to promote patient safety and infection control in Saudi Arabia. Through the review, the researcher seeks to uncover best practices and show gaps and recommendations to improve healthcare quality initiatives in the Kingdom by reviewing the recent studies.

Study Objective

This systematic review aims to evaluate the importance of TQM systems for improving patient safety and preventing infection within Saudi Arabian health care organizations. This review will also look at synthesizing the current evidence for the adoption of TQM frameworks within Saudi Arabian hospitals and healthcare facilities.

Research Methodology

Research Question

The research questions of the current study are:

Q1. How effective have TQM frameworks been at decreasing HAIs in hospitals and other healthcare settings in Saudi Arabia?

Q2. What are the effects of TQM on creating a culture of patient safety for healthcare practitioners in Saudi Arabia?

Q3. In Saudi Arabia, what are the barriers to implementing TQM systems effectively with respect to infection control and patient safety?

Research Design

The proposed study assumes a systemic review format, which is regarded as the gold standard in synthesizing evidence in the system of various studies. To be transparent and rigorous, the review is conducted using common criteria like the framework of Preferred Reporting Items of Systematic Reviews and Meta-Analyses (PRISMA). The relevant literature that was published in the last three years (2018-2025) was located using detailed searches in international databases (PubMed, Scopus, MEDLINE), as well as Saudi-based journals. The extraction of data was also done in a systematic manner with the synthesis of findings being done on a thematic basis to indicate the influence of TQM practices on healthcare outcomes. The design will enable critical evaluation of available evidence, discovery of gaps, and creating recommendations that fit the Saudi healthcare situation.

Search Strategy

An extensive searching strategy has been used to locate the appropriate research studies on the role of Total Quality Management (TQM) systems in patient safety and infection control in Saudi Arabia. Articles published in the last 2 and a half years, 2018-2025, were systematically searched using the electronic databases such as PubMed, MEDLINE, Scopus, and Web of Science. Besides that, Saudi specific journals and institutional repositories were also searched to include studies published in the region. Hand searching of reference lists of the included articles also led to the identification of other relevant publications. This multi-layered methodology made sure that both the international and the local views were considered in the review to offer a broad evidence base to examine.

Types of Studies Included

Peer-reviewed empirical studies that were done in Saudi Arabia and focused on the implementation of Total Quality Management (TQM) systems in relation to patient safety and infection control were included in the systematic review. Inclusion criteria were that the study should be quantitative research (e.g. survey research, observational study, intervention trial, etc.) and quantify outcomes (e.g. healthcare-associated infection (HAI) rates, adherence to safety protocols, patient safety measures, etc.). Also, qualitative studies that focus on the perceptions and organizational culture and leadership of healthcare professionals regarding TQM implementation were added to present the contextual information. This broad based strategy made the review to be able to capture not only the quantitative results but also the subjective view which offered a comprehensive evaluation of the role of TQM in healthcare contexts in Saudi.

Keywords

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

"Total Quality Management" OR TQM AND "Patient Safety" OR "Safety Culture" AND "Infection Control" OR "Healthcare-Associated Infections" OR HAIs AND "Saudi Arabia" OR "Kingdom of Saudi Arabia"

Inclusion and Exclusion Criteria

Inclusion in this review required articles documenting studies that took place in Saudi Arabia and assessed both TQM systems related to patient safety and infection prevention control; all studies conducted outside Saudi Arabia and all articles that were not peer reviewed were excluded from this review. Furthermore, any article that was not specifically related to TQM was also excluded.

