

# Use of Technology to Reduce Medication Errors and Improve Patient Safety

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**Abstract** – Medical errors have become one of the most common accidents that occur in the hospital. Also, it has become a concern for many patients and affects their confidence in the service provided to them. In fact, many studies have proven that these errors can be avoided by using information technology. According to healthcare providers today, using technology has shown great results in improving patient safety and reducing medical errors. This study aims to evaluate and quantify the impact of technology on medication errors and improve patient safety. The references that were used in the study provide evidence that the technology can reduce medical errors and improve patient safety. The research based on qualitative data was collected from scientific websites and an online survey targeting members of the public, health students, and healthcare providers. The results showed agreement with previous studies that technology can reduce medical errors. However, there were some negatives in the earlier studies and the results we reached about some disadvantages of using technology in hospitals.

**Keywords** – Technology, HIT, EHR, CPOE, Medical errors, Patient Safety.

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## 1. Introduction

The use of technology has become an essential part of healthcare all over the world. Reducing medical errors and Patient safety is one of the most critical goals that make health facilities and hospitals resort to the use of advanced technologies, and they have proven their effectiveness in reaching these goals. Nearly 98,000 deaths occur annually in hospitals due to medical errors, according to Starfield and the American Institute of Medicine (IOM) [1]. For this, we need to have systems and rules that are approved and standardised worldwide. As a subset of healthcare, patient safety refers to avoiding, preventing, and mitigating adverse outcomes or injuries associated with healthcare processes [2]. The use of (HIT) in hospitals and care centers is being generalised and standardized to improve the services provided. The term healthcare information technology (HIT) refers to the use of information processing that involves both computer hardware and software to store, retrieve, share, and utilize healthcare data, knowledge, and information for communication and decision-making [2]. The use of technology also contributes to reducing national concerns caused by the frequency of medical errors and the lack of care that reduces patient safety. Therefore, the latest technologies are now used, such as computerized provider order entry (CPOE), Automated dispensing systems (ADS), Electronic Health Records (EHR), Barcode Medication Administration (BCMA), Radio Frequency Identification (RFID), interdisciplinary application and alert system to prevent such accidents. Accordingly, in this research, we will try to prove that using technology enhances patient safety by preventing medication errors and assessment errors, and we will investigate the reasons for their occurrence.

## 2. Literature review

The research findings were as follows: Technology has been shown to play an essential role in reducing medical errors and improving patient safety, according to the following sources: Some sources say CPOE and EHR are the best methods for reducing medical errors [1], [2].

RFID is another technology that can meet expectations, but if used alone, it will not be sufficient [3]. Some research suggests that Health care professionals must look for optimal measures to ensure patient safety, adequate documentation, and clear communication among the entire patient care team. Also, in hospitals with comprehensive computerized technology and greater automation, patient outcomes are better, with fewer complications, lower mortality, and lower costs [4]. There are, however, some disadvantages to these techniques, including the fact that information technology systems may worsen clinical care because they may generate more work for clinicians or generate new errors themselves [5]. Healthcare systems are expensive, and incentives need to be more aligned, with hospitals and physicians paying for them while insurance companies make more money; these are the main barriers to widespread use [5]. Also, some studies said that some techniques, such as BCMA, need more research to prove their use's effectiveness [6]. Current and future information technology may be a solution for decreasing medical errors and improving patient safety and care; errors could have been prevented by using a well-designed interdisciplinary application and alert system. Health professionals would benefit from a system of alerts that would inform them about data that may affect their decisions [7], [8]. In addition, bar-coding can assist with identifying patients uniquely within a hospital, as well as preventing "wrong patient" and "wrong drug" errors. Smart pumps and bar-coding technologies can also assist with cost savings over CPOE systems [8]. By using a Web-based reporting system for medical errors, healthcare providers reduce the time between reporting errors and risk management investigating them [9]. Finally, Despite the importance of IT in preventing medication errors, other measures such as healthcare worker education, centralized intravenous additive services (CIVAS) and clinical pharmacy are complementary [10]. Ideally, any personnel time saved during IT implementation is devoted to these activities [10].

### 3. Methodology

The primary and Secondary data have been collected. Secondary data from scientific websites and primary data via online surveys that were designed in Google form Were searched to identify articles that discussed the use of technology to reduce medication errors and improve patient safety. We have created an online survey targeting Healthcare providers and students in the medical field and public members, and they will be asked to complete a questionnaire to evaluate the way

to reduce medical errors and improve patient safety and what is the contributing factors related to these errors.

Our research also is based on the qualitative method and the study sample representative through the snowball technique. We asked a variety of types of questions: open questions and closed-ended questions. And we published the questionnaire through social media and groups of health professionals and got 51 responses within two weeks. We created our questions based on Arabic and English languages. The questions focused on the technology help in reducing medical errors and improving the health care provided, the factors related to these errors, and the technical rules in patient safety.

