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**Perception of Nurses toward Medication Administration
Errors at Medical Pediatric Wards in Governmental
Hospitals- Gaza Strip**

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Errors at Medical Pediatric Wards in Governmental
Hospitals- Gaza Strip**

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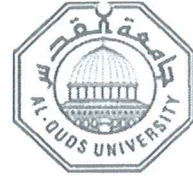
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Thesis Approval

Perception of Nurses toward Medication Administration Errors at Medical Pediatric Wards in Governmental Hospitals- Gaza Strip

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Jerusalem – Palestine

1440 / 2018

Dedication

I would like to dedicate this work to the soul of my father...

To my kind mother who prayed for me all the time ...

My beloved wife and my sons , for their encouragement and support
all the way.

To everyone who contributed to make this study a reality, thank
you.

Nidal M. A. Zourob

Declaration

I certify that this thesis submitted for the degree of Master, is the result of my own research, except where otherwise acknowledged, and this study (or any part of the same) has not been submitted for a higher degree to any other university or institution.

Signed:

Nidal M. A. Zourob

...../...../.....

Acknowledgement

First of all, praise is to Allah, the lord of the world, and peace and blessings of Allah be upon the noblest of all Prophets and messengers, our prophet Muhammad, all thanks for Allah who granted me the help and capability to complete this thesis.

I had the great fortune to complete this thesis under the supervision, guidance and revision of Dr. Akram Abu Salah.

I would like to convey my warm thanks to all the nurses at pediatric wards in governmental hospitals for their help and support during data collection.

Nidal Zourob

December, 2018

Abstract

Administration of medication is one of the most important duties of nurses as it requires a particular set of knowledge and attitude to be implemented correctly. The purpose of this study was to assess the perception of nurses about medication administration errors at pediatric wards in governmental hospitals of Gaza strip. A descriptive, cross sectional design had been used with 110 pediatric nurses selected conveniently from 5 governmental hospitals namely Al Rantesy, Al Nasser, European Gaza Hospital, Nasser Medical Complex, and Al Najar hospital. An adapted self-administered high reliable (Cronbach's $\alpha = 0.932$) questionnaire was used. The researcher used SPSS program version 22 for data analysis; which the conducted tests were: frequencies, percentage, means, standard deviation, T-test, and Chi square. The results indicated that 67.3% of participants were female nurses, mean age 34.64 ± 8.27 years, 60.9% live in cities, mean years of experience 11.05 ± 7.16 years, 74.5% have bachelor degree, 84.5% married, 68.2% satisfied with their work, and 51.8% working day shift only. The results also showed that 25.5% of the participants reported errors in the process of giving medication at work. These errors capture four main points: type of error, error stage, cause of error and proposed methods to prevent error. Giving wrong type of medication (28.6%) was the most prevalent type of medication errors and most of errors occurred at the administration stage (42.8%). The results showed that there were no statistical significant relationship between the errors in the medication process and the demographic variables; despite of present differences. Ranking of perceived errors showed that giving wrong dose was the most prevalent type of medication errors, and heavy workload was the most prevalent cause of medication errors. Therefore, the increase number of nurse / patient ratio, the receipt of the prescription correctly, and provision of an appropriate work environment were the most suggested methods to avoid such errors. The domain of fear factors (wt%= 69%, $P \leq 0.01$), managerial factors (wt%= 66.6%, $P \leq 0.01$), and reporting factors (wt%= 64.2%, $P \leq 0.01$) showed the perceived prominent reasons for hindering medication errors reporting. Therefore, the study recommends that ME is a professional act that should not be used for disciplinary or punishment purposes, but should be considered as a healthy behavior to enable the hospital to identify weaknesses in the system and find appropriate solutions to avoid future mistakes.

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List of Abbreviations

ADE	Adverse Drug Event
ADR	Adverse Drug Reaction
EGH	European Gaza Hospital
GS	Gaza Strip
MA	Medication Administration
MAE	Medication Administration Error
ME	Medication Errors
MoH	Ministry of Health
NGOs	Non-Governmental Organizations
NCCMER	National Coordinating Council for Medical Error Reporting and Prevention
NMC	Nasser Medical Complex
OCHA	Office for the Coordination of Humanitarian Affairs
PCBS	Palestinian Center Bureau of Statistics
SPSS	Statistical Package for Social Sciences
UNRWA	United Nations Relief and Works Agency for the Palestinian Refugees in the Near East
WB	West Bank
WHO	World Health Organization

Chapter One

Introduction

1.1 Background

Administration of medication is one of the most important duties of nurses. It requires a particular set of knowledge and attitude to be implemented correctly. Medication errors (MEs) can put nursing practice at risk and can create preventable risk for children. Nurses hold responsibility for taking care of children and providing safety for them. Nurses spend approximately 40% of their time for medication therapy, therefore they have a key role for reduces MEs and increase patients' safety (Ito and Yamazumi, 2013).

National Coordinating Council for Medical Error Reporting and Prevention (NCCMER) define MEs as "any preventable event that may cause or lead to inappropriate medication use or patient harm" (NCCMER, 2017). It's impose more obligation on them, thousands of Americans die due to these errors every year. The financial costs associated with these medical complications have been estimated as \$77 million annually (Tang et al., 2007).

Medication errors are a significant and growing problem in health care settings, that understanding of some associated factors, such as the hospital unit and nursing shift, might assist nursing administrators to identify common patterns and improve nursing care, ensure patient safety, and reduce hospital costs. Better organizational systems then could be designed and implemented to reduce potential medication errors (Mohamed and Gabr, 2011). In hospitals, medication delivery passes through 3 steps, the physician orders the medication, a pharmacist prepares the medication, and the nurse administers it. Medication errors can happen anywhere along the chain of the process. Errors can occur with prescribing, documenting, transcribing, dispensing, administering and monitoring. At all these points along the chain, a nurse has to step in and double-check that everyone, from

the doctor to the pharmacist, performed their job correctly. With all of this responsibility falling to one person, it is no wonder that errors happen (Bonsall, 2011).

Medication errors have been reported as the most common cause of hospital adverse events, as a large number of children are prescribed drugs on a hospital basis (Chiang et al., 2010). Although there are abundant advantages and ethical bases in elaboration and reports of nurses' errors, it is very difficult to obtain accurate statistics of medication errors due to nurses' protection against punishment, absence of an appropriate reporting and recording system, and shortage of information (Cheraghi et al., 2012) .

Literature reports that young children are the most vulnerable group due to their limited capability to communicate the initial symptoms of drug errors or reactions, and due to their body mass ratio less capable to "buffer error" as compared to adults (Gonzales , 2010). A low percent of medication errors are actually reported, medication administration errors present a universal problem and can cause serious consequences for children, especially those with acute complex medical conditions (Alsulami et al., 2013).

In Palestinian governmental hospitals, an incidence report (IR) form is available to report any medical error, but unfortunately, it's not used frequently, and usually nurses try to avoid filling it unless serious case of medical error had been committee. Nurses lie in the front line of administrating the medications to the patients, and they are considered to be the responsible for the patient safety. Therefore, the study takes place in Gaza Strip (GS) to identify the causes, types of medication errors and the barriers of medication errors reporting from the perspective of medical pediatric nurses.

1.2 Research problem

For many health institutions, medication errors are a very important concern that might cause: disability, death, physical and psychological harm; and also, increase the cost of hospitalization. There are many factors that put children at a greater risk for medication errors, such as their variations in age and weight, high intra-patient variability, and rapid changes in the pharmacokinetic properties of drugs in children (Al-Jeraisy et al., 2011). The children are particularly vulnerable to medication errors because drug dosages are calculated for body weight. Medication dosing errors occur in up to 17.8% of hospitalized children. (John et al., 2012). Furthermore, up to the researcher's knowledge, in GS there is not enough collected data or conducted researches about medication errors in GS. Therefore, this study takes place as an initial step in GS to highlight this problem and to assess perception of nurses toward medication administration errors in medical pediatric wards of governmental hospitals.

1.3 Justifications of the study

Medication errors in pediatric wards remind a critical issue occurring in hospitalized children, in pediatric wards medication errors it has been estimated that 3 - 7 % occur during prescribing, 5 - 58 % during dispensing, 72 - 75 % during administration, and 17-21 % are documentation errors (Miller and Robinson, 2007). These errors are both preventable and expensive to the health care system and often lead to severe and devastating consequences for children and their families (Tang et al. 2007). World Health Organization (WHO) put the medication error in the first six priority list for research related to patient safety (WHO, 2009).

Up to the researcher's knowledge, there is a limited information in GS about the incidence, causes, and barriers of medication errors at medical pediatric wards. Therefore, this study is considered the first step in highlighting this problem that would address medication errors

from the perspective of pediatric nurses to review and identify nurses' perception about medication errors, causes of errors, and suggestions to avoid such errors. A comprehensive overview of medication errors from a pediatric nursing perspective will help to develop policy to reduce the rate of such errors and to put in place safeguards to improve child safety and increase the quality of care.

1.4 Aim of the study

The aim of this study is to assess the perception of pediatric nurses about medication administration errors at pediatric wards at governmental hospitals in Gaza strip.

1.5 Objectives of the study

1. To identify the rate of medication administration errors among medical pediatric nurses in Gaza strip.
2. To examine the relationship between sociodemographic characteristic of nurses and the occurrence of medications errors.
3. To identify the most common types of medication errors where occurred at medical pediatric wards.
4. To determine the most prevalent stage of the medication errors where common to occur at medical pediatric wards
5. To identify the most common causes of medication errors occurrence at medical pediatric wards
6. To know the opinions of pediatric nurses to avoid medication administration errors in the future.
7. To identify barriers of reporting medication errors at medical pediatric wards in governmental hospitals of Gaza Strip.

1.6 Questions of the study

1. What is the rate of medication administration errors at medical pediatric wards?
2. What is the relationship between demographic characteristic of nurses and the occurrence of medications errors?
3. What are the most common types of medication errors where occurred at pediatric wards in governmental hospitals.
4. Which are the most common stages where the medication errors occurred at medical pediatric wards
5. What are the most common causes of medication errors occurrence at medical pediatric wards
6. What are the opinions of medical pediatric nurses towards methods of avoidance medication errors?
7. What are the barriers of reporting medication errors at medical pediatric wards in governmental hospitals of Gaza Strip?

1.7 Context of the study

1.7.1 Sociodemographic context

Palestine lies within an area of 27,000 square kilometers (Km²), expanding from Ras Al-Nakoura in the north to Rafah in the south, and due to the Israeli occupation, the Palestinian territory is divided into three areas separated geographically; the West Bank (WB) 5.655 Km², GS 365 Km² and East Jerusalem, with estimated population about 4,95 million, of them 3,008 in WB and 1,943 in GS with male to female ration 103.4. The population density (capita/km²) is 778 in Palestine (506 in WB and 4,986 in GS). The Palestinian population is characterized by high percentage of young age as the percentage of people younger than 5 years was 15% (13.8% in WB and 17% in GGS, and those aged between 0 – 14 years accounted for 39.4% (37.2% in WB and 43% in GS) (Palestinian Central Bureau of Statistics - PCBS, 2017).

1.7.2 Economic context

Economic status in the Palestine is very low especially in GS due to siege against the Strip. The percentage of poverty was 13.9% in the WB, while it reached 53.0% in GS. It is worth mentioning that because of Israeli siege against GS and the ongoing political division, the situation of level of living in GS became worse than it was in 2011. Poverty among individuals in GS was 38.8% in 2011 while it jumped to 53.0% in 2017 with 37% increase. In WB, the situation was different, as the poverty percentages decreased from 17.8% in 2011 to 13.9% in 2017 with about 22.0% decrease. Deep poverty percentages also increased significantly in GS, as the deep poverty percentage was 21.1% in 2011 and became 33.8% in 2017 with an increase by around 60%. In WB, there was a decrease in deep means poverty percentages, as it was 7.8% in 2011 and became 5.8% in 2017 with a decrease by 25.6% (United Nations Office for the Coordination of Humanitarian Affairs - OCHA, 2018).

1.7.3 Health care system

The health system in Palestine fragmented and consists of different parties. The main parties that offer health services are the Ministry of Health (MOH), NGOs, United Nations Relief and Works Agency for Palestinian Refugees in the Near East (UNRWA), the military health services, and the private sector. The number of hospitals in governmental hospitals in GS is 13 hospitals with bed capacity 1664 beds (MOH, 2018), and the number of beds allocated for children is 19.3% of the total number of beds in MOH hospitals (260 beds in WB and 381 beds in GS) (MOH, 2017).

1.8 Operational and theoretical definitions

- ***Adverse Drug reaction:*** refers to any response to a drug which it's harmful and unintended.

- **Nurse:** a person who has completed a program of basic, generalized nursing education and is authorized by Palestinian regulatory authority to practice nursing.
- **Medication error:** it's unintentional errors in the prescribing, dispensing, administration or monitoring of a medicine while under the control of a healthcare professional, patient, or consumer
- **Patient Safety:** It's referring to the prevention of avoidable errors and adverse effects to patients associated with health care.

1.9 Boundaries of the study

- **Conceptual boundary:** assess the perception of nurse's towards medication errors and their recommendations for prevention the occurrence of medication error in pediatric wards
- **Setting boundary:** the study has been conducted at medical pediatric wards in governmental hospitals in the Gaza strip namely; Al-Rantaisy hospital, Al-Nasser hospital, European Gaza Hospital, Nasser Medical Complex, and Al-Najjar hospital.
- **Temporal boundary:** the whole study is proposed to be applied in the period between September 2017 till October 2018.
- **Population boundary:** eligible registered nurses who are working at pediatric wards on governmental hospitals of GS during the time of study application.