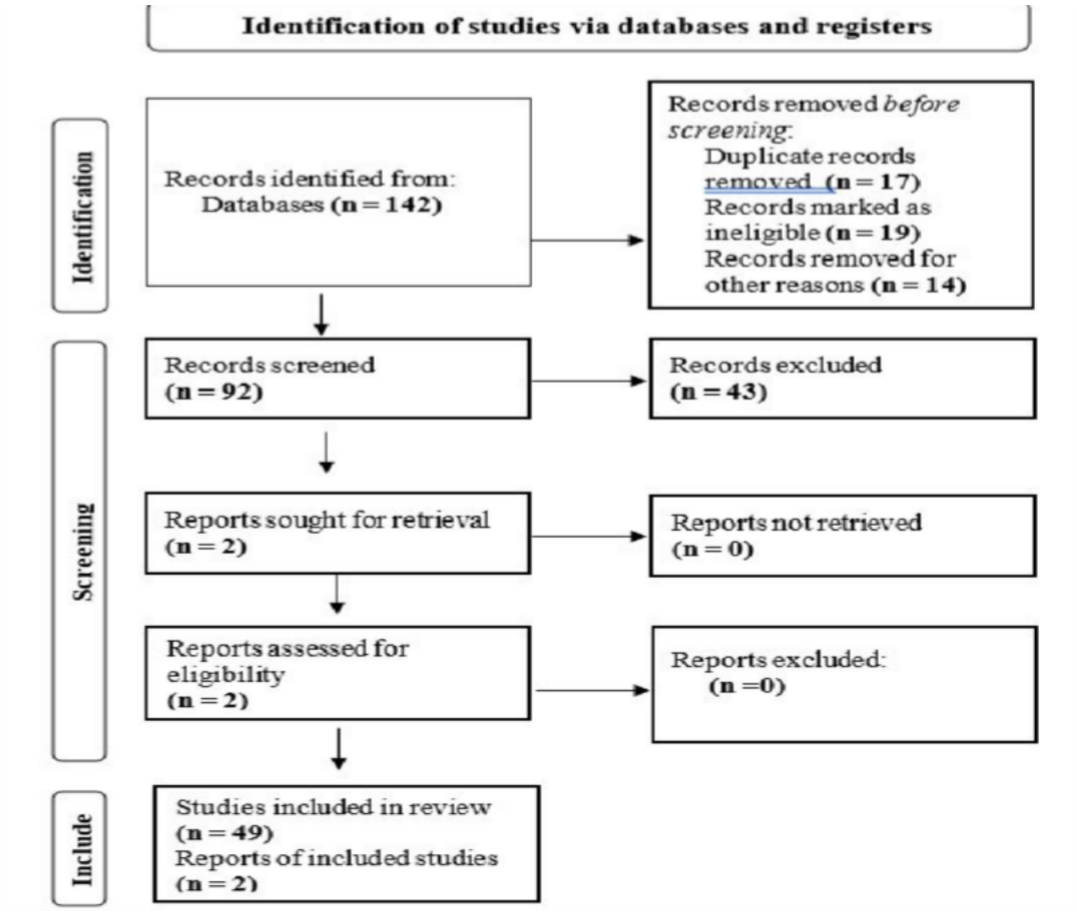
Data Management

The systematic review process was followed to retrieve all the data that were handled by a systematic approach facilitating accuracy, transparency, and reproducibility. The data extraction form was standardized to identify the important characteristics of the study such as author, year, study design, sample size, interventions, and outcomes associated with Total Quality Management (TQM), patient safety, and infection control. Data that was extracted were stored in a safe place and were coded thematically to make them easy to synthesize. This method of data management contributed to a minimal bias and consistency, and additionally, it gave a clear audit trail that could be reviewed.

Results

A total of 142 research studies and two reports were identified, the studies were evaluated as per the availability of research articles and reports, based on the the role of total quality management systems in enhancing patient safety and infection control in Saudi Arabia. Out of these identified studies, 17 were removed because of duplication of records, references and location and 19 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.

Improved Education for Infection Control a systematic literature search demonstrated that systematic training programs in infection prevention and control (IPC) for HCP (healthcare providers) resulted in a marked increase in HCP compliance with IPC practices, and ultimately a reduction in healthcare-acquired infections (HAIs) relative to HCP in non-structured training environments. **[10], [8], [13]**



Source: Page MJ, et al. BMJ 2021;372:n71. doi: 10.1136/bmj.n71 https://creativecommons.org/licenses/by/4.0/

For instance, in an investigation of adherence rates of Saudi HCP to the recommendations for infection prevention, the

degree to which HCP were adherent to infection prevention recommendations was significantly affected by the organisational culture, leader support, and ongoing monitoring. **[5], [16], [2]** Further, the authors of this paper concluded that the total quality management (TQM) framework assisted HCP to overcome obstacles associated with motivation and inconsistent application of guidelines. Also, an additional study of safety culture improvements in the care of patients found that safety culture initiatives formulated under the TQM framework resulted in documented increases in medical error reporting, team collaboration, and involvement by leadership. **[11],12** The study further indicated that hospitals using structured quality management systems had improved safety cultures relative to hospitals that did not utilize structured quality management systems. **[17], [9]**

Discussion

TQM Approach of Infection Prevention and Control

The effectiveness of the TQM-based solution to the problem of infection control is best illustrated by the example of the national program of decreasing Central Line-Associated Bloodstream Infections (CLABSI). The rates of CLABSI in adult ICUs were a key crisis in the sphere of public health in 2021. **[14], [15]** As a measure, the MOH initiated a strategic project that included facility managers, clinicians and IPC professionals. The program, which was a combination of evidence-based guidelines on central line insertion and maintenance, and a Go Green competition as an incentive to excellent performance. **[8]**

The outcomes of this project were exceptional. The compliance rate with the central line maintenance bundle was 98 percent, which explains why the attention to the standardization of the processes and employee involvement provided by TQM can result in patient outcomes drastically. **[9]** To implement TQM, real-time data must be correct in order to detect epidemics and trends. This has been made easier in Saudi Arabia through the Health Electronic Surveillance Network (HESN), a web-based network that was introduced in 2012 to administer infectious diseases and vaccinations. **[2], [15]** HESN offers a single system of monitoring disease trends, identifying clusters, and material inventory management. **[8]**

