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Drug Dispensing Systems at Al-Shifa Hospital and the European Gaza Hospital: A Comparative Study

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Drug Dispensing Systems at Al-Shifa Hospital and the European Gaza Hospital: A Comparative Study

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Dedication

To whom because of them and for them I exist, my family ……

To my friends who always supported my endeavors ……

To those who had inspired me to conduct this study ……

To the hope for peace and tolerance throughout the world ……

I dedicate this work

Declaration

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

Signed: ……..

Mokhlis Khalil Al-Adham

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Abstract

Implementing an effective drug dispensing system at hospitals is very important in order to ensure that the prescribed drugs are rationally used and safely administered. The overall aim of this study is to compare the Unit Dose System utilized at the European Gaza Hospital (EGH) and the Ward Stock System utilized at Al-Shifa Hospital, in order to assess which drug dispensing system is more appropriate and contributing more to the safe and rational drug use.

A quantitative comparative cross-sectional design using three research instruments was followed in this study. The instruments were structured questionnaire directed toward pharmacists and head nurses, missed drug registration sheet and drug administration observation sheet. The total number of pharmacists and head nurses at both hospitals was 92, and the response rate for the questionnaire was 94.5%.

The study illustrated that more than 70% of the respondents at both Al-Shifa Hospital and the European Gaza Hospital reported that they had sometimes experienced drug shortage in their settings, and also that more than 86% of the respondents at both hospitals considered drug shortage at the Ministry of Health Drug Stores as the main reason of drug shortage at their settings. Additionally, nearly 64% of the study respondents at Al-Shifa Hospital reported that drug shortage was observed with all cases (the newly-admitted and the previously admitted cases), while 76% of respondents reported that drug shortage was mostly observed with the newly-admitted cases at the EGH.

This study showed that the percentage of missed drugs at Al-Shifa Hospital was 5%, while it was 2.9% at the EGH and the differences were statistically significant. Also, the study clarified that the rate of medication administration errors was higher at Al-Shifa Hospital than the EGH with percentages of 9.7% and 6% respectively.

This study elucidated that nurses' time spent on drug management process at Al-Shifa Hospital was perceived to be longer than it at the EGH. Additionally, guidelines about drugs preparation and administration were more available at the EGH and there was nearly absence of reporting about medication errors at both hospitals. Moreover, the study showed that the degree of pharmacists' involvement in clinical pharmacy activities was more prominent at the EGH and therefore the level of pharmacists-physicians contact was higher at the EGH than it at Al-Shifa Hospital.

Also, the study clarified that 86.7% of head nurses at the EGH were returning the unused drugs to the pharmacy and 13.3% of them keep these drugs at the ward, while at Al-Shifa Hospital 63.9% of the head nurses reported keeping the unused drugs at wards and the remaining 36.1% returning them to the pharmacy.

This study elucidated that 92.9% of the EGH pharmacists and only 9.1% of Al-Shifa Hospital's pharmacists agreed on that their drug dispensing system contributes to the rational use of drugs. Also, the study revealed that 92.9% of the pharmacists at the EGH were able to make proper drug control and monitoring within their drug dispensing system, while only 13.6% of them at Al-Shifa Hospital reported the ability to make proper drug control and monitoring.

The study concluded that the unit dose drug dispensing system is more appropriate and recommended utilizing it at other hospitals.

ملخص الدراسة

مقارنة بين أنظمة صرف الدواء في كل من مستشفى غزة الأوروبي و مستشفى الشفاء بغزة

يعتبر تطبيق نظام فعال لصرف الأدوية داخل المستشفيات أمرا في غاية الأهمية و ذلك لضمان تجهيز الدواء الموصوف بشكله الصيدلاني الصحيح و تركيزه المطلوب، و إيصاله إلى المريض في الوقت المناسب. تهدف هذه الدراسة إلى مقارنة نظام الجرعة الواحدة المطبق في مستشفى غزة الأوروبي و نظام مخزون الدواء في الأقسام المطبق في مستشفى الشفاء بغزة لمعرفة أي النظامين أفضل من ناحية الفعالية و الاقتصاد و السلامة.

أهداف الدراسة الخاصة

- معرفة نقاط القوة ونقاط الضعف الموجودة في كل من نظام الجرعة الواحدة و نظام المخزون في الجناح
- معرفة وجهة نظر الصيادلة و الممرضين بأنظمة صرف الأدوية المطبقة في المستشفيات التي يعملون بها
- تحديد نسبة الأدوية المفقودة في كل من نظام الجرعة الواحدة و نظام المخزون في الجناح و من ثم معرفة أي النظامين أكثر إسهاما في الاستخدام الرشيد للدواء
- تحديد معدل الأخطاء الدوائية في كل من نظام الجرعة الواحدة و نظام المخزون في الجناح و من ثم تحديد أي النظامين أكثر أمانا للمرضى

محيط الدراسة و أدواتها

تم اختيار كل من مستشفى الشفاء و مستشفى غزة الأوروبي لإجراء الدراسة لأنهما اكبر مستشفيين في غزة ينتفعان من نظامي صرف الأدوية موضع الاهتمام. استخدم الباحث في هذه الدراسة ثلاث أدوات بحثية هي استبانه لمعرفة وجهة نظر الصيادلة و الممرضين عن نظام صرف الأدوية المستخدم عندهم، ملف لجمع الأدوية المفقودة و آخر لتسجيل الأخطاء الدوائية أثناء مرحلة إعطاء الأدوية. العدد الكلي للصيادلة و رؤساء أقسام التمريض في كل من مستشفى غزة الأوروبي و مستشفى الشفاء بغزة هو 92، استجاب منهم للإستبانة 87 فكان معدل الاستجابة 94.5% .

تحليل البيانات

تم استخدام البرنامج الإحصائي SPSS لتحليل المعلومات، و تم اختبار النتائج باستخدام كل من Cross tabulation لتوضيح الفروق بين المستشفيات عبر النسب المئوية و كذلك تم استخدام t-Test لإيجاد الفروق بين بعض المتغيرات.

نتائج الدراسة

بينت الدراسة أن أكثر من 70% من الصيادلة و الممرضين في كل من المستشفيين كانوا أحيانا يواجهون نقص في الأدوية، و اعتبر أكثر من 86% منهم أن نقص الدواء في مخازن وزارة الصحة المركزية هو السبب الرئيسي لنقص الأدوية في المستشفيات و المؤسسات الصحية الأخرى، كذلك أظهرت الدراسة أن نسبة الأدوية المفقودة في مستشفى الشفاء كان 5% فيما كان 2.9% في مستشفى غزة الأوروبي، و كان الفرق في متوسط الأدوية المفقودة بين المستشفيين ذو دلالة إحصائية، و كذلك أظهرت الدراسة أن نسبة الأخطاء الدوائية المتعلقة بمرحلة الإعطاء كانت 9.7% في

مستشفى الشفاء بينما كانت 6% في مستشفى غزة الأوروبي. أيضا بينت الدراسة أن الوقت الذي يقضيه الممرضين في التعامل مع الدواء كان أطول في مستشفي الشفاء منه في مستشفي غزة الأوروبي ،وكذلك نسبة اكبر من الممرضين في مستشفي غزة الأوروبي قالوا أن لديهم إرشادات عن طرق تحضير وإعطاء الأدوية. الدراسة أظهرت أن انخراط الصيادلة في نشاطات الصيدلة السريرية كان أفضل بقليل في مستشفي غزة الأوروبي عنه في مستشفي الشفاء.

التوصيات

توصيات الدراسة

- تبني نظام الجرعة الواحدة كنظام صرف للأدوية في المستشفيات من قبل وزارة الصحة، لأن هذا النظام اظهر العديد من المزايا المهمة مثل قلة الأخطاء الدوائية و قلة الأدوية المفقودة.

- ضرورة أن تقوم وزارة الصحة بإعطاء دورات تدريبية عن الأخطاء الدوائية للعاملين في المجال الصحي، و كذلك تطوير نظام لتدوين الأخطاء الدوائية التي قد تحدث في المؤسسات الصحية.

- ضرورة توفير إرشادات من قبل الصيادلة عن طرق تحضير و خلط و إعطاء الأدوية، و وضعها في أقسام التمريض للاستعانة بها عند الحاجة.

- تشجيع الصيادلة لزيادة انخراطهم في نشاطات الصيدلة السريرية و من ثم في الرعاية الصحية للمريض.

توصيات بحثية

- إجراء دراسة لحساب تكلفة الأدوية التي تفقد في كل من نظام الجرعة الواحدة و نظام المخزون في الجناح لبيان أي النظامين أكثر جدوى اقتصادية

- إجراء دراسة لمعرفة معدل الأخطاء الدوائية المتعلقة بمراحل وصف الدواء من قبل الأطباء و صرفه من قبل الصيادلة في النظامين

- عمل دراسة لتقييم مستوى الرضا لدى العاملين في مستشفى غزة الأوروبي عن نظام الجرعة الواحدة لصرف الدواء

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Chapter 5 Conclusion and Recommendations

List of abbreviations

ACCP	American College of Clinical Pharmacy
ADDS	Automated Drug Dispensing System
DDS	Drug Dispensing System
EDL	Essential Drug List
EGH	European Gaza Hospital
GDP	Gross Domestic Product
GHI	Governmental Health Insurance
GNP	Gross National Product
HSs	Health Systems
ICU	Intensive Care Unit
MOH	Ministry of Health
NDP	National Drug Policy
NGOs	Non Governmental Organizations
OCHA	United Nations Office for the Coordination of Humanitarian Affairs
PCBS	Palestinian Central Bureau of Statistics
PHC	Primary Health Care
SPSS	Statistical Package of Social Sciences
UDDDS	Unit Dose Drug Dispensing System
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNRWA	United Nations Relief and Works Agency
WHA	World Health Assembly
WHO	World Health Organization
WSDDS	Ward Stock Drug Dispensing System

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Chapter 1: Introduction

To give an introductory background about this study, the researcher provides this chapter which includes the research background, research problem, justification of the study and research objectives and questions. Moreover, this chapter presents the context of the study as well as some related operational definitions.

