

## [Challenges in implementing electronic hand hygiene monitoring systems in King Khaled Hospital)

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### الملخص باللغة العربية:

**مقدمة:** تعتبر نظافة اليدين واحدة من أكثر الطرق فعالية للحد من انتقال مسببات الأمراض التي تسبب العدوى المرتبطة بالرعاية الصحية (HAIs). يمكن تسمية الإصابات المرتبطة بالرعاية الصحية (HCAIs) كأحد أعباء العالم في الوقت الحاضر (Weston)، (Burgess & Roberts 2016) وفقاً للإحصاءات العالمية، فإنها تؤثر على مئات الملايين من المرضى سنوياً، ويمكن أن يطلق على "HCAI الحدث الضار الأكثر شيوعاً في الرعاية الصحية"، والذي لا تزال البيانات الإحصائية الموثوقة غير معروفة.

**الهدف:** الهدف الرئيسي من هذه الدراسة هو تحديد التحديات في تنفيذ أنظمة مراقبة نظافة اليدين الإلكترونية.

**المنهج:** لغرض أهداف الدراسة الحالية يستخدم الباحث الاستبانة لمعرفة النتائج المتوقعة.

**النتائج:** أظهرت النتائج أهمية التغييرات في التصورات المتعلقة بالعدوى المرتبطة بالرعاية الصحية.

**الكلمات المفتاحية:** التحديات، نظافة اليدين، أنظمة مراقبة نظافة اليدين الإلكترونية.

## Abstract:

**Introduction:** Hand hygiene is one of the most effective ways of reducing the transmission of pathogens that cause health care–associated infections (HAIs). Healthcare-associated infections (HCAIs) can be named as one of the worlds’ burdens nowadays (Weston, Burgess & Roberts 2016). According to worldwide statistics, they affect hundreds of millions of patients yearly, and HCAI can be called “the most frequent adverse event in health care”, which reliable statistical data is unknown.

**Objective:** The main aim of this study is to identify the challenges in implementing electronic hand hygiene monitoring systems.

**Method:** For the purpose of the current study objectives, the researcher will use the questionnaire to catch the expected results.

**Results:** The findings showed that the importance of the changes in perceptions of healthcare-associated infections.

**Keywords:** Challenges, Hand hygiene, Electronic hand hygiene monitoring systems.

## Introduction

Hand hygiene is one of the most effective ways of reducing the transmission of pathogens that cause health care–associated infections (HAIs). Healthcare-associated infections (HCAIs) can be named as one of the worlds’ burdens nowadays (Weston, Burgess & Roberts 2016). According to worldwide statistics, they affect hundreds of millions of patients yearly, and HCAI can be called “the most frequent adverse event in health care”, which reliable statistical data is unknown (World Health Organization, 2021).

Even though hand hygiene (HH) is a basic and the most accessible way of infection prevention, implementing and maintaining its successful practices is a challenging process. Moving forward to successful HH practices can be possible with its proper assessment. It becomes a crucial factor in the healthcare facilities and, especially, hospitals considering HCAIs. The HH assessment and monitoring is done by electronic systems is not a common method nowadays. The reason for that is the lack of accuracy and feasibility of existing electronic hand hygiene monitoring systems (EHHMS) (Levin, et al, 2019).

## Literature Review

In this section, the researcher analyses literature from different references in all countries especially research done on the Challenges in implementing electronic hand hygiene monitoring systems in King Khaled Hospital.

## Review of Evidence

Hand hygiene is one of the most important practices in preventing the spread of infections in healthcare settings. However, ensuring that healthcare workers comply with hand hygiene guidelines can be a challenge. Electronic hand hygiene monitoring systems have been introduced as a way to improve compliance and reduce the risk of healthcare-associated infections.