Chapter Two

Literature Review

2.1 Conceptual Framework

Conceptual framework is the map that guides the researcher during the process of preparing the research (Figure 2.1). It's designed by the researcher based on review of available literature and previous studies.

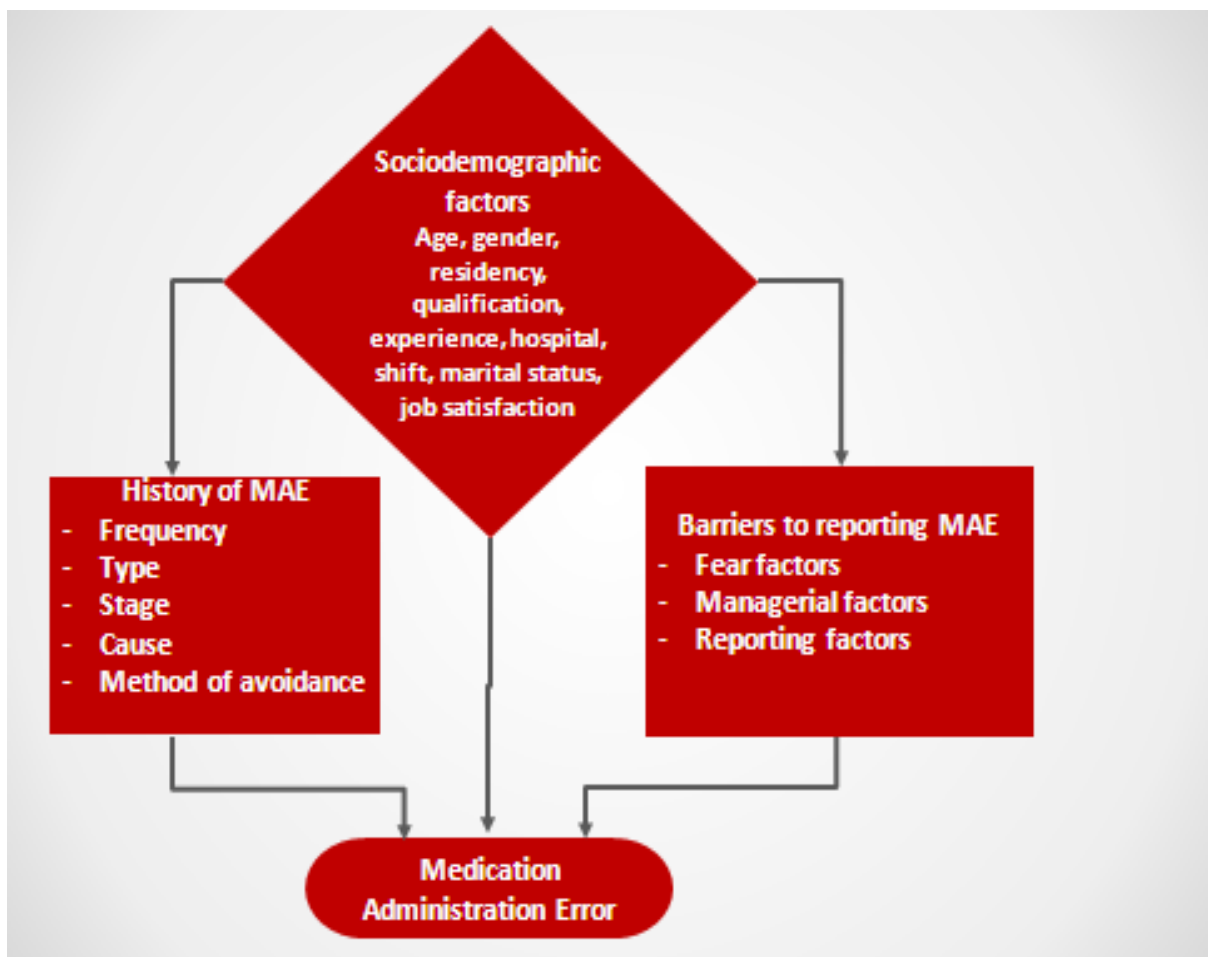


Figure (2.1): Diagram of conceptual framework (Self-developed)

2.1.1 Perception of nurses towards medication errors

Medication errors are a significant global concern and can cause serious medical consequences that will affect health status of patients. ME have been reported as the most common cause of hospital adverse events, as large number of children are prescribed drugs on a hospital basis (Chiang et al. 2010), and children are particularly vulnerable to ME because of their unique physiology and developmental needs (Abusaad and Etawy, 2015).

Medication errors can occur at each stage of the cycle from prescribing, transcription, dispensing to administration. This means that all health care professionals, including doctors, nurses and pharmacists should be involved in an approach to preventing the problem of MEs (Williams, 2007). It is widely acknowledged now that MEs occur when human errors and system factors interact with this cycle, so rather than just focusing on the individual, the conditions within the organization and clinical practice are important causes of error (Armitage et al. 2010). As these types of errors are deemed to be preventable, there is the opportunity to learn from any failures and respond in order to prevent them in the future (Chuang et al. 2007). However, nurses stand in the front line of administering the medications to the patients, and they are considered to be the responsible for the patient safety; thus, acquainting their knowledge about the issue, could be the first step to be able to set policies and strategies to focus on the problem, and build safer health system.

2.1.2 Barriers of reporting medication errors

Despite the fact that reporting the ME is very important in order to control those errors and help to identify them and implement the policies and rules to control them and minimize their occurrence. However, a low percent as less than 25% of medication errors are reported using incidence report (Alsulami et al., 2013). However, Hartnell et al. (2012) emphasized that the major barriers to safe medication administration were lack of interdisciplinary collaboration and communication, nurses' work environment that does not

support safety, also, systems design and difficulties in translating research into practice were identified as significant barriers to safe medication administration.

When it comes to report an error many factors prevent nurses from reporting ME, they could be due to lack of knowledge about the ME in general, like when the nurse doesn't know the exact definition of the ME, or when it should reported, or due to fear from managers or peers, and could be to the personal judgment of the nurse for the ME he committed to be minor and doesn't deserve to be reported.

In Palestine, Al-Sarawan, (2014) carried out a study in WB found that thinking that the error had been committed is not serious and not needed to be reported was the most common barrier against reporting medication error, while most of the nurses said that they know the exact definition of medication errors and when to report them, the results showed that a big gap exists between actual knowledge and what is perceived. The same as in Egypt, a descriptive study found that the barriers to error reporting as perceived by the staff included no clear definition for medication errors, writing a report take a long time, and focusing on individual punishment more than system improvement (Khalifa et al., 2013).

Also, other descriptive study conducted in pediatric wards indicated that the strongest perceived barriers to medication administration errors reporting were fear from consequences of reporting, then managerial factor and then the process of reporting from the nurse's viewpoint. The nurses agree that identifying benefits of reporting followed agree that feeling safe about working environment, and agree that good professional relationship with physicians was the most facilitating factors of reporting medication errors (Abusaad and Etawy, 2015).

Another descriptive, cross sectional study conducted in pediatric wards in four hospitals in Turkey aimed to determine the perspective of pediatric nurses regarding the causes,

reporting, and prevention of medication errors showed that the most common barriers to reporting included potential blaming of nurses in case of adverse outcome for the patient (52.95%), loss of trust (50.45%), and fear of disciplinary actions or punishment (42%). Regarding to avoidance of errors, 45.4% of nurses stated that they are in need for adequate information regarding the safe use of medications (Toruner and Uysal, 2012). The same as in Iran a study showed that the rate of reporting medication errors among nurses was far less than medication errors they had made. Nurses perceived that the most important barriers to reporting ME were blaming individuals instead of the system, consequences of reporting errors, and fear of punishment (Bayazidi et al. 2012).

2.1.3 Contributing factors related to medication errors

In fact, the responsibilities of the nurses are to prepare the medications, administer them to the patient, monitor, evaluate and report any adverse drug reaction (ADR) due to medication. Different factors may contribute to medication errors, such of them are: the off-label and unlicensed use of medicine, which may increase the risk of avoidable medication-associated harm. Pediatric prescribing also requires weight-related dose adjustment and other dosing calculation, and healthcare providers may feel that they do not have time to properly check doses in relation to child's weight, and thus has the potential to lead to inaccurate prescriptions being written and dispensed (WHO, 2016).

Moreover, Khalifa et al. (2013) declare in his descriptive study that the most factors could relate to errors were low number of doctors, nurses, pharmacists, lack of experience of doctors, and pharmacists, and night shift significantly affected error frequency. The same as, staff members have perceived unreadable hand writing, repeated change of orders, similar drugs, change of nurses among units, work over load, low number of nurses, and dealing with big number of drugs as the most important risk factors of errors. A descriptive study carried out in Iran aimed to determine the frequency and type of medication errors

committed by nurses in hospitals of Ahvaz University of Medical Sciences. The sample of the study consisted of 225 nurses selected through multistage random sampling. The findings also showed that demographics characteristics such as age, gender, work experience, employment type and the type of medication errors were significant factors for ME (Mohammadi et al. 2014).

In Palestine, a descriptive cross-sectional study aimed to describe nurse's perception about the main types and factors contributing to medication errors. A total number of 340 nurses from 6 governmental hospitals in West Bank participated in the study. The results showed that nurses working experience more than 5 years was associated with higher percent of the nurses who report their medication errors using incidence error (Al-Sarawan, 2014).

2.2 Literature Review

2.2.1 Background

The nurse is an integral part of health care professions. Nurses perform various duties in delivering nursing care to their patients, and among these duties administering medication. In giving medication, some unwanted incident may happen and MAE may occur. The medication administration (MA) process is an everyday part of nursing practice, and is often viewed as a routine and basic nursing task (Park et al. 2011). Also, MA is an important part of patient safety within any healthcare setting, and preventing ME represents a central focus of hospitals' quality improvement and risk management initiatives (Al-Youssif et al. 2013). It is estimated that 40% of the nurse's time is spent on medication preparation and administration to the patients, thus medication administration is a core role of the nurse's career (Ito and Yamazumi, 2013). So, while they are feeling worry about the patient's health and safety; committing a ME by a nurse has a negative impact on themselves, they will feel upset, terrified and they may loss the confidence in

their abilities as clinical practitioner, and that may lead them finally to feel anger at themselves and at the system as a whole

Both health workers and patients themselves can make mistakes that result in errors and may cause harm. In general, these mistakes could be in ordering, prescribing, dispensing, preparing, administering or consuming the wrong medication or the wrong dose at the wrong time, but all medication errors are potentially avoidable, and preventing errors requires putting systems and procedures in place to ensure the right patient receives the right medication at the right dose via the right route at the right time (WHO, 2017).

Therefore, identifying the main types, contributing factors and reporting attitude of the nurses will be the first step to understand the extent of the problem and its scope in Palestine. This could be a baseline for the stakeholders to set strategies and tactics to minimize and solve it.

2.2.2 Definition of medication errors

The concept of MEs is not new in healthcare services that literature described it since long years ago. The researchers differentiate between the two terms medication errors and MAE, that the first term is consider a wider term which implies that error may occur during prescribing, transcribing, dispensing, administering, adherence, and monitoring of a drug, while the term medication administration errors is generally used to describe the process which a nurse undertakes when preparing and giving medication to a patient. This separates the activity from the prescribing of medications by doctors and dispensing of medications by pharmacists. Therefore, nurses may make errors during medication administration which are called "medication administration errors" and these errors may occur in different stages of preparation and administering medications (Al Reshidi, 2016).

National Coordinating Council for Medical Error Reporting and Prevention define medication error as "any preventable event that may cause or lead to inappropriate medication use or patient harm" (NCCMER, 2017). While, King's College London (2010) described MAEs as "any deviation from the physician's medication order as written on the patient's chart. On other hand nurses define MEs as "mistakes associated with drugs and intravenous solutions that are made during the prescription, transcription, dispensing, and administration phases of drug preparation and distribution (Peris-Lopez et al. 2010).

However, it is worth to say that MAEs can be classified as either acts of commission or omission, and may include wrong drug, wrong route, wrong dose, wrong patient, wrong timing of drug administration, a contra-indicated drug for that patient, wrong site, wrong drug form, wrong infusion rate, expired medication date, or prescription error (Jones and Treiber, 2010; Gonzale, 2009).

2.2.3 Incidence rate of medication errors

It is clear that medication error is a growing problem in health care settings. Pediatric medication errors have been identified as the most frequent type of medical error involving children (Sears et al. 2012). A systematic review of study aimed to identify incidence, and types of ME in middle east countries found that 20% of studies focused on ME in pediatric patients, and error rates varied from 7.1% - 90.5% for prescribing, and from 9.4% - 80% for administration (Alsulami et al. 2013).

In a strong systematic review study aimed to investigate the epidemiology of medication errors and error-related adverse events. The review included 60 studies, and the results reflected that incidence of prescribing errors was reported in 46 studies: prevalence estimates ranged widely from 2% to 94%. The incidence of preventable adverse drug events (ADEs) was estimated at 15/1000 person-years, the prevalence of drug-drug

interaction-related adverse drug reactions at 7% and the prevalence of preventable ADE at 0.4% (Assiri et al. 2017).