1.1 Research Background

Health care is an industry associated with the provision of medical care to individuals. Health care is one of the world largest and fastest-growing professions which consumes high percentage of Gross Domestic Product (GDP) of most nations. Health Systems (HSs) provide many services for the clients and the communities and are always subjected to reform activities aiming for improvement that could reduce costs, increase accessibility, enhance quality, and improve the health of people in general (Kawachi and Kennedy, 2001). Pharmacy sector, which is concerned with promoting the safe and appropriate use of drugs, is considered as one of the most important sectors of the HSs in any country because it represents a high proportion of that system expenditure (Pudjaningsih and Santoso, 2002). So, it is very important for any government to ensure high access to a secure, safe, and stable supply of pharmaceuticals at the lowest possible costs (Smith, 2004). Hospital pharmacy is the largest consuming part of pharmaceutical products in the pharmacy sector, so it is of key importance for hospital pharmacists to be aware of providing a cost-effective pharmacy services and to exert their utmost efforts to contribute in minimizing the expenditure on medicines in their hospital settings as possible as they

can (Pudjaningsih and Santoso, 2002). Clinical Pharmacy services are the building blocks of modern hospital pharmacy through which pharmacists provide advice to clinicians on pharmaceutical and therapeutic aspects of drug use, choice of formulation and routes of administration. Also, clinical pharmacists provide clinical interventions, adverse drug reactions reporting, patients counseling and participate in nurses and junior medical staff education. Through participation in these activities hospital pharmacists are a vital part of the clinical team and can help to ensure that drugs are used in the best way from safety, efficacy and economic points of view (Kaushal and Bates, 2001).

Drug Dispensing Systems (DDSs) play a major role in improving the pharmaceutical services provided in hospitals. There are many types of DDSs that could be implemented to deliver pharmaceutical services in hospitals such as Ward Stock Drug Dispensing System (WSDDS), Unit Dose Drug Dispensing System (UDDDS), Automated Drug Dispensing System (ADDS), and others (Murray and Shojania, 2000). The literature reveals that proper DDS can help in providing an effective, efficient, and safe pharmacy practices through rational drug use, patient safety protection, and increasing clinical pharmacy interventions within hospitals (Asiri, 2003).

The DDS used in most Palestinian Ministry of Health (MOH) hospitals is the traditional one, which is the WSDDS through which drugs are dispensed from the pharmacy to hospital departments where they are stored in stocks, and then used by nurses according to physicians orders (MOH, 2005). This system makes hospital pharmacists just drug dispensers and neglecting their role as clinical pharmacists who are not only able to maximize the drug effectiveness and safety, but also rationalize its use (Asiri, 2003).

UDDDS is another drug dispensing system applied in some of the MOH hospitals. In UDDDS, drugs are dispensed in amounts that fulfill the needs of the patients for only 24 hours (Murray and Shojania, 2000). It is claimed that UDDDS maximizes the

pharmaceutical benefits for both patients and hospitals through rationalizing drug use, enhancing clinical pharmacy interventions and minimizing drug administration errors.

As mentioned in the coming paragraphs the concern of this study is to illustrate which drug dispensing system (UDDDS or WSDDS) is more suitable and safer than the other.

1.2 Research Problem

In Palestinian health care system, the drug budget is one of the largest expenses in the overall budget (MOH, 2004). Hospitals consumption of drugs is nearly two times as that of primary health care centers where hospitals consume about 61% of the dispensed medications (MOH, 2004). Most Palestinian hospitals use the traditional WSDDS to provide the pharmaceutical services for their clients. This DDS is characterized by high percentage of drug waste, high rate of medication errors and nearly absence of hospital pharmacists' involvement in clinical pharmacy services (Asiri, 2003).

The European Gaza Hospital (EGH) is a large hospital in Palestine which uses UDDDS to provide pharmaceutical services for patients. This system is claimed to be an effective and efficient DDS that highly contributes to the improvement of the pharmacy services provided in hospitals. In contrary, Al-Shifa Hospital is the largest hospital in Palestine which still uses the WSDDS for providing its pharmaceutical care. In the MOH, there is a current debate whether UDDDS should be implemented in other Palestinian hospitals, especially the newly established ones or not. Therefore, this study tries to answer a remained unanswered question about the best DDS to be implemented in the Palestinian hospitals in order to provide cost-effective pharmacy services in Palestinian hospitals. In another words, shall other MOH hospitals shift to UDDDS or not?

1.3 Justification of the study

In Palestine, a limited resources country, there is an urgent need to improve the health services and to decrease the expenditure on the health sector in general and on drugs in particular. As aforementioned, hospitals consume the majority of MOH drugs, so it is of key importance to rationalize drug use in them and to make their pharmaceutical services more cost-effective. Selecting a proper DDS could contribute to rational use of drugs and to improve the quality of the hospital pharmacy services in Palestine and this will be consistent with the general objectives of the WHO pharmaceuticals program in Palestine that focuses on guaranteeing Palestinians access to drugs and improving their rational use (WHO, 2006a). To the best knowledge of the researcher, no previous studies were conducted on DDSs in Gaza hospitals, and since we are in the way to develop a national drug policy, it is of key importance to adopt a cost-effective DDS depending on an evidence-based practice principle. This study is conducted to assess whether and to which extent UDDDS is more suitable, efficient, and safe one compared with WSDDS. Also the study had technical, financial, safety and equity dimensions.

The results of this study could be used in the ongoing reform activities currently taking place. Planners can use the findings of this study in setting corrective strategies that rationalize the use of drugs which has many advantages including but not restricted to cost containment, decreasing health hazards associated with misuse of medications and increasing patients' access to medications.

1.4 Research objectives

1.4.1 General objective

To assess the drug dispensing systems utilized in MOH Gaza hospitals and recognize the appropriate one, based on a comparison between the UDDDS and the WSDDS that are implemented at the EGH and Al-Shifa Hospital respectively.

1.4.2 Specific objectives

1. To appraise the strength and weakness points encountered in the drug dispensing systems utilized at the two target hospitals.
2. To identify the percentage of the missed drugs in both systems and thus highlight which system contributes the most to the rational use of drugs.
3. To recognize which system is safer by calculating the rate of medication administration errors in both systems.
4. To explore pharmacists and head nurses perceptions about the two utilized systems.
5. To suggest recommendations for decision makers in the MOH to promote the rational use of drugs at hospitals through adopting the more appropriate system.

1.5 Research questions

1. What are the strength points in the UDDDS and WSDDS?
2. What are the weaknesses in the UDDDS and WSDDS?

3. Does UDDDS decrease the number/amount of missed drugs?

4. Does WSDDS exhibit a high amount of missed drugs?

5. What is the difference between UDDDS and WSDDS in reference to the rational use of drugs?

6. Does WSDDS contribute to the rational drug use in comparison with UDDDS?

7. What is the rate of medication administration errors in UDDDS?

8. What is the rate of medication administration errors in WSDDS?

9. To which extent the UDDDS ensures patients' safety?

10. Does WSDDS guarantee patient safety?

11. Does UDDDS promote clinical pharmacy services?

12. Which DDS is more safe, efficient, and promoting clinical pharmacy activities?

13. Which system is more positively perceived by nurses?

14. Which system is more positively perceived by pharmacists?

1.6 Context of the study

In order to understand the health care system in an appropriate way and to be aware of the settings of pharmacy services provided in the Gaza Strip, we introduce the following characteristics that may influence health care system in general and pharmacy sector in particular.

1.6.1 Socio-demographic context

" Palestine constitutes the southwestern part of huge geographical unity in the eastern part of the Arab world, which is Belad El Sham. In addition to Palestine, Belad El Sham

contains Lebanon, Syria, and Jordan. So, Palestine has common borders with these countries, in addition to Egypt. The entire area of Palestine is about 27000 sq. kilometers (Annex 1). Now, the remaining part of historical Palestine comprises two areas separated geographically: West bank and Gaza Strip "(MOH, 2005). Although comparatively small, in fact the equivalent of a medium-size region in a typical European country or one of the smallest states in the United States, Palestine comprises a significant variation of morphological and climatic regions, and this is making it of important geographic position (Dellapergola, 2001).

The population size in Palestine was estimated at 3,662,205 in 2007. Out of the total number, 2,274,929 in the West Bank and 1,87,276 in the Gaza Strip with percentages of 62.1% and 37.9% respectively. Al Khalil governorate had the highest rate of population at 13.9% of the total population, followed by Gaza governorate at 13.2%. Jericho governorate had the lowest rate of population at 1.2% (PCBS, 2007).

Although the Gaza Strip (Annex 2) is a narrow piece of land that is located on the coast of Mediterranean sea, its position on the crossroad from Africa to Asia made it strategic for occupiers over centuries (MOH, 2005). Gaza Strip is a crowded place with area of 365 Sq. km. and considered as the second most populated place on the earth after Hong Kong (World Bank, 2002). Gaza Strip comprises five main governorates which are: North of Gaza (17% of Gaza Strip total area), Gaza City (20.3% of Gaza Strip total area), Mid-Zone (15% of Gaza Strip total area), Khan-Younis (30.5% of Gaza Strip total area), and Rafah (16.2% of Gaza Strip total area) (MOH, 2005).

After Oslo Accords, it was expected that the Palestinian economy will go through a period of steady and rapid growth (World Bank, 2007). Gross National Product (GNP) in Palestine had been subjected to fluctuations since 2000. GNP was US $ 5,454 million in 1999 and dropped to US $ 4,169 million in 2005 (MOH, 2005). In 1999, the GDP was US $ 4,512 million. But since 2000, when Israel imposed a strict closure on Palestinian territories as a response to the second Intifada, it decreased to US $ 3,557 millions in 2002 (World Bank, 2007). In 2004, the GDP recovered slightly and continue in this recovery for nearly two years. But, due to continued growth in settlements and the cut off in the direct aid as a result of last parliament elections, GDP fell again in 2006. GDP is expected to be about US $ 3,901 million in 2007 (World Bank, 2007).