King Khaled Hospital is a large healthcare facility in Saudi Arabia that has implemented electronic hand hygiene monitoring systems. However, there are challenges that need to be addressed to ensure the effective implementation of these systems. Some of these challenges include:

1. Resistance to change: Healthcare workers may resist the implementation of electronic hand hygiene monitoring systems because it requires them to change their behavior and adopt new practices.
2. Technical issues: Electronic hand hygiene monitoring systems may be prone to technical issues such as connectivity problems, data accuracy issues, and system downtime.
3. Data privacy and security concerns: The collection and storage of personal data may raise concerns among healthcare workers and patients about data privacy and security.
4. Cost: Electronic hand hygiene monitoring systems may require significant financial investment, which may be a barrier to implementation.
5. Training and education: Healthcare workers may require training and education on how to use electronic hand hygiene monitoring systems effectively.

Addressing these challenges will be critical to the successful implementation and adoption of electronic hand hygiene monitoring systems in King Khaled Hospital, and ultimately improving patient safety and reducing healthcare-associated infections.

### **Theoretical framework literature**

Hospital Acquired Infections (HAIs) is the most adverse event that cause worsening of the patients' clinical outcomes. Global evidence shows its impact in increasing mortality rates of 18.7% - 75.1%, extending the length of stay (LOS) by 3.9 - 12 days, and increasing health costs by \$593 - \$40,000/case. The acquisition of infection is caused by multifactorial, but one of the most important causes is the poor practice of clean care in healthcare facilities.

Hand hygiene by all health care workers (HCWs), including those outside the medical or nursing staff, also by the patients and their relatives, is the key factor in clean care, the simple and cost-effective method to prevent HAIs. Although hand hygiene is not the only element measured in infection control, there is much evidence to prove that improvements to hand hygiene is a strategic element in reducing the incidence of HAIs. Multi-modal hand hygiene improvement strategy (MHHS) is developed by WHO to promote practical improvement for several decades in most hospitals worldwide. However, the HCWs' hand hygiene practices at the point of care, in many developing countries' hospitals, including those in Indonesia, are still at varying levels.

The researcher hopes obtain valuable and useful results that contribute to suggest a more feasible EHHMS's adoption strategy for hospitals, and to improve HH monitoring in the hospital environment by increasing the feasibility of the electronic hand hygiene monitoring systems.

However, many studies show high potential and effectiveness of the technology for hand hygiene assessment improvement (Meng, Sorber, Herzog, Igel & Kugler 2018). So, finding solutions for EHHMS's adoption and feasibility challenges will increase the profit of the system's advantages. Consequently, it may increase awareness of hand hygiene compliance level among the population, influence people behavior and, finally, prevent communicable diseases and, especially, HAIs. Nurses are the key actors in a strategy of the effective hand hygiene compliance practices among the population

since the numbers of hand hygiene events in their daily work is the biggest, and they mainly play the role of educator for patients and clients in health care.

Most of the studies related to the HH monitoring performed with help of technology, which are available in databases, were conducted in English language mostly in the USA, UK and some other European and South American countries. There was no reliable information among academic articles or other research works found concerning similar experiments done in KSA. The theoretical framework provides with evidence-based epidemiological knowledge on infection transmission and its prevention methods, including HH quality, compliance rate, environment specifics, and data collection methods.

### Summary

In summary, the experimental data gap instruction regarding the challenges of implementing electronic environment monitoring systems at Khalid King Hospital. This can allow the infection to spread over a short period of time. In addition, continuing professional education has been prepared and hand hygiene training has been incorporated into the health exercise curriculum.

### Study Objectives and Justification

The main aim of this study is to identify the challenges in implementing electronic hand hygiene monitoring systems.

1. Identify the ways used in implementing electronic hand hygiene monitoring systems
2. To determine the challenges faced providers in King Khalid hospital through implementing electronic hand hygiene monitoring systems
3. To find out how to improve HH monitoring methods in the hospital environment

### Study Questions:

1. What are the ways used in implementing electronic hand hygiene monitoring systems?
2. What are the challenges faced providers in King Khalid hospital through implementing electronic hand hygiene monitoring systems?
3. What is the feasibility of applying electronic hand hygiene monitoring systems in hospitals?