Moreover, a descriptive cross-sectional study carried out in Iran aimed to assess medication errors among pediatric nurses indicated that 58.4% of nurses reported at least one MEs and totally 131 MEs were occurred in three months (Miladinia et al. 2016). Also, a retrospective, secondary database study was conducted at a large tertiary care medical center in Houston. The study included a total of 1,887,751 medication orders and 50 pharmacists. The results revealed that the overall error rate was 4.87 errors per 100,000 verified orders (Gorbach et al. 2015).

In Egypt, a descriptive study found that frequency of reporting among nurses was (44%), compared to (15%) among doctors and (3%) among pharmacists (Khalifa et al. 2013). In Palestine, a descriptive cross-sectional study aimed to describe nurse's perception about the main types and factors contributing to medication errors. A total number of 340 nurses from 6 governmental hospitals in West Bank participated in the study. The results showed that 22% of the nurses do not report their ME by any mean; however, among nurses who committed ME, 78% of the nurses said that they report medication error verbally and 59% of them said that they write an incident report too if they commit ME (Al-Sarawan, 2014).

2.2.4 Types of medication errors

Medication errors may occur at various forms during the drug use process; either in a form of wrong route, changing of medication, frequency of medication, wrong dose, wrong patient, or wrong time. In a strongest systematic review study aimed to investigate the epidemiology of medication errors and error-related adverse events. The review included 60 studies, and the results reflected that inappropriate prescribing was the most common type of errors reported, while only one study reported the prevalence of monitoring errors,

and incomplete therapeutic/safety laboratory-test monitoring occurred in 73% of patients (Assiri et al. 2017).

In other systematic review of study aimed to identify types of ME in middle east countries found that the most common types of prescribing errors reported were incorrect dose with an incident rate from 0.15% - 34.8% of prescriptions, followed by wrong frequency and wrong strength (Alsulami et al. 2013). Also, a cross-sectional study was performed on 53 pediatric nurses in Ahvaz, South-west of Iran showed that the most prevalent type and cause of medication errors were wrong dose and poor medication knowledge, respectively.

In Palestine, a descriptive cross-sectional study aimed to describe nurse's perception about the main types and factors contributing to medication errors. The results showed that the most common perceived type of medication errors was wrong time as 79% of nurses reported that medication given one hour before or after intended time occurs frequently, while heavy work load was reported as the first leading factor for medication error reported by 80% of the nurses followed by in adequate staff (Al-Sarawan, 2014).

2.2.5 Stages of medication errors

Medication errors may occur at any stage of drug use process; either during prescription, dispensing, or administration phases (Maralyn and Karen, 2006). A descriptive study conducted in pediatric wards in Egypt aimed to examine types, stages and causes of medication errors. The results indicated that the highest stage of medication errors done by nurses was missing of medication then patient monitoring and administration, and the highest cause of medication errors was due to heavy workload (Abusaad and Etawy, 2015). In Egypt, a descriptive study carried out in Zagazig University hospitals. The sample of the study consisted of 547 health care providers, and the results found that the most errors was

occurred in stages of: dispensing (46%), followed by administration (41%), then prescription stage (13%) (Khalifa et al. 2013).

Also, a descriptive study was conducted in 4 Pediatric hospital using a structured interview questionnaire found that the highest types of medication errors was the wrong route, the highest stage of medication errors done by nurses was missing of medication then patient monitoring and administration and the highest cause of medication errors was due to heavy workload. The researcher recommended that the good relationship between the staff nurse, managers and physicians were the most facilitators of reporting medication errors (Abusaad, 2015).

2.2.6 Causes of medication errors

Medication delivery is complex in all areas of health care; safe delivery of medications to children, however, presents additional challenges and opportunities for error. A descriptive study carried out in Pakistan showed that the possible causes for medication errors include complexity of procedures, lack of adequate knowledge, gaps in training, increased workload, and distraction (Hirani and McFarlane, 2016). Another descriptive, cross sectional study conducted in pediatric wards in four hospitals in Turkey aimed to determine the perspective of pediatric nurses regarding the causes, reporting, and prevention of medication errors showed that the most common causes of medication errors were long work hours (68.1%) and a high patient/nurse ratio (58.8%). The results also indicated that even though the majority of nurses (88%) made use of a medication error notification system, still many errors were not reported (Toruner and Uysal, 2012).

Moreover, a descriptive cross-sectional study carried out in Iran aimed to assess medication errors among pediatric nurses indicated that the most prevalent of MEs types were reported: 36.6% wrong dose and 14.5% wrong drug preparation. Also, most prevalent

of MEs causes from nurses' perspective were poor medication knowledge reported by 96.2% of nurses and poor calculation skills reported by 73.5% of nurses (Miladinia et al. 2016). A retrospective, secondary database study was conducted at a large tertiary care medical center in Houston. The results revealed that the associated risk factors for ME included an increased number of orders verified per pharmacist, the type of shift, the type of day, and the mean number of pharmacists per shift (Gorbach et al. 2015).

However, in according to report published by WHO (2017), medication errors can be caused by health worker fatigue, overcrowding, staff shortages, poor training and the wrong information being given to patients, among other reasons. Any one of these, or a combination, can affect the prescribing, dispensing, consumption, and monitoring of medications.

2.2.7 Methods of medication errors avoidance

It is clear that MEs is a growing problem in health care settings. Thus, enhanced understanding of some associated factors, such as the hospital unit and nursing shift on which the error occurred might assist nursing administrators to identify common patterns and improve nursing care, ensure patient safety, and reduce hospital costs. Better organizational systems then could be designed and implemented to reduce potential medication errors (Mohamed and Gabr, 2011).

Another descriptive, cross sectional study conducted in pediatric wards in four hospitals in Turkey aimed to determine the perspective of pediatric nurses regarding the causes, reporting, and prevention of medication errors showed that 45.4% of nurses state that avoidance of medication errors could achieved by adequate information regarding the safe use of medications (Toruner and Uysal, 2012).

2.2.8 The role of organizational safety culture in preventing medication errors

A safety culture in healthcare systems comprises enlightened leadership, teamwork and a patient-centered approach to care of patients (Sammer et al. 2010). Health facilities involved in highly complex, technological process demand a failure-free operational standard from their staff.

Effective communication is a key element of the safety culture in the hospital, particularly the communication between and within multidisciplinary teams in relation to medication process (Savvato and Efstratios, 2014). Nurses are directly involved in preventing errors at administration level and are often integral to prompting prescriptions, advising on dosages during the prescription writing phase, informing pharmacy about incorrectly dispensed medication, detecting errors and taking corrective action in medication preparation before administration (Popescu et al. 2011).

Inexperienced nurses are particularly vulnerable to errors associated with miscommunication because of low levels of anticipation or awareness of the potential for errors, they are therefore less likely than their experienced colleagues to seek clarification either through verbal communication with colleagues or from written information (Savvato and Efstratios, 2014). In this regard, it is worth to say that experience promotes anticipation and early detection of errors, therefore, ensuring an adequate skill mix of shifts may help prevent medication errors.

2.2.9 The role of interruptions and distractions in medication errors

Higher medication error rates are associated with greater levels of interruptions during medication administration (Westbrook et al. 2010). When a number of patients' activities occur simultaneously, nurses are involved in complex decision-making to prioritize activities; many competing activities have the potential to result in distractions and

interruptions that can interfere with a primary task and may contribute to errors. So, nurses are often required to choose between attending to, ignoring or delaying attending to distractions when undertaking medication administration, which may result in the nurse anticipating potential distractions, prioritizing one task over another or delegating a secondary task (Popescu et al. 2011). In this regard, nurses should take active steps to avoid distractions and interruptions, and they should learn to recognize when it is appropriate to be interrupted, and this requires exercising critical thinking and making appropriate clinical judgments, which are fundamental responsibilities of the professional nurse (Jones and Treiber, 2010). In my opinion, nurses need to be aware of their potential to distract and interrupt other nurses and should work towards minimizing activities that may interrupt other nurses.

Chapter Three

Methodology

3.1 Study design

A descriptive cross-sectional design has been used in this study; as it's appropriate for describing the status of phenomena or for describing relationships among phenomena and involves the collection of data once the phenomena under study are captured during a single period of data collection (Polit and Beck, 2012).

3.2 Population of the study

The study population consisted of all the nurses who are working in medical pediatric wards at governmental hospitals in Gaza Strip. Their total number was 180 nurses.

3.3 Sampling method and sample size

To carry out the study, five governmental hospitals that offer medical pediatric care have been selected. These hospitals are the major hospitals that offer pediatric medical care to children. The sample of the study was census sample, and the number of eligible nurses who participated in the study was 110 with response rate 61%. Distribution of study participants was as follows: 38 from Al Rantesy pediatric hospital, 20 from Al Nasser pediatric hospital, 20 from European Gaza Hospital (EGH), 20 from Nasser Medical Complex (NMC), and 12 from Al Najjar hospital.

3.4 Setting of the study

The study has been conducted in five governmental hospitals; Al Rantesy pediatric hospital and Al Nasser pediatric hospital in Gaza governorate, NMC and EGH in Khanyounis governorate, and Al Najjar hospital in Rafah governorate.

3.5 Period of the study

The study has been commenced during the period from September 2017 till October 2018.

Data collection has been carried out from April to July 2018.

3.6 Eligibility criteria

3.6.1 Inclusion criteria

- Nurses who are working full-time schedule in medical pediatric wards.
- Nurses who have permanent or yearly contract with MoH.

3.6.2 Exclusion criteria

- Nurses who are working in medical pediatric wards less than 3 months.
- Nurses who have temporary contract (job creation for 3 – 6 months).
- Volunteer nurses and students nurses.

3.7 Instrument of the study

In this study, the researcher used self-administered questionnaire that measures perception of nurses about medication administration errors (Annex 2). The questionnaire was adapted from Al-Shara (2011) with some modifications. The questionnaire consisted of the following parts:

Part I: Sociodemographic characteristics of study participants.

Part II: History of previous medication errors.

Part III: Perceived type of medication errors (9 items). Ranking according to frequency (1 the most frequent and 9 the least frequent).

Part IV: Perceived stage of medication errors (5 items). Ranking according to frequency (1 the most frequent and 5 the least frequent).

Part V: Perceived cause of medication errors (13 items). Ranking according to frequency (1 the most frequent and 13 the least frequent).

Part VI: Perceived methods of avoiding medication errors (13 items). Ranking according to frequency (1 the most frequent and 13 the least frequent).

Part VII: Perceived barriers to reporting errors consisted of 22 items according to 5 scores Likert scale. This part distributed into three domains as the following:

- Fear factors: consisted of 11 items.
- Managerial factors: consisted of 5 items.
- Reporting factors: consisted of 6 items.

Table (3.1): Interpretation of 5-points Likert scale

Class	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Degree	5	4	3	2	1
Average mean	4.21-5.00	3.41-4.20	2.61-3.40	1.81-2.60	1-1.80

3.8 Pilot study

A pilot study has been carried out on 20 nurses before starting data collection to examine reliability of the questionnaire. The questionnaires that have been used in the pilot study were included in the actual study sample as there is no changes were done in the content of the questionnaire.

3.9 Validity and reliability of the questionnaire

3.9.1 Face and content validity

The questionnaire was distributed to a panel of experts (Annex 3) in research methodology and pediatric field to examine its validity, clarity and suitability of its contents, and their comments were considered.

3.9.2 Reliability

The researcher used Cronbache alpha method to examine the reliability of the barriers to medication errors scale. The questionnaire showed high reliability as Cronbache alpha reading was 0.932 (Table 3.2).

Table (3.2): Reliability of barriers to medication errors scale by Alpha Cronbache

No.	Domain	Alpha coefficient
1	Fear factors	0.878
2	Managerial factors	0.804
3	Reporting factors	0.874
Overall		0.832

3.10 Data collection

Data has been collected by the researcher. Consent form (Annex 1) has been attached to each questionnaire that asks the nurses to participate in the study voluntary. Time estimated for each questionnaire was 20 minutes.

3.11 Data entry and statistical analysis

The researcher got assistance from a statistician for data entry and analysis. SPSS program (version 22) has been used. The process of data entry and statistical analysis included the following process:

- Overview of filled questionnaires
- Designing data entry model
- Coding and data entry into the computer

- Data cleaning to ensure accurate entry of data. This process was achieved by checking out a random of questionnaires and performing descriptive statistics for all the variables.

Data analysis included:

- Frequencies, percentage, mean and standard deviation for distribution of the study variables.
- In addition, one sample (t) test, cross tabulation and Chi square has been used.
- To examine reliability of the questionnaire, Cronbache alpha coefficient has been used.

3.12 Ethical and administrative considerations

Before starting the study, the researcher obtained approval from Al-Quds University, then got approval from Helsinki Committee (annex 4), and permission from MoH (annex 5) to conduct the study. All participants were asked to fill the questionnaire in voluntary manner after assure them about confidentiality of obtained data for the purpose of research only.

3.13 Limitation of the study

- Difficulty of data collection as participants working rotation shifts, so, the researcher went many times to meet the nurses.
- Some respondents may fear to say the truth about occurrence of medication errors.
- Fallibility of not all eligible nurses may not invite to participate in the study due to the system of duty shifts and vacations.
- Limited literature about the topic, in the study locality, since it's the first study done in Gaza strip

Chapter Four

Results and discussion

This chapter presents the findings of data analysis. It begins with description of demographic characteristics of study participants, followed by inferential findings for selected designed variables.

