



Barriers and Problems in Implementing Health-Associated Infections Surveillance Systems in Iran: A Qualitative Study

Naser Nasiri¹, Parvin Mangolian Shahrabaki², Ali Sharifi^{3*}, Iman Ghasemzadeh¹, Malahat Khalili⁴, Ali Karamoozian⁵, Ali Khalooei⁶, AliAkbar Haghdoost¹, Hamid Sharifi^{1*}

Received: 19 Jul 2022

Published: 23 May 2023

Abstract

Background: Healthcare-associated infections (HAIs) are among the most critical challenges for patients and healthcare providers. To achieve the goals of the surveillance system, it is necessary to identify its barriers and problems. This study aimed to identify the barriers and problems of the surveillance system for HAIs.

Methods: This qualitative study was conducted using the content analysis method to investigate the challenges of this surveillance system from the perspective of 18 infection control nurses from hospitals in different cities of Iran with work experience of 1 to 15 years. Data were collected through semi-structured interviews and analyzed using the Lundman and Graneheim qualitative content analysis method.

Results: In this study, we found 2 categories and 7 subcategories. Two categories were barriers related to human resources and organizational barriers to infection control. The 7 subcategories included weakness of medical staff in adherence to health principles, obstacles related to patients, high workload and insufficient motivation, lack of staff knowledge, lack of human resources, functional and logistical weaknesses, and weaknesses in the surveillance system.

Conclusion: To reduce problems and improve HAIs reporting, the HAIs surveillance system needs the support of health system officials and managers. This administrative and support focus can establish the framework for removing and lowering other barriers, such as the number of reported cases, physician and staff noncooperation, and the prevalence of HAIs. It can also bring HAIs cases closer to reality.

Keywords: Surveillance System, Reporting; HAI, Qualitative Study, Infection Control, Iran

Conflicts of Interest: None declared

Funding: This study was funded by the student research committee of Kerman University of Medical Sciences. (Grant number, 40000394).

*This work has been published under CC BY-NC-SA 1.0 license.

Copyright© Iran University of Medical Sciences

Cite this article as: Nasiri N, Mangolian Shahrabaki P, Sharifi A, Ghasemzadeh I, Khalili M, Karamoozian A, Khalooei A, Haghdoost AA, Sharifi H. Barriers and Problems in Implementing Health-Associated Infections Surveillance Systems in Iran: A Qualitative Study. *Med J Islam Repub Iran.* 2023 (23 May);37:57. <https://doi.org/10.47176/mjiri.37.57>

Introduction

“Healthcare-associated infections (HAIs) are infections people get while they are receiving health care for another condition. HAIs can happen in any healthcare facility, including hospitals, ambulatory surgical centers, end-stage renal disease facilities, and long-term care facilities (1).”

These infections pose a great burden to patients (2). These infections are caused by various factors such as bacteria, viruses, and fungi. The 4 main types of these infections are ventilator-associated pneumonia, bloodstream infections, urinary tract infections, and surgical site infections (3).

Corresponding author: Dr Hamid Sharifi, hsharifi@kmu.ac.ir
Dr Ali Sharifi, a_sharifi@kmu.ac.ir

¹ HIV/STI Surveillance Research Center, and WHO Collaborating Center for HIV Surveillance, Institute for Futures Studies in Health, Kerman University of Medical Sciences, Kerman, Iran

² Nursing Research Center, Kerman University of Medical Sciences, Kerman, Iran

³ Department of Ophthalmology, Shafa Hospital, Afzalipour School of Medicine, Kerman University of Medical Sciences, Kerman, Iran

⁴ The Michael G. DeGroote Institute for Pain Research and Care, McMaster University, Hamilton, Ontario, Canada

⁵ Modeling in Health Research Center, Institute for Futures Studies in Health, Kerman University of Medical Sciences, Kerman, Iran

⁶ Social Determinants of Health Research Center, Institute for Futures Studies in Health, Kerman University of Medical Sciences, Kerman, Iran

↑What is “already known” in this topic:

Healthcare-related infections are a significant problem in Iran. A representative surveillance system to detect and report health-associated infections could be an important factor in controlling these infections.

→What this article adds:

The healthcare-associated infection surveillance system is faced with different challenges. Assistance from hospital and university officials is necessary due to the system members' lack of collaboration. Infrastructure upgrades and increased monitoring are required for this system. To increase this system's effectiveness, it is required to solve its challenges.

These infections can cause various complications, such as the increased risk of death, more extended hospital stay, and higher treatment costs for patients (4).

The prevalence of HAIs differs in high-income and middle- and low-income countries. The prevalence of these infections in high-income countries ranges from 1.4% to 5.1% (5-7) and in the middle- and low-income countries from 6.3% to 17% (8-10). In Middle Eastern countries, HAIs are a major problem and cause significant morbidity and mortality (3). Based on 2 review studies in Iran, the prevalence of HAIs was estimated to be about 4.5% (11, 12). Low- and middle-income countries face many problems in implementing programs to control HAIs (13). Problems such as lack of valid data (4), poor quality of laboratory data, poor communication at the local and national level, provider workload, and hand hygiene have complicated the surveillance system in low- and middle-income countries (13). Improving each of these factors can be a practical step in controlling HAIs. For example, improving hand hygiene among nurses, physicians, and those involved in cleaning will reduce the incidence of HAIs (14), or increasing and changing nurse-to-patient ratios significantly decreases the rate of HAIs (13).