### 4. Results

According to the results of the online survey, students in the health field, healthcare providers and public members of different ages and genders are among the 51 participants who contributed to this survey through their experiences and expertise to assess the use of technology in health fields and whether it helps to reduce and improve the care provided. The first part of the questionnaire contained personal information, which consisted of three questions (see Figure 1, Figure 2 and Figure 3), and the second part of the questionnaire contains questions regarding if family members or close relatives suffer due to a medical error (see Figure 4). In Addition, the question of if ever experienced any medical error in hospitals has been asked (see Figure 5). Then the question of do participants think hospitals are qualified to use advanced technology was asked (see Figure 6). The rest of the questions were focused on the role of technology in improving or reducing medical errors, the factors contributing to these errors, and the obstacles to using technology.

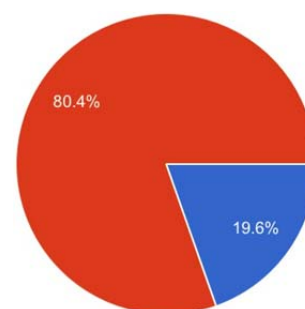


Figure 1. Gender of Participants

41 people (80.4%) was females, and 10 people (19.6%) Was males

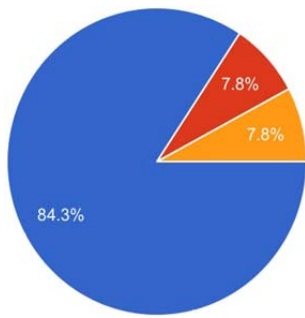


Figure 2. Age of participants

43 people (84.3%) was from age 18-25 years  
 4 people (7.8%) was from age 26-30 years  
 4 people (7.8%) was from age older than 30

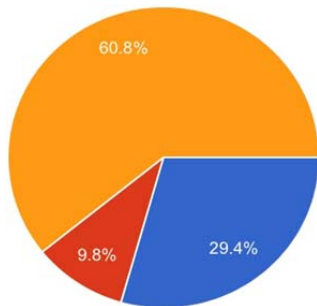


Figure 3. Participants affiliation

31 people (60.8%) were public members  
 15 people (29.4%) were students in health field  
 5 people (9.8%) were from healthcare providers

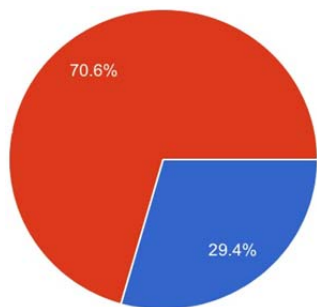


Figure 4. If family members or close relatives suffer due to a medical error.

The answers were:

36 people (70.6%) is No  
 15 people (29.4%) is yes

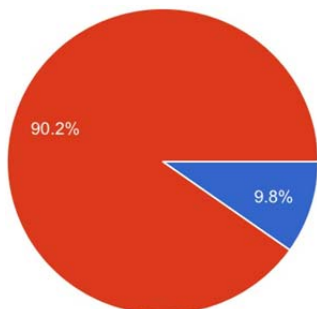


Figure 5. If ever experienced any medical error in hospitals?

46 people (90.2%) is No  
 5 people (9.8%) is Yes

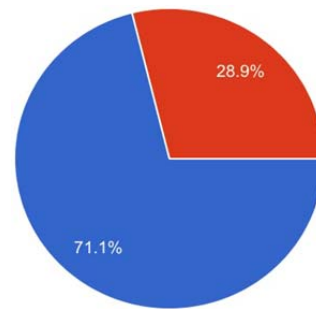


Figure 6. Do you think hospitals in your area are qualified to use advanced technology?

The answers to the following questions were:

32 people (71.1%) is Yes, and 13 people (28.9%) is No

Now the details of the answers to all questions are provided:

Question 1: Have any of your family members or close relatives suffered due to a medical error?

- The total number of responses to this question was 51; 36 people answered “no” and the other 15 answered “yes”.

Question 2: If yes, what kind of suffering?

- We received 36 responses to this question, and among the answers we got were: errors in premarital analysis, errors during childbirth, in surgeries, in medication dosage, in installing a cannula or wrong medication.

Question 3: Have you ever experienced any medical error in hospitals?

- The total responses were 51, 46 of them answered “no” and the remaining 5 answered “yes”.

Question 4: What is your reason for going to the hospital?

- We got 31 responses, and the most frequent answer was because of fatigue or pain, or to do tests and follow up with the doctor

Question 5: What do you think is the main reason for the occurrence of medical error? Does the use of technology play a role in reducing it?

