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Medication error awareness among health care providers in Palestine: A questionnaire-based cross-sectional observational study



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ABSTRACT

Background: Increased awareness among healthcare professionals regarding medication errors and the establishment of a medication error reporting system can significantly reduce the prevalence of medication errors. Unfortunately, Palestine lacks a regulatory system for the control, reporting, and education of medication errors.

Objectives: This study aimed to assess the awareness of medication errors and reporting of medication errors in the Palestinian medical community.

Methods: A cross-sectional observational study was conducted using a self-administered survey involving doctors, nurses, and pharmacists in Palestine. The survey consisted of 20 questions to assess healthcare providers' awareness and course of actions related to medication errors. Data were collected from February 2020 to April 2020. Statistical Package for the Social Sciences (SPSS) was used for data analysis. This study was approved by the ethical committee of Birzeit University.

Results: A total of 394 participants were included, including 202 nurses, 114 doctors, and 78 pharmacists. 203 (51.5%) had a good awareness level of medication errors, whereas 126 (32%) and 65 (16.5%) had average awareness and poor awareness levels, respectively. In addition, 66.0% of providers did not inform the patients after recognizing the error. Fear of legal or social consequences and being too busy are significant barriers to reporting medication errors. Moreover, 35 % of all providers were not aware of the reporting system in their institutions or the reporting methodology, and only 26% of all participants confirmed that their institutions provided continuous education on medication errors.

Conclusion: This study revealed differences in healthcare professionals' awareness of medication errors. The study's findings emphasize the urgent need to adopt appropriate measures to raise awareness about medication errors among healthcare providers in Palestine. Furthermore, establishing a regulatory policy and a national medication error reporting system to improve medication safety.

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1. Introduction

Many health services use medications, and millions of people are treated at hospitals, increasing the risk of medication errors (Shawahna et al., 2019; Duerden et al., 2013). In addition, hospitalized patients are most vulnerable to errors due to their illnesses, weakness, and the number of medications they take (Shawahna

et al., 2019). The medication errors annual cost in the US has been estimated at 42 billion dollars. It is considered the leading cause of injury and avoidable patient harm (Aitken and Gorokhovich, 2012), with an estimated 400,000 deaths per year from preventable medication errors (James, 2013).

The United States National Coordinating Council for Medication Error Reporting and Prevention defines a medication error as "any preventable event that may cause or lead to inappropriate medication use or patient harm while the medication is in the control of the healthcare professional, patient, or consumer." Such events may be related to all aspects of medication use, including administration, education, monitoring, compounding, dispensing, distribution, prescribing, order communication, product labeling, packaging, nomenclature, professional practice, healthcare products, procedures, and systems (NCCMERP, 2021).

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Recognizing and reporting medication errors can be challenging for healthcare providers because of many factors such as health providers' workload, training, education, institutional policies and protocols, and fear of lawsuits or disciplinary actions (Rodziewicz et al., 2021). The blame culture, fear of punishment, lack of knowledge of the usefulness of reporting medication errors, and lack of information on how to report medication errors are various barriers that lead to under-reporting of medication errors by health care providers (Rutledge et al., 2018). Identifying and reporting medication errors is an opportunity for healthcare providers and institutions to identify weaknesses and improve patient care (Helo and Moulton, 2017). However, underreporting medication errors can impede patient safety improvement as it results in gaps in the knowledge of health care professionals about the factors involved in causing medication errors and, thus, prevents the hospital from the potentially harmful practice (Abdel-Latif, 2016).

The scientific literature on medication errors published in Middle Eastern countries is limited. Most studies related to medication errors have been conducted in high-income countries, the USA, and Europe (Alsulami et al., 2013). A systematic review in the Middle East revealed several studies regarding medication errors in high-income and upper-middle-income countries such as Israel, Iran, and Saudi Arabia. Furthermore, there is relatively scarce data on medication errors in the lower-middle-income countries (LMIC) as Egypt, Palestine, Syria, Yemen, and Iraq. Middle Eastern countries lack a regulatory system and data for optimizing primary care and reducing these errors (Alsulami et al., 2013).

Only a few studies have been conducted among Middle Eastern healthcare providers exploring the awareness of medication errors. For example, in a questionnaire-based study, Tobaigy et al. identified three critical factors that hinder healthcare workers from reporting medication errors: poor awareness, workload, and time constraints (Tobaigy and Stewart, 2013). In another study in Saudi Arabia, Alsulami et al. concluded that despite sufficient awareness of medication errors and reporting knowledge, there was significant underreporting among health care professionals (Alsulami et al., 2019).

Palestine still lacks a regulatory system for controlling, reporting, monitoring medication error reporting, and educating on medication errors. Furthermore, information on the incidence and types of medication errors is limited, and no studies have assessed healthcare providers' awareness of medication errors. In this sense, our research goals were to assess healthcare providers' awareness of medication errors and their attitude toward reporting medication errors and provide adequate education to maximize the safe use of medications, reduce and ultimately prevent medication errors.

2. Materials and Methods

A cross-sectional questionnaire was designed in English based on a literature review (Abdel-Latif, 2016; Alsulami et al., 2019). A survey sample was tested randomly among healthcare professionals for reliability and validity. The questionnaire was distributed to healthcare providers (physicians, pharmacists, and nurses) at nine hospitals in different cities in Palestine, Ramallah, Jerusalem, Bethlehem, Jericho, and Hebron. This study was conducted between February 2020 and April 2020.

The self-administered questionnaire consists of two sections: Part (1) consisted of demographic data, sex, profession, and years of practice. Part (2) consists of 20 questions that evaluate healthcare providers' awareness, actions, reporting, and causes of medication errors. Six questions focused on the basic knowledge, definition, and types of medication errors (No. 1, 2, 3, 4, 5 and 11). Three questions focused on reasons for not informing of medication

errors when they happened (No. 6, 7, and 8). Two questions addressed participants' attitudes and beliefs about reporting medical errors (No. 12 and 13). Two questions were asked about informing patients of medication errors and patients' rights to know if errors occur (No. 9 and 14). Four questions addressed participant recommendations and opinions to improve the medication error reporting system and control medication errors (No. 10, 15, 16, and 17). For question 18, participants were asked to choose between 11 suspected causes of medication errors. Finally, two questions addressed the current status of safe medication practice and continuous education (C.E.) on medication errors (No. 19 and 20).