According to the World Bank, the unemployment rate increased from 11.8% in 1999 to 32% in 2005. The poverty rate in Palestine was 40% , and this is largely due to Israeli restrictions on Palestinian territories (MOH, 2005). In general, the unemployment rate in the Gaza Strip was higher than it in the West Bank (World Bank, 2003).

According to the education indicators in Palestine, we can conclude that Palestinian community is a well- educated one and that palestinians have always highly appreciated education (MOH, 2005).

1.6.2 Health Care System and health indicators

Palestinian MOH has been fully responsible of the management of health services in the Palestinian Tterritories since the transfer of responsibilities from the Israeli Civil Administration to the Palestinian Authority in 1994. Gaza and Jericho were transferred to the Palestinians in May 1994, while the health systems in the remaining areas of West

Bank were transferred in December 1994 (World Health Assembly, 2005). Now MOH is the main health care provider in Palestine. MOH is the only health authority responsible of supervision, regulation, licensure, and control for all health services. United Nations Relief and Works Agency (UNRWA), Medical Services for Police and general security, and other Nongovernmental Organizations (NGOs) are considered as second hand providers of health care services in Palestine (MOH, 2003).

Palestinian health care system mainly includes eight components which are Primary Health Care, Laboratories and Blood Banks, Hospitals, Health Human Resources, Health Finance, Governmental Health Insurance, Treatment Abroad, and Health Projects (MOH, 2005). Primary Health Care (PHC) is one of the most important components of the Palestinian health care system. PHC centers provide accessible and affordable health services for all Palestinians, especially for children and other vulnerable groups (MOH, 2005). MOH is working with other health sectors in providing the primary health services, mainly UNRWA and NGOs. It is worth mentioning that private sector plays an important role in providing PHC services to the Palestinians (MOH, 2005). Hospitals and the other for mentioned components of Palestinian health care system are also of key importance for the effective and complementary performance of the Palestinian health care system (MOH, 2005).

In Palestine, the crude death rate is 2.7 per 1000 population. The Infant Mortality Rate is 24 per 1000 live births (62 in Turkey, 41 in Egypt, 40 in Tunisia, 21 in Jordan, and 7 in Israel) (Hamad, 2001). The leading causes of adult death are similar to developed countries including cardiovascular diseases and cancers with a high prevalence of stress and psychological trauma related diseases. On the other hand, diseases of poverty are still

prevalent such as respiratory infections and diarrhea diseases that remain important causes of child mortality and morbidity (MOH, 2005). Thus, it could be said that despite the harsh difficulties facing Palestinians, their health status is relatively good compared with other countries at a similar level of economic development.

1.6.2.1 Hospitals in Palestine

In Palestine, the secondary healthcare services are provided by governmental, non-governmental, UNRWA, and private sectors. MOH is the main provider of secondary healthcare services and some of the tertiary care (MOH, 2003). In Palestine, there are 78 hospitals. The population/hospital ratio is 47,920. In the Gaza Strip, there are 24 hospitals with population/hospital ratio 57,098. In West Bank and Jerusalem, there are 54 hospitals with population/hospital ratio 43,844. The average bed capacity per hospital in the Gaza strip is 79.88 bed, while it is 51.15 bed in the West Bank (MOH, 2003). According to hospitals categories, they are divided into 45 general hospitals with 3726 beds, 10 specialized hospitals with 812 beds, 19 maternity hospitals with 322 beds, and 4 rehabilitation centers with 165 beds. Despite the availability of maternal departments in the general hospitals, MOH doesn't own any obstetrics or gynecology hospitals. All rehabilitation centers are owned and operated by NGOs (MOH, 2005). In general, Access to Palestinian hospitals is considerably good (MOH, 2005).

The MOH owns and operates 22 hospitals (10 in the Gaza Strip and 12 in West Bank, furnished with 2,815 beds (1,499 in the Gaza Strip and 1,316 in the West Bank). The non-MOH hospitals constitute 71.1% of the total hospitals in Palestine (about 63.6% of the total

hospitals in the West Bank and 54.5% of the total hospitals in Gaza Strip), they are furnished with 44% of the total hospital beds (MOH, 2005).

1.6.2.1.1 Al-Shifa Hospital

Al-Shifa Hospital is the biggest medical center in Palestine which is located in the middle west of Gaza City at the end of Al Wehda Street. It was established in 1946 on an area of 42 dunams, developed over years until it reached the current level with nearly 590 beds (MOH, 2003). Al-Shifa Hospital is divided into 3 sub-hospitals which are the Medical Hospital, the Surgical Hospital, and the Maternity Hospital. Each of these hospitals has its own management team that is consisted from Medical Director, Nursing Director, and Director for the supportive services and pharmaceuticals. In general, Al-Shifa Hospital includes nearly 45 departments . Within these departments it provides most secondary and tertiary health services to about 500,000 of Gaza Strip citizens (MOH, 2003).

The average occupancy rate at Al-Shifa Hospital in 2002 was 84.6% including the occupancy rate of day care beds. The average length of stay was 3 days. The total number of employees at Al-Shifa Hospital was 999 in 2003, and they were classified as 331 physicians, 384 nurses, 17 pharmacists, 77 administrators, 84 technicians, 90 workers, and 16 from other categories (MOH, 2003).

1.6.2.1.2 European Gaza Hospital

European Gaza Hospital (EGH) is located in the southern Gaza governorate of Khanyounis. EGH is considered as one of the most important investment in the area, with a total cost of $ 60 million. Firstly, the EGH was managed by international management

team, who took the responsibility to commission the hospital. On the15th of October 2000, the management authority transferred to local Palestinian staff. The hospital presents services to catchment's population of 500000, bringing international standards of care to the communities of Southern Gaza (MOH, 2003).

EGH played a major role in the development of health services through introducing new systems such as: Appointment System, Computerized System, UDDDS, Continuous Education and other training programs. The 240 bed center provides a full range of secondary, primary, and planned tertiary patient care services for both inpatients and outpatients. Now, the EGH provides a major portion of medical services for the Palestinians through a full range of diagnostic and management services for patients of all age groups. Services in the EGH are divided into medical department services (such as surgery, internal medicine, anesthesia, ICU, operations, and cardiac catheterization), and paramedical department services e.g. laboratory, pharmacy, physiotherapy and medical supplies (MOH, 2003).

The total number of physicians in the EGH is 140 and the total number of the nursing staff is 205, while the total number of pharmacy staff is 15. The bed occupancy rate in the hospital is 86%, while the average length of stay is 4.5 days (MOH, 2003).

1.6.2.2 Pharmacy Services in Palestine

The General Administration of Pharmacy in the MOH is responsible for the development and implementation of policies supporting the management of essential medicines. The department had adopted a rational medicines management approach and developed in 2000 an Essential Drug List (EDL) and National Drug Formulary following WHO guidelines. The EDL seeks to promote health by ensuring the quality, efficacy, safety and rational use

of medicines. This was very clear from the mission statement of the General Administration of Pharmacy which is "providing well-organized pharmaceutical services and safe medications to all the Palestinian population at affordable cost". Public facilities are only provided with medicines included in the EDL. A therapeutic drug committee is responsible for determining which drugs should be included on the EDL. The Pharmacy Department is also responsible for developing clinical guidelines and protocols to support rational drug use, providing continuous training to pharmacists and conducting monitoring and evaluation. It also undertakes other regulatory functions including drug registration and quality assurance and testing. The Pharmacy Department does not have a National Medicines Policy defining medicines pricing, financing or benefits (Sarley, Aburadaha, and Abudayya, 2005).

In 2005, MOH expenditure on medications, medical disposables, vaccines and laboratory reagents was 22.6% of the actual MOH running expenditures (MOH, 2005). About 55% of the dispensed medications, medical disposables, and laboratory reagents were for the West Bank and 45% for the Gaza Strip. It is worth mentioning that the highest portion of the MOH expenditures is on medications, medical disposables and laboratory reagents. In relation to the total MOH expenditures, medications represented 18% of it and this is considered as a high percentage. Out of this cost, 68% is for hospitals and nearly 22% for primary health care centers (MOH, 2005).

Most medications dispensed in the MOH pharmacies are from the MOH essential drug list (those satisfying the priority health care needs of the population). There is at least one pharmacy in each MOH hospital that dispenses the medications for the hospital inpatients and outpatients. Also there is a pharmacy in every MOH primary healthcare center (MOH, 2005).

1.7 Operational Definitions

Clinical Pharmacy: Is a part of pharmacy services, provided mainly in hospitals, characterized by high level of physicians –pharmacists interaction in order to improve the quality of patient care (Bond, 2007).

Drug Administration Errors: Is a medication error that occur in the administration stage when the medication has to be given by the nurse to patients in the hospital (Schelbred and Nord, 2007).

Drug Dispensing Systems*:* Systems through which drugs are distributed for inpatients in hospitals.

Drugs Pilferage: The act of stealing a small amount of drugs.

Missed Drug: Any drug dispensed from the pharmacy in a special period , and neither registered in the patient files , nor present in the ward stock.

Medication Error: Any deviation from standard of care related to the medicine therapy of patients. It can concern prescription, dispensing, preparation, storage, delivery, administration, etc (Gibson, 2001).

Rationale Use of Drugs: Providing effective therapeutic drugs with the lowest possible cost (Kole, 2005).

Unit Dose System: Drug dispensing system in which drugs dispensed for inpatients in hospitals for a period of not more than 24 hours (Murray and Shojania, 2000).

Ward Stock Drug Dispensing System: Drug dispensing system in which nurses order drugs in bulk supplies from the pharmacy and store them in the wards (Mc Nally, Page, and Bruce, 1997).

Wrong Drug: Administration of a medication other than the one prescribed (Fontan, Maneglier, Nguyen, Brion, and Loirat, 2003).

Wrong Dose: amount of drug given is greater or less than the prescribed dose. Extra dose will also be included (Fontan, Maneglier, Nguyen, Brion, and Loirat, 2003).

Wrong Route: Administrating a medication via a different route (Fontan, Maneglier, Nguyen, Brion, and Loirat, 2003).