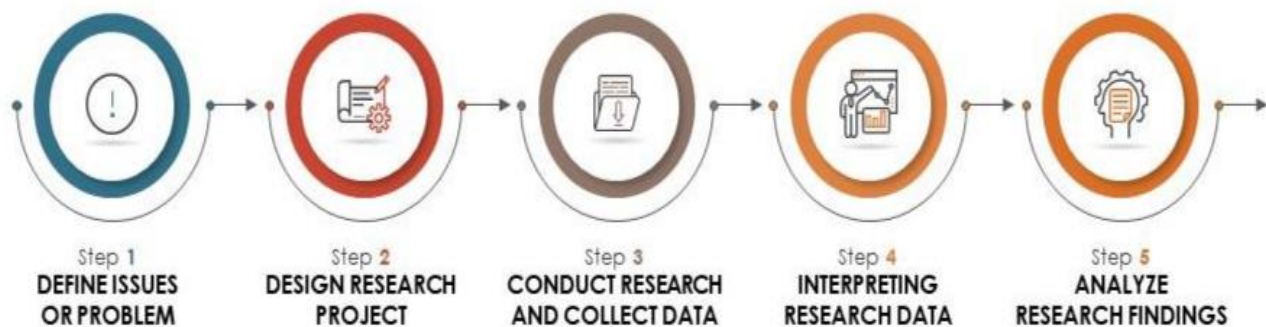


Fig. 1: Research study approach

## Definition of concepts

### Challenges:

Challenges refer to difficulties or obstacles that must be overcome to achieve a particular goal or objective. In the context of electronic hand hygiene monitoring systems, challenges can include a range of issues that can make it difficult to implement or use the technology effectively. These challenges can be related to factors such as cost, privacy concerns, technology limitations, and resistance from healthcare workers. Overcoming these challenges is essential for the successful implementation and adoption of electronic hand hygiene monitoring systems, which are important tools for preventing healthcare-associated infections and improving patient safety.

### hand hygiene:

Hand hygiene refers to the process of cleaning and sanitizing the hands to reduce the presence of germs and prevent the spread of infections. Hand hygiene is a critical practice in healthcare settings, where healthcare workers come into contact with patients and may be exposed to infectious organisms. The most common methods of hand hygiene include washing with soap and water, or using an alcohol-based hand sanitizer. Hand hygiene is important for preventing healthcare-associated infections, which can have serious consequences for patients, particularly those who are already ill or have weakened immune systems.

### Electronic hand hygiene monitoring systems:

Electronic hand hygiene monitoring systems are automated systems that track healthcare workers' compliance with hand hygiene protocols in healthcare settings. These systems use sensors, such as radiofrequency identification (RFID), ultrasound, or infrared, to detect when a healthcare worker enters or exits a patient's room or an area where hand hygiene is required. They may also use cameras to capture images of healthcare workers' hand hygiene practices. The data collected by these systems can be used to provide feedback to healthcare workers and to monitor compliance with hand hygiene protocols, which is important for preventing the spread of healthcare-associated infections.

## Research Methodology

### Introduction

This section explains the methodology and the design of the study. It gives information about the population, the sample, the instrument, as well as the statistical procedures that were used in the study.

### Methods

In studies involving human subjects, Methods for sampling population and the type of sampling procedure (Subject Recruitment, inclusion/exclusion, advertising and Selection), Location, Duration, Specimens, investigations, Potential Risks, Potential Benefits, Contact People)

For the purpose of the current study objectives, the researcher will use the questionnaire to catch the expected results.

**The data collection process will include the following points:**

1. Obtaining official approval to proceed with this study from the chosen hospital.
2. Obtaining official permission from the author of the selected survey.
3. Reviewing the study tool and making the necessary adjustments to it in line with the culture of Saudi hospitals.
4. Conduct an empirical study of the issue of tool reliability and decide if there are adjustments to be made.
5. Collecting data for the study sample by distributing study questionnaires to the participants and ensuring ethical considerations.

**Study Setting**

The current study will be conducted at King Khalid Hospital in Hail, Kingdom of Saudi Arabia.