4.1 Descriptive Results

4.1.1 Sociodemographic characteristics of study participants

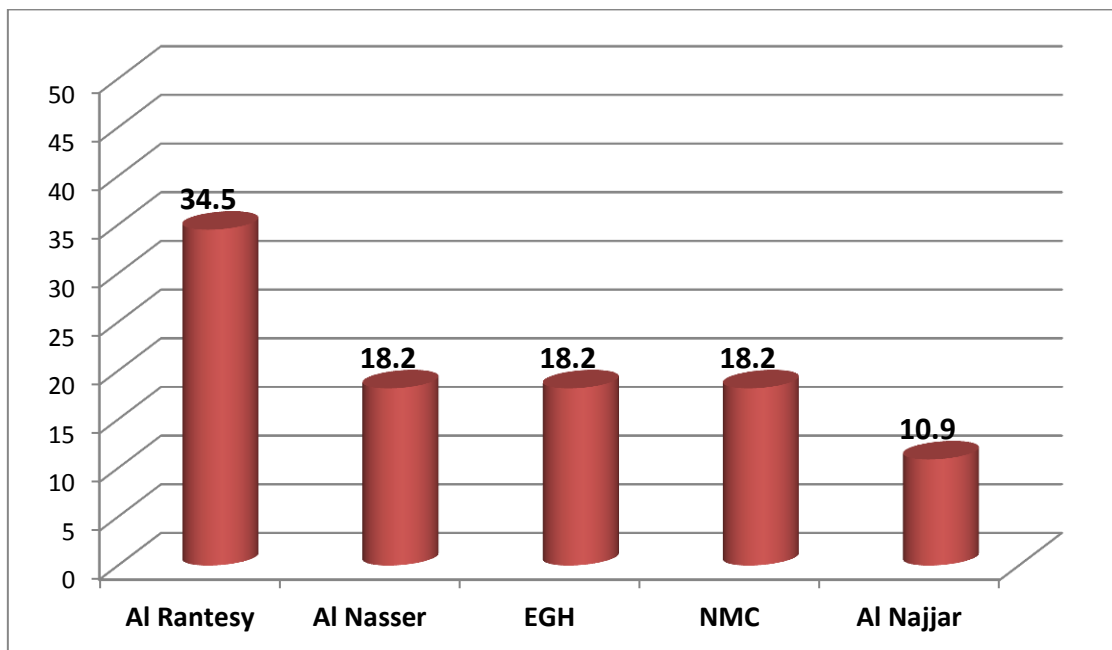


Figure (4.1): Distribution of study participants by hospital name

As presented in figure (1), 110 nurses participated in the study. They are working in pediatric departments in five governmental hospitals in GS. Their distribution according to hospital capacity was: 38 (34.5%) from Al Rantesy pediatric hospital, 20 (18.2%) from Al Nasser pediatric hospital, 20 (18.2%) from EGH, 20 (18.2%) from NMC and 12 (10.9%) from Al Najjar hospital.

Table (4.1): Demographic characteristics of study participants (N = 110)

Variable	N	%
Gender		
Male	36	32.7
Female	74	67.3
Age		
30 years and less	40	36.4
31 – 40 years	52	47.3
41 years and more	18	16.3
<i>Range 20 – 60 years Mean age = 34.645 years SD = 8.276</i>		
Place of residency		
Village	15	13.6
Camp	28	25.5
City	67	60.9
Years of experience		
5 years and less	25	22.7
6 – 10 years	39	35.5
11 – 15 years	25	22.7
16 years and more	21	19.1
<i>Range 1 – 35 years Mean years of experience = 11.054 SD = 7.164</i>		
Qualification		
Diploma	21	19.1
Bachelor	82	74.5
Master degree	7	6.4
Marital status		
Single	17	15.5
Married	93	84.5
Job satisfaction		
Satisfied	75	68.2
Not satisfied	35	31.8

Table (4.1) presents the sociodemographic characteristics of study participants. It showed that more than two thirds of nurses 74 (67.3%) were female nurses, and the age of study sample ranged between 20 – 60 years with mean age 34.645±8.276 years, that the highest frequency 52 (47.3%) were from the middle age (31 – 40 years), and 67 (60.9%) live in

cities. The results also shows that years of experience ranged between 1 – 35 years with mean years 11.054 ± 7.164 , and 39 (35.5%) of nurses have an experience of 6 – 10 years. Furthermore, the majority of nurses in this study (82, 74.5%) have bachelor degree, compared to 21 (19.1%) and 7 (6.4%) were have diploma and master degree respectively. In other hand, 93 (84.5%) of the participants were married, compared to 17 (15.5) were single. Finally, 75 (68.2%) of participants reported that they were satisfied from their work compared to 35 (31.8%) were dissatisfied.

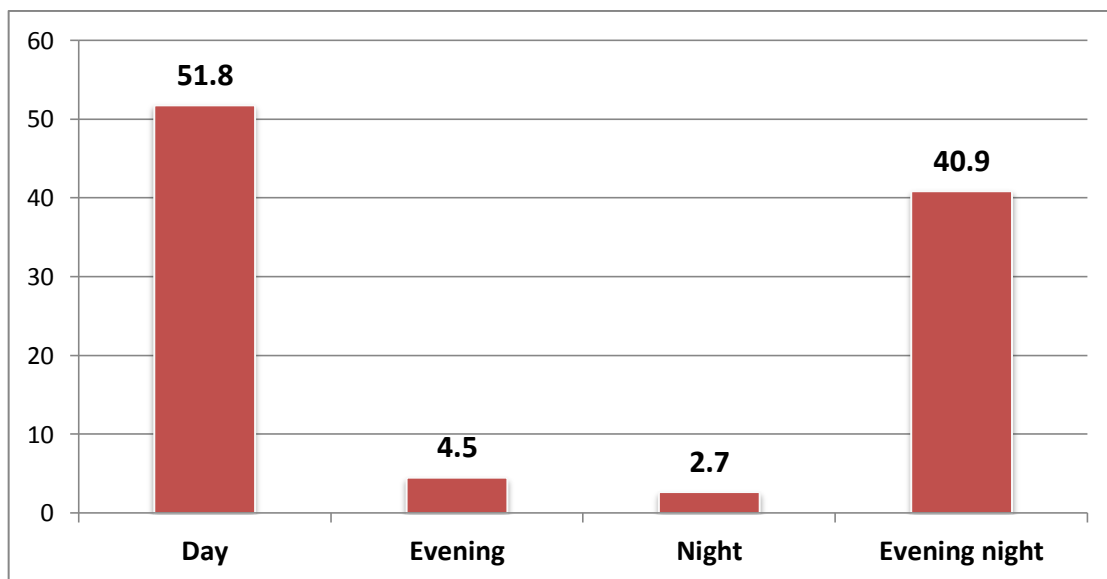


Figure (4.2): Distribution of study participants by working shift

Figure (4.2) shows that the majority of participants 57 (51.8%) working day shift only and 45 (40.9%) working evening-night shift, compared to only 5 (4.5), and 3 (2.7) working in evening and night shifts respectively.

4.1.2 Inferential results of the research questions

Question 1: What is the incidence rate of medication administration errors at medical pediatric wards?

Table (4.2): Incidence, frequency and type of medication errors (N = 110)

Variable	N	%
Occurrence of medication error (N = 110)		
No	82	74.5
Yes	28	25.5
Frequency of medication errors (N= 28)		
One time	10	35.7
Two times and more	18	64.3
Type of error (N= 28)		
Wrong route	2	7.1
Changing prescribed medication	2	7.1
Frequency of medication	1	3.6
Wrong type of medication	8	28.6
Wrong time of administration	3	10.7
No medication given	8	28.6
Wrong rate	4	14.3
Stage of medication error (N = 28)		
Missing of medication	7	25.0
Physician ordering	7	25.0
Pharmacy dispensing	1	3.6
Patient monitoring	1	3.6
Administration	12	42.8

Table (4.2) shows that 28 (25.5%) of participants were reported occurrence of medication errors during their work; of them, 10 (35.7%) nurses experienced error for only one-time compared to 18 (64.3%) experienced errors for two times and more. The most frequent type of occurred medication error were giving wrong type of medication that accounted for 8 (28.6%) and forgot to give medication accounted for 8 (28.6%), while the lowest type of error was frequency of medication that accounted for 1 (3.6%). Concerning stage of

medication error, the results showed that administration was the most frequent stage of medication errors in which accounting for 12 (42.8%) and the least frequent were pharmacy dispensing and patient monitoring that accounting only 1 (3.6%) for each stage.

Question 2: What is the relationship between demographic characteristic of nurses and the occurrence of medications errors?

Table (4.3): Distribution of medication errors by age groups of the nurse (N= 28)

Variable	Age (years)			χ^2	P value
	≤ 30 N (%)	31 – 40 N (%)	≥ 41 N (%)		
Frequency of medication error					
One time	2 (7.1)	8 (28.6)	0	4.044	0.132
Two times and more	6 (21.4)	8 (28.6)	4 (14.3)		
Total	8 (28.6)	16 (57.1)	4 (14.3)		
Type of medication error					
Wrong route	1 (3.6)	1 (3.6)	0	8.896	0.712
Changing prescribed	0	2 (7.1)	0		
Frequency of medication	1 (3.6)	0	0		
Wrong type of medication	3 (10.7)	5 (17.9)	0		
Wrong time of	1 (3.6)	1 (3.6)	1 (3.6)		
No medication	1 (3.6)	5 (17.9)	2 (7.1)		
Wrong rate	1 (3.6)	2 (7.1)	1 (3.6)		
Total	8 (28.6)	16 (57.1)	4 (14.3)		
Stage of medication error					
Missing of medication	1 (3.6)	5 (17.9)	1 (3.6)	13.021	0.111
Physician ordering	1 (3.6)	6 (21.4)	0		
Pharmacy dispensing	1 (3.6)	0	0		
Patient monitoring	0	0	1 (3.6)		
Administration	5 (17.9)	5 (17.9)	2 (7.1)		
Total	8 (28.6)	16 (57.1)	4 (14.3)		

Table (4.3) shows that the highest frequency of medication errors occurred in the age group 31 – 40 years old as 8 (28.6%) experienced one-time error and 8 (28.6%)

experienced two errors and more without statistically significant differences related to age ($p= 0.132$). In addition, the most frequent type of medication error was in wrong type of medication as 3 (10.7%) of nurses aged 30 years and less and 5 (17.9%) of nurses aged 31 – 40 years stated that they gave wrong type of medication, but differences between groups were insignificant ($p= 0.712$). On other hand, the most frequent stage of medication errors was in administration as 5 (17.9%) of nurses aged 30 years and less, 5 (17.9%) of nurses aged 31 – 40 years, and 2 (7.1%) of nurses aged 41 years and more reported that they experienced medication error in the administration stage.

Table (4.4): Distribution of medication errors by gender of the nurse (N= 28)

Variable	Gender		χ^2	P value
	Male N (%)	Female N (%)		
Frequency of medication error				
One time	2 (7.1)	8 (28.6)	1.052	0.305
Two times and more	7 (25.0)	11 (39.3)		
Total	9 (32.1)	19 (67.9)		
Type of medication error				
Wrong route	1 (3.6)	1 (3.6)	5.458	0.487
Changing prescribed	0	2 (7.1)		
Frequency of medication	0	1 (3.6)		
Wrong type of medication	3 (10.7)	5 (17.9)		
Wrong time of administration	2 (7.1)	1 (3.6)		
No medication	3 (10.7)	5 (17.9)		
Wrong rate	0	4 (14.3)		
Total	9 (32.1)	19 (67.9)		
Stage of medication error				
Missing of medication	2 (7.1)	5 (17.9)	3.275	0.513
Physician ordering	3 (10.7)	4 (14.3)		
Pharmacy dispensing	1 (3.6)	0		
Patient monitoring	0	1 (3.6)		
Administration	3 (10.7)	9 (32.1)		
Total	9 (32.1)	19 (67.9)		

Table (4.4) shows that female nurses reported higher frequency of medication errors compared to male nurses as 8 (28.6%) of female nurses experienced one-time error and 11 (39.3%) experienced two errors and more without statistically significant differences related to gender (P= 0.305). Also, the most frequent type of medication error was in wrong type of medication as 3 (10.7%) of male nurses and 5 (17.9%) of female nurses reported that they gave wrong type of medication, but differences between male and female nurses were insignificant (P= 0.487). Moreover, the most frequent stage of medication errors was in administration as 3 (10.7%) of male nurses and 9 (32.1%) of female nurses reported that they experienced medication error in the administration stage but differences between groups were insignificant (P= 0.513).