Wrong Time: Administration of the drug to the patients 30 minutes before or after the prescribed time (Fontan, Maneglier, Nguyen, Brion, and Loirat, 2003).

Wrong Patient: Administration of a medication for a patient other than whom it was prescribed for (Fontan, Maneglier, Nguyen, Brion, and Loirat, 2003).

Chapter 2: Literature Review

This chapter discusses the conceptual framework and the main concepts and variables related to the study. These concepts include pharmacy as profession, hospital pharmacy, current dimensions of pharmacy practices, DDSs utilized at hospitals, rational use of drugs and medication errors. Additionally, this chapter presents some previous studies concerning the utilized DDSs at hospitals.

2.1 Conceptual framework

For seeing the Forest before becoming immersed in the trees, the researcher provides framework for this study. The study framework identifies the most common points that are associated with implementing an effective DDS at hospitals.

2.1.1 Factors affecting the DDSs

The factors that affect the utilized DDSs are diverse and can be summarized as follow:

- **Nursing staff**

  Nurses play a vital role in the utilized DDSs because they are the persons who prepare and administer medications for patients. So, nurses' perceptions, skills and experiences with the utilized DDS as well as their characteristics may affect the implementation and effectiveness of the DDS. Therefore, considering perceptions and experiences of nurses at the real world is so important in making future improvements.

- **Pharmacists**

  Pharmacists are the main professionals dealing with medications and can be considered as the nucleus of the DDSs at most hospitals. Pharmacists' characteristics and their perceptions about the utilized DDS also have a major impact on the implementation and effectiveness of proper DDS. Therefore, considering perceptions and experiences of pharmacists at the real world is also so important in making current improvements and future decisions.

- **Managerial context**

  Management support is highly necessary and to high extent affects the effectiveness and success of the utilized DDS. The management role is to strengthen and effectively supervise the implemented DDS through adopting some supportive policies such as rational drug use, continuous education program, monitoring and computerized procedures.

- **Commodity management**

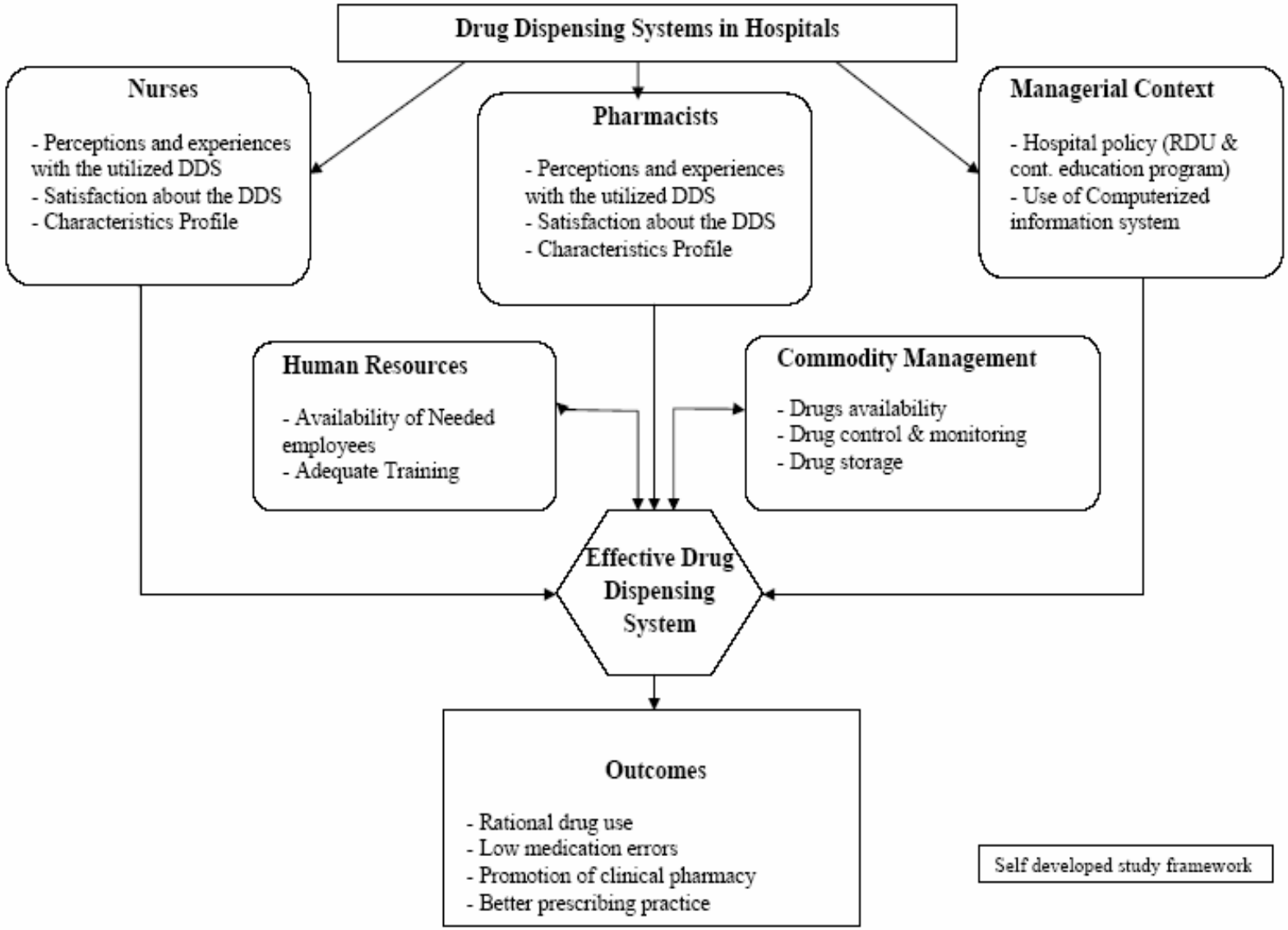
  Appropriate drug management is considered among the basics of effective DDSs as it reflects the drug handling process such as constant drugs availability, drug storage processes and drug monitoring. Effective drug management process is so crucial in maintaining proper DDS and vice versa.

- **Human resources**

  Availability of adequate number of trained health workers in general, pharmacists and head nurses in particular may be critical to obtain the best results concerning effective DDS.

2.1.2 Outcomes of an effective DDS

The end result of considering the aforementioned points would be the availability of an effective drug dispensing system that exhibits rational drug use, low rate of medication errors, promotion of clinical pharmacy activities and therefore appropriate level of pharmacists-physicians contact and finally, yet most importantly, better health outcomes for clients.



Self developed study framework

2.2 Pharmacy

2.2.1 Definition of Pharmacy

Pharmacy is the health profession that links the health sciences with the chemical sciences, and it is charged with ensuring the safe and effective use of medication (Smith, 2004). The scope of pharmacy practice includes more traditional roles such as compounding and dispensing medications, and it also includes more modern services related to patient care, including clinical services, reviewing medications for safety, efficacy and providing drug information (Traynor, 2002).

2.2.2 Pharmacy as a profession

Professions exist to serve society, hence the mission of the pharmacy profession must address the needs of society and individual patients. At one time, the acts of deciding on drug therapy and implementing it were relatively simple, safe and inexpensive. The physician prescribed and the pharmacist dispensed. However, there is substantial evidence to show that the traditional method of prescribing and dispensing medication is no longer appropriate to ensure safety, effectiveness and adherence to drug therapy (Wiedenmayer, Summers, Mackie, Gous and Everard, 2006).

The accountability of health professionals for their actions is a major issue in health care provision. In the traditional relationship between the doctor as prescriber and the pharmacist as dispenser, the prescriber was accountable for the results of pharmacotherapy. That situation is changing in rapidly evolving health systems (Smith, 2004).

Dispensing is, and must remain, a responsibility of the pharmacy profession. While fewer pharmacists may be actually engaged in dispensing medications, more pharmacists will be managing the dispensing process and assuming responsibility for its quality and outcomes. While change may generate potential threats, it can also open up immense opportunities. The pharmacy profession has a responsibility to identify new opportunities for pharmacy practice in a changing health sector context, to assess and test them and to demonstrate its ability to implement them successfully (Wiedenmayer, Summers, Mackie, Gous and Everard, 2006).

Historically, the first synthetic pharmaceutical Aspirin was introduced in 1897. In 1941, the world has seen the first modern antibiotic, two years later in 1943 the first commercially Anti-malarial drug has been formulated, and in 1944 the first Anti tubercular dug was formulated (WHO, 2002a). In 1950, Oral Contraceptives, Diabetes drugs and drugs for mental illness have been introduced to the public. After this, rapid development in the field of pharmaceuticals has been achieved, including the development of drugs for other infectious diseases, for cardiovascular diseases and for wide range of other health conditions (WHO, 2002a).

Many changes in the pattern of diseases and drug demands, as well as the rise of new diseases, the recurrence of other diseases and increasing drug resistance of potentially fatal diseases, all of these problems along with the attitudes and behaviors of governments, prescribers, dispensers, consumers and drug industry all contributed to the increased spending on drugs and growing pressure on health resources (WHO, 2002b). Thus, WHO recommends all countries to initiate and implement a comprehensive national drug policy (NDP). NDP will help in identifying the needs and prioritizing the medium to long term goals, and it is very important for the NDP to be developed and fit within the context of the

national health policy. Any NDP must have four important components which are availability of essential drugs, affordability of essential drugs, high quality of drugs, and rational use of drugs (Burden, Rainhorn and Reich,1999).

2.2.3 Current Dimensions of Pharmacy Practice

Over the past four decades there has been a trend for pharmacy practice to move away from its original focus on medicine supply towards a more inclusive focus on patient care. The role of the pharmacist has evolved from that of a compounder and supplier of pharmaceutical products towards that of a provider of services and information and ultimately that of a provider of patient care. Increasingly, the pharmacist's task is to ensure that a patient's drug therapy is appropriately indicated, the most effective available, the safest possible, and convenient for the patient. By taking direct responsibility for individual patient's medicine-related needs, pharmacists can make a unique contribution to the outcome of drug therapy and to their patients' quality of life. The new approach has been given the name pharmaceutical care (Wiedenmayer, Summers, Mackie, Gous and Everard, 2006).