The sample size was calculated using Raosoft calculator. With a 95% confidence interval and a 5% source of error according to the region's population size estimated to be 20,000 (the highest number that Raosoft takes), the minimum sample size is recommended to be 377. Therefore, 500 surveys were distributed to ensure achieving the recommended sample size.

Participation in the study was voluntary. All healthcare providers had the right to reject participation in the study, and those who agreed to participate had the right to withdraw. Informed consent was obtained prior to participation. The participants' identities remained unknown; confidentiality was ensured, and the data obtained was only used for research aims. The study protocol was approved by the Ethical Committee of Birzeit University

2.1. Data collection and Statistical analysis

After explaining the study objectives and obtaining consent, the participants were randomly selected ($n = 500$), provided a copy of the paper questionnaire, and requested to complete the questionnaire in one sitting (no time restriction). Healthcare professionals (HCP) categories involved in the study were physicians, pharmacists, and nurses working in different hospitals in several Palestinian cities. 394 Of the 500 HCP who participated in the study, 106 participants who did not return or submitted incomplete questionnaires were excluded.

Completed questionnaires were collected from all participants to evaluate their responses. Information from paper sources was converted to an electronic format on Microsoft Excel and analyzed using the Statistical Package for the Social Sciences (SPSS) version 22. First, the awareness scale was constructed from questions used to identify basic knowledge, definition, and types of medication errors with acceptable internal consistency value ($\alpha 0.633$). The scale was recoded as having good (knew 5 to 6 questions), average (knew 3 to 4), or poor awareness level (knew 2 or less). A second scale was developed based on recommendations and opinions to improve the medication error reporting system and control medication error questions with adequate internal consistency ($\alpha 0.59$). The scale was recoded as support all changes (agreeing to the four ideas) or support some changes (agreeing to three ideas or less) toward the reporting system. Frequencies and percentages were reported for data; chi-square testing was used to check for significant associations of HCP awareness, actions, opinions, and reporting with each variable; age, sex, region, occupation, and experience. Statistical significance was set at $P \leq 0.05$.

3. Result

Out of 500 distributed questionnaires, 394 respondents who returned a completed questionnaire were included, with a response rate of 78.8%. Among these participants, 219 (55.6%) were males, 163 (41.4%) were aged between 22 and 32 years, and 116 (29.4%) were living in Ramallah. In addition, half of the respon-

dents, 202 (51.3%), were nurses, and 151 (38.3%) had a long experience (10 years or more) at their work (Table 1).

3.1. Health care providers' awareness

Out Of 394 respondents, 203 (51.5%) had good awareness levels (GAL), whereas 126 (32%) had average awareness levels (AAL) and 65 (16.5%) had poor awareness levels (PAL).

302 (76.6%) of respondents revealed can differentiate between medication errors and adverse drug reactions, 380 (96.4%) were aware of the definition of the medication errors, 238 (60.4%) were aware of the types of that errors, 299 (75.9%) were aware of the interventions needed to prevent that medication errors, 334 (84.8%) were aware how to proceed if a medication error occurred and 207 (52.5%) were aware of the reporting system.

As shown in Table 2, chi-square test results affirmed that the HCP awareness regarding medication errors was significantly associated with their occupation ($p < 0.001$), with 65.4% of pharmacists revealing PAL compared to doctors and nurses 5.3% and 4%, respectively. Additionally, a significant association was found with experience long ($p < 0.001$), that participants with experience duration between 5 and 9 years at their work were less likely to have GAL 35.3% compared to those with little experience (<5 years) 58.1% and those with long experience time (10 years or more) 58.1%. Add that respondents aged>43 years were significantly more likely to have GAL (72%, $P < 0.001$) compared to youngers aged 22–32 years (58.9%) or 33–43 years (32.2%). Finally, HCPs in Jerusalem city were significantly more likely to have GAL (60.6%, $p < 0.001$) than others.

3.2. Reporting of medication errors

When participants asked about the reasons for not reporting after noticing the medication error, 241 (61.2%) revealed that might be due to fear of any legal or social consequences, 162 (41.1%) said that they were too busy, and 125 (31.7%) stated that they did not know whom to inform.

Table 3 shows that males were significantly more likely not to know how to inform the medical errors (36.1%, $p = 0.038$) than females (26.3%). Regarding age, younger were significantly less likely not to report due to legal or social consequences (42.9%, $p < 0.001$) or being too busy (27.6%, $p < 0.001$) compared to older aged 33–43 years (74.5%, 49.7%) or aged over 43 years (73.2%, 52.4%), respectively). At the same time, HCP aged > 43 years were significantly more likely not to know how to report the errors (53.7%, $p < 0.001$) compared to younger aged 22–32 (30.7%) or aged 33–43 (20.8%).

Table 1
Socio-demographic characteristics of participants (N = 394).

Characteristics	n (%)	
Sex	Males	219 (55.6%)
	Females	175 (44.4%)
Age	22–32 yrs.	163 (41.4%)
	33–43 yrs.	149 (37.8%)
	44 yrs. or more	82 (20.8%)
Governorate	Ramallah	116 (29.4)
	Jerusalem	66 (16.8)
	Bethlehem	84 (21.3)
	Jericho	66 (16.8)
	Hebron	62 (15.7)
Profession	Doctor	114 (28.9%)
	Pharmacist	78 (19.8%)
	Nurse	202 (51.3%)
Experience	<5 yrs.	124 (31.5%)
	5–9 yrs.	119 (30.2%)
	>9 yrs.	8.3%)

There were variations in reporting among different governorates. For example, Jerusalem was significantly less likely not to inform due to fear of different consequences (39.4%, $p < 0.001$), being too busy (18.2%, $p < 0.001$), or lack of knowledge of the reporting system (16.7%, $p = 0.033$) compared to respondents from the other four cities.