**Study Subjects:**

The study population consisted of all doctors, specialists and nurses in the infection control department and the intermediate and intensive care departments at King Khalid Hospital. The rest of the people who do not need to wash their hands during work will be excluded because they do not deal with patients directly or do not have direct contact with patients will be excluded from the study.

**Study Design**

Study design will be a quantitative cross-sectional design will be adopted to guide this study. This design characterized by meeting the study objective in measurable time and considered practical advantage of this design examines and describe characteristics of population.

The target population of this study will consist of doctors, specialists and nurses in the infection control department and the intermediate and intensive care departments at King Khalid Hospital. The researcher hopes that the sample size will be all of these staffs, and they approximately (100) sample. The questionnaires will be distributed to the doctors, specialists and nurses in the infection control department and the intermediate and intensive care departments at King Khalid Hospital, and the distribution will be done in a random sample method, as the researcher will not interfere in choosing those hospitals from the study population.

**Sample size:**

The target population of this study consisted of physicians, specialists and nurses in the infection control department and the intermediate and intensive care departments at King Khalid Hospital. After the researcher collected the responses of the sample, they numbered (107) individuals

**Sampling Technique:**

The questionnaires will be distributed to the doctors, specialists and nurses in the infection control department and the intermediate and intensive care departments at King Khalid Hospital, and the distribution will be done in a random sample method, as the researcher will not interfere in choosing those hospitals from the study population.

## Management Plan

The rest of the people who do not need to wash their hands during work will be excluded because they do not deal with patients directly or do not have direct contact with patients will be excluded from the study.

## Data analysis

1. Questionnaires will be distributed to all patients in hospitals within the boundaries of the study population,
2. To measure the validity of the instrument, it will be presented to a number of arbitrators, and then the required adjustments
3. Reliability will be measured using the internal consistency method, using the Cronbach's alpha test.
4. This study depends on statistically analyzing the data collected from the study sample using the SPSS program after its validity and validity are verified for analysis.
5. The arithmetic mean and standard deviation will be extracted to confirm the hypotheses and questions of the study.

## Ethical Considerations

The approval for conducting the particular research will be granted by the Ethics and Research Committee of Hail University.

## Results of the study and discussion

### Discussion

#### The first aspect: Changes in perceptions regarding healthcare associated infections

#### Table (1)

Means and standard deviations for the items “Changes in perceptions of healthcare-associated infections” in descending order of means

(Sample size=107)

Paragraph	Mean	standard deviations	Rank
Effectiveness of hand hygiene in preventing health care associated infection	3.84	0.78	1
Impact of health care associated infection on patient's clinical outcome	3.74	0.75	2
Importance of hand hygiene at institution	3.72	0.68	3
Total	3.76	0.69	***