An effective surveillance system can help providers plan for HAIs reduction (15). Several countries are developing and implementing systems to monitor HAIs to better plan and identify them. In Iran, the system for surveillance of HAIs has been developed and implemented since 2016 (16). In the designed system, the infection control nurses (ICN) are responsible for identifying, reporting, and tracking the causes of HAIs, which requires the collaboration of different hospital departments. Hospital department staff, laboratories, team members, infection control committees, and specialists are among the most important people in identifying HAIs (16, 17). This system requires laboratory and clinical evaluations to diagnose HAIs (18). If each of these members cannot do their job correctly, identifying and reporting HAIs can be challenging (16, 17).

Between 2015 and 2019, various qualitative studies were conducted in Iran to examine a range of issues and challenges, including poor intersectoral collaboration, a lack of human resources, a lack of awareness, the high workload of ICNs, a lack of financial resources, underreporting of infections, antibiotic consumption from the perspectives of various people in charge of prevention programs, and the management of HAIs in Iran (19-21). Improving the surveillance system and access to reliable information would save costs, improve patient safety and quality of care, and prevent infection outbreaks; however, information about HAIs in the surveillance system is unavailable due to inadequate infrastructure for infection prevention and control programs (13). Assessment of the problems and deficiencies of the HAIs surveillance system is necessary for the implementation and continuation of effective interventions (15). In designing this study, it was assumed that by examining and analyzing the experiences of ICNs directly involved in the HAIs surveillance system, the problems and barriers of the HAIs surveillance system could be identified using a qualitative method.

Methods

Study Design

This study used a qualitative method with a conventional content analysis approach to collect and analyze data. The content analysis examines and explains a text's concepts, words, and phrases (22).

Sample and Setting

This study sampled 18 ICNs of 18 hospitals between December 22, 2021, and May 10, 2022, from 3 medical sciences universities in Kerman province. The participants were included from different hospital types (governmental, private, teaching, police, social security, psychiatric, and women's hospitals). Challenges with performance and implementation are one of the issues with the HAIs surveillance system; ICN is directly in charge of the HAI surveillance programs. The ICN's responsibilities include data collection and monitoring. Since ICN is directly responsible for controlling and managing HAIs in hospitals (16), we included them in this study. Participants had direct exposure to hospital infection control in terms of barriers and issues related to identification and reporting HAIs. Participants had sufficient experience ranging from 1 to 15 years, were physically and mentally healthy, and were fluent in Persian. Participants were selected based on age, work experience, education level, type of hospital, and the number of licensed beds. With their approval, interviews were done in person at the ICNs' places of employment, with telephone follow-ups as necessary. Interviews lasted between 40 to 50 minutes. Sampling continued until saturation was reached. Saturation means that no new data are added to the data. In this study, we reached saturation with 14 interviews. To ensure data saturation, the study continued with up to 18 interviews.

The data collection method was a semi-structured face-to-face interview by the first author. First, some questions were asked, and a 2-way conversation was conducted to familiarize the participants with the interviewer. Then, questions were asked about the research topic, and participants commented on their experiences in this regard. Some of the questions were as follows: In your experience, what are the challenges in identifying and reporting HAIs? What are the roles of people and the problems associated with those people in identifying and reporting HAIs? Then, some inquiries were made in response to the participant's responses to elicit pertinent information (eg, can you elaborate? Can you give an example?). The first author recorded all responses after obtaining consent from the participants.

Data Analysis

The data analysis process was performed according to the steps suggested by Lundman and Graneheim. For this purpose, each interview was transcribed verbatim in the first step to get an overview of the topic. Second, the text was broken down into condensed units of meaning. Words and phrases with relevant elements were summarized into each meaning unit. Third, the summarized meaning units were coded and labeled. In the fourth stage, the codes were divided into subcategories and categories based on similarities and differences. A category class at the manifest level

is composed of related codes. Themes were created to express the latent meaning of the text once the underlying meaning and content of the data were found (23). Any observations or suggestions that the researcher made while collecting and analyzing the data were recorded in a memo to be used in the next interviews. To compare the ideas extracted from the text, the participants reviewed part of the text along with the initial codes, and the concepts created were reviewed and confirmed. The analysis was performed using MAXQDA 10 software (VERBI Software; Udo Kuckartz).

Trustworthiness

We ensured the credibility, transferability, dependability, and confirmability of the results. To ensure credibility, prolonged engagement, and member checks were conducted, and notes were taken during the researcher's presence at the hospital. Data transferability was enhanced by conducting available samples and reviewing the details of the work. To ensure dependability and conformability, the results were reviewed by a person experienced in qualitative studies (24).

To member check, 4 interviews were sent to the participants after coding and writing the results. We contacted them if they had any more comments. The information from each interview was transposed after each interview. To gain an initial understanding of the data, 4 texts were read several times by 2 research team members, and then the coding process was conducted separately for each of these studies. The coding team met for 2 sessions to review and determine the codes. In case of disagreement in coding, the problem was resolved by consulting with the members. After 2 meetings with the team members and a review of the text of the articles, the relevant codes were determined. To ensure consistency of the codes, a team member checked the given codes using 2 texts, and the final codes were defined.