Table (4.5): Distribution of medication errors by years of experience (N= 28)

Variable	Years of experience				χ^2	P value
	≤ 5 N(%)	6 – 10 N(%)	11 - 15 N(%)	≥ 16 N(%)		
Frequency of medication error						
One time	1(3.6)	5(17.9)	2(7.1)	2(7.1)	1.597	0.660
Two times and more	4(14.3)	5(17.9)	5(17.9)	4(14.3)		
Total	5(17.9)	10(35.7)	7 (25.0)	6 (21.4)		
Type of medication error						
Wrong route	1(3.6)	0	1(3.6)	0	16.539	0.555
Changing prescribed medication	0	1(3.6)	0	1(3.6)		
Frequency of medication	1(3.6)	0	0	0		
Wrong type of medication	1(3.6)	4(14.3)	3(10.7)	0		
Wrong time of administration	0	1(3.6)	0	2(7.1)		
No medication	1(3.6)	3(10.7)	2(7.1)	2(7.1)		
Wrong rate	1(3.6)	1(3.6)	1(3.6)	1(3.6)		
Total	5(17.9)	10 (35.7)	7 (25.0)	6 (21.4)		
Stage of medication error						
Missing of medication	1(3.6)	3(10.7)	1(3.6)	2(7.1)	17.646	0.127
Physician ordering	0	1(3.6)	5(17.9)	1(3.6)		
Pharmacy dispensing	0	1(3.6)	0	0		
Patient monitoring	0	0	0	1(3.6)		
Administration	4(14.3)	5(17.9)	1(3.6)	2(7.1)		
Total	5(17.9)	10 (35.7)	7 (25.0)	6 (21.4)		

Table (4.5) shows that the highest frequency of medication errors occurred among nurses who have an experience of 6 – 10 years as 5 (17.9%) experienced one-time error and 5 (17.9%) experienced two errors and more without statistically significant differences related to years of experience ($p= 0.660$). In addition, the most frequent type of medication error was in wrong type of medication as 1 (3.6%) of nurses who have an experience of 5 years and less, 4 (14.3%) of nurses who have an experience of 6 – 10 years, and 3 (10.7%) of nurses who have an experience of 11 – 15 years reported that they gave wrong type of medication, but differences between groups were insignificant ($p= 0.555$). Moreover, the most frequent stage of medication errors was in administration as 4 (14.3%) of nurses who have an experience of 5 years and less, 5 (17.9%) of nurses who have an experience of 6 – 10 years, 1 (3.6%) of nurses who have an experience of 11 – 15 years, and 2 (7.1%) of nurses who have an experience of 16 years and more reported that they experienced medication error in the administration stage, but differences between groups were insignificant ($P= 0.127$).

Table (4.6): Distribution of medication errors by hospital (N= 28)

Variable	Hospital					χ^2	P value
	Al Rantesy N (%)	Al Nasser N (%)	EGH N (%)	NMC N (%)	Al Najar N (%)		
Frequency of medication error							
One time	3 (10.7)	1 (3.6)	5(17.9)	1 (3.6)	0	8.464	0.076
Two times and more	8 (28.6)	7(25.0)	2 (7.1)	0	1 (3.6)		
Total	11(39.3)	8(28.6)	7(25.0)	1 (3.6)	1 (3.6)		
Type of medication error							
Wrong route	2 (7.1)	0	0	0	0	15.996	0.888
Changing prescribed medication	1 (3.6)	0	1(3.6)	0	0		
Frequency of medication	1 (3.6)	0	0	0	0		
Wrong type of medication	4 (14.3)	2 (7.1)	2 (7.1)	0	0		
Wrong time of administration	1 (3.6)	1 (3.6)	1 (3.6)	0	0		
No medication	2 (7.1)	2 (7.1)	2 (7.1)	1 (3.6)	1 (3.6)		
Wrong rate	0	3 (10.7)	1 (3.6)	0	0		
Total	11 (39.3)	8 (28.6)	7(25.0)	1(3.6)	1(3.6)		

Variable	Hospital					χ^2	P value
	Al Rantesy N (%)	Al Nasser N (%)	EGH N (%)	NMC N (%)	Al Najar N (%)		
Stage of medication error							
Missing of medication	1(3.6)	2(7.1)	4(14.3)	0	0	13.631	0.626
Physician ordering	3(10.7)	3(10.7)	0	0	1(3.6)		
Pharmacy dispensing	1(3.6)	0	0	0	0		
Patient monitoring	1(3.6)	0	0	0	0		
Administration	5(17.9)	3(10.7)	3(10.7)	1(3.6)	0		
Total	11 (39.3)	8 (28.6)	7 (25.0)	1 (3.6)	1 (3.6)		

Table (4.6) shows that the highest frequency of medication errors occurred in Al Rantesy pediatric hospital as 3 (10.7%) of nurses reported one-time error and 8 (28.6%) reported two errors and more without statistically significant differences between hospitals ($p=0.076$). In addition, the most frequent type of medication error was in wrong type of medication as 4 (14.3%) of nurses from Al Rantesy pediatric hospital, 2 (7.1%) of nurses from Al Nasser pediatric hospital, and 2 (7.1%) of nurses from EGH reported that they gave wrong type of medication, but differences between groups were insignificant ($p=0.888$). Moreover, the most frequent stage of medication errors was in administration as 5 (17.9%) of nurses from Al Rantesy pediatric hospital, 3 (10.7%) of nurses from Al Nasser pediatric hospital, 3 (10.7%) of nurses from EGH, and 1 (3.6%) of nurses from NMC reported that they experienced medication error in the administration stage, but differences between groups were insignificant ($p=0.626$).

Table (4.7): Distribution of medication errors by qualification of the nurse (N= 28)

Variable	Qualification			χ^2	P value
	Diploma N (%)	Bachelor N (%)	Masters N (%)		
Frequency of medication error					
One time	0	10 (35.7)	0	5.185	0.075
Two times and more	4 (14.3)	11(39.3)	3 (10.7)		
Total	4 (14.3)	21 (75.0)	3 (10.7)		
Type of medication error					
Wrong route	0	1 (3.6)	1 (3.6)	11.153	0.516
Changing prescribed	0	2 (7.1)	0		
Frequency of medication	0	1 (3.6)	0		
Wrong type of medication	1 (3.6)	6 (21.4)	1 (3.6)		
Wrong time of administration	1 (3.6)	2 (7.1)	0		
No medication	0	7 (25.0)	0		
Wrong rate	2 (7.1)	2 (7.1)	0		
Total	4 (14.3)	21 (75.0)	3 (10.7)		
Stage of medication error					
Missing of medication	0	6 (21.4)	1 (3.6)	6.603	0.580
Physician ordering	0	6 (21.4)	1 (3.6)		
Pharmacy dispensing	0	1 (3.6)	0		
Patient monitoring	0	1 (3.6)	0		
Administration	4 (14.3)	7 (25.0)	1 (3.6)		
Total	4 (14.3)	21 (75.0)	3 (10.7)		

Table (4.7) shows that the highest frequency of medication errors occurred with nurses who have bachelor degree as which 10 (35.7%) of them reported one-time error and 11 (39.3%) reported two errors and more without statistically significant differences between different qualifications ($p= 0.075$). Also, the most frequent type of medication error was in wrong type of medication as 1 (3.6%) of nurses who have diploma certificate, 6 (21.4%) of nurses who have bachelor degree, and 1 (3.6%) of nurses who have master degree reported that they gave wrong type of medication, but differences between groups were insignificant ($p= 0.516$). Moreover, the most frequent stage of medication errors was in

administration as 4 (14.3%) of nurses who have diploma certificate, 7 (25.0%) of nurses who have bachelor degree, and 1 (3.6%) of nurses who have master degree reported that they experienced medication error in the administration stage, but differences between groups were insignificant ($p= 0.580$).

Table (4.8): Distribution of medication errors by work shift (N= 28)

Variable	Work shift			χ^2	P value
	Day N (%)	Night N (%)	Evening -night N (%)		
Frequency of medication error					
One time	3 (10.7)	1 (3.6)	6 (21.4)	4.480	0.106
Two times and more	12 (42.9)	0	6 (21.4)		
Total	15 (53.6)	1 (3.6)	12 (42.9)		
Type of medication error					
Wrong route	0	1(3.6)	0	9.683	0.644
Changing prescribed	0	0	2 (7.1)		
Frequency of medication	1 (3.6)	0	0		
Wrong type of medication	3 (10.7)	0	5 (17.9)		
Wrong time of	2 (7.1)	0	1 (3.6)		
No medication	6 (21.4)	1 (3.6)	1 (3.6)		
Wrong rate	2 (7.1)	0	2 (7.1)		
Total	15 (53.6)	1 (3.6)	12 (42.9)		
Stage of medication error					
Missing of medication	5 (17.9)	0	2 (7.1)	4.689	0.790
Physician ordering	4 (14.3)	0	3 (10.7)		
Pharmacy dispensing	0	0	1 (3.6)		
Patient monitoring	1 (3.6)	0	0		
Administration	5 (17.9)	1 (3.6)	6 (21.4)		
Total	15 (53.6)	1 (3.6)	12 (42.9)		

Table (4.8) shows that the highest frequency of medication errors occurred with nurses who are working day shift as 3 (10.7%) of them reported one-time error and 12 (42.9%) reported two errors and more without statistically significant differences between different shifts ($p= 0.106$). Also, the most frequent type of medication error was in wrong type of

medication as 3 (10.7%) of nurses who are working day shift, and 5 (17.9%) of nurses who are working evening-night shift reported that they gave wrong type of medication, but differences between groups were insignificant ($p= 0.644$). Moreover, the most frequent stage of medication errors was in administration as 5 (17.9%) of nurses who are working day shift, 1 (3.6%) of nurses who work night shift, and 6 (21.4%) of nurses who work evening-night shift reported that they experienced medication error in the administration stage, but differences between groups were insignificant ($p= 0.790$).

Table (4.9): Distribution of medication errors by marital status (N= 28)

Variable	Marital status		χ^2	P value
	Single N (%)	Married N (%)		
Frequency of medication error				
One time	1 (3.6)	9 (32.1)	0.655	0.418
Two times and more	4 (14.3)	14 (50.0)		
Total	5 (17.9)	23 (82.1)		
Type of medication error				
Wrong route	1 (3.6)	1 (3.6)	7.548	0.273
Changing prescribed	0	2 (7.1)		
Frequency of medication	1 (3.6)	0		
Wrong type of medication	1 (3.6)	7 (25.0)		
Wrong time of administration	0	3 (10.7)		
No medication	1 (3.6)	7 (25.0)		
Wrong rate	1 (3.6)	3 (10.7)		
Total	5 (17.9)	23 (82.1)		
Stage of medication error				
Missing of medication	1 (3.6)	6 (21.4)	0.974	0.914
Physician ordering	1 (3.6)	6 (21.4)		
Pharmacy dispensing	0	1 (3.6)		
Patient monitoring	0	1 (3.6)		
Administration	3 (10.7)	9 (32.1)		
Total	5 (17.9)	23 (82.1)		

Table (4.9) shows that the highest frequency of medication errors occurred with nurses who are married as 9 (32.1%) of them reported one-time error and 14 (50.0%) reported two errors and more without statistically significant differences between married and single nurses ($p= 0.418$). Also, the most frequent type of medication error was in wrong type of medication as 1 (3.6%) of nurses who are single, and 7 (25.0%) of nurses who are married reported that they gave wrong type of medication, but differences between groups were insignificant ($p= 0.273$). Moreover, the most frequent stage of medication errors was in administration as 3 (10.7%) of nurses who are single, and (32.1%) of nurses who are married reported that they experienced medication error in the administration stage, but differences between groups were insignificant ($p= 0.914$).

Table (4.10): Distribution of medication errors by job satisfaction (N= 28)

Variable	Job satisfaction		χ^2	P value
	Satisfied N (%)	Not satisfied N (%)		
Frequency of medication error				
One time	8 (28.6)	2 (7.1)	2.426	0.119
Two times and more	9 (32.1)	9 (32.1)		
Type of medication error				
Wrong route	1 (3.6)	1 (3.6)	5.465	0.486
Changing prescribed	2 (7.1)	0		
Frequency of medication	0	1 (3.6)		
Wrong type of medication	4 (14.3)	4 (14.3)		
Wrong time of	3 (10.7)	0		
No medication	5 (17.9)	3 (10.7)		
Wrong rate	2 (7.1)	2 (7.1)		
Stage of medication error				
Missing of medication	4 (14.3)	3 (10.7)	1.398	0.845
Physician ordering	4 (14.3)	3 (10.7)		
Pharmacy dispensing	1 (3.6)	0		
Patient monitoring	1 (3.6)	0		
Administration	7 (25.0)	5 (17.9)		

Table (4.10) showed that 9 (32.1%) of nurses who are satisfied from their work and 9 (32.1%) of nurses who are not satisfied were reported two errors and more without statistically significant differences between the two groups of satisfaction ($p= 0.119$). Also, the most frequent type of medication error was in wrong type of medication as 4 (14.3%) of nurses who are satisfied in their work and 4 (14.3%) of nurses who are not satisfied reported that they gave wrong type of medication, but differences between groups were insignificant ($p= 0.486$). Moreover, the most frequent stage of medication errors was in administration as 7 (25.0%) of nurses who are satisfied from their work and 5 (17.9%) of nurses who are not satisfied reported that they experienced medication error in the administration stage, but differences between groups were insignificant ($p= 0.845$).

Question 3: What are the most common types of medication errors that occurred at pediatric wards in governmental hospitals?

Table (4.11): Ranking of medication errors according to type (N = 110)

Rank	Type of error	Mean
1	Wrong dose	4.372
2	Wrong type of medication	4.545
3	Wrong time of administration	4.772
4	Frequency of medication	4.890
5	Wrong rate (too fast or too slow)	4.954
6	Wrong route	5.363
7	Changing of prescribed medication	5.472
8	No medication	6.018
9	Wrong documentation	6.209

(Note: low score indicates higher frequency)

Table (4.11) indicates that the most frequent type of medication error was wrong dose ($m= 4.372$) followed by wrong type of medication ($m= 4.545$), and the least frequent type of medication error was wrong documentation ($m= 6.209$) followed by unavailability of medication ($m= 6.018$).