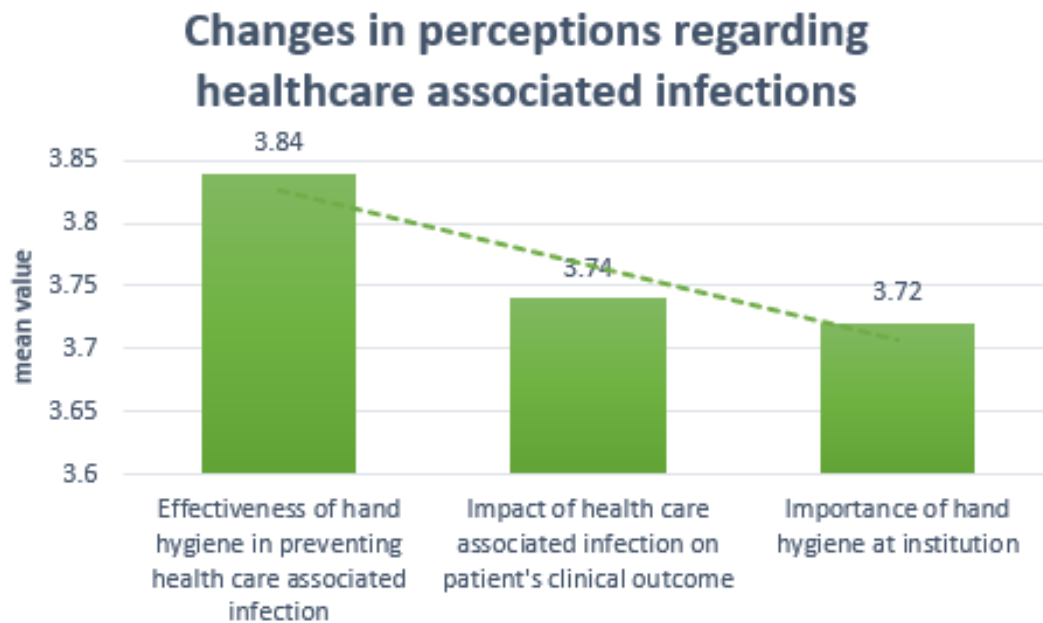


Figure 1: Changes in perceptions regarding healthcare associated infections

This table (1) shows the statistical mean is (3.76) and standard deviation is (0.69). It is noted from this table that paragraph "Effectiveness of hand hygiene in preventing health care associated infection got the highest rank in the average mean of (3.84) and a standard deviation (0.78), and Impact of health care associated infection on patient's clinical outcome got highest rank in the average mean of (3.74) and a standard deviation (0.75), while Importance of hand hygiene at institution got the last rank in the study with (3.72) average and (0.68) standard deviations. This shows the importance of the changes in perceptions of healthcare-associated infections. And we need to give our concern to these factors.

**The second aspect: Healthcare workers recommended activities to permanently improve hand hygiene in their institution**

In order to answer this aspect, the researcher calculated the mean and standard deviation for the paragraphs of the aspect, and arranged them in descending order according to the arithmetic mean of the domain paragraphs. Table (2) indicates that.



**Table (2)**

**Means and standard deviations for the items “Healthcare workers recommended activities to permanently improve hand hygiene in their institution” in descending order of means**

**(Sample size=107)**

<b>Paragraph</b>	<b>Mean</b>	<b>standard deviations</b>	<b>Rank</b>
Leaders and senior managers support and openly promote hand hygiene	3.97	83.9	1
Always perform hand hygiene as recommended (good example to colleagues)	3.93	83.5	2
Each health care worker receives education on hand hygiene	3.89	83.2	3
Hand hygiene posters displayed at point of care as reminders	3.86	82.9	4
Clear and simple instructions on hand hygiene are visible for every health care worker	3.85	82.6	5
Health care workers regularly receive feedback on hand hygiene performance	3.82	81.9	6
Health institution makes alcohol-based hand-rub always available at each point of care	3.79	81.4	7
Patients are invited to remind health care workers to perform hand hygiene	3.77	80.9	8
Total	3.78	79.5	