2.2.3.1 Pharmaceutical care

Pharmaceutical care is a ground-breaking concept in the practice of pharmacy which emerged in the mid-1970s. It stipulates that all practitioners should assume responsibility for the outcomes of drug therapy in their patients. It encompasses a variety of services and functions – some new to pharmacy, others traditional – which are determined and provided

by the pharmacists serving patients (Traynor, 2002). The concept of pharmaceutical care also includes emotional commitment to the welfare of patients as individuals who require and deserve pharmacists' compassion, concern and trust. Pharmaceutical care does not exist in isolation from other health care services. It must be provided in collaboration with patients, physicians, nurses and other health care providers. Pharmacists are responsible directly to patients for the cost, quality and results of pharmaceutical care (Wiedenmayer, Summers, Mackie, Gous and Everard, 2006).

2.2.3.2 Meeting patients' needs (Patient Care)

In patient-centered health care, the first challenges are to identify and meet the changing needs of patients. Pharmacists need to ensure that people can access medicines or pharmaceutical advice easily and, as far as possible, in a way and at a time and place of their own choosing. They can empower patients by engaging them in dialogue to communicate knowledge which enables them to manage their own health and treatment (Wiedenmayer, Summers, Mackie, Gous and Everard, 2006). Although patients are exposed to a wide range of information from package inserts, promotional materials, advertising in the media and through the Internet, this information is not always accurate or complete (Smith, 2004). The pharmacist can help informed patients to become accurately informed patients by offering unbiased relevant evidence-based information and by pointing to reliable sources. Counseling on disease prevention and lifestyle modification will promote public health, while shared decision-making on how to take medicines through a concordant approach will optimize health outcomes, reduce the number of medicine-related adverse events, cut the amount of medicine which is wasted and improve adherence to medical treatment (Wiedenmayer, Summers, Mackie, Gous and Everard, 2006).

2.2.3.3 Quality assurance of pharmaceutical care services

The implementation and practice of pharmaceutical care must be supported and improved by assessing and measuring the whole pharmacy activities and then trying to fill in the gaps that might disturb the work and this means that there would be a continuous improvement of the pharmacy services (Traynor, 2002). It is worth mentioning that in many cases the quality of pharmacy services could be improved by making changes to the health care system or the pharmacy system without necessarily increasing resources. Improving the processes of pharmacy practice not only creates better outcomes but also reduces cost through eliminating waste, unnecessary work and repetition of work already done. Thus quality improvement must address both the resources (structures) and activities carried out (processes) to ensure or improve the quality of pharmaceutical care (outcomes) (Curtiss, Fry and Avey, 2004).

2.2.3.4 The pharmacist as a member of the health care team

The health care team consists of the patient and all the health care professionals who have responsibility for patient care. This team needs to be well defined, and collaboration needs to be actively sought. Pharmacists have an important role to play in this team. They will need to adapt their knowledge, skills and attitudes to this new role, which integrates traditional pharmaceutical science with clinical aspects of patient care, clinical skills, management and communication skills, active collaboration with medical teams and solving of medicine-related problems (Traynor, 2002). If Pharmacists are to be recognized as full members of the health care team, they will need to adopt the essential attitudes required by health professionals working in this area: visibility, responsibility, accessibility in a practice aimed at the general population, commitment to confidentiality and patient orientation. Pharmacists will need to be competent and possess both vision and a voice to

fully integrate themselves into the health care team (Wiedenmayer, Summers, Mackie, Gous and Everard, 2006).

2.2.4 The seven-star pharmacist

To be effective health care team members, pharmacists need skills and attitudes enabling them to assume many different functions. The concept of the "seven-star pharmacist" was introduced by WHO and stated that pharmacists should cover these roles: caregiver, decision-maker, communicator, manager, life-long learner, teacher and leader. Some books had added the function of the pharmacist as a researcher as an extra role (Wiedenmayer, Summers, Mackie, Gous and Everard, 2006) .

The roles of the pharmacist are described below and include the following functions:

 Caregiver: Pharmacists provide caring services for patients. They must view their practice as integrated and continuous with those of the health care system and other health professionals. Pharmacy Services must be of the highest quality.

 Decision-maker: The appropriate, efficacious, safe and cost-effective use of resources (e.g., personnel, medicines, chemicals, equipment, procedures, practices) should be the foundation of the pharmacist's work. At the local and national levels, pharmacists play a role in setting medicines policy. Achieving this goal requires the ability to evaluate, synthesize data and information and decide upon the most appropriate course of actions (Wiedenmayer, Summers, Mackie, Gous and Everard, 2006) .

 Communicator: The pharmacist is in an ideal position to provide a link between prescriber and patient, and to communicate information on health and medicines to the public. He or she must be knowledgeable and confident while interacting with other health

professionals and the public. Communication involves verbal, non-verbal, listening and writing skills.

 Manager: Pharmacists must be able to manage resources (human, physical and financial) and information effectively; they must also be comfortable being managed by others, whether by an employer or the manager/leader of a health care team. More and more, information and its related technology will provide challenges as pharmacists assume greater responsibility for sharing information about medicines and related products and ensuring their quality (Wiedenmayer, Summers, Mackie, Gous and Everard, 2006) .

 Life-long-learner: It is impossible to acquire in pharmacy school all the knowledge and experience needed to pursue a life-long career as a pharmacist. The concepts, principles and commitment to life-long learning must begin while attending pharmacy school and must be supported throughout the pharmacist's career. Pharmacists should learn how to keep their knowledge and skills up to date.

 Teacher: The pharmacist has a responsibility to assist with the education and training of future generations of pharmacists and the public. Participating as a teacher not only imparts knowledge to others, it offers an opportunity for the practitioner to gain new knowledge and to fine-tune existing skills (Wiedenmayer, Summers, Mackie, Gous and Everard, 2006) .

 Leader: In multidisciplinary (e.g., team) caring situations or in areas where other health care providers are in short supply or non-existent the pharmacist is obligated to assume a leadership position in the overall welfare of the patient and the community. Leadership involves compassion and empathy as well as vision and the ability to make decisions, communicate, and manage effectively. A pharmacist whose leadership role is to be recognized must have vision and the ability to lead.

 Researcher: The pharmacist must be able to use the evidence base (e.g., scientific, pharmacy practice, health system) effectively in order to advise on the rational use of medicines in the health care team. The pharmacist can also contribute to the evidence base with the goal of optimizing patient care and outcomes. As a researcher, the pharmacist is able to increase the accessibility of unbiased health and medicines-related information to the public and other health care professionals (Wiedenmayer, Summers, Mackie, Gous and Everard, 2006) .

2.3 Hospital Pharmacy

The past 30 years has seen a number of factors changing the role and function of hospital pharmacies. The increase in the sophistication and extent of use of the intravenous route has been mirrored by the shift of the bulk preparation of infusion fluids to pharmaceutical industry. At the same time, the need for specialized products has emerged and thus has created a very large demand for individually dispensed, aseptically prepared medicines – typically exemplified by intravenous nutrition cocktails of nutrients, electrolytes and vitamins. The use of such products, being prepared for individual patients, has led to the need for the pharmacist to build effective working relations with the end-users, prescribers, nurses, dietitians and biochemists (Hudson, 2000). Similar changes have occurred in the use of other medicines prepared aseptically, such as intravenous antimicrobial agents, anesthetic and pressor agents in intensive care, analgesics and cytotoxic drugs. Each group of drugs that has placed special requirements on the traditional preparatory role of the hospital pharmacist has also created a need for closer working relations at ward level. The consequence has also been multidisciplinary collaboration with other clinical support

services such as microbiology and biochemical laboratory scientists (Thurmann, Harder and Steioff,1999).

The changes arising from an increased emphasis on providing products to suit individual patients' needs have occurred internationally. At the same time the drug industry has adapted to meet the provision of most of the bulk supplies of medicinal products. The technical advances in pharmacotherapy have therefore shifted the application of pharmacy facilities and skills in the direction of identifying and responding to specific drug use problems and to contributions to individual patient care (Hudson, 2000).

Hospital pharmacists perform many work activities in their settings such as: participating in ward rounds to take patient drug histories and contribute to the treatment decision-making process including highlighting a drug's potential side effects, harmful interactions with other drugs and the suitability of treatments for patients with particular health conditions. Also hospital pharmacists liaise with physicians, nurses and other fellow health care professionals to ensure the delivery of safe, effective and economic drug treatment. Counseling patients on the effects, dosage and route of administration of their drug treatments, particularly those who require complex drug therapy is considered among the main activities of hospital pharmacists and also they have to monitor every stage of medication therapy and prepare sterile medications under special and for certain conditions (Debbie,2006). Hospital pharmacists have to ensure that medicinal products are stored appropriately and securely to ensure freshness and potency, medication reaches the patient in the correct form and dose, supervise and check the work of less experienced and less qualified staff, respond to medication-related queries from within the hospital, other hospitals and the general public and keep up to date with, and contributing to, research and development, often in collaboration with medical staff and colleagues. Additionally, they

have to write guidelines for drug use within the hospital, preparing bulletins and implementing hospital regulations (Debbie,2006).

In modern hospital pharmacy practice, pharmacists have to visit each hospital ward daily to initiate the supply of newly-prescribed non stock medications. These visits could have a major impact on maximizing the benefit of the medications and also promote the pharmacists role in direct patient care (Bryony, Achere, Gallivan and Barber, 2004).

In a study conducted in Indonesia (Muhammadiyah Hospital) to develop an efficiency indicators for use in rapid-assessment of hospital drug management, percentage of expired medications was considered as a valid sensitive indicator of measuring the quality of drug management and was able to show differences among hospitals. The standard value for the percentage of expired drugs in this study was considered 0% (Pudjaningsih and Santoso, 2002).