Question 4: Which are the most common stages where the medication errors occurred at medical pediatric wards?

Table (4.12): Ranking of medication errors according to stage (N = 110)

Rank	Stage of error	Mean
1	Physician ordering	2.590
2	Administration	2.745
3	Patient monitoring	2.927
4	Pharmacy dispensing	3.472
5	Missing of medication	3.554

(Note: low score indicates higher frequency)

Table (4.12) indicated that the most frequent stage of medication error was physician ordering stage (m= 2.590), and the least frequent stage of medication error was missing of medication (m= 3.554).

Question 5: What are the most common causes of medication errors occurrence at medical pediatric wards?

Table (4.13): Ranking of medication errors according to cause of error (N = 110)

Rank	Cause of error	Mean
1	Heavy workload	4.263
2	Lack of experience i.e. new staff	5.645
3	Given of medication by another nurse who not prepare it	5.736
4	Complicated prescription as illegible handwriting & abbreviations	6.509
5	Unfamiliarity with medication	6.772
6	Environmental factors such i.e. noise, interruptions & poor	6.900
7	Insufficient training	7.100
8	Lack of patient's wrist band	7.718
9	Lack of knowledge about the prescribed medication	7.772
10	Similarity between two medications	7.781
11	Lack of specific protocol for administering medication	8.009
12	Lack of documentation of administering medication	8.290
13	Personal neglect	8.818

(Note: low score indicate higher frequency)

Table (4.13) indicated that the most frequent cause of medication error was heavy workload (m= 4.263) followed by lack of experience (m= 5.645), and the least frequent cause of medication error was personal neglect (m= 8.818) followed by lack of documentation of administering medication (m= 8.290).

Question 6: What are the opinions of medical pediatric nurses towards methods of avoidance of medication errors?

Table (4.14): Ranking of medication errors according to method of avoidance (N= 110)

Rank	Method of avoidance	Mean
1	Increasing nurse / patient ratio	4.690
2	Taking the orders correctly and adequately	5.472
3	Ensure suitable work environment	6.072
4	Reduce work hours	6.127
5	Training about safety medication administration	6.209
6	Improve the team communication	6.700
7	Providing appropriate dosages and forms for pediatric patients	7.018
8	Improve work environment	7.036
9	Double check all calculation, even simple calculation	7.254
10	More involvement of pharmacists in clinical practice	7.418
11	Improve monitoring of staff	7.981
12	Medication error reporting	8.563
13	Technological advancements i.e. barcode medication	9.900

(Note: low score indicate higher frequency)

Table (4.14) indicated that the most frequent method of avoidance of medication error was increasing nurse / patient ratio (m= 4.690) followed by taking the orders correctly and adequately (m= 5.472), and the least frequent method of avoidance of medication error was technological advancements i.e. barcode medication administration (m= 9.900) followed by medication error reporting (m= 8.563).

Question 7: What are the barriers to reporting medication errors at medical pediatric wards in governmental hospitals of Gaza Strip?

Table (4.15): Barriers to reporting medication errors (Fear factors)

Items	Strongly agree	Agree	Uncertain	Disagree	Strongly disagree	Mean	S.D.	Weighted %	t value	P value	Rank
Fear of revealing error to patient and their family.	2.7	16.4	22.7	35.5	22.7	3.59	1.09	71.8	34.4	≤ 0.01	1
Judicial issues following reporting on medication errors.	3.6	15.5	15.5	50.0	15.5	3.58	1.04	71.6	35.9	≤ 0.01	2
Being labeled as incompetent nurses.	2.7	20.0	20.9	31.8	24.5	3.55	1.14	71.0	32.5	≤ 0.01	3
Informing colleagues working in other units and facilities about the errors.	6.4	14.5	19.1	40.0	20.0	3.52	1.15	70.4	32.0	≤ 0.01	4
Being blamed by the head nurse.	5.5	18.2	20.0	34.5	21.8	3.49	1.17	69.8	31.0	≤ 0.01	5
Fear of being blamed by colleagues.	6.4	19.1	16.4	35.5	22.7	3.49	1.21	69.8	30.0	≤ 0.01	6
Expressing a negative attitude toward the nurse who making the error.	4.5	17.3	20.9	40.0	17.3	3.48	1.10	69.6	33.0	≤ 0.01	7
Producing side effects in patients.	7.3	14.5	23.6	36.4	18.2	3.43	1.16	68.6	31.0	≤ 0.01	8
The impact of reporting of errors on the salary and benefits.	11.8	13.6	22.7	34.5	17.3	3.31	1.24	66.2	27.8	≤ 0.01	9
Being blamed by disciplinary team e.g. doctor and else.	10.0	18.2	18.2	37.3	16.4	3.31	1.23	66.2	28.2	≤ 0.01	10
The impact of reporting of errors on the personnel's annual evaluation.	10.1	19.1	16.4	43.6	10.9	3.26	1.18	65.2	28.8	≤ 0.01	11

Table (4.15) presents fear factors barriers, which shows that there was a significant agreement (71.8%) about the most prevalent barrier to reporting medication error is fear of revealing error to patient and their family (m= 3.59, p= ≤ 0.01), followed by judicial issues

(71.6%) following reporting on medication errors ($m= 3.58$, $p= \leq 0.01$), and fear of being labeled as incompetent nurse ($m= 3.55$, $p= \leq 0.01$), while the least prevalent barrier was fear of the impact of reporting of errors on the personnel's annual evaluation ($m= 3.26$, $p= \leq 0.01$).

Table (4.16): Barriers to reporting medication errors (Managerial factors)

Items	Strongly agree	Agree	Uncertain	Disagree	Strongly disagree	Mean	S.D.	Weighted %	t	P value	Rank
Lack of clear protocol for reporting medication errors.	3.6	21.8	23.6	28.2	22.7	3.44	1.16	68.8	30.9	≤ 0.01	1
Bad experience from nursing administration toward dealing with medication errors.	7.3	18.2	19.1	40.0	15.5	3.38	1.16	67.6	30.4	≤ 0.01	2
Disproportionate reactions of the head nurse to the seriousness of the errors.	8.2	20.0	19.1	36.4	16.4	3.32	1.20	66.4	28.9	≤ 0.01	3
The head nurse focuses on finding the event and blaming, regardless of other factors related to occurrence of errors.	7.3	17.3	22.7	42.7	10.0	3.30	1.09	66.0	31.6	≤ 0.01	4
Lack of receiving positive feedback from the head nurse following to report of medication errors.	10.0	20.0	20.0	39.1	10.9	3.20	1.18	64.0	28.5	≤ 0.01	5

Table (4.16) presents managerial factors barriers, which shows that the most prevalent managerial barrier to reporting medication error was lack of clear protocol for reporting medication errors ($m= 3.44$, $P= \leq 0.01$), while the least prevalent barrier was lack of receiving positive feedback from the head nurse following to report of medication errors ($m= 3.20$, $p= \leq 0.01$).

Table (4.17): Barriers to reporting medication errors (Reporting factors)

Items	Strongly agree	Agree	Uncertain	Disagree	Strongly disagree	Mean	S.D.	Weighted %	t	P value	Rank
Lack of proper feedback from head nurse regarding writing the reports.	10.0	13.6	29.1	30.9	16.4	3.30	1.19	66.0	29.0	≤ 0.01	1
Lack of a clear definition of medication errors.	5.5	21.8	21.8	40.9	10.0	3.28	1.08	65.6	31.7	≤ 0.01	2
Long time-consuming in reporting process.	10.9	19.1	21.8	27.3	20.9	3.28	1.29	65.6	26.6	≤ 0.01	3
Not paying attention to the reporting some medication error.	7.3	20.9	29.1	33.6	9.1	3.16	1.08	63.2	30.5	≤ 0.01	4
Forget reporting on the medication errors.	1.8	32.7	25.5	28.2	11.8	3.15	1.06	63.0	30.9	≤ 0.01	5
Considering that the error is not serious and not needed for reporting.	14.5	18.2	19.1	36.4	11.8	3.12	1.26	62.4	25.9	≤ 0.01	6

Table (4.17) presents reporting factors barriers. The results shows that the most prevalent reporting barrier was lack of proper feedback from head nurse regarding writing the reports (m= 3.30, p= ≤ 0.01), while the least prevalent barrier was considering that the error is not serious and not needed for reporting (m= 3.12, p= ≤ 0.01).

Table (4.18): Barriers to reporting medication errors (overall)

Factor	No. of items	Mean	S.D.	Weighted %	t	P value	Rank
Fear factors	11	3.45	0.78	69.0	46.5	≤ 0.01	1
Managerial factors	5	3.33	0.87	66.6	40.1	≤ 0.01	2
Reporting factors	6	3.21	0.91	64.2	36.8	≤ 0.01	3
Overall	22	3.36	0.74	67.2	47.3	≤ 0.01	

Table (4.18) shows that the overall average mean score of barriers to reporting medication errors was 3.36 (67.2%), that the fear factors domain showed the most significant barriers to reporting medication errors with mean score 3.45 (69%, $p = \leq 0.01$) followed by managerial factors with mean score 3.33 (66.6%, $p = 0.000$) and finally reporting factors with mean score 3.21 (64.2%, $p = \leq 0.01$).

4.2 Discussion

4.2.1 Background

Medication errors are a significant global concern and can cause serious medical consequences that will affect health status of patients, and children are particularly vulnerable to ME because of their unique physiology and developmental needs. The aim of this study was to assess the perception of pediatric nurses about medications administration errors at pediatric wards in governmental hospitals of GS. The sample of the study consisted of 110 nurses who are working at medical pediatric wards in five governmental hospitals in GS distributed as follows: 38 (34.5%) from Al Rantesy pediatric hospital, 20 (18.2%) from Al Nasser pediatric hospital, 20 (18.2%) from European Gaza Hospital, 20 (18.2%) from Nasser Medical Complex, and 12 (10.9%) from Al Najar hospital. The results obtained by Abusaad (2015) study showed that 80 pediatric nurses were included in the study gathered from 4 pediatric hospitals. Also, Al-Sarawan (2014) study in Palestine used sample size 200 nurses from 340 accessible nurses at 6 governmental hospitals in North West Bank. Therefore, the used sample size is considered an appropriate to measure the studied variables as represent about 61% of the total accessible population.

The reported mean age of the studied sample 34.645 ± 8.276 years, two-thirds were female nurses, two-thirds of them live in a city, mean years of experience was 11.054 ± 7.164 years, about three-quarters have bachelor degree in nursing, more than two-thirds were satisfied with their work, and half of them work morning shift, and 40.9% work evening-night shift. Nearly the same as Al-Sarawan (2014) showed that mean age of used sample was 32 ± 7.5 , female represent 56%, mean years of experience 9.3 years, 55% have bachelor degree of nursing and 17.1% only working in morning shift.

4.2.2 Incidence rate, frequency, type, and stage of medication administration errors

The results of the study showed that 25.5% of nurses stated that they committed ME, and among those who made errors, one-third stated that they committed MAE one time during their work and two-thirds of nurses committed two times and more. The most frequent type of MAE were giving wrong type of medication accounted for 28.6%, forgetting to give medication accounting for 28.6%, while the lowest type of MAE was the frequency of medication accounted for 3.6%. Concerning stage of MAE, the most frequent was administration stage accounted for 42.8% and the least frequent stage was pharmacy dispensing and patient monitoring 3.6% for each.

Several types of MEs may occur during the process of medication preparation and administration. The most frequent type of MEs were giving wrong type of medication accounted for 28.6%, forgetting to give medication accounting for 28.6%, while the lowest type of MEs was frequency of medications accounted for 3.6%. In this regard, Benner et al. (2002) identified seven types of ME including missed doses of medication, wrong time of administration, administering intra-venous (IV) medication too fast, or too slow, wrong concentration of dosage of medication delivered via IV route, wrong route of administration, wrong patient and wrong medications administered. Miladinia et al. (2016) and Alsulami et al. (2013) showed that the highest type of MEs was wrong dose, while in a systematic review of 60 studies the results reflected that inappropriate prescribing was the most common type of errors reported (Assiri et al. 2017). Furthermore, Mohammadi et al. (2014) found that the most frequent types of MEs were untimely drug administration accounted for 55.6% and drug administration without prescription accounted for 44.5% among nurses in Iran. In a study conducted in WB of Palestine showed that the most common perceived type of ME was wrong time (Al-Sarawan, 2014).

On the other hand, the study reported that the most frequent stage of error was occurred in administration stage accounted for 42.8% and the least frequent stage was pharmacy dispensing and patient monitoring accounted for 3.6% for each. This is coming in contrary with a study conducted in Egypt found that the most common type of errors was dispensing accounted for 46%, followed by administration accounted for 41%, then errors in prescription accounted for 13% (Khalifa et al., 2013). Previous studies indicated that ME may occur at any stage of drug use process; either during prescription, dispensing, or administration phases (Maralyn and Karen, 2006). In more detail, Abusaad and Etawy (2015) reported that the highest types of ME occurred when the medication is delivered by the wrong route, the highest stage of medication errors committed by nurses was missing of medication then patient monitoring and administration. In addition, Alsulami et al. (2013) reported that error rates varies from 7.1% - 90.5% for prescribing, and from 9.4% - 80% for administration, and the most common types of prescribing errors reported were incorrect dose of prescriptions, followed by wrong frequency and wrong strength.