Additionally, pharmacists were significantly more likely not to inform because of fear of consequences (78.2%, $p = 0.001$) and significantly less likely not to report because they were busy (9%, $p < 0.001$). Doctors were more likely not to report because they did not know the informing process (60.5%, $p < 0.001$). Moreover, HCP with less experience were significantly more likely not to inform due to fear (41.9%, $p < 0.001$) and less likely not to inform due to being busy (23.4%, $p < 0.001$). At the same time, those with long experience were more likely not to inform that they did not know whom to inform (39.1%, $p = 0.031$).

3.3. Participants believe in reporting medication errors

Table 4 reveals that more than half of HCPs, 221 (56.1%), thought it was important to report medication errors even if no harm was caused or reached the patient, and 315 (79.9%) believed that reporting was part of their work duties. The Bivariate analysis showed that participants aged between 33 and 43 years were significantly less likely to report errors that caused no harm (36.2%, $p < 0.001$) compared to those aged 22–32 years and more 43 years (66.9%, 70.7%) respectively. Bethlehem respondents were also significantly less likely to report (38.1%, $p < 0.001$) than other cities. Among HCPs, doctors and those with a short time of practice were significantly more likely to report (80.7%, $P < 0.001$), (65.3%, $p < 0.001$) respectively even no harm caused compared to nurses (54.4%) and pharmacists (24.4%), and those with longer experience 5–9 years (41.2%) or more than 9 years (60.3%).

Regarding HCPs' beliefs, doctors (55.3%, $p < 0.001$), HCPs with long experience (68.9%, $p < 0.001$), Hebron workers (67.7%, $p = 0.002$), and those aged>43 years (53.7%, $p < 0.001$) all were significantly less likely to believe that reporting is part of their professional duty compared to others in each subgroup.

When respondents asked about the patient's right to be informed if a medication error occurred, 289 (73.4%) were agreed, and when they asked if they had informed patients before, only 134 (34%) revealed that they did. Fig. 1 shows that 80.6% of the respondents informed the patient when the error occurred believed it was the patient's right to be informed. In comparison, 69.6% of those who did not inform the patient after noticing a medication error believed the patient should be informed.

3.4. Health care providers' opinion on recommendations for medication error system improvement

Out Of 394 health care providers, 298 (75.6%) revealed that they supported all changes (SAC), while 96 (24.4%) support some changes (SSC) toward the medical reporting system in the future. 353 (89.6%) believed that the reporting would significantly benefit the patient and prevent future errors. 365 (90.4%) stated the need for improved system among hospitals, 359 (91.1%) revealed that proper recommendation of organization, legislation, regulation, and resources improved control of medication errors and safe use of drugs, and 355 (90.1%) recommended the presence of integrated approach toward training and education about these errors among both, medical institute and the public.

Chi-square results showed that females were significantly more likely to SAC (81.2%, $p = 0.023$) than males (71.2%). Elders were also significantly more likely to SAC (90.2%, $p < 0.001$) compared to those aged 22–32 years (67.5%) or aged 33–43 years (76.5%). In addition, HCPs working at Bethlehem were significantly more

Table 2
HCPs awareness regarding medication errors.

Characteristics		Having GAL n (%)	Having AAL n (%)	Having PAL n (%)	p-value
Sex	Males	122 (55.7)	67 (30.6)	30 (13.7)	0.116
	Females	81 (46.3)	59 (33.7)	35 (20)	
Age	22–32 yrs.	96 (58.9)	42 (25.8)	25 (15.3)	<0.001
	33–43 yrs.	48 (32.2)	76 (51)	25 (16.8)	
	44 yrs. or more	59 (72)	8 (9.8)	15 (18.3)	
Governorate	Ramallah	59 (50.9)	27 (23.3)	30 (25.9)	<0.001
	Jerusalem	40 (60.6)	11 (16.7)	15 (22.7)	
	Bethlehem	32 (38.1)	52 (61.9)	0 (0)	
	Jericho	37 (56.1)	12 (18.2)	17 (25.8)	
Profession	Hebron	35 (56.5)	24 (38.7)	3 (4.8)	<0.001
	Doctor	81 (71.1)	27 (23.7)	6 (5.3)	
	Pharmacist	21 (26.9)	6 (7.7)	51 (65.4)	
Experience	Nurse	101 (50)	93 (46)	8 (4)	<0.001
	<5 yrs.	72 (58.1)	31 (25)	21 (16.9)	
	5–9 yrs.	42 (35.3)	74 (62.2)	3 (2.5)	
	>9 yrs.	89 (58.9)	21 (13.9)	41 (27.2)	

Table 3
HCPs' reasons for not reporting medication errors.

Characteristics		Fearing from legal or social consequences n (%)	Being too busy n (%)	Not knowing whom to inform n (%)
Total frequency		241 (61.2)	162 (41.1)	125 (31.7)
Sex	Males	132 (60.3)	96 (43.8)	79 (36.1)
	Females	109 (62.3)	66 (37.7)	46 (26.3)
	p- value	0.684	0.220	0.038
Age	22–32 yrs.	70 (42.9)	45 (27.6)	50 (30.7)
	33–43 yrs.	111 (74.5)	74 (49.7)	31 (20.8)
	44 yrs. or more	60 (73.2)	43 (52.4)	44 (53.7)
	P- value	<0.001	<0.001	<0.001
Governorate	Ramallah	70 (60.3)	37 (31.9)	45 (38.8)
	Jerusalem	26 (39.4)	12 (18.2)	11 (16.7)
	Bethlehem	76 (90.5)	75 (89.3)	26 (31)
	Jericho	39 (59.1)	15 (22.7)	20 (30.3)
	Hebron	30 (48.4)	23 (37.1)	23 (37.1)
	p- value	< 0.001	<0.001	0.033
Profession	Doctor	70 (61.4)	61 (53.5)	69 (60.5)
	Pharmacist	61 (78.2)	7 (9)	9 (11.5)
	Nurse	110 (54.5)	94 (46.5)	47 (23.3)
	p-value	0.001	<0.001	<0.001
Experience	<5 yrs.	52 (41.9)	29 (23.4)	37 (29.8)
	5–9 yrs.	87 (73.1)	78 (65.5)	29 (24.4)
	>9 yrs.	102 (67.5)	55 (36.4)	59 (39.1)
	p- value	<0.001	<0.001	0.031