Finally we can say that hospital pharmacists provide hospital pharmacy services, primarily within the public sector. They are responsible for ensuring the safe, appropriate and cost-effective use of medicines. Hospital pharmacists use their specialist knowledge to dispense drugs and advise patients about the medicines they have been prescribed. They work collaboratively with other health care professionals to devise the most appropriate drug treatment for patients. Some pharmacists will also be involved in the manufacture of the required drug treatments (McCabe and Robins, 2003).

2.3.1 Drugs and Therapeutics Committees

The hospital pharmacists in many countries have developed a range of initiatives at institutional level to support the safe, effective and economic use of medicines in hospitals.

For example, multidisciplinary committees have emerged as the means of formulating drug use policies to help control budgetary spend and to address the need for safe and effective ways of using drugs (Scala, Bracco and Cozzolino, 2001). Such committees have brought pharmacists into closer formal working relationships with medically trained clinical pharmacologists and hospital medical specialists to devise hospital policies. Such committees have typically been referred to as Drugs and Therapeutics Committees (Scala, Bracco and Cozzolino, 2001).

2.3.2 Medicines information services

Advances in pharmacotherapy have created a demand for medicines information services within hospitals. Those services in many hospital pharmacies, which now form an internationally recognized sub-specialty in hospital pharmacy, have developed out of paper-based systems of cataloguing manufacturers' information on their drug products. Recently, specialized national and international databases have been developed to focus on the need to support drug treatment decisions within the hospital, both at individual patient care and institutional levels (Cole, 2001).

2.3.3 Pharmacovigilance

The voluntary reporting of unwanted drug effects provides the basis for pharmacovigilance of adverse effects to newer drugs and serious reactions to established drugs. Hospital pharmacists in clinical settings and in medicines information centers in a number of countries have evolved local connections into regional and national pharmacovigilance systems, often working closely with clinical pharmacologists (Wilson and Tsui, 2000). Examples of highly developed pharmacovigilance systems can be found in the

Netherlands, France, the United Kingdom and Norway. The reporting of adverse effects by hospital pharmacists directly into such systems is evident in a number of countries, and in the United Kingdom this remains an area of continuing professional development as pharmacists become more closely involved with individual patient care (Wilson and Tsui, 2000).

2.4 Drug Dispensing Systems at Hospitals

In any hospital, a DDS is required to supply the prescribed medications for each inpatient. The DDS includes all the processes that occur between the prescription of a drug and the administration of that drug to the patient. There are many varieties of DDSs in use throughout the world, but all have the same goal: to ensure that each dose of medication administered to each patient is exactly that which was intended by the prescriber (Murray and Shojania, 2000).

Several years ago, the DDSs in the United States gradually changed. In many hospitals, ward stock systems were eliminated in favor of patient-orientated distribution systems that were managed from the hospital pharmacy. Later, hospital pharmacies in some countries were also increasingly allocated the responsibility for managing medication stocks and supplying ready-to-use drugs. Despite of this trend, the ward stock systems are still in widespread use in many countries (Coman and Dowling, 2003).

Medication distribution is the responsibility of the pharmacy. The pharmacists, with the assistance of P&T committees and the departments of nursing, must develop comprehensive policies and procedures that lead to the safe distribution of all medications and related supplies to inpatients and outpatients (Murray and Shojania, 2000).

2.4.1 Unit Dose Drug Dispensing System (UDDDS)

The UDDDS is a pharmacy-coordinated method of dispensing and controlling medications in organized health-care settings (Evans, Stuart and Christopher, 1998). UDDDS is a medication delivery system that provides individual nursing units a determined quantity of single dose packaged drugs sufficient to meet patient requirements over a given time frame not to exceed twenty-four hours. This medication delivery system takes into account prescribing, interpretation, processing, packaging, storing, dispensing, delivery and administration of unit dose medications (Murray and Shojania, 2000) .

UDDDS was developed in the 1960s to support nurses in medication administration, provide nurses more time and pharmacists more chance for patient care, and reduce the waste of increasingly expensive medications. Now, unit-dose dispensing of medications is a standard of practice at hospitals in many countries around the world (Murray and Shojania, 2000).

In UDDDS, medication is dispensed in a package that is ready to administer to the patient. It can be used for medications administered by any route, but oral, parenteral, and respiratory routes are especially common. When UDDDS first began, hospital pharmacies equipped themselves with machines that packaged and labeled tablets and capsules, one pill per package. They also purchased equipments for packaging liquids in unit-doses. As the popularity of this packaging increased, the pharmaceutical industry began prepackaging pills in unit-of-use form. Many hospitals now purchase prepackaged unit-dose medications. However, it is still common for hospital pharmacies to purchase bulk supplies of tablets and capsules from manufacturers and repackage them in the central

pharmacy into unit-dose packages. It is important to note that hospitals vary in the proportion of their wards covered by a unit-dose system (Murray and Shojania, 2000).

There are many variations of unit-dose dispensing. As just one example, when physicians write orders for inpatients, these orders are sent to the central pharmacy (by pharmacists, nurses, other personnel, or computer). Pharmacists verify these orders and technicians place drugs in unit-dose carts. The carts have drawers in which each patient's medications are placed by pharmacy technicians-one drawer for each patient. The drawers are labeled with the patient's name, ward, room, and bed number. Before the carts are transported to the wards, pharmacists check each drawer's medications for accuracy. The next day, the carts are retrieved from the wards and replaced by a fresh and updated medication supply. Medications that have been returned to the central pharmacy are credited to the patient's account (Murray and Shojania, 2000).

UDDDS has many advantages over other alternative drug dispensing systems. These advantages include a reduction in the incidence of medication errors, a decrease in the total cost of medication-related activities, a more efficient usage of pharmacy and nursing personnel which allow for more direct patient-care involvement by pharmacists and nurses, improved overall drug control and drug use monitoring, more accurate patient billings for drugs, greater control by the pharmacist over pharmacy workload patterns and staff scheduling, a reduction in the size of drug inventories located in patient-care areas, and greater adaptability to computerized and automated procedures (Stewart, Kelly and Dinel, 1999). The main disadvantage of Unit Dose Drug Dispensing System is the high initial cost which could be compensated by time (Asiri, 2003).

2.4.2 Ward Stock Drug Dispensing System (WSDDS)

In WSDDS, nurses order drugs in bulk supplies from the pharmacy, the drugs are stored in a medication room on the ward. Nurses interpret physicians orders and prepare medication for each patient during medication administration cycles. Also in WSDDS, compounding of I.V. admixture is mostly carried out by nurses (Ringold, Santell and Schneider, 2000).

WSDDS has some advantages such as easiness, availability of medicine at nursing sites, reduction in the number of pharmacy personnel, and reduction in the number of orders received in the pharmacy (Asiri, 2003). There are many disadvantages of WSDDS such as high percentage of medication errors, relatively great opportunity for pilferage, increased hazards associated with drug deterioration, lack of proper storage facilities, greater nurses time spent on drug handling process, minimal pharmacy-physician contact, and also pharmacists can't make proper drug control and monitoring (Asiri, 2003).

2.4.3 Automated Drug Dispensing System (ADDS)

In the 1980s, automated dispensing devices appeared on the scene, a generation after the advent of unit-dose dispensing. The invention and production of these devices brought hopes of reduced rates of medication errors, increased efficiency for pharmacy and nursing staff, ready availability of medications where they are most often used (the nursing unit or inpatient ward), and improved pharmacy inventory and billing functions. Although the capacity of such systems to contribute to patient safety appears great, surprisingly few studies have evaluated the clinical impact of these devices (Murray, 2001).

Automated dispensing systems are drug storage devices or cabinets that electronically dispense medications in a controlled fashion and track medication use. Their principal advantage lies in permitting nurses to obtain medications for inpatients at the point of use. Most systems require user identifiers and passwords, and internal electronic devices track nurses accessing the system, track the patients for whom medications are administered, and provide usage data to the hospital's financial office for the patients' bills. These automated dispensing systems can be stocked by centralized or decentralized pharmacies. Centralized pharmacies prepare and distribute medications from a central location within the hospital. Decentralized pharmacies reside on nursing units or wards, with a single decentralized pharmacy often serving several units or wards. These decentralized pharmacies usually receive their medication stock and supplies from the hospital's central pharmacy (Dib, Abdulmohsin, Farooki, Mohammed, Iqbal and Khan, 2006).

2.5 Clinical Pharmacy Services

Modern clinical practice involves the use of increasingly sophisticated medicines in the management of diseases. Such medicines are very powerful therapeutic tools requiring judicious use in order to provide optimal efficacy with minimal risk (Clark, 2001). In recent years there have been major changes in the provision of hospital pharmaceutical services. Two or three decades ago, hospital pharmaceutical services were almost entirely concerned with the preparation and dispensing of medicines, with little direct patient contact. These technical services are still fundamental to the current pharmacy services and have become increasingly specialized, but they are now complemented by a wide variety of ward-based, patient-focused activities. These are generally referred to as clinical pharmacy services. Although there is a relatively small number of hospital pharmacists,

their input into patient care is disproportionately large. Their activities can influence expenditure on medicines and also improve the safety and effectiveness of medicines' usage. In particular, hospital pharmacists can make a significant contribution to the reduction of medication errors (Bond and Raehl,2007).

The overall goal of clinical pharmacy activities is to promote the correct and appropriate use of medicinal products and devices. These activities aim at maximising the clinical effect of medicines by using the most effective treatment for each type of patient, minimising the risk of treatment-induced adverse events through monitoring the therapy course and the patient's compliance with therapy, and minimising the expenditures for pharmacological treatments born by the national health systems and by the patients via trying to provide the best treatment alternative for the greatest number of patients (ACCP, 2008).

Clinical pharmacists work in the context of a multidisciplinary care team. The benefits of their contribution include the identification and reduction of clinically important drug related problems, improved patient knowledge of, and concordance with, prescribed therapy, enhanced clinical outcomes, reduced length of hospital stay and improved cost effectiveness (Bond and Raehl, 1999).

The results of a study conducted in Japan to identify the work activities of clinical pharmacists using a multidimensional work sampling method, showed that the major activities of clinical pharmacists included giving instructions and consultations to patients, reviewing the patients charts for drug history, suitable drug, suitable dose, and possible drug interactions, and finally managing drug information. Also the study showed that

clinical pharmacists spent 78.6% of their time performing clinical activities at ward level (Hamai, Kimura, Suzuki and Misaki, 2001).

In a study conducted in France aiming to compare drug use processes in three different dispensing systems (WSDDS, A mobile Wardrobe System, and UDDDS), UDDDS was the best way to prove that the right drug was administered to the right patient and thus usually accompanied with the lowest possible medication errors and the highest level of pharmacist interventions in patient care (Callaert, 2000).

2.6 Rational Use of Drugs

According to the World Health Organization (WHO), "Rational use of drugs requires that patients receive medications appropriate to their clinical needs, in doses that meet their own individual requirements for an adequate period of time, at the lowest cost to them and their community" (WHO, 2004). Today, rational use of drug/pharmaceuticals is an issue of the utmost importance. This growing concern is not only important for the promotion of appropriate use of pharmaceuticals, but also for human related quality of life in a community (Kole, 2005).

Irrational use of medicines is a major problem worldwide. WHO estimates that more than half of all medicines are prescribed, dispensed or sold inappropriately, and that half of all patients fail to take them correctly. The overuse, underuse or misuse of medicines results in wastage of scarce resources and widespread health hazards (WHO, 2003).

Common types of irrational use of drugs include non-compliance with health provider prescription, self-medication with prescription drugs, overuse and misuse of antibiotics, overuse of relatively safe drugs, use of needless luxurious drugs such as life style drugs etc. This particular activity is influenced by promotions from pharmaceutical companies, lack of government regulations, easy but unreliable, unauthenticated availability of drug information (Wayne, N .D.).

WHO adopted many key interventions to promote more rational drug use such as establishment of a multidisciplinary national body to coordinate policies on medicine use, use of clinical guidelines, development and use of national essential medicines list, establishment of drug and therapeutics committees in districts and hospitals, inclusion of problem-based pharmacotherapy training in undergraduate curricula, continuing in-service medical education as a licensure requirement, supervision, audit and feedback, use of independent information on medicines, public education about medicines, use of appropriate and enforced regulation, and Sufficient government expenditure to ensure the availability of medicines and staff (Otoom and Sequeira, 2006).

Due to the political situation from the beginning of 2006, shortage of medications and medical supplies are still reported by the Palestinian MOH, with approximately 25% shortfall in the essential drug list supplies at the central drug store in Gaza City. The Palestinian essential drug list includes 470 items of medicine, out of them 61 items are about to be depleted within one month while 120 items will be depleted within three months. The shortage of sensitive items as for instance intravenous solutions, antibiotics, medicines needed for kidney patients might disturb the work in many essential departments in the MOH institutions (OCHA, 2007).

A study conducted in the Gaza Strip to evaluate the compliance of the Gaza Strip physicians with the essential drug list in PHC facilities that are owned and managed by the MOH, showed that 94% of the respondents had experienced drug shortage at the PHC facilities. The study regarded this shortage as a bad signal because it reflects unavailability of essential drugs which should be 100% available all the time (Fattouh, 2005).

2.6.1 Essential Drug List Concept

Essential medicines are those that satisfy the priority health care needs of the population, and they are usually selected with due regard to disease prevalence, evidence on efficacy and safety, and comparative cost-effectiveness . Essential medicines are intended to be available within the context of functioning health systems at all times in adequate amounts, in the appropriate dosage forms, with assured quality, and at a price the individual and the community can afford (WHO, 2006b).

By the end of 2003, 156 Member States had official essential medicines lists, of which 99 had been updated in the previous five years. Most countries have national lists and some have provincial or state lists as well. National lists of essential medicines usually considered as national guidelines for clinical health care practice which are used for the training and supervision of health workers (WHO, 2007).

The economic impact of pharmaceuticals is substantial, especially in developing countries. While spending on pharmaceuticals represents less than one-fifth of total public and private health spending in most developed countries, it represents 15 to 30% of health spending in transitional economies and 25 to 66% in developing countries. In most low income countries pharmaceuticals are the largest public expenditure on health after personnel costs and the largest household health expenditure, and the expense of serious

family illness, including drugs, is a major cause of household impoverishment. Despite the potential health impact of essential drugs and despite substantial spending on drugs, lack of access to essential drugs, irrational use of drugs, and poor drug quality remain serious global public health problems (Shekelle, 2001).

Lists of Essential Medicines also guide the procurement and supply of medicines in the public sector. Many international organizations, as well as nongovernmental organizations and international non-profit supply agencies, have adopted the essential medicines concept and base their medicine supply system mainly on the Model List (WHO, 2006b).

2.6.2 Medicines Policy

WHO supports Member States in country and regional efforts to develop, implement and monitor the effectiveness of national medicines policies, guidelines, strategies and plans that ensure the availability, affordability and rational use of essential medicines and traditional, complementary and alternative medicines that are safe, effective and of good quality (Al Halawani and Qwwas, 2006).

WHO Medicines policy activities focus on ensuring the implementation and monitoring of national medicines policies, with a focus on continued support to ensure that all countries develop a national medicines policy and that these are implemented, monitored, and regularly updated in line with broader health and development objectives (WHO, 2004). Moreover, WHO policies focus on supporting countries in their efforts to use public health safeguards in international, regional, and bilateral trade agreements to improve access to priority medicines. Additionally, WHO policies focus on the access to essential medicines as a fundamental human right, public investment in medicines research and development,

especially for neglected diseases and ethical practices in the pharmaceutical sector (WHO, 2004).

WHO's goal in medicines is to help save lives and improve health by ensuring the quality, efficacy, safety and rational use of medicines, including traditional medicines, particularly for the poor and disadvantaged. The challenge for WHO in is to continue to interpret the concept of essential medicines via a strategy and activities that reflect both the ongoing issues and the current high profile issues around access to, financing, and quality of medicines (Ambwani and Mathur, 2005).

A study carried out in Croatia at Dubrava University Hospital to test the effects of the implementation of UDDDS compared with the traditional WSDDS in the same hospital. In this study consumption of drugs was measured every week by statistical unit DDD⁄100 hospital days (Defined Daily Dose) according to the Anatomic-Therapeutic-Chemistry classification of drugs. The study showed that UDDDS implementation leaded to a rationalization of drug consumption and great savings. The study also found that pharmacist-physician interactive role began to emerge as a direct result of UDDDS implementation. Hospital pharmacist had become a visible member of health care team who is responsible for quality of all medication-related activities and thus had taken opportunity for clinical pharmacy practice (Vrca, Bozikov, Crncec, Sutlic, Simic and Becirevic, 2000).

A study done in United States of America at the University of Arkansas Medical Center Hospital to compare an experimental UDDDS with a control study on the WSDDS concerning medication errors and drug losses. The study found that medication errors rate was 17% during the control ward stock period as opposed to a 7.2% rate during the

experimental unit dose period. Interestingly, time errors were nearly three times higher during the control ward stock period. The same study revealed that drug losses were higher in the control ward stock period than it in the experimental unit dose period, and conclude that savings to the hospital annually in reduction of drug losses through use of UDDDS would amount to approximately $26,000 (Barker and Heller, 1994).

2.7 Drugs safety and medications errors

Risk associated with medical drugs (one of the main tools used today to protect, maintain and restore health) have increased. The onset of adverse effects, with its damaging consequences for patients, health professionals, and health institutions, is reason for concern in most health-related sectors. This concern, in fact, is linked to the origin of the therapeutics (Anacleto, Perini, Rosa and Cesar, 2005).

Drug safety is not a static concept. The perception of what is acceptable as risk or benefit together with safety evidence requirements has radically changed during the 20th century, in tune with therapeutic developments and the resulting disasters related to such developments (Anacleto, Perini, Rosa and Cesar, 2005).

The very first problem when considering medication safety is that confusion and misunderstandings occur frequently because the different terms used for medication safety are not clearly defined and not used in the same way. For a correct understanding of evidence-based data on preventable adverse drug events, an accurate use of specific terms is fundamental (Council of Europe, 2006).

Although medication safety comprises both medication errors and adverse drug reactions, a clear distinction has to be made between them: medication errors are linked to the safety of health care service, whereas adverse drug reactions are linked to product safety. This distinction between safety of practices and product safety was clearly adopted by WHO's 55th World Health Assembly in May 2002 and its associated report (Council of Europe, 2006).

The hospital pharmacist is best placed to oversee the quality of the entire drug distribution chain, from prescribing, drug choice, dispensing and preparation to the administration of drugs, and can fulfill a vital role in improving medication safety (Guchelaar and Colen, 2005).

2.7.1 A View on Medication Errors

Medical errors have received a great deal of attention in recent years. The phrase "medical error" is an umbrella term given to all errors that occur within the health care system, including mishandled surgery, diagnostic errors, equipment failures, and medication errors. Medical error is a major problem in most countries of the world, in both primary and secondary care, and policy initiatives have been implemented to reduce it (Ghaleb and Wong, 2005). Medication errors are probably one of the most common types of medical errors as medication is the most common health care intervention (Ghaleb and Wong, 2005).

The American National Coordinating Council for Medication Error Reporting and Prevention defines a medication error as "any preventable event that may cause or lead to inappropriate medication use or patient harm while the medication is in the control of the health care professional, patient, or consumer. Such events may be related to professional

practice, health care products, procedures, and systems, including prescribing, order communication, product labeling, packaging, nomenclature, compounding, dispensing, distribution, administration, education, monitoring, and use" (Meadows, 2003).

Medication error also defined as any deviation from ordinary standards of care that are appropriate for the medicine therapy of a patient (Schelberd and Nord, 2007). A medication error is a non intentional omission or failed activity related to the medication use system, which can be the cause of a risk or of an adverse event reaching the patient. By definition, a medication error is preventable because it evidences what should have been done and what was not it during the medicine therapy of a patient. A medication error not only can concern one or several stages of the medication use system, such as formulary selection, prescription, dispensing, orders validation, preparation, storage, delivery, administration, therapeutic monitoring, and information, but also its interfaces, such as communications and transcriptions (Schelberd and Nord, 2007).

Medication errors (prescribing, transcribing, dispensing, and administration errors) are associated with considerable patient morbidity and mortality. An estimated 1 to 2 percent of inpatients in the United States are harmed as a result of such errors. Administration errors are one of the most common types of medication errors. On the basis of the findings of a number of United Kingdom observational studies in general hospitals, administration errors affect approximately 5 percent of all administered doses. However, in an American study of 36 health care facilities, the reported frequency was 19 percent. Much of the research on administration errors has focused on general hospitals and on errors involving intravenous drugs and infusions. Few studies of medication errors have been conducted in psychiatric settings, and even fewer have concentrated on administration errors. An American study of medication errors, based on a retrospective review of records in a state

psychiatric hospital, showed that administration errors were more frequent than prescribing, transcribing, and dispensing errors combined (Haw, Dickens and Stubbs, 2005).

In the United States, it is estimated that medication errors kill 7000 patients (both adults and children) a year. In United Kingdom hospitals, the incidence and consequences of medication errors appear similar to those reported in the United States, with prescribing errors occurring in 1.5% of prescriptions, and administration errors in 3–8% of doses given (Ghaleb and Wong, 2005).

When a medication error happened, nurses have an ethical and legal responsibility to report it, so the patient's safety is maintained. As soon as an error is recognized, the patient condition is checked and the mistake is reported to the prescriber and the supervising nurse immediately to take the required measures (Barbara, 2003).

Errors often reflect a problem in the medication system involving one or more of the four phases (prescribing, transcribing, dispensing and administering of medications). Errors are also caused by human error and does cross professional boundaries and departments. For example, a medication error may involve the nurse, the prescriber and the pharmacist (College of Nurses of Ontario, 2006).

Medication error rates should be considered as quality indicators of the different processes of the medication use system. Even if there are still too few reliable data on the frequency of medication errors in many countries, the available studies carried out in Europe reveal that medication errors have a similar magnitude as in the United States and other countries. Medication error rates have often been played down because most of medication errors are minor and seemed to have little consequences. However, some dramatic errors that

happened with high risk medicines showed that failures in the medication use system are very dangerous (Council of Europe, 2006).

Pharmacies permeate and interconnect various actions in different sectors within the complex process of the use of drugs in a hospital. Dispensing failures mean that a breach has occurred in one of the last safety links in the use of drugs. Although most failures do not harm patients, their existence suggests fragility in the process and indicates an increased risk of severe accidents (Council of Europe, 2006). Present concepts on drug-related incidents may be classified as side effects, adverse effects, and medication errors. Among these are dispensing errors, usually associated with poor safety and inefficient dispensing systems. Factors associated with medication errors may be communication failures, problems related to package labels, work overload, the physical structure of the working environment, distraction and interruption, the use of incorrect and outdated information sources and the lack of patient knowledge and education about the drugs they use (Coombes, Pillans, Storie and Radford, 2001).

For reducing medication errors in hospitals, various interventions have been studied. Examples include Computerized Physician Order Entry systems, having a clinical pharmacist review orders, the use of a unit dose system, using preprinted order forms, easy access to information on prescribing such as a handheld computer, and holding educational sessions for the staff (Kozer, Scolnik, Macpherson, Rauchwerger and Koren, 2005).

2.7.1.1 Causes of medication errors occurrence

The view many researchers in the field share is that most medication errors occur as a result of multiple, compounding events rather than from a single act by a single individual. Medication errors invariably represent the collapse of a faulty system, not a faulty human

being. For many years, psychologists have been studying how and why people make errors. They have determined that errors can be classified as either *active* or *latent*. Active errors have an effect that is immediate, such as being hit by oncoming traffic after running a red light. Latent errors, on the other hand, have delayed effects or results. Most medication errors are considered latent (Bruce and Wong, 2001). For example, when a pharmacist fills a prescription with the incorrect medication, patients typically realize this mistake once they have returned home and have taken the first dose. Latent errors can be described as "accidents waiting to happen". The causes of these types of errors are usually identifiable and can be corrected before the error recurs. For instance, if the pharmacist in this example misread the prescription because it was poorly written, one strategy to prevent the recurrence of this type of error is to analyze future prescriptions more carefully and verify the medication with the prescriber when there is doubt. Although various strategies can prevent this error from recurring, it is vital to establish and universally follow a standard procedure within the department (Bruce and Wong, 2001).

2.7.1.2 Common Types of Medication Errors

Historically, the cause of most medication errors has been attributed to poor penmanship or the use of unfamiliar abbreviations on the prescription. However, due to advances in technology, other possible causes or errors have expanded to include areas such as product labeling and packaging, product nomenclature, compounding, and order communication (Ross, Wallace and Paton, 2000).

The American Hospitals Association considers the following as some common types of medication errors: incomplete patient information (not knowing about patients' allergies, other medicines they are taking, previous diagnoses, and lab results), unavailable drug

information (such as lack of up-to-date warnings), miscommunication of drug orders, lack of appropriate labeling as a drug is prepared and repackaged into smaller units, and environmental factors, such as lighting, heat, noise, and interruptions, that can distract health professionals from their medical tasks (Ross, Wallace and Paton, 2000).

The American Institute for Safe Medication Practices identifies the following areas as potential causes of medication errors: Failed communication (handwriting and oral communications, especially over the telephone, drugs with similar names, missing or misplaced zeroes and decimal points, confusion between metric and apothecary systems of measure, use of nonstandard abbreviations, ambiguous or incomplete orders), Poor drug distribution practices, complex or poorly designed technology, access to drugs by nonpharmacy personnel, workplace environmental problems that lead to increased job stress, dose miscalculations, lack of patient information and Lack of patients' understanding of their therapy (Guchelaar, Colen, 2005).

A study conducted to compare the rate of medication errors in an American Hospital with UDDDS, and a British Hospital with WSDDS, using a disguised-observation technique, showed that the American Hospital with UDDDS had a significantly higher medication errors rate (6.9%) than the British Hospital with WSDDS (3%). Also the study found that incorrect doses were the most common types of errors in both hospitals (Dean, Allan, Barber and Barker, 1995).

2.7.2 Medication administration errors

Medication errors are especially likely when health professionals engage in multiple tasks within a short time span. This situation occurs repeatedly in hospitals when pharmacists and technicians load unit-dose carts, and when nurses administer medications. Unit-dose

carts are prepared daily, often manually, by technicians and then checked by pharmacists. These carts, containing thousands of patient-specific dosages of drugs, are sent to the wards daily, for nurses to administer medications to patients. Dosing frequencies vary widely, ranging from regular intervals around the clock to "stat" doses given to control acute pain or other symptoms. Medication administration alone is an enormous task for nurses, and one in which they are repeatedly interrupted. It is not surprising that the administration phase of medication use is particularly vulnerable to errors (Bowdle, 2003).

Drug administration is one of the highest risk areas of nursing practice and a matter of considerable concern for both managers and practitioners. Drug administration errors are less likely to be prevented, because they occur in the last stage of the drug distribution process. This is especially the case in non-alert patients, as patients often form the final barrier for the prevention of errors (Kozer, Scolnik, Macpherson, Rauchwerger and Koren, 2005).

Although the 5 "rights" of medication administration (right patient, right drug, right dose, right route, and right frequency) are the basis of most education on drug administration and form the core for medication administration policies, the 5 rights are not inclusive of major sources of error, they may limit critical thinking, and they may not reflect current nursing practice. Medication administration is fraught with transcription misadventures, misinterpretation of orders, inappropriate timing of doses, drug-food interactions, and wrong doses secondary to dose preparation (Mrayyan, Shishani and Al-Faouri, 2007).

During the administration phase, nurses must check that they are administering the right drug, right dose, to the right client at the right time, by the right route (The 5 rights). Documentation also should occur during or after administration. Removing one of these

steps increases the risk of the errors. For example, imagine that you have cared for the same clients for the past two days. You think you have become familiar with the medications the client is receiving; therefore, you assume the medication doses have not changed and administer the amounts given yesterday. During the previous night, the dose was reduced. Because you did not confirm the dose before administering, a medication error occurred (College of Nurses of Ontario, 2006).

Medication administration is documented on the patient chart as soon as possible because timely documentation prevents medication errors as it demonstrates that the medication order has been implemented (Barbara, 2003).

When preparing medications for patients, nurses must check the label of the drug container three times: when reaching for the medication, just before placing the medication into an administration cup, and when returning the medication to the patient drawer (Barbara, 2003).

Administering a drug with lack of knowledge about that drug can lead to a medication error and harm the client. Knowing about the drug you are administering and using your professional judgment to determine that the medication is the correct drug (dose and route) required for the client's condition decreases medication errors. If the nurse is concerned or requires clarification on the medication prescribed, the nurse would consult with the prescriber and other appropriate resources such as the pharmacist and/or drug reference books (College of Nurses of Ontario, 2006). Many studies indicate that the rate of errors concerning intravenous administration in hospitals are considerably higher than those involving medicines for oral use. In one study, at least one error occurred in 49.3% of

intravenous medicine doses prepared on hospital wards. 1% were considered errors with potentially severe consequences and 29% errors of potentially moderate severity (Jackson and Reines, 2003).

A study was carried out in one pediatric nephrology ward in a French hospital to evaluate the rates and types of drug administration errors through comparing UDDDS with WSDDS, showed that the administration errors rate including administration associated with time errors was only 22.5% for the UDDDS, compared to 29.3% for the WSDDS, which means that drug error rates were significantly decreased using UDDDS as compared with WSDDS. The same study revealed that time errors were the most common types in the WSDDS, while incorrect doses were the most common ones in the UDDDS (Fontan, Maneglier, Nguyen, Loirate and Brion, 2003).

Taxis, Dean and Barber, (1999) conducted a study to compare the incidence of medication administration errors in a British Hospital using WSDDS, a German Hospital using the UDDDS, and a German Hospital using WSDDS. Medication errors were identified by observing the process of drug preparation and administration. The study found that medication error rate was 8% in