- We got 21 responses to this question. The answers to the first part differed, some of which were due to the negligence of the health staff, increased work pressure on them, a decrease in their number, wrong medical diagnosis, lack of knowledge and experience, or lack of focus. While the answer to the second part of the question was, the vast majority of the answers supported that the use of technology reduces medical errors.

Question 6: As a caregiver or patient, what does society need to reduce medical errors and improve patient safety?

- We got 22 responses. Some of the answers were similar in mentioning the point of education and that the staff should be tested using standard tests. Also, there are answers that mention that the community needs to intensify health awareness and provide hospitals with the necessary tools, as well as reduce pressure on workers, reduce shift hours at work, support them, and use modern technologies.

Question 7: Do you think technology can help improve patient safety?

- The total number of responses was 51, all of whom agreed that using technology would improve patient safety.

Question 8: If your answer to the previous question is yes, how will that be done?

- The responses were 14, and they contained some explanations, such as that using them is useful and positive in measuring the vital signs of the patient and that the burden on the medical staff will be reduced and thus improving the quality of work. Some of the answers also provided suggestions, such as the use of artificial intelligence and its integration in hospitals or the use of robots.

Question 9: Is there any obstacle to using technology in the medical field that you know as a caregiver or as a patient?

- There were 16 responses to this question, and almost half of the answers were no, but some of them were yes. Either the obstacles are due to the Internet, frequent maintenance of devices, lack of technological support, or because of high costs and unavailability, or lack of training in using and difficult to use.

Question 10: What do you think are the contributing factors to medical errors made by nurses, and what technology will reduce these errors?

- We got 22 responses, some of which differed on the cause of the medical error made by the nurse. Some of the answers were due to work pressure, following the doctor's orders without checking them, not taking sufficient information about the patient, and recording it in his file, negligence, lack of nurse awareness, and procrastination.

As for the techniques that contribute to reducing errors, some answers mentioned the existence of an application or program in which all patient data are recorded on it, barcode devices that help verify the drug dose for the appropriate patient, and alarm devices.

Question 11: Do you think hospitals in your area are qualified to use advanced technology? • The number of responses was 45, 32 answered yes and 16 answered no.

Question 12: and why?

- We got 23 responses, some of the approved answers about hospitals in the region that are eligible to use the technology, in which it was mentioned: Because most of the new staff are familiar with using the technology, the hospital will be benefited from investing in the technology which will lead to reducing the numbers of the medical error, time-consuming, work overload, and the cost of the patient return. The answers that did not agree stated that it was because hospitals lacked more professional doctors, or due to the lack of suitable buildings, or because people did not accept their use.

Question 13: What are the appropriate suggestions or solutions from your point of view to improve the use of technology in hospitals?

- We got 25 responses. Some of the answers suggested that successful administrative leaders should be provided, regular courses should be organised the medical staff, and they should be trained and made aware of the use of modern technology

and how to deal with it. And to try the techniques before starting to use them and change them every period.

## 5. Discussion

Based on the results of our research, most of the findings agreed on the importance of using modern technology to reduce medical errors. It also showed that one of the important reasons for committing medical errors is the increased pressure on workers and the lack of awareness, education, training or testing before practising the profession. Some other findings suggested the existence of artificial intelligence or a programming base for computers. These results are almost consistent with the results of previous research. Even in the negative aspects of the use of technologies, the results of the research supported previous studies that the devices may sometimes make mistakes themselves or that they may be very expensive. Therefore, the competence of the health staff to perform the tasks must not be neglected.

## 6. Conclusion

The result of the research has answered the question of the impact of using technology to help improve patient safety and reduce medication errors. Technology is the key component of medical fields to help prevent medication errors and improve patient safety. It aims to try to improve the care provided to patients to obtain the highest satisfaction and the best results. The use of technology has proven its success and its effective role in improving and developing in many fields, including the medical field. The implementation of this technology can result in a reducing medical error and can impact quality of patients care.

Technology has several potential roles or positives in reducing medical errors and improving patient safety, but hospitals need to take into account the methods of implementing this technology, adequate training in its use and knowledge of the implications of its application in order to succeed in applying this technology and obtaining the best results several things must be worked on including Continuous and periodic maintenance of technical devices, taking into account the opinions of health care providers regarding this technology and trying to improve or develop it, and also important to teach health care providers to use technology professionally for the best results. Hospitals using advanced technology have many advantages that reduce complications, improve outcomes, and help reduce morbidity and mortality due to avoidable errors. For a long time, the human suffers from many fears of medical errors and providing optimal care for patients free of complications, it has a great impact on health care industry, and it is a global problem. At the present time and in the future, the role of technology may have a limit or reduce medical errors and improve the care provided. The limitations of the study including the time was short and limited, and we did not get a sufficient number of responses, and most of the interaction was from the public members, and we did not get a sufficient number of responses from health care providers, and we did not get an answer to specific technology that reduce errors to help us to compare them together.

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