Results

The age of the participants ranged from 35 to 55 years, and they were women. The hospitals where they worked had between 100 and 350 beds. Participants reported working 8 to 10 hours per day, although some indicated that this time was spent more than infection control due to various tasks.

According to the opinions of the ICNs, the 2 categories of direct and indirect barriers to controlling, detecting, and reporting HAIs were as follows: barriers related to human resources in infection control and organizational barriers in infection control. Each of them was divided into subcategories. Subcategories related to human resource barriers in infection control included weakness of the medical staff in adhering to health principles, barriers related to patients in infection control, and subclasses associated with the class of organizational barriers in infection control, including high workload and insufficient motivation to perform tasks, lack of knowledge of medical staff, lack of workforce, functional and logistical weaknesses in infection control, and weakness in the monitoring and surveillance system

(Table 1).

1- Barriers Related to Human Resources in Infection Control

The ICNs state that there are a number of human resource-related barriers to preventing and controlling HAIs, including patient barriers to infection control and the medical staff's poor adherence to health principles.

1.1. Weakness of the Medical Staff in Complying with Health Principles

1.1.1. Failure of Physicians and Nurses to Adhere to Health Principles

Physicians and nurses who provide care to patients play an essential role in causing HAIs and must follow the principles to control and prevent infections. *"In recent years, we have not been able to tell the medical group to ... [adhere to the health principles]. The staff also says if it's bad for us, it's bad for them [adherence to health principles is low]."* (ICN 7).

1.1.2. Lack of Cooperation by Physicians in Identifying Cases of Infection

ICNs stated that physicians' cooperation with the HAIs control unit is not good and that physicians need training. They said that physicians' perceptions of HAIs were negative and that this had a negative impact on their work, causing them to fail to report HAIs and fail to admit patients who had HAIs back to the hospital. *"In general, physicians do not have a good view of the term hospital-acquired infection, which means that if it's their practice, the patient is now going to the doctor's office to be treated as an outpatient. They do not like it when a hospital infection is discovered."* (ICN 10).

1.1.3. Failure of the Head Nurse to Cooperate in Identifying and Reporting Infection Cases

The department's physicians and staff performance are monitored by the head nurse, who can see obstacles and issues connected to HAIs. If necessary, the head nurse can report these issues to the ICNs and assist in the planning and implementation of the training program. The head nurse can help encourage more HAIs to be reported and more accurate statistics to be compiled, either in person or by encouraging staff. *"I cannot go to the wards more than twice a week because that leaves the rest of the work...the head nurse will give a warning as soon as they see it... but they often do not pay attention because they say they are busy."* (ICN 7).

1.2. Patient-Related Barriers to Infection Control

1.2.1. Lack of Patient Cooperation in Post-Discharge Follow-up

Post-discharge follow-up can help with review and education reminders and identify issues leading to HAIs. Due to a lack of post-discharge follow-up, patients who have developed infection may not be counted, and HAIs may be underestimated. There is evidence that patients do not respond appropriately to calls from ICNs. *"It's a bit challenging that we can't just [speak] with the patient to see what the next problem is when the patient returns home since*

Table 1. Barriers and challenges to identifying and reporting health-associated infections in Iran

Themes	Categories	Subcategories	Codes
The traumatic background of healthcare-associated infections	Barriers related to human resources in infection control	Weakness of the medical staff in complying with health principles	Failure of physicians to adhere to health principles. Failure of nurses to adhere to health principles. The poor supervision of the head nurse on the health principles observed by the staff working in the department Failure of the head nurse to cooperate in identifying and reporting infection cases Non-cooperation of staff and infection control link nurses of each department in identifying and reporting infection cases Lack of cooperation by physicians in identifying cases of infection Non-cooperation of laboratory staff to send culture results Poor cooperation between different departments of the hospital
			Failure of patients to continue treatment Poor economic conditions of patients Lack of awareness among patients regarding infection control Lack of awareness of patients' families regarding infection control Non-cooperation of patients in follow-up after discharge Lack of patient families cooperation in post-discharge follow-up
	Organizational Barriers to infection control	High workload and insufficient motivation to perform tasks	High workload of nursing staff High workload of laboratory staff Side responsibilities of ICNs* The insufficient motivation of ICNs
		Lack of knowledge of medical staff	Lack of knowledge of personnel involved in patient care Lack of knowledge of ICNs Lack of knowledge of physicians Inadequacy of educational programs Lack of knowledge of hospital and university officials about infection control
		Lack of human resources	Lack of nursing staff working in the departments Lack of laboratory staff Lack of workforce in the office of infection control Inappropriate distribution of infectious diseases specialists
		Functional and logistical weaknesses in infection control	Low-quality materials Inappropriate physical space of departments Lack of equipment and materials ICNs lack access to the HIS & Lack of equipped laboratories in the hospital HAIs [#] are not a priority for hospital and university administrators Lack of support from hospital and university administrators
		Weakness in the monitoring and surveillance system	Passive surveillance system Underreporting Lack of necessary infrastructure for communication between medical centers Lack of necessary infrastructure for post-discharge tracking and follow-up Inadequate monitoring of antibiotic use Inactivity of the infection control team and committee Lack of feedback

* ICNs: Infection control nurses; & HIS: Hospital information system; [#] HAIs: Healthcare-associated infections.

most of the time they don't answer us and get furious about why we contacted them." (ICN 3).