likely to SAC (98.8%, $p < 0.001$) than the four other regions. Regarding profession, pharmacists were significantly more likely to SAC (91%, $p = 0.002$) compared to doctors (71.9%) and nurses (71.8%) (Table 5).

3.5. Contributing factors of medication errors

When respondents were asked about some factors that would cause medical errors, as shown in Fig. 2, the most common cause they expected was missing of the needed clinical information (84.3%) followed by lack of staff education (79.9%) while drug storage or delivery problems expected to be the least cause of the medical errors (36.3%).

3.6. Evaluation of the current reporting system

Respondents were asked two questions to evaluate the current status of the medical reporting system; as shown in Table 6., 265 (65%) revealed that their institute had written policies and procedures on safe medication practice, and 102 (25.9%) works within institutes provide C E. on medication errors.

Chi-square test results showed that there was a significant difference between regions in the institution written policies and procedures on safe medication practice ($p = 0.004$), that HCPs in Hebron were less likely to have these policies (48.4%), followed by Ramallah (59.5%). On the other hand, Jerusalem's institution was more likely to have written policies (75.8%). In addition, doctors were significantly less likely to work in institutions with strict policies (34.2%, $p < 0.001$) compared to pharmacists (87.2%) and nurses (73.8%).

Regarding providing CE, less than half of institutes in different governorates were investing in CE. Institutes at Bethlehem were significantly less likely to provide CE. (3.6%, $p < 0.001$) compared to Hebron (48.4%), Jericho (30.3%), Ramallah (27.6%), and Jerusalem (25.8%). Nurses were the group of HCPs who were significantly more likely to be provided with C.E. programs (33.7%, $p = 0.001$) compared to doctors (21.1%) and pharmacists (12.8%).

4. Discussion

This study assessed awareness among HCP in Palestinian health institutions and communities regarding medication errors, prevention, reporting, and monitoring of these errors.

Table 4
HCPs attitudes and beliefs about reporting medical errors.

Characteristics	Thinking it is important to report medication errors if no harm caused or harm caused but not reach the patient	Believing that reporting medication errors is participants' professional duty.
Total frequency	221 (56.1)	315 (79.9)
Sex		
Males	127 (58)	170 (77.6)
Females	94 (53.7)	145 (82.9)
p- value	0.395	0.198
Age		
22–32 yrs.	109 (66.9)	142 (87.1)
33–43 yrs.	54 (36.2)	129 (86.6)
44 yrs. or more	58 (70.7)	44 (53.7)
P- value	<0.001	<0.001
Governorate		
Ramallah	75 (64.7)	94 (81)
Jerusalem	38 (57.6)	61 (92.4)
Bethlehem	32 (38.1)	61 (72.6)
Jericho	35 (53)	57 (86.4)
Hebron	41 (66.1)	42 (67.7)
p- value	0.002	0.002
Profession		
Doctor	92 (80.7)	63 (55.3)
Pharmacist	19 (24.4)	72 (92.3)
Nurse	110 (54.5)	180 (89.1)
p- value	<0.001	<0.001
Experience		
<5 yrs.	81 (65.3)	110 (88.7)
5–9 yrs.	49 (41.2)	101 (84.9)
>9 yrs.	91 (60.3)	104 (68.9)
p- value	<0.001	<0.001

4.1. Basic knowledge and information and awareness of medication errors

Levels of medication error awareness were assessed by answering six questions related to the definition of medication errors, their various types, interventions to prevent them, how to proceed if they occur, and the difference between medication errors and adverse drug reactions. The majority of participants had good awareness levels of medication errors. In addition, they can differentiate between medication errors and side effects; this finding is very similar to studies conducted in India and Saudi Arabia (Abdel-Latif, 2016; Sewal et al., 2014). In addition, the results revealed that HCP with <5 years of experience have good awareness compared to participants with more vast experience, which might be due to fac-

tors such as new graduates having college courses that focus on medication errors identification and prevention. Furthermore, an alarming finding for a pharmacist was that 65% have poor awareness of medication errors, which requires actions from pharmacy schools to add medication errors courses within the curriculum to increase competency in pharmacovigilance and medication error awareness (Reumerman et al., 2018).

4.2. Reporting of medication error

Reporting medication errors is an opportunity to prevent errors and learn from mistakes. Reporting will lead to a root cause analysis of the error to establish policies and protocols, increase awareness, provide training and education. It is also important to report errors regardless of whether they cause harm or not; even errors that did not get to the patient should be reported. Failing to report contributes to the likelihood of serious patient harm (Rodziewicz et al., 2021). Several barriers to reporting errors have been reported in different studies, such as not understanding who to report or the value of reporting, being too busy, and fear of legal and social consequences (Mauti and Githae, 2019; Naome et al., 2020; Mohamed et al., 2021; Bovis et al., 2018). These barriers were very evident in this study, where most participants (61.2%) reported fear of legal consequences as a significant factor for not reporting medication errors. In addition, more than one-third of health care providers (41.1%) concluded that they did not report due to busy environments, as they were too busy and failed to report because of the long working shifts and the time-consuming nature of reporting. This issue is significant, especially for doctors participating in the study, as half of them reported facing this barrier. Considering the human and financial burden of medication errors, HCP should find more accessible strategies to report errors, even in busy environments (Khammarnia et al., 2015).