It is worth to say that the process of medication preparation and administration is a critical phase as in this phase wrong medication or wrong dose may be prepared and then administered to the patient. Once the medication is administered to the patient, the harm will occur. Thus, nurses should pay attention and concentration during administration, and by following the five rights of medication (right patient, right drug, right dose, right route, and right time) will decrease the chance of making errors in drug administration. In addition, careful check of medication with the kardex and double check for dangerous drugs will decrease the chance of making errors.

4.2.3 Association between medication administration errors and selected demographic variables

The results of the study indicated that the highest incidence of MAE occurred among nurses from the age group 31 – 40 years. In addition, wrong type of medication was the most prevalent among nurses aged 30 years and less and nurses aged 31 – 40 years old. Also, the administration stage was the most prevalent among nurses aged 30 years and less and nurses aged 31 – 40 years. This result reflected that the highest frequency of MEs occurred among middle age nurses.

However, the researcher suggests that this phenomenon occurred because the nurses in the middle age usually have a considerable experience and they carry out more activities and tasks in their work compared to younger nurses with less experience and less familiarity with nursing tasks, thus these nurses are more prone to make errors, and to avoid these errors, the nurse who is responsible for medication preparation and administration should be free from other tasks to give him the opportunity to concentrate on medication only.

Mohammadi et al. (2014) found that demographics characteristics such as age, gender, work experience, employment type and the type of medication errors were significant factors for ME. Moreover, Tabatabaee et al. (2014) reported that age, work experience, working department, shift work and marital status were found to be significantly influential on medication errors, and Al-Sarawan, (2014) nurses working experience more than 5 years was associated with higher percent of the nurses who report their medication errors using incidence error.

The results also showed insignificant higher frequency of errors, giving wrong medication, and administration stage of MAE occurred with female nurses, and nurses who have an experience of 6 – 10 years, nurses who are working in Al Rantesy pediatric hospital, nurses who have bachelor degree, nurses who are working day shift, nurses who are married.

Likewise, there were no significant differences in frequency and type of error between nurses who are satisfied and nurses who are not satisfied with their work in regards to MEs. These results revealed that there was a considerable differences in MAE related to sociodemographic characteristics of nurses, but these differences were statistically not significant. Gorbach et al. (2015) support this result as they found that demographic variables were not associated with risk of error, while other study showed that demographic characteristics such as age, gender, work experience, employment type and the type of MEs were significant factors for MEs (Mohammadi et al. 2014).

4.2.4 Ranking of medication errors according to type, stage, cause, and method of avoidance

The results of the study showed that most pediatric nurses declared that the most frequent type of MEs was wrong dose, followed by wrong type of medication, and the least frequent was wrong documentation. In addition, the most frequent stage of ME was physician ordering stage, and the least frequent stage was missing of medication. Moreover, the most frequent cause of medication error was heavy workload, followed by lack of experience, and the least frequent cause was personal neglect, followed by lack of documentation. Moreover, the most frequent method of avoidance of ME was increasing nurse / patient ratio, followed by taking the orders correctly and adequately, and the least frequent method was technological advancements i.e. barcode medication administration, followed by reporting of errors.

Medication error is a sensitive issue in health profession, and errors occur by a variety of causes on the personal level or system level. According to report published by WHO (2017) ME can be caused by health worker fatigue, overcrowding, staff shortages, and poor training, and any one of these, or a combination, can affect the prescribing, dispensing, consumption, and monitoring of medications. In Egypt, Khalifa et al. (2013)

found that low number of doctors, nurses, pharmacists, lack of experience, and night shift significantly affected error frequency, also, staff members has perceived unreadable hand writing, repeated change of orders, similar drugs (name, shape), change of nurses among units, work over load, low number of nurses, and dealing with big number of drugs as the most important risk factors of errors.

In addition, Gorbach et al. (2015) mentioned that associated risk factors for ME included an increased number of medication orders, while Abusaad and Etawy, (2015) found that the highest cause of medication errors was due to heavy workload, and Toruner and Uysal, (2012) reported that the most common causes of medication errors were long work hours and a high patient/nurse ratio.

In Turkey, Toruner and Uysal, (2012) mentioned that the most common causes of medication errors were long work hours and a high patient/nurse ratio, while Hirani and McFarlane, (2016) stated that possible causes for medication errors include complexity of procedures, lack of adequate knowledge, gaps in training, increased workload, and distraction during preparation and administration of medication. Also, ME may be caused due to unfamiliarity with medication and miscalculation of doses. Miladinia et al. (2016) indicated that most prevalent of MEs causes were poor medication knowledge reported by 96.2% of nurses and poor calculation skills reported by 73.5% of nurses. In Palestine, Al-Sarawan, (2014) found that heavy work load was the first leading cause of medication error followed by in adequate staff.

Therefore, it is worth to say that medication errors could occur due to some personal and structural factors. Personal factors such as newly employed nurses without adequate experience and training can commit medication errors easier than nurses who have good experience. In addition, structural factors including designed special separated area for

preparation of medication away from noise and interruption, and not allowing other nurses or visitors to disrupt the nurse who prepares the medication. Also, adequate ventilation, suitable temperature and lighting should be available in the area designed for preparation of medication. More important is prescribing by physicians should be written clearly using generic name to avoid mistakes in reading the name of medication that will lead to administration of wrong medication or wrong dose.

4.2.5 Barriers to reporting medication errors

The results showed that within fear factors, the most prevalent barrier to reporting ME was fear of revealing error to patient and their family, followed by judicial issues following reporting on ME, and fear of being labeled as incompetent nurse, while the least prevalent barrier was fear of the impact of reporting of errors on the personnel's annual evaluation. Among managerial factors, the most prevalent factor was lack of clear protocol for reporting ME, while the least prevalent barrier was lack of receiving positive feedback from the head nurse following to report of ME. Among reporting factors barriers, the most prevalent reporting barrier was lack of proper feedback from head nurse regarding writing the reports, while the least prevalent barrier was considering the error as not serious and no need for reporting.

Reporting of ME is very important issue in nursing practice to get feedback and avoid the occurrence of errors in the future. As mentioned by Abusaad and Etawy, (2015), the strongest perceived barriers to medication administration errors reporting were fear from consequences of reporting, then managerial factor and then the process of reporting from the nurse's viewpoint. The nurses agree that identifying benefits of reporting followed agree that feeling safe about working environment, and agree that good professional relationship with physicians was the most facilitating factors of reporting medication. Also, Toruner and Uysal, (2012) found that barriers to reporting ME included potential blaming

of nurses (52.95%), loss of trust (50.45%), and fear of disciplinary actions or punishment (42%). While Khalifa et al. (2013) indicated that the most important barriers to error reporting included no clear definition for medication errors, writing a report take a long time, and focusing on individual punishment more than system improvement.

In Iran, Bayazidi et al. (2012) found that nurses perceived that the most important barriers to reporting ME were blaming individuals instead of the system, consequences of reporting errors, and fear of punishment, and Tabatabaee et al. (2014) found that the major factors contributing to medication error under reporting included fear of legal involvement, fear of losing job, and fear of the consequences of error.

These results reflected several barriers that may hinder the nurses from reporting medication errors. Many nurses attributed under-reporting fear of being blamed or punished by their manager. Reporting an error is a personal sensitive issue and reflects honest response from nurses. Reporting ME is a valuable legal issue to protect the nurse, and highlighting the factors that lead to making errors should be studied and give feedback to the nurses about the conditions that lead to error commitment. Appropriate feedback will highlight the weak points in the system and give opportunity to take actions and make modifications in the system to avoid the repetition of errors in the future.

Chapter Five

Conclusion and Recommendations

5.1 Conclusion

The study focused on a sensitive issue in nursing profession that have a medico-legal and ethical perspectives. Medication error is considered a preventable unintentional event that may cause or lead to inappropriate medication use or patient harm, while medication administration error describes an undesirable event undertaken by a nurse when preparing and giving medication to a patient. As a rule, sick children are admitted to the hospital for treatment should receive their care in a safe and efficient manner without harm from the side of nurses and physicians. Thus, nurses are the corner stone in the whole process from receiving the prescribed medicine to administration to the intended patient.

The purpose of this study was to assess the perception of pediatric nurses about MAE at pediatric wards in governmental hospitals of Gaza Strip. The study utilized descriptive, cross sectional design with a sample of 110 pediatric nurses selected conveniently from five governmental hospitals that offer medical pediatric care; namely Al Rantesy pediatric hospital, Al Nasser pediatric hospital, European Gaza Hospital, Nasser Medical Complex, and Al Najar hospital. The study has been commenced during the period from September 2017 till October 2018, which the data collection was carried out from April to July 2018. The researcher used adapted highly reliable self-administered questionnaire that measure perception of pediatric nurses about MAEs.

The researcher used SPSS program version 22, that frequencies, percentage, means, standard deviation, t-test, and Chi square were used as a statistical tests to measure the study variables. The questionnaire consisted of sociodemographic characteristics of study participants, history of previous medication errors, type of medication errors, stage of

medication errors, and perceived ranking of errors according to causes, and methods of avoidance and lately barriers to reporting errors.

This study concluded that one-fourth of nurses reported that they committed ME during their work in pediatric departments. Giving wrong type of medication, and forgetting to give medication were the most prevalent types of ME, and most of errors occur at the administration stage. This study found that most of ME errors committed by middle-age nurses, but sociodemographic characteristics did not cause significant differences in ME.

Ranking of errors showed that giving wrong dose and wrong type of medication was the most prevalent type of ME, administration stage was the most prevalent stage, heavy workload, and Lack of experience were the most prevalent causes of ME, and increasing nurse / patient ratio was the most prevalent method of avoiding ME.

However, medication errors are usually under-reported, and associated with fear factors, managerial factors, and reporting factors. Reporting of ME is a professional act that should not be used for disciplinary or punishment purposes, but should be considered as a healthy behavior to enable the hospital to identify weaknesses in the system and find solutions to avoid its occurrence in the future.

5.2 Recommendations

In the light of the study results, the researcher recommends the following:

Recommendations for nurses:

- Develop and implement an educational program to pediatric nurses about medication administration.
- Discuss with nurses the common errors that encounter during the process of preparation and administration of medication.

- Emphasize the need to double check of medication to assure safe preparation and administration of drugs; in particular narcotics and dangerous drugs.
- Avoid disruption and distraction of nurses who are assigned to prepare and administer medication.
- Monitoring new nurses by a senior nurse during preparation and administration of medication.

Recommendations for the health institutes' managers:

- Design a special area for keeping and preparing medication with adequate light and ventilation.
- Visiting times should be arranged in a way that do not meet with designated times of medication administration.
- Encourage nurses to report medication errors in an incident report form and assure them that reporting is not for punishment purposes.

5.2.1 Suggestions for further research

- To conduct a study aiming to assess incidence of medication errors in a wider range sample to include physicians, pharmacists, and nurses (prescribing, dispensing, and administration).
- To carry out a study to examine weaknesses in the system that may lead to medication errors.

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Annexes

Annex (1): Consent form

Title:

Perceptions of Nurses toward Medication Administration Error at Pediatric Wards on Governmental Hospitals of Gaza Strip

I agree to participate in a research project that submitted in fulfilment of the requirement for the master degree. The purpose of this study is to assess the perceptions of nurses toward medication administration error at paediatric wards on governmental hospitals of Gaza Strip.

Dear Participant:

The information provided by you in this questionnaire will be used for research purposes. It will not be used in a manner which would allow identification of your individual responses. Therefore, all given data will be prepared and explained in terms of tables, figures and ratio without mention of names. Also, your participation in this study is voluntary that you have the full right to refuse or withdraw from the study if you feel uncomfortable in any way during the questionnaire filling.