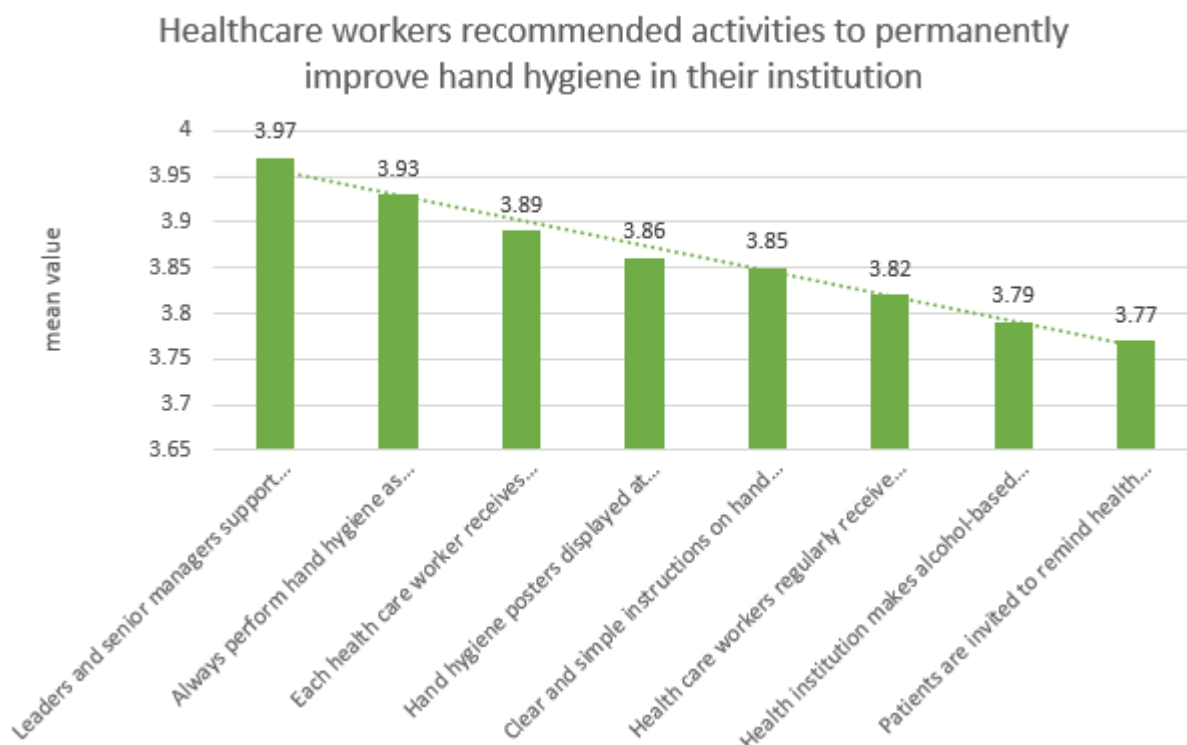


Figure 2: Healthcare workers recommended activities to permanently improve hand hygiene in their institution

This table (2) shows the statistical mean is (3.78) and standard deviation is (79.5). It is noted from this table that paragraph " Leaders and senior managers support and openly promote hand hygiene" ranked first with a mean (3.97) and a standard deviation (83.9), and the paragraph "Always perform hand hygiene as recommended (good example to colleagues)" came in second place with a mean (3.93) and a standard deviation (83.5), the paragraph "Health institution makes alcohol-based hand-rub always available at each point of care" came in second to last with a mean (3.78) and a standard deviation (81.4), and the paragraph " Patients are invited to remind health care workers to perform hand hygiene" came in last rank with a mean (3.77) and standard deviation (80.9).

### The third aspect: Perceived institutional and personal efforts towards hand hygiene

**Table (3)**

**Means and standard deviations of the paragraphs, Perceived institutional and personal efforts towards hand hygiene**

**In descending order according to averages**

**(Sample size=107)**

Paragraph	Mean	standard deviations	Rank
The importance of leaders and senior managers publicly supporting and promoting hand hygiene	4.19	90.1	1
Educating healthcare workers about hand hygiene in meetings and seminars	4.11	88.3	2
Distribute hand hygiene posters at the point of care as a constant reminder	4.02	70.9	3
Always use alcohol-based hand rub after every care	3.89	79.1	4
The importance of having clear and simple hand hygiene instructions visible to every healthcare worker	3.83	80.4	5
Health care workers regularly receive feedback on hand hygiene performance	3.78	73.8	6
Remind health care workers to their peers while working with hand hygiene	3.74	86.0	7
Maintaining hand hygiene as recommended on a regular basis	3.71	84.6	8
Total	3.95	87.5	