Furthermore, doctors were significantly more likely not to report because they were unaware of the informing process. Pharmacists were significantly more likely not to report medication errors due to fear of legal consequences. Developing a safety culture requires changing healthcare professionals' attitudes and behavior from hesitance, fear, and defensiveness about medication errors to an attitude of openness, where one can admit what went wrong and seek to learn from mistakes (Guillod, 2013). This can be supported by education on using the reporting system, incident

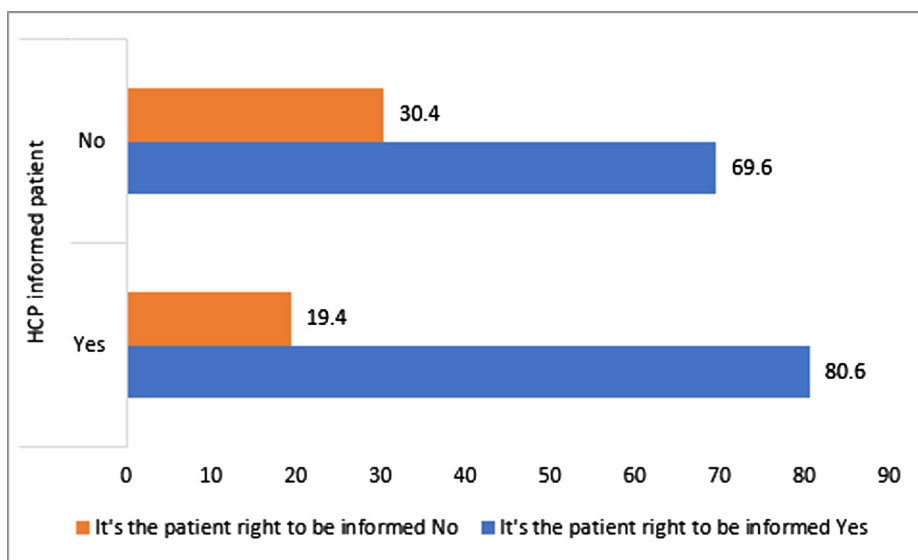


Fig. 1. HCP's believes and practices about informing patients of medication errors.

Table 5
HCPs recommendations to support medication error reporting system changes.

Characteristics	SAC n (%)	SSC n (%)	p-value	
Sex	Males	156 (71.2)	63 (28.8)	0.023
	Females	142 (81.1)	33 (18.9)	
Age	22–32 yrs.	110 (67.5)	53 (32.5)	<0.001
	33–43 yrs.	114 (76.5)	35 (23.5)	
	44 yrs. or more	74 (90.2)	8 (9.8)	
Governorate	Ramallah	91 (78.4)	25 (21.6)	<0.001
	Jerusalem	51 (77.3)	15 (22.7)	
	Bethlehem	83 (98.8)	1 (1.2)	
	Jericho	44 (66.7)	22 (33.3)	
	Hebron	29 (46.8)	33 (53.2)	
Profession	Doctor	82 (71.9)	32 (28.1)	0.002
	Pharmacist	71 (91)	7 (9)	
	Nurse	145 (71.8)	57 (28.2)	
Experience	<5 yrs.	91 (73.4)	33 (26.6)	0.510
	5–9 yrs.	88 (73.9)	31 (26.1)	
	>9 yrs.	119 (78.8)	32 (21.2)	

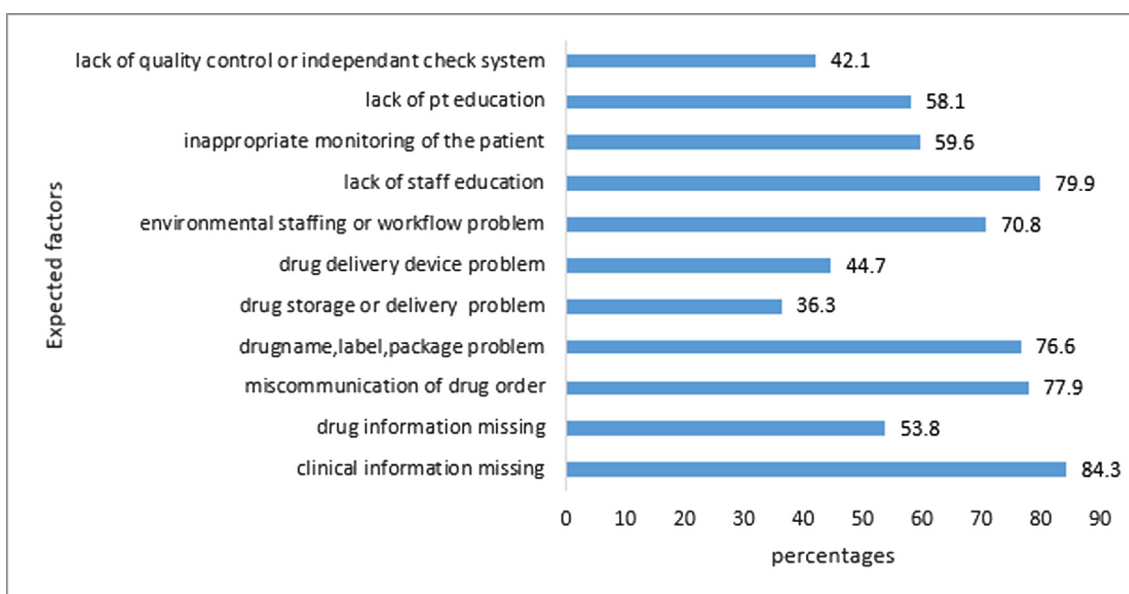


Fig. 2. The expected causes for medical errors.

Table 6
Evaluation of current practices.