The filling of questionnaire will last approximately 10-15 minutes

Thank you very much for agreeing to participate in this research

Signature of Participant

Date

Researcher: Nidal Mousa Zourob

E-mail: nedalmz@hotmail.com

Mobile: 0599630699

Annex (2): Medication administration errors questionnaire

Part I: Socio-demographic Domain		
Age:years	Gender Male <input type="checkbox"/> Female <input type="checkbox"/>	Place of residency: <input type="checkbox"/> Village <input type="checkbox"/> Camp <input type="checkbox"/> City
Experience:years	Hospital <input type="checkbox"/> Rantesy Pediatric Hospital <input type="checkbox"/> Naser Pediatric Hospital <input type="checkbox"/> European Gaza Hospital <input type="checkbox"/> Nasser Medical Complex Abu Yousef El-Najjar Hospital <input type="checkbox"/>	Academic qualification: <input type="checkbox"/> Diploma <input type="checkbox"/> Baccalaureate <input type="checkbox"/> Master <input type="checkbox"/> Other (specify).....
Work shift Day <input type="checkbox"/> <input type="checkbox"/> Evening Night <input type="checkbox"/> Evening-night <input type="checkbox"/>	Marital status: <input type="checkbox"/> Single <input type="checkbox"/> Engaged <input type="checkbox"/> Married <input type="checkbox"/> Divorce <input type="checkbox"/> Widowed	Job Satisfaction: <input type="checkbox"/> Satisfied <input type="checkbox"/> Not Satisfied
Part II: History of medication errors :		
<p>Have you ever exposed to medication administration errors? No <input type="checkbox"/> <input type="checkbox"/> Yes, if yes</p> <p>How many times?</p> <p>What is the types of error?</p> <p>In which stage occurred?</p> <p><input type="checkbox"/> Missing of medication <input type="checkbox"/> Patient monitoring <input type="checkbox"/> Physician ordering <input type="checkbox"/> Administration <input type="checkbox"/> Pharmacy dispensing</p>		

Direction: Rank a list of 9 of most frequent types of medication errors with number 1 being the most frequent and number 9 being the least frequent one.			Direction: Rank a list of 5 possible stages of medication errors, which are carried by medical staff with number 1 being the most frequent and number 5 being the least frequent stage.		
No.	Types of Error	Rank	No.	Stages of Error	Rank
1	Wrong route		1	Missing of medication	
2	Changing of prescribed medication		2	Patient monitoring	
3	Frequency of medication		3	Physician ordering	
4	Wrong type of medication		4	Administration	
5	Wrong dose		5	Pharmacy dispensing	

6	Wrong time of administration				
7	No medication				
8	Wrong rate (too fast or too slow)				
9	Wrong documentation				
Direction: Rank a list of 13 possible causes of medication errors, with number 1 being the most frequent cause and number 13 being the least frequent cause of medication errors.			Direction: Rank a list of 13 possible methods of avoidance of medication errors, with number 1 being the most frequent method and number 13 being the least frequent method of avoidance.		
1	Heavy workload		1	Training about safety medication administration	
2	Personal neglect		2	Increasing nurse / patient ratio	
3	Insufficient training		3	Improve the team communication	
4	Complicated prescription as illegible handwriting & abbreviations		4	Taking the orders correctly and adequately	
5	Lack of experience i.e. new staff		5	More involvement of pharmacists in clinical practice	
6	Given of medication by another nurse who not prepare it.		6	Ensure suitable work environment	
7	Unfamiliarity with medication Inadequate drug knowledge and experience		7	Providing appropriate dosages and forms for pediatric patients	
8	Lack of patient's wrist band		8	Reduce work hour	
9	Environmental factors such i.e. noise, interruptions & poor lighting		9	Double check all calculation, even simple calculation	
10	Similarity between two medications		10	Improve work environment	
11	Lack of knowledge about the prescribed medication		11	Improve of monitoring staff	
12	Lack of documentation of administering medication		12	Medication error reporting	
13	Lack of specific protocol for administering medication		13	Technological advancements i.e. barcode medication administration	

Barriers to Reporting Medication Errors						
No.	Fear Factors	Strongly disagree	Disagree	Uncertain	Agree	Strong Agree
1	The impact of reporting of errors on the personnel's annual evaluation	1	2	3	4	5
2	The impact of reporting of errors on the salary and benefits	1	2	3	4	5
3	Being blamed by the head nurse	1	2	3	4	5
4	Fear of being blamed by colleagues	1	2	3	4	5
5	Being blamed by disciplinary team e.g. doctor and else	1	2	3	4	5
6	Producing side effects in patients	1	2	3	4	5
7	Being labeled as incompetent nurses	1	2	3	4	5
8	Fear of revealing error to patient and their family	1	2	3	4	5
9	Expressing a negative attitude toward the nurse who making the error	1	2	3	4	5
10	Judicial issues following reporting on medication errors	1	2	3	4	5
11	Informing colleagues working in other units and facilities about the errors	1	2	3	4	5
Managerial Factors						
12	Lack of receiving positive feedback from the head nurse following to report of medication errors	1	2	3	4	5
13	The head nurse focuses on finding the event and blaming, regardless of other factors related to occurrence of errors	1	2	3	4	5
14	Lack of clear protocol for reporting medication errors	1	2	3	4	5
15	Bad experience from nursing administration toward dealing with medication errors	1	2	3	4	5
16	Disproportionate reactions of the head nurse to the seriousness of the errors	1	2	3	4	5
Reporting factors						
17	Not paying attention to the reporting some medication error	1	2	3	4	5
18	Lack of a clear definition of medication errors	1	2	3	4	5
19	Forget reporting on the medication errors	1	2	3	4	5
20	Considering that the error is not serious and not needed for reporting	1	2	3	4	5
21	Lack of proper feedback from head nurse regarding writing the reports	1	2	3	4	5
22	Long time-consuming in reporting process	1	2	3	4	5

Annex (3): List of experts

Name	Place of work
Dr. Hamza Abdeljawad	Palestine College of Nursing
Dr. Khalil Shuaib	Palestine College of Nursing
Dr. Mohammad Al Jerjawy	Palestine College of Nursing
Dr. Abdel Rahman Al Hams	Palestine College of Nursing

Annex (4): Approval from Helsinki Committee



المجلس الفلسطيني للبحوث الصحي

Palestinian Health Research Council

تعزير النظام الصحي الفلسطيني من خلال مأسسة استخدام المعلومات البحثية في صنع القرار
Developing the Palestinian health system through institutionalizing the use of information in decision making

Helsinki Committee

For Ethical Approval

Date: 05/02/2018 **Number: PHRC/HC/338/18**

Name: NEDAL M. ZUROB **الاسم:**

We would like to inform you that the committee had discussed the proposal of your study about: **نفيدكم علماً بأن اللجنة قد ناقشت مقترح دراستكم حول:**

Perception of Nurses toward Medication Administration Errors at Medical Pediatric Wards in Governmental Hospitals- Gaza Strip.

The committee has decided to approve the above mentioned research. Approval number PHRC/HC/338/18 in its meeting on 05/02/2018 **و قد قررت الموافقة على البحث المذكور عاليه بالرقم والتاريخ المذكوران عاليه**

Member



Signature



Member



Genral Conditions:-

1. Valid for 2 years from the date of approval.
2. It is necessary to notify the committee of any change in the approved study protocol.
3. The committee appreciates receiving a copy of your final research when completed.

Specific Conditions:-

E-Mail: pal.phrc@gmail.com

Gaza - Palestine **غزة - فلسطين**
شارع النصر - مفترق العيون

Annex (5): Approval from MOH

State of Palestine
Ministry of health



دولة فلسطين
وزارة الصحة

التاريخ: 07/05/2018
رقم المراسلة 215083

السيد : رامي عيد سليمان العبادله المحترم

مدير عام بالوزارة /الإدارة العامة لتنمية القوى البشرية - /وزارة الصحة

السلام عليكم ...

الموضوع/ تسهيل مهمة الباحث//نضال زعرب

التفاصيل //

بخصوص الموضوع أعلاه، يرجى تسهيل مهمة الباحث/ نضال موسى زعرب
الملتحق ببرنامج ماجستير التمريض - تخصص تمريض أطفال- جامعة القدس أبوديس في إجراء بحث بعنوان:-
“**Perception of Nurses toward Medication Administration Errors at Medical Pediatric Wards
in Governmental Hospitals of Gaza Strip**”

حيث الباحث بحاجة لتعبئة استبانة من عدد من الممرضين العاملين في أقسام الأطفال في المستشفيات الحكومية التي تقدم
الخدمات للأطفال، بما لا يتعارض مع مصلحة العمل وضمن أخلاقيات البحث العلمي، ودون تحمل الوزارة أي أعباء أو مسئولية.
وتفضلوا بقبول التحية والتقدير،،،

ملاحظة/ البحث حصل على موافقة لجنة أخلاقيات البحث الصحي
ملاحظة / تسهيل المهمة الخاص بالدراسة أعلاه صالح لمدة 6 شهر من تاريخه.

محمد إبراهيم محمد السرساوي
مدير دائرة الإدارة العامة لتنمية القوى البشرية -



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غزة

Annex (6): Incident report

State of Palestine
Ministry of Health
Hospitals General Administration



دولة فلسطين
وزارة الصحة
الإدارة العامة للمستشفيات

Incident Report

<input type="checkbox"/> اداري	<input type="checkbox"/> فني	نوع الحدث:- أخرى:	/ /	التاريخ:					
					الوقت:				
تفاصيل الحدث:-									
اسم وتوقيع الشاهد			اسم وتوقيع الشاهد		اسم الموظف المعني بالحدث				
اسم وتوقيع المسئول المباشر			ملاحظات المسئول المباشر:-						
اسم وتوقيع مدير الدائرة			توصيات مدير الدائرة:-						
توقيع مدير المستشفى			توصيات مدير المستشفى:-						

عنوان الدراسة: توجهات الممرضين نحو الأخطاء الواردة في عملية إعطاء الأدوية بأقسام باطنة الأطفال في المستشفيات الحكومية -قطاع غزة.

إعداد: نضال موسى زعرب

إشراف: د. أكرم أبو صلاح

ملخص الدراسة

تعتبر عملية إعطاء الأدوية للمرضى من أكثر واجبات التمريض أهمية، حيث تتطلب كفاية في المعرفة حول الأدوية من أجل التنفيذ الصحيح خلال مراحل إعداد وتنفيذ العلاج. هدفت هذه الدراسة إلى معرفة توجهات الممرضين والمرضات نحو الأخطاء الواردة في عملية إعطاء العلاج بأقسام باطنة الأطفال داخل المستشفيات الحكومية في قطاع غزة. تم استخدام المنهج الوصفي التحليلي المقطعي، حيث شملت عينة الدراسة 110 ممرض وممرضة يعملون في خمسة مستشفيات حكومية، وهي مستشفى الرنتيسي للأطفال، مستشفى النصر للأطفال، مجمع ناصر الطبي، مستشفى غزة الأوروبي، ومستشفى أبو يوسف النجار.

تم جمع البيانات باستخدام استبانة معتمدة لقياس توجهات التمريض نحو الأخطاء الواردة في عملية إعطاء الدواء. كما تم إجراء دراسة استطلاعية وتبين أن معامل الثبات ألفا كرونباخ بلغ 0.932. تم استخدام برنامج الرزم الإحصائية للعلوم الاجتماعية لتحليل البيانات، والتي تضمن التكرارات، المتوسطات الحسابية، النسب المئوية، اختبار (ت)، واختبار مربع كاي.

أظهرت نتائج الدراسة أن 67.3% من المشاركين في الدراسة كانوا من الممرضات، متوسط أعمار العينة 34.6 ± 8.2 سنة، يسكنون في المدن 60.9%، متوسط سنوات الخبرة 7.16 ± 11.05 سنة، حاصلين على درجة البكالوريوس 74.5%، متزوجين 84.5%، راضين عن عملهم 68.2%، وكذلك 51.8% يعملون فترة صباحية فقط.

كما أظهرت النتائج أن 25.5% من المشاركين أفادوا بحدوث أخطاء في عملية إعطاء الأدوية أثناء العمل، حيث تمثلت هذه الأخطاء في أربعة نقاط رئيسية: نوع الخطأ، مرحلة الخطأ، سبب الخطأ، والطرق المقترحة لمنع حدوث الخطأ، حيث تبين أن أكثر أنواع الأخطاء تكراراً هو إعطاء الدواء الخطأ للمريض (28.6%)، كما أن مرحلة إعطاء الدواء كانت أكثر المراحل تكراراً لحدوث الأخطاء بها وذلك بنسبة بلغت 42.8%، كما بينت الدراسة وجود علاقة غير ذات دلالة إحصائية بين الأخطاء الواردة في عملية إعطاء الأدوية وبين المتغيرات الديمغرافية لهم.

كما وأظهر ترتيب الأخطاء المتصورة أن إعطاء جرعة خاطئة ونوع خاطئ من الأدوية قد يكون النوع الأكثر انتشاراً، وكان زيادة عبء العمل ونقص الخبرة أكثر الأسباب توقعاً كسبب لحدوث الأخطاء. وعليه أظهرت فان زيادة عدد الممرضين بالنسبة للمرضى، استلام الوصفة الطبية بشكل صحيح، وتوفير بيئة عمل مناسبة كانت أكثر الطرق المقترحة لتلافي حدوث الأخطاء.

بالنسبة للعوامل التي تمنع الممرضين من توثيق الخطأ في إعطاء الدواء كتابياً فقد توزعت على ثلاثة محاور، حيث أن محور الخوف هو السبب الأول ($wt. = 69\%$, $p \leq 0.01$) لعدم توثيق الأخطاء، وتمثل الخوف من معرفة المريض والأهل بوقوع الخطأ بنسبة 71.8% بين المخاوف الأخرى، يليه الخوف من العقوبات الإدارية الناتجة عن الخطأ، والخوف من وصف الممرض بأنه غير كفؤ لإعطاء الأدوية. وكان المحور الإداري هو السبب الثاني ($wt. = 66.6\%$, $p \leq 0.01$) لعدم توثيق الأخطاء، حيث أن عدم وجود بروتوكول واضح لتوثيق الأخطاء مثل 68.8% بين الأسباب الأخرى لهذا المحور، بينما احتل محور التوثيق السبب الأخير ($wt. = 64.2\%$, $p \leq 0.01$)، حيث أن عدم وجود تغذية راجعة من رئيس القسم مثل 66.0% لعدم توثيق الأخطاء. وعليه فان الدراسة توصي بأهمية توثيق الأخطاء العلاجية ولا يجب استخدامه كأداة عقابية، ولكن يمكن الاستفادة من توثيق الأخطاء الدوائية في عملية التقييم وتحديد نقاط الضعف في النظام الصحي من أجل إيجاد الحلول المناسبة لتلافي حدوث تلك الأخطاء في المستقبل.