2. Organizational Barriers to Infection Control

2.1. High Workload and Insufficient Motivation to Perform Tasks

The workload of medical and paraclinical staff and ICNs plays an important role in implementing HAIs control and prevention programs. One of the problems and challenges in the HAIs surveillance system is the high workload of various staff dealing with HAIs and the low motivation of ICNs due to a lack of support and specific and proper or-

ganizational position and financial benefits. "The least noticed place is the infection control department. There is only one. The legal status I have as an infection control nurse is that I work in the hospital but do not have a specific position in a department." (ICN 11).

2.2. Lack of Knowledge of Medical Staff

2.2.1. Lack of Knowledge of Physicians

The role of physicians in HAIs control and prevention is critical. Because education is essential to implementing HAIs programs, updating information for physicians and educating them about infection control and prevention

should be on the agenda of HAIs surveillance system planners and implementers. *"A course specifically for physicians would be significantly better. Specifically, there might be a lot more patients if physicians reported."* (ICN 8).

2.3. Lack of Human Resources

2.3.1. Inappropriate Distribution of an Infectious Disease Specialist

A hospital may experience difficulties if there is no infectious disease expert on staff who can confirm HAIs. The number of cases found could decline as a result. The lack of an infectious disease specialist in hospitals with a small number of beds and a single specialty can be a barrier to HAIs detection and control, which was more common in some hospitals during infectious disease epidemics such as the COVID-19 pandemic. *"[One of the problems] is the lack of a resident infectious disease physician in hospitals, especially single-specialty hospitals."* (ICN 13).

2.4. Functional and Logistical Weaknesses in Infection Control

2.4.1. ICNs Lack of Access to the Hospital Information System (HIS)

Lack of access to the HIS system and an equipped laboratory was one of the problems reported by ICNs. Removing the obstacles and problems and providing the necessary infrastructure for better HAIs detection is one of the basic requirements for the HAIs surveillance system. *"We must have access to the systems [HIS], be able to diagnose accurately, and have access from anywhere else if we are to avoid missing the patient or the infection."* (ICN 5).

2.4.2. Lack of Equipped Laboratories in the Hospital

One of the weaknesses of a HAIs surveillance system was the lack of a well-equipped and functional laboratory for HAIs detection. Without a laboratory in the hospital, it is challenging to identify HAIs cases. This issue gets worse when, despite the hospital having a laboratory, the laboratory lacks the tools necessary to detect cases despite the use of antibiotics, and when, despite a clinical diagnosis of HAIs, the specimen sent turns out to be negative due to the use of antibiotics before the culture is sent, which increases the number of false-negative results for HAIs. Evidence shows that some hospitals do not have the necessary equipment to detect HAIs cases despite the use of antibiotics. *"We do not have an active laboratory system that informs us of antibiotic resistance or cultures at the right time, which means that the microbiology department of the laboratory has to deal with a lack of staff and equipment."* (ICN 8).

2.4.3. Lack of Support from Hospital and University Administrations

HAIs control, like any other program, requires the help and support of officials. The lack of support from officials results in the HAIs control program not being taken seriously by staff in treatment and paraclinical departments and by subordinate officials, and thus the success of control programs declines. It seems that the performance of hospital officials and deputy treatment for prevention and control of HAIs is inadequate because ICNs indicated that they do

not have the support of officials, including hospital officials (eg, director of nursing). *"If a decision is taken in the infection control committee, the board of the hospital should support the expert for the decision to be taken."* (ICN 18).

2.5. Weaknesses in the Monitoring and Surveillance System

2.5.1. Lack of Necessary Infrastructure for Post Discharge Tracking and Follow-up

Among the problems in identifying HAIs is the system of post discharge follow-up. Enabling the post discharge follow-up system can help increase the number of HAIs reported. *"The patient leaves the hospital; then, there is not much follow-up, it is not possible at all for one person to take over tasks both in the hospital and outside the hospital."* (ICN 2).

2.5.2. Lack of Necessary Infrastructure for Communication Between Medical Centers

One of the effective factors in identifying and controlling HAIs is interhospital communication and awareness of the length of hospital stay and actions taken. Lack of adequate communication and access to procedures and treatments may be the missing piece in identifying and controlling HAIs. ICNs indicated a lack of ability to communicate and track actions taken at the hospital where the patient was previously hospitalized. *"If I had a case of HAIs from another hospital here and it's being treated, I can establish that relationship with that hospital appropriately so that at least we can do something for the patient to prevent these cases from recurring."* (ICN 15).