Characteristics	Work at an institution provide continuous education	Work at an institution have policies on safe practice
Total frequency	102 (25.9)	256 (65)
Governorate	Ramallah	32 (27.6)
	Jerusalem	17 (25.8)
	Bethlehem	3 (3.6)
	Jericho	20 (30.3)
	Hebron	30 (48.4)
	p- value	<0.001
Profession	Doctor	24 (21.1)
	Pharmacist	10 (12.8)
	Nurse	68 (33.7)
	p- value	0.001

reporting, communication, and feedback about errors. In addition, the development and implementation of disclosure policies, including apologies to patients and families and showing respect for patients and their autonomy, prevail as a source and support for patients' right to information about health care errors. These

policies should be part of an organization-wide effort to include open communication, truth-telling, and no blaming (Welsh et al., 2018).

4.3. HCP's believes in reporting medication errors

Medications errors can be detected through reports of errors that harm patients, errors that occur but do not result in patient harm, and errors that could have caused harm but were alleviated before reaching the patient (Hashemi et al., 2012). The majority of participants in the study (79.9%) believed that reporting was part of their duties. Furthermore, more than half believed that it was necessary to report. However, only 25% of pharmacists in our study thought it was important to report near-misses compared to other healthcare providers, doctors, and nurses (65% and 54.5%, respectively). Reporting near misses, which can occur 300 times more frequently than adverse events, is as important as reducing errors because it can provide invaluable information for proactively reducing errors (Wolf and Hughes, 2008). When both errors and near misses are reported, the information can help organizations identify the combination of factors that lead to an error/near miss, determine its frequency, revise and predict whether it could hap-

pen again, and create processes to reduce the risk of errors (*Advances in Patient Safety*, 2008).

4.4. Disclosure of errors to patients

Two-thirds of HCP did not inform patients when a medication error occurred, although 73.4% of participants believed that a patient should be informed if a medication error occurs. Disclosure of errors to patients and their families is of paramount importance. In a study in the USA regarding the patient perspective of medication errors, most patients agreed that hospitals should be required to report errors to patients (*Lind et al.*, 2020). In a study examining U.S. and Canadian physicians toward disclosing errors to patients, 98% of physicians endorsed disclosing serious errors to patients, 78% supported disclosing minor errors, and the malpractice environment was the major barrier to disclosing errors (*Gallagher et al.*, 2006). Patients' trust in the healthcare system is enhanced when they know that clinicians acknowledge errors, and these errors are reported so that quality improvement efforts will prevent similar future errors (*Mutair et al.*, 2021). Nevertheless, participants in the study did not inform the patients even though they believed in their right to be informed because they were afraid of being held liable.

4.5. Health care providers' opinion on medication error system improvement recommendations

The majority of medication errors occur because of fragility in the health care systems that allow for error as opposed to individual problems (*Kohn et al.*, 2000). Therefore, a system to detect and prevent errors getting to a patient is a healthcare necessity. Although Palestine lacks a universal reporting system for voluntary reporting of medication errors, hospitals have internal medication error systems. In this study, 75.6% of participants supported all suggested recommendations for system improvements at their institutions regarding medication errors, including an integrated approach toward training and education about medication errors in medical institutions and the general public. Furthermore, support organizational recommendations, legislation, regulation, and resources to improve control of medication errors and safe use of drugs and improve systems in hospitals for medication error reporting. Pharmacists and females were significantly more likely to support all changes than other HCP.

4.6. Contributing factors of medication errors

The most common contributory factor to medication errors shared by HCP is clinical information missing, with a percentage of 84%. Age, weight, date of birth, current allergy information, vitals, labs, pregnancy, and address should always be obtained from every patient at each visit. Missing information adversely affects the quality, efficiency, and confidence in care (*Schilling et al.*, 2010). In addition, more than half of the healthcare providers believe that lack of patient education is one of the most common contributory factors to medication errors (*Fig. 2*). As the last individuals involved in the medication use cycle, patients' awareness of their health conditions and treatment can minimize the number of medication errors. Education and patient engagement in medication safety are key strategies in reducing medication errors (*Kim et al.*, 2018). Communication between practitioners is substantial, and it encourages all healthcare providers to be vigilant, detect and act on potential errors rather than rejecting them (*Araujo et al.*, 2019). Miscommunication of drug orders (illegible, ambiguous, incomplete, misunderstood order, and intimidation) is a common contributory factor to medication errors by healthcare providers. The Institute for Safe Medication Practices (ISMP) rec-

ommends utilizing standardized orders to help organizations ensure that the elements of safe order communication are followed when designing paper-based or electronic order sets to improve communication and reduce the likelihood of misinterpretation of orders (*ISMP*, 2022).

A high percentage (77%) of all healthcare providers in our study indicated faulty drug identification due to similar drug names, labels, and packages as a contributing factor to medication errors. However, a less problematic factor is the drug storage or delivery problem. Thus, to prevent drug names, labels, packaging, and storage problems, it may be best to keep look-alike and sound-like medications separated by a physical barrier or stored away from one another on pharmacy shelves. Furthermore, All medications dispensed to patients should be appropriately labeled with the name of the medication, strength, dose, frequency, purpose, lot number, expiration date, the quantity of medication, patient's name, date of dispensing and prescribing, and prescribing information (*Jenkins and Vaida*, 2007).

Finally, 71% of HCP reported that environmental staffing and workflow problems (lighting, noise, clutter, interruption, staffing deficiency workload, employee safety) are common causes of medication errors leading to confusion and negatively impacting safe medication practice. Thus, the interventions to be implemented include signage and designated "quiet zones" that reduce the effect of distractions and interruptions on staff administering medications. Moreover, checklists carried by nurses can be used, and double-checking or even triple-checking can be performed. Furthermore, nurses can wear vests or lighted lanyards during medication administration to alert others not to disturb them (*Raban and Westbrook*, 2014).