The perceptions of HESN by the users also show that there is a satisfactory degree of satisfaction (70.8%), and most of the healthcare personnel have reported that HESN is much more useful compared to the old paper-based systems. **[17], [18]** The capability of the system to come up with hypotheses and offer early warning of an imminent threat renders it a necessity to IPC in the Kingdom. HESN (along with other digital solutions such as Taqasi) has been essential during the COVID-19 pandemic, as it was used to conduct contact tracing and manage the epidemic.**[4]**

Leadership Styles

Leadership style used in an organization is very crucial in determining the success of any system of TQM. The nurse managers and hospital administrators are the key participants in creating the atmosphere where the patient safety and infection prevention measures are implemented in Saudi healthcare. **[16], [18]** It is commonly accepted that transformational leadership is the most efficient one in developing a quality culture. Transformational leaders motivate their staff members by fostering a common vision, innovation, and the atmosphere of trust and empowerment. This practice can be applied in nursing practice to empower the staff to make decisions and reflect on the care provision processes. Research has indicated that transformational leadership is positively linked to increased job satisfaction, decreased staff turnover, and patient outcomes. **[19], [7]**

Conversely, transactional leadership is about hierarchy, discipline and accomplishment of goals that were stipulated in advance via a reward and punishment system. Although this style might be efficient in the high-stress environment such as an emergency department where adherence to the protocols is a mandatory requirement, it might not be effective in promoting the same degree of long-term creativity and employee involvement as the transformational leadership style. **[8], [10], [13]** There are researches that specifically investigate Saudi head nurses, and it was discovered that the authentic and transformational leadership styles can contribute to the reduction of infection rates that are related to vascular access and urinary catheters to a considerable extent. These leaders can provide a workspace in which the multidisciplinary team can collaborate towards shared safety objectives by eliminating obstacles to compliance and using facilitators in the work environment. **[9]**

Process Optimization

Although TQM gives the philosophical structure, such techniques as Lean Six Sigma (LSS) furnish the technical instruments with which extensive analysis and optimization of the processes are carried out. LSS integrates the waste minimization element of Lean and the variation minimization capabilities of Six Sigma. **[16], [17]** Despite the fact that the implementation of LSS in Saudi Arabia is in its infancy, it has shown to be of great help in minimizing the waiting time and medical errors. The use of LSS in hospitals of Saudi emphasizes the significance of making decisions based on data. Getting out of the previous habit of basing decisions on gut feelings instead of statistical data, healthcare managers will be in a better position to make more specific changes to clinical workflows, with an ultimate result of efficiency and safety increase. **[21]**

Digital Health Transformation and TQM

Digital revolution is one of the main pillars of Saudi Vision 2030, and its influence on the quality management of healthcare

is tremendous. Access to care is quicker due to digitization, more accurate due to improved diagnosis and provides improved continuity of care because of interoperable patient records. TQM monitoring has transformed with the integration of the Electronic Health Records (EHR) across the Ministry of Health and the specialized providers, such as the Ministry of National Guard Health Affairs (MNGHA). **[21], [22]** With the help of EHRs, one will be able to collect and report clinical information systematically and on the episode level, which will allow administrators to attain increased value due to better transparency. More so, the utilization of big data and AI to conduct predictive analytics is aided using digital platforms, which can help decision-makers to make better use of healthcare resources. **[15]**

The swift growth of e-health services, such as tele-medicine and mobile health applications (mHealth), during the COVID-19 pandemic was the essential part of the national response. The Saudi government made use of 13 electronic health services 10 smartphone applications in managing the crisis. **[16], [12]** These digital tools can not only be applied to increase the efficiency of operations but also patient engagement, which is one of the primary sources of quality in the TQM model. Nevertheless, the implementation of these technologies is successful only when they consider the problem of digital divide and provide effective data security. **[15]**

2. CONCLUSION

The adoption of the Total Quality Management systems in Saudi Arabia is a complex reaction to the issues of the contemporary healthcare environment. By means of the national requirement to CBAHI accreditation and the strategic deployment of the FIT model, the Kingdom has developed a solid platform on patient safety and infection control. The measurable achievement of such programs as the CLABSI reduction program and the successful implementation of the Six Sigma in medication safety give a definite testament of the effectiveness of TQM when coupled with a powerful leadership and highly developed technologies. With Saudi Arabia on the way to the objectives of the Vision 2030, it is important to keep on institutionalizing these gains and addressing the barriers that are permeating the system through staff turnover and organizational resistance. With an emphasis on culture of transformational leadership, the adoption of digital innovation, and the focus on empowering the front-line employees, the Saudi healthcare community will be in a position to attain the world-class standard of excellence that is safe, effective, and responsive to the needs of its citizens.

Future scope of Study

Although this systematic review shows that Total Quality Management (TQM) systems are positively related to the safety of patients and measures against infections in Saudi Arabia, there are still several areas that can be explored further. Future studies ought to be conducted in longitudinal research, which will be able to measure the long-term implications of implementing TQM on healthcare-associated infections (HAIs) and safety culture. It is also possible to conduct comparisons between various regions and types of hospitals in Saudi Arabia in order to find the differences in the outcomes and optimal practices.

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