Discussion

Among the essential problems standing in the way of the HAIs surveillance system are misdiagnosis and underreporting of HAIs, which is one of the problems of the HAIs surveillance system in Iran (25). According to the results of this study, there are several reasons for these problems in Iranian hospitals. These problems included insufficient attention of hospital managers (president, hospital director, and nursing director) and deputy treatment managers, lack of cooperation of some physicians, inappropriate distribution of infectious disease specialists in some hospitals, and lack of cooperation of head nurses, nurses, and laboratory staff. According to the ICNs, the shortage of nursing and laboratory staff and the heavy workload of nursing and laboratory staff can be considered as the reason for their non-cooperation. The logistical weakness of HAIs control and prevention is a major challenge and has caused HAIs surveillance system programs to deviate from their goals.

According to the ICNs, managers at different levels are not doing enough for the HAIs control and prevention program, and it seems that HAIs are not among the priorities of health managers; this problem was also mentioned in another study in Iran (19). If so, the HAIs system needs the cooperation of these people. Inadequate support from these individuals is an important barrier to infection control in hospitals in the country (26). Involving leaders in the HAIs control program leads to the allocation of more resources, motivation of staff, planning of training needs, feedback,

and transparency about HAIs (27). Leaders can identify HAIs as a priority, and their perspective improves communication with lower levels of management and frontline staff. The appropriate adjustments can also be made by managers to help the HAIs control program. Frontline employees are reminded to put forth their best effort in HAIs control by managers' attention to the program and their visits to carry out the program. Providing appropriate feedback to staff on how they are performing about HAIs informs them on how to provide clinical care that does not result in HAIs. When managers are at the center of the HAIs control program, they can help strengthen the HAIs control program by identifying weaknesses in staff training and replicating the best training for staff (28). To be successful with HAIs control programs, managers should pay more attention to HAIs. For example, the nurse manager's attention to the program enhances the performance of the head nurse who plays a key role in properly implementing infection control programs. Indeed, managers' views of staff indicate that the HAIs control program and the errors that led to HAIs are among the system's priorities. Therefore, despite the fact that everyone is aware of the busy work that treatment area managers do, they should be aware of the fact that they play a crucial and vital role in the HAIs surveillance system. They should also pay close attention to this crucial issue.

A significant factor in the underreporting of HAIs may be the lack of collaboration among physicians and the improper distribution of infectious diseases specialists in some hospitals, particularly in small hospitals and hospitals with Single-specialty. Meanwhile, this problem is still a challenge in implementing infection control system programs in hospitals where the role of physicians in HAIs control and prevention programs is clear and specific (29). When there is no collaboration in defining HAIs types based on the HAIs system guidelines, it is impossible to identify and confirm HAIs (30). This lack of collaboration may be caused by some physicians' lack of knowledge about HAIs and the surveillance system. Therefore, increasing physicians' knowledge, awareness, and empowerment is a crucial issue that should be taken into account (29). According to the ICNs in the present study and previous findings, this is true even though only a small number of physicians participate in educational workshops (29). Implementing a successful HAIs prevention and control program requires collaboration among all stakeholders (31), particularly physicians, infection control specialists, and infection control committee members (20). Therefore, policymakers, planners, and health care leaders should consider how to encourage and raise awareness of physician participation in the HAIs surveillance system and identify barriers and issues that may be the reason for the lack of physician cooperation and infectious disease specialists in some hospitals.

The present HAIs control and prevention surveillance system faces weak collaboration among all nurses, especially infection control link nurses and laboratory staff. The success of surveillance system programs depends on the quality of data collected. Many people are collecting data in the surveillance system (32). According to another study

from Iran, collaboration among the people involved in the hospital surveillance system is necessary for the program's success (20). Since nurses have the most contact with patients, their teamwork, especially with physicians, is a great help in control programs (33). Infection control link nurses provide a link between nurses and the infection control team (34). The lack of cooperation among staff results in a failure to recognize the true burden of these infections. This lack of cooperation has already been noted in another qualitative study in Iran (19). The lack of adequate staff cooperation may have reasons such as the high workload of staff (19) due to the high volume of clerical tasks in addition to patient tasks (26) and the low number of human resources (19). The lack of time for daily activities (29) has made it impossible to implement the daily infection control program. However, it must be remembered that insufficient employee comprehension of low-risk situations and knowledge (35) may also be contributing factors to the low level of staff involvement with the infection control program. Therefore, training programs should be improved according to the effective role of training (26), and regular and consistent training programs (32) should be implemented. Officials should note that increasing nurses' strength and resilience for infection control is also important for infection control programs (34). Staff members should pay more attention to the fact that their lack of attention to the infection control issue may significantly impact the implementation of the program in addition to decreasing issues such as staff workload and raising staff awareness on behalf of treatment area officials. Logistical deficiencies, such as limited access to electronic systems, a lack of equipment, low-quality materials, and a lack of a laboratory with the necessary tools, are one of the challenges in the control and prevention of HAIs. Access to data is an essential requirement and one of the challenges of the HAIs control and prevention program. To successfully implement the HAIs prevention and control program, it is necessary to have access to the required data at all times (26). Time is successfully freed up for other HAIs prevention program activities, such as staff training, when HAIs are identified, tracked, and reported using an electronic system. However, we should not forget that not all problems can be solved with the electronic system, which is not a comprehensive solution to the HAIs problem (36). In addition to the lack of access to an effective electronic system, the low quality of materials, which was also mentioned in another study in Iran, also leads to the inability of some healthcare workers to comply with hygiene principles (19). In addition to the low quality of materials, the lack of equipment also makes staff less able to comply with hygiene principles (37). Using gloves and masks and adhering to standard precautions are important issues in HAIs control. Another study in Iran has cited this issue as a solution to reduce HAIs (20). The microbiology laboratory is one of the most important components of the HAIs surveillance system necessary to identify new HAIs cases and microbial resistance. The lack of a well-equipped laboratory in some hospitals is also one of the challenges of the existing HAIs control and prevention program. Although having a microbiologist on staff, who is a crucial and significant element

of the infection control team, is necessary for the HAIs control program, it is impossible to identify (38) and treat HAIs effectively without a properly equipped laboratory (39). Therefore, resolving logistical issues and weaknesses is crucial to the HAIs prevention and control program, and formal planning should be established to address logistical issues. This is something that health officials should take into consideration. The main barriers and suggestions for infection prevention and control (IPC) were evaluated in different countries. According to a study in Sweden, the barriers to IPC were poor unit-level commitment to HAI concerns, inadequate support at higher management levels, limited time allotted for HAI work, incorrect staff perceptions of their roles in the HAI issue, and low perceptions of staff about IPC (29). Also, a study showed that the main barriers to control HAI caused a lack of infrastructure, a scarcity of skilled employees, and a lack of trained personnel (40). According to research conducted in 8 low-and middle-income countries, the main obstacle to IPC was a lack of resources, which included a lack of hospital furniture, medications, and necessary IPC supplies, including cleaning equipment (41). The main obstacles in Mongolia were a lack of laboratory space and an inadequate budget for IPC (42). Additionally, the following recommendations were made for the IPC: provide staff with competitive incentives, (43, 44), ensure that tools and supplies are useful, (43), and establish a system of feedback following the reporting of an infection, (40, 43, 44), develop automation options to facilitate and improve data collection, (45, 46), raise the standards of the surveillance system, lessen the workload, lengthen follow-up periods, (46), and evaluate the structure of facilities and laboratories (40). Increase staff communication and IPC awareness (41,43,44), make IPC their primary responsibility, integrate IPC as a structural educational element into study program curricula (44), update the policy (47), and allocate sufficient funds (43, 47).

Limitations

First, we included the ICNs from governmental hospitals, most of which were included in the south of Iran. Because the culture, facilities, workforce, logistics, management structure, roles, and responsibilities are different in different hospitals and other regions, the results could not be generalizable to other hospitals in other parts of the country. Second, 2 biases could have an impact on the findings and generalizability of this study: selection bias as the participants were selected using convenience sampling in accordance with the framework of a qualitative study, and information bias as some participants may have exaggerated the barriers as the study was conducted in the time of the COVID-19 pandemic. Thus, it is recommended that this study be conducted in other areas of the country.

Conclusion

A few issues with Iran's HAI surveillance system include insufficient reporting, the incorrect allocation of infection specialists, and certain physicians' lack of cooperation, as well as the lack of cooperation among infection control link

nurses. Treating physicians seem concerned, which has affected their practice of HAIs reporting and makes some of them hesitant to report HAIs. HAIs control, however, has not been given top importance in the daily routines of staff members due to their heavy workload. The HAIs surveillance system program needs the attention of health officials and managers. The attention of officials and managers is, directly and indirectly, focused on increasing coverage and improving indicators of the HAIs surveillance system. Reducing the logistical problems of the HAIs control and prevention program is necessary to achieve the goals of the program along with other measures.

Acknowledgments

The authors appreciate the support of the infection control nurses and hospital staff who made this study possible.

Ethical Considerations

This study was approved by the Ethics Committee of the Kerman University of Medical Sciences (ethics code IR.KMU.REC.1400.270). Before the start of the study, all participants gave their informed consent, and the interview was recorded. The research team guaranteed confidentiality, and participants received guarantees that their information would be kept confidential and that, if they were dissatisfied, they could refuse to answer any questions they did not want to answer.

Conflict of Interests

The authors declare that they have no competing interests.

References

1. Department of Health and Human Services (HHS). Health Care-Associated Infections, <https://www.hhs.gov/oidp/topics/health-care-associated-infections/index.html>. Accessed 17 May 2023.
2. Markwart R, Saito H, Harder T, Tomeczyk S, Cassini A, Fleischmann-Struzek C, et al. Epidemiology and burden of sepsis acquired in hospitals and intensive care units: a systematic review and meta-analysis. *Intensive Care Med*. 2020 Aug;46 (8):1536-51.
3. Nimer NA. Nosocomial Infection and Antibiotic-Resistant Threat in the Middle East. *Infect Drug Resist*. 2022 Feb 25;15:631-9.
4. Sikora A, Zahra F. Nosocomial infections. In: *StatPearls* [Internet]. 2022 Feb 28. StatPearls Publishing.
5. Spiga R, Subtil F, Grattard F, Fascia P, Mariat C, Auboyer C, et al. Hospital-acquired infections documented by repeated annual prevalence surveys over 15 years. *Med Mal Infect*. 2018 Mar;48(2):136-40.
6. Wang J, Liu F, Tartari E, Huang J, Harbarth S, Pittet D, et al. The prevalence of healthcare-associated infections in mainland China: a systematic review and meta-analysis. *Infect Control Hosp Epidemiol*. 2018 Jun;39(6):701-9.
7. Zhang Y, Zhong ZF, Chen SX, Zhou DR, Li ZK, Meng Y, et al. Prevalence of healthcare-associated infections and antimicrobial use in China: Results from the 2018 point prevalence survey in 189 hospitals in Guangdong Province. *Int J Infect Dis*. 2019 Dec;89:179-84.
8. Alemu AY, Endalamaw A, Belay DM, Mekonen DK, Birhan BM, Bayih WA. Healthcare-associated infection and its determinants in Ethiopia: A systematic review and meta-analysis. *PloS One*. 2020 Oct 23;15(10):e0241073.
9. Saleem Z, Hassali MA, Godman B, Hashmi FK, Saleem F. A multicenter point prevalence survey of healthcare-associated infections in Pakistan: findings and implications. *Am J Infect Control*. 2019 Apr;47(4):421-4.
10. Iliyasu G, Dayyab FM, Abubakar S, Inuwa S, Tambuwai SH, Tihamiyu AB, et al. Laboratory-confirmed hospital-acquired infections: An analysis of a hospital's surveillance data in Nigeria. *Heliyon*. 2018 Aug

- 2;4(8):e00720.
11. Ghashghaee A, Behzadifar M, Azari S, Farhadi Z, Bragazzi NL, Behzadifar M, et al. Prevalence of nosocomial infections in Iran: A systematic review and meta-analysis. *Med J Islam Repub Iran*. 2018 Jun 11;32:48.
 12. Mohammadi M, Vaisi Raiegan A, Jalali R, Ghobadi A, Salari N, Barati H. The prevalence of nosocomial infections in Iranian hospitals. *J Babol Univ Me Sci*. 2019;21:39-45.
 13. Alp E, Damani N. Healthcare-associated infections in intensive care units: epidemiology and infection control in low-to-middle income countries. *J Infect Dev Ctries*. 2015 Oct 29;9(10):1040-5.
 14. Han C, Song Q, Meng X, Lv Y, Hu D, Jiang X, et al. Effects of a 4-year intervention on hand hygiene compliance and incidence of healthcare associated infections: a longitudinal study. *Infection*. 2021 Oct;49(5):977-81.
 15. Khan HA, Baig FK, Mehboob R. Nosocomial infections: Epidemiology, prevention, control and surveillance. *Asian Pac J Trop Biomed*. 2017;7(5):478-82.
 16. Eybpoosh S, Eshtrati B. Nosocomial Infection Surveillance System in Iran: Structures, Processes and Achievements. *Iran J Epidemiol*. 2019;15:105-15.
 17. Pezhman B, Fatemeh R, Amir R, Mahboobeh R, Mohammad F. Nosocomial infections in an Iranian educational hospital: an evaluation study of the Iranian nosocomial infection surveillance system. *BMC Infect Dis*. 2021 Dec 15;21(1):1256.
 18. Kajiyazdi M, Dasdar S, Kianfar N, Kaveh M. Nosocomial Infection Surveillance in Neonatal Intensive Care Units of Bahrani Children's Hospital. *Arch Pediatr Infect Dis*. 2021;9(3):e108840.
 19. Esfandiari A, Rashidian A, Asl HM, Foroushani AR, Salari H, Sari AA. Prevention and control of health care-associated infections in Iran: A qualitative study to explore challenges and barriers. *Am J Infect Control*. 2016 Oct 1;44(10):1149-53.
 20. Esfandiari A, Salari H, Rashidian A, Asl HM, Foroushani AR, Sari AA. Eliminating healthcare-associated infections in Iran: a qualitative study to explore stakeholders' views. *Int J Health Policy Manag*. 2018 Jan 1;7(1):27-34.
 21. Seifi A, Dehghan-Nayeri N, Rostamnia L, Varaei S, Sari AA, Haghani H, et al. Health care-associated infection surveillance system in Iran: Reporting and accuracy. *Am J Infect Control*. 2019 Aug;47(8):951-5.
 22. Hsieh HF, Shannon SE. Three approaches to qualitative content analysis. *Qual Health Res*. 2005 Nov;15(9):1277-88.
 23. Graneheim UH, Lundman B. Qualitative content analysis in nursing research: concepts, procedures and measures to achieve trustworthiness. *Nurse Educ Today*. 2004 Feb;24(2):105-12.
 24. Korstjens I, Moser A. Series: Practical guidance to qualitative research. Part 4: Trustworthiness and publishing. *Eur J Gen Pract*. 2018 Dec;24(1):120-4.
 25. Nasiri N, Sharifi A, Ghasemzadeh I, Khalili M, Karamoozian A, Khalooei A, et al. Incidence, accuracy, and barriers of diagnosing healthcare-associated infections: a case study in southeast Iran. *BMC Infect Dis*. 2023 Mar;23(1):171.
 26. McAlearney AS, Hefner JL. Facilitating central line-associated bloodstream infection prevention: a qualitative study comparing perspectives of infection control professionals and frontline staff. *Am J Infect Control*. 2014 Oct;42 Suppl 10:S216-22.
 27. McClung L, Obasi C, Knobloch MJ, Safdar N. Health care worker perspectives of their motivation to reduce health care-associated infections. *Am J Infect Control*. 2017 Oct 1;45(10):1064-1068.
 28. McAlearney AS, Gaughan AA, DePuccio MJ, MacEwan SR, Hebert C, Walker DM. Management practices for leaders to promote infection prevention: lessons from a qualitative study. *Am J Infect Control*. 2021 May;49(5):536-41.
 29. Ridelberg M, Nilsen P. Using surveillance data to reduce healthcare-associated infection: a qualitative study in Sweden. *J Infect Prev*. 2015 Sep;16(5):208-14.
 30. Eshtrati B, Asl HM, Afhami S, Pezeshki Z, Seifi A. Health care-associated infections in Iran: a national update for the year 2015. *Am J Infect Control*. 2018 Jun;46(6): 663-67.
 31. Stone PW, Pogorzelska-Maziarz M, Reagan J, Merrill JA, Sperber B, Cairns C, et al. Impact of laws aimed at healthcare-associated infection reduction: a qualitative study. *BMJ Qual Saf*. 2015 Oct;24(10):637-44.
 32. Russo PL, Havers SM, Cheng AC, Richards M, Graves N, Hall L. Characteristics of national and statewide health care-associated infection surveillance programs: a qualitative study. *Am J Infect Control*. 2016 Dec 1;44(12):1505-1031.
 33. Robbins J, McAlearney AS. Encouraging employees to speak up to prevent infections: Opportunities to leverage quality improvement and care management processes. *Am J Infect Control*. 2016 Nov 1;44(11):1224-30.
 34. Dekker M, Mansfeld Rv, Vandenbroucke-Grauls CM, Lauret TE, Schutjser BC, de Bruijne MC, et al. Role perception of infection control link nurses: a multi-centre qualitative study. *J Infect Prev*. 2022 May;23(3):93-100.
 35. Maroldi MAC, Felix AMdS, Dias AAL, Kawagoe JY, Padoveze MC, Ferreira SA, et al. Adherence to precautions for preventing the transmission of microorganisms in primary health care: a qualitative study. *BMC Nurs*. 2017 Sep 11;16:49.
 36. Uchida M, Stone PW, Conway LJ, Pogorzelska M, Larson EL, Raveis VH. Exploring infection prevention: policy implications from a qualitative study. *Policy Polit Nurs Pract*. 2011 May;12(2):82-9.
 37. Joshi SC, Diwan V, Tamhankar AJ, Joshi R, Shah H, Sharma M, et al. Staff perception on biomedical or health care waste management: A qualitative study in a rural tertiary care hospital in India. *PLoS One*. 2015 May 29;10(5):e0128383.
 38. Kalenic S, Budimir A. The role of the microbiology laboratory in healthcare-associated infection prevention. *Int J Infect Control*. 2009 Mar 14;5(2).
 39. Curren EJ, Lutgring JD, Kabbani S, Diekema DJ, Gitterman S, Lautenbach E, et al. Advancing diagnostic stewardship for healthcare-associated infections, antibiotic resistance, and sepsis. *Clin Infect Dis*. 2022 Mar 1;74(4):723-8.
 40. Bardossy AC, Zervos J, Zervos M. Preventing hospital-acquired infections in low-income and middle-income countries: impact, gaps, and opportunities. *Infect Dis Clin North Am*. 2016 Sep;30(3):805-18.
 41. Lowe H, Woodd S, Lange IL, Janjanin S, Barnett J, Graham W. Challenges and opportunities for infection prevention and control in hospitals in conflict-affected settings: a qualitative study. *Confl Health*. 2021 Dec 20;15(1):94.
 42. Ider BE, Adams J, Morton A, Whitby M, Clements A. Perceptions of healthcare professionals regarding the main challenges and barriers to effective hospital infection control in Mongolia: a qualitative study. *BMC Infect Dis*. 2012 Jul 31;12(1):170.
 43. Alqattan H, Cleland J, Morrison Z, Cameron IM. Exploring Patient Safety Culture in a Kuwaiti Secondary Care Setting: A qualitative study. *Sultan Qaboos Univ Med J*. 2021 Feb;21(1):e77-e85.
 44. Houben F, van Hensbergen M, den Heijer CD, Dukers-Muijers NH, Hoebe CJ. Barriers and facilitators to infection prevention and control in Dutch psychiatric institutions: a theory-informed qualitative study. *BMC Infect Dis*. 2022 Mar 11;22(1):243.
 45. Mitchell BG, Hall L, Halton K, MacBeth D, Gardner A. Time spent by infection control professionals undertaking healthcare associated infection surveillance: a multi-centred cross sectional study. *Infect Dis Health*. 2016;21(1):36-40.
 46. Verberk JD, van der Kooij TI, Derde LP, Bonten MJ, de Greeff SC, van Mourik MS. Do we need to change catheter-related bloodstream infection surveillance in the Netherlands? A qualitative study among infection prevention professionals. *BMJ Open*. 2021 Aug 18;11(8):e046366.
 47. National Assessment of the Infection Prevention and Control System in Thailand [cited 2022 Oct 18] Available from: <http://ihppthaigov.net/DB/publication/attachresearch/426/chapter1.pdf> NAotIPaCSiT.