4.7. Evaluation of the current reporting system.

About 65% of participants confirmed that their institutions had written policies and procedures on safe medication practice; however, only 26% confirmed that they provide continuous education on medication errors. There were significant differences among different regions, whereas Jerusalem institutions were more likely to have written policies, and beitlahim institutions were the least likely to provide continual education. Furthermore, nurses were the highest healthcare professionals who had received continual education.

Implementation of policies and procedures for safe practices to prevent medication errors has shown to be effective in preventing medication errors and increasing patient safety (*Cohen et al.*, 2018). Continual education is essential to maintain competency, continuity of practice, and professional development in HCPs (*Schindel et al.*, 2012). Many medical, nursing, and pharmacy boards require continuing education for professional license renewal.

5. Limitation

This study has several limitations. First, this study has methodological weaknesses since the survey relied on the participants' self-rated assessment. Even though confidentiality and anonymity were achieved, HCPs may have been unwilling to reveal their practice deficiencies. Thus, this information bias may not indicate the actual Knowledge of the healthcare professionals regarding the various aspects of medication errors. In addition, selection bias is also possible because some healthcare professionals refused to participate in our study. Finally, the study sample did not represent all healthcare professionals in Palestine; thus, the findings cannot be generalized for two major reasons. First, some cities could not be reached due to the outbreak of Covid-19, hence, the lockdown,

making it likely that participants in other settings could have different perceptions about medication errors.

The survey was written in the English language, limiting some healthcare providers' participation. Moreover, it was conducted in busy environments (hospitals) with relatively more distractions than one might encounter in the privacy of one's home. Finally, there is a time limitation; if we had more time, we could have waited for the end of the lockdown in Palestine and collected data from all parts of Palestine.

Other studies considering these weaknesses are necessary to confirm our results. We recommend conducting a longitudinal study, and researchers may consider using an incentive to increase survey participation.

6. Conclusion

The study's findings emphasize the urgent necessity to adopt appropriate measures to raise awareness about medication errors in Palestinian hospitals. Adopting policies and procedures for reporting medication errors and providing continuous education on medication errors, reporting, and reporting benefits to ensure medication safety and learning from mistakes is a healthcare system necessity.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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References