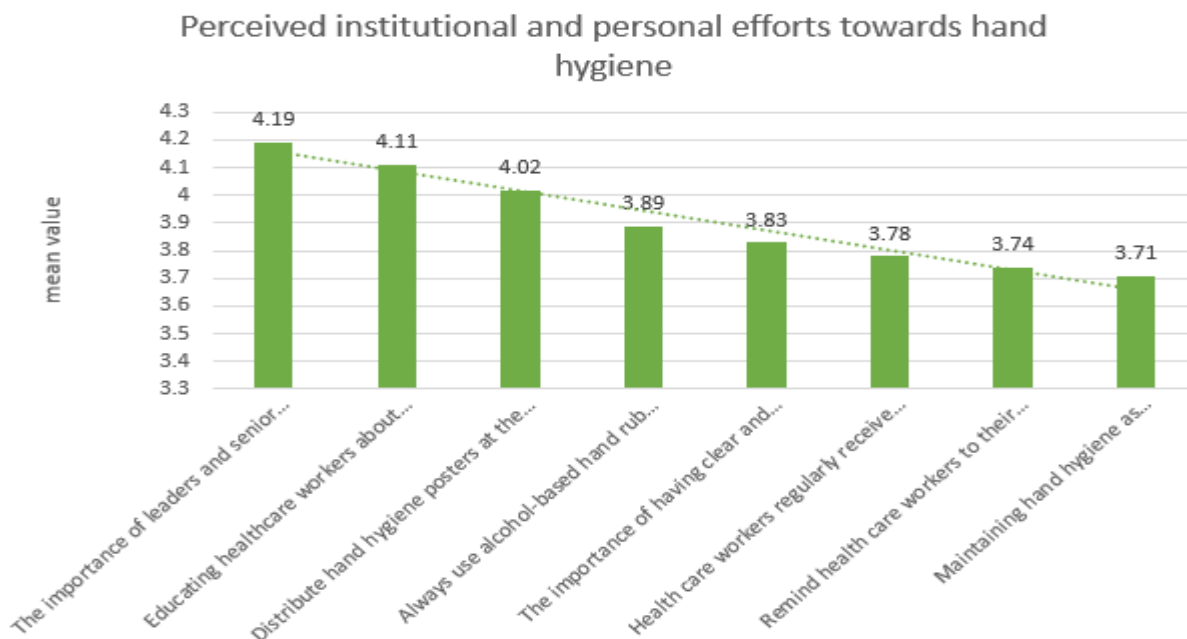


Figure 3: Perceived institutional and personal efforts towards hand hygiene

This table (3) shows the statistical mean is (3.95) and standard deviation is (87.5). It is noted from this table that paragraph " The importance of leaders and senior managers publicly supporting and promoting hand hygiene " ranked first with a mean (4.19) and a standard deviation (90.1), and the paragraph " Educating healthcare workers about hand hygiene in meetings and seminars" came in second place with a mean (4.11) and a standard deviation (88.3), the paragraph "Remind health care workers to their peers while working with hand hygiene" came in second to last with a mean (3.74) and a standard deviation (86.0), and the paragraph "Maintaining hand hygiene as recommended on a regular basis" came in last rank with a mean (3.71) and standard deviation (84.6).

**The fourth aspect: Assessment of interventional policies on hand hygiene**

**Table (4)**

Descriptive statistics of the study sample directions for Assessment of interventional policies on hand hygiene

(Sample size=107)

Paragraph	Mean	standard deviations	Rank
Current hand hygiene promotional campaign increased awareness of good hand hygiene practices	4.19	83.8	1
Participation in educational activities important in improving hand hygiene practices	4.11	83.5	2

Improvement of safety climate helped to improve hand hygiene practices	4.02	83.3	3
Administrators supportive of hand hygiene improvement	3.77	82.5	4
Total	4.02	82.4	

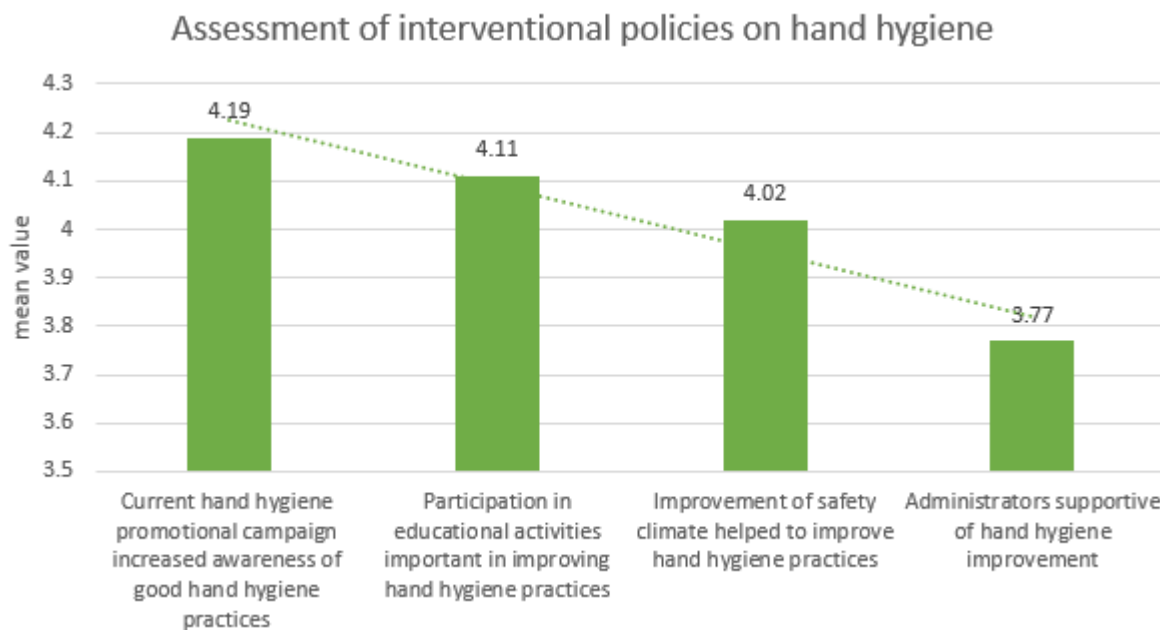


Figure 4: Assessment of interventional policies on hand hygiene

This table (4) shows the statistical mean is (4.02) and standard deviation is (82.4). It is noted from this table that paragraph "Current hand hygiene promotional campaign increased awareness of good hand hygiene practices" ranked first with a mean (4.19) and a standard deviation (83.8), and the paragraph "Participation in educational activities important in improving hand hygiene practices" came in the second place with a mean (4.11) and a standard deviation (83.3) and the paragraph "Administrators supportive of hand hygiene improvement" came in last rank with a mean (3.77) and standard deviation (82.5).

### Conclusion

The recent study assessed the challenges in implementing electronic hand hygiene monitoring systems in King Khaled Hospital, in Hail city, KSA. The overall results showed that the importance of the changes in perceptions of healthcare-associated infections.

## The Results

This study dealt with the challenges in implementing electronic hand hygiene monitoring systems in King Khaled Hospital based on analyzing the results of the study, and answering its questions, and we can summarize the most important results of this study as follows:

1. The role of hand hygiene in preventing health care associated infections is highly effective.
2. Healthcare-associated infections affect a patient's clinical outcome very significantly.
3. Leaders and senior managers publicly support and promote hand hygiene as it plays an important role in preventing the spread of infection.
4. Always perform hand hygiene as recommended (a good example for colleagues).
5. The importance of publicly supporting leaders and senior managers and promoting hand hygiene
6. Health care workers are educated about hand hygiene in meetings and seminars.
7. The importance of hand hygiene promotional campaigns in raising awareness of good hand hygiene practices.
8. Participation in important learning activities contributes to improving hand hygiene practices.

## Recommendations

In light of the current study results provide the researcher a number of recommendations which hopes to contribute to shed light on the subject of challenges in implementing electronic hand hygiene monitoring systems in King Khaled Hospital:

1. We need to give our concern to the changes in perceptions of healthcare-associated infections factors.
2. The health establishment should make alcohol-based hand rub available at every point of care.
3. We need to remind healthcare workers to peer while working with hand hygiene.
4. The need to maintain recommended hand hygiene on a regular basis.
5. The need for officials to support hand hygiene.

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