- Abdel-Latif, M.M., 2016. Knowledge of healthcare professionals about medication errors in hospitals. *J. Basic Clin. Pharm.* 7 (3), 87. <https://doi.org/10.4103/0976-0105.183264>.
- Advances in Patient Safety. In: Hughes RG, ed. *Patient Safety and Quality: An Evidence-Based Handbook for Nurses*. Rockville (MD): Agency for Healthcare Research and Quality (US); 2008.
- Aitken, M., Gorokhovich, L., 2012. Advancing the responsible use of medicines: applying levers for change. Available at SSRN 2222541. <https://doi.org/10.2139/ssrn.2222541>.
- Alsulami, S.L., Sardidi, H.O., Almuzaini, R.S., Alsaif, M.A., Almuzaini, H.S., Moukaddem, A.K., Kharal, M.S., 2019. Knowledge, attitude and practice on medication error reporting among health practitioners in a tertiary care setting in Saudi Arabia. *SMJ* 40 (3), 246–251.
- Alsulami, Z., Conroy, S., Choonara, I., 2013. Medication errors in the Middle East countries: a systematic review of the literature. *Eur. J. Clin. Pharmacol.* 69 (4), 995–1008. <https://doi.org/10.1007/s00228-012-1435-y>.
- Bovis, J.L., Edwin, J.P., Bano, C.P., Tyraskis, A., Baskaran, D., Karuppaiah, K., 2018. Barriers to staff reporting adverse incidents in NHS hospitals. *Future Healthcare J.* 5 (2), 117–120.
- Cohen, M.R., Smetzer, J.L., Vaida, A.J., 2018. ASHP guidelines on preventing medication errors in hospitals: Advancing medication safety to the next level. *Am. J. Health-Syst. Pharm.* 75 (19), 1444–1445. <https://doi.org/10.2146/ajhp180283>.
- de Araujo, B.C., de Melo, R.C., de Bortoli, M.C., Bonfim, J.R.D.A., Toma, T.S., 2019. How to prevent or reduce prescribing errors: an evidence brief for policy. *Front. Pharmacol.* 10, 439. <https://doi.org/10.3389/fphar.2019.00439>.
- Duerden, M., Avery, T., Payne, R., 2013. Polypharmacy and medicines optimisation. *Making it safe and sound*. The King's Fund, London.
- Gallagher, T.H., Waterman, A.D., Garbutt, J.M., Kapp, J.M., Chan, D.K., Dunagan, W.C., Fraser, V.J., Levinson, W., 2006. US and Canadian physicians' attitudes and experiences regarding disclosing errors to patients. *Arch. Intern. Med.* 166 (15), 1605. <https://doi.org/10.1001/archinte.166.15.1605>.
- Guillod, O., 2013. Medical error disclosure and patient safety: legal aspects. *J. Public Health Res.* 2 (3), 31. <https://doi.org/10.4081/jphr.2013.e31>.
- Hashemi, F., Nasrabadi, A.N., Asghari, F., 2012. Factors associated with reporting nursing errors in Iran: a qualitative study. *BMC Nursing* 11 (1), 1–8. <https://doi.org/10.1186/1472-6955-11-20>.
- Helo, S., Moulton, C.-A., 2017. Complications: acknowledging, managing, and coping with human error. *Transl. Androl. Urol.* 6 (4), 773–782.
- ISMP (ISMP). Guidelines for Standard Order Sets. <https://www.ismp.org/guidelines/standard-order-sets>. Published 2010. Accessed January, 04, 2022.
- Institute of Medicine Committee on Quality of Health Care in A. In: Kohn LT, Corrigan JM, Donaldson MS, eds. *To Err is Human: Building a Safer Health System*. Washington (DC): National Academies Press (US) Copyright 2000 by the National Academy of Sciences. All rights reserved.; 2000.
- James, J.T., 2013. A new, evidence-based estimate of patient harms associated with hospital care. *J. Patient Saf.* 9 (3), 122–128. <https://doi.org/10.1097/pts.0b013e3182948a69>.
- Jenkins, R.H., Vaida, A.J., 2007. Simple strategies to avoid medication errors. *Family Practice Manage.* 14 (2), 41.
- Khamarnia, M., Ravangard, R., Barfar, E., & Setoodehzadeh, F. (2015). Medical errors and barriers to reporting in ten hospitals in southern Iran. *Malaysian J. Med. Sci.: MJMS*, 22(4), 57. <https://www.ncbi.nlm.nih.gov/pubmed/28729811>
- Kim, J.M., Suarez-Cuervo, C., Berger, Z., Lee, J., Gayleard, J., Rosenberg, C., Nagy, N., Weeks, K., Dy, S., 2018. Evaluation of patient and family engagement strategies to improve medication safety. *Patient-Patient-Centered Outcomes Res.* 11 (2), 193–206. <https://doi.org/10.1007/s40271-017-0270-8>.
- Lind, D.P., Andresen, D.R., Williams, A., 2020. Medical Errors in Iowa: Prevalence and Patients' Perspectives. *J. Patient Saf.* 16 (3), e199–e204.
- Mauti, G., Githae, M., 2019. Medical error reporting among physicians and nurses in Uganda. *African Health Sci.* 19 (4), 3107–3117. <https://doi.org/10.4314/ahs.v19i4.33>.
- Mohamed, M.F., Abubeker, I.Y., Al-Mohanadi, D., Al-Mohammed, A., Abou-Samra, A. B., Elzouki, A.N., 2021. Perceived Barriers of Incident Reporting Among Internists: Results from Hamad Medical Corporation in Qatar. *Avicenna J. Med.* 11 (03), 139–144. <https://doi.org/10.1055/s-0041-1734386>.
- Mutair, A.A., Alhumaid, S., Shamsan, A., Zaidi, A.R.Z., Mohaini, M.A., Al Mutairi, A., Rabaan, A.A., Awad, M., Al-Omari, A., 2021. The Effective Strategies to Avoid Medication Errors and Improving Reporting Systems. *Medicines* 8 (9), 46. <https://doi.org/10.3390/medicines8090046>.
- Naome, T., James, M., Christine, A., Mugisha, T.I., 2020. Practice, perceived barriers and motivating factors to medical-incident reporting: a cross-section survey of health care providers at Mbarara regional referral hospital, southwestern Uganda. *BMC Health Services Res.* 20 (1), 1–9. <https://doi.org/10.1186/s12913-020-05155-z>.
- NCCMERP. What is a Medication Errors. <https://www.nccmerp.org/about-medication-errors>. Published 2014. Accessed December 15, 2021, 2021.
- Raban, M.Z., Westbrook, J.L., 2014. Are interventions to reduce interruptions and errors during medication administration effective?: a systematic review. *BMJ Quality Saf.* 23 (5), 414–421. <https://doi.org/10.1136/bmjqs-2013-002118>.
- Reumerman, M., Tichelaar, J., Piersma, B., Richir, M.C., Van Agtmael, M.A., 2018. Urgent need to modernize pharmacovigilance education in healthcare curricula: review of the literature. *Eur. J. Clin. Pharmacol.* 74 (10), 1235–1248. <https://doi.org/10.1007/s00228-018-2500-y>.
- Rodziewicz, T.L., Houseman, B., Hipskind, J.E., 2021. *Medical Error Reduction and Prevention*. StatPearls [Internet]. StatPearls Publishing.
- Rutledge, D.N., Retrosi, T., Ostrowski, G., 2018. Barriers to medication error reporting among hospital nurses. *J. Clin. Nurs.* 27 (9–10), 1941–1949. <https://doi.org/10.1111/jocn.14335>.
- Schilling, L.M., Crane, L.A., Kempe, A., Main, D.S., Sills, M.R., Davidson, A.J., 2010. Perceived frequency and impact of missing information at pediatric emergency and general ambulatory encounters. *Appl. Clin. Informatics* 1 (03), 318–330. <https://doi.org/10.4338/ACI-2010-04-RA-0022>.
- Schindler, T.J., Kehrer, J.P., Yuksel, N., Hughes, C.A., 2012. University-based continuing education for pharmacists. *Am. J. Pharmaceutical Education* 76 (2), 20. <https://doi.org/10.5688/ajpe76220>.
- Sewal, R.K., Singh, P.K., Prakash, A., Kumar, B., Medhi, B., 2014. A prospective study to evaluate awareness about medication errors amongst health-care personnel representing North, East, West Regions of India. *Int. J. Appl. Basic Med. Res.* 4 (1), 43. <https://doi.org/10.4103/2229-516X.125694>.
- Shawahna, R., Abbas, A., Ghanem, A., 2019. Medication transcription errors in hospitalized patient settings: a consensual study in the Palestinian nursing practice. *BMC Health Services Res.* 19 (1), 1–12. <https://doi.org/10.1186/s12913-019-4485-3>.
- Tobaigy, M., Stewart, D., 2013. Exploring health professionals' experiences of medication errors in Saudi Arabia. *Int. J. Clin. Pharm.* 35 (4), 542–545. <https://doi.org/10.1007/s11096-013-9781-0>.
- Welsh, D., Zephyr, D., Pfeifle, A.L., Carr, D.E., Fink III, J.L., Jones, M., 2018. Development of the Barriers to Error Disclosure Assessment (BEDA) Tool. *J. Patient Saf.* 17 (5), 363–374.
- Wolf, Z.R., Hughes, R.G., 2008. Advances in Patient Safety Error Reporting and Disclosure. In: Hughes, R.G. (Ed.) *Patient Safety and Quality: An Evidence-Based Handbook for Nurses*. Rockville (MD): Agency for Healthcare Research and Quality (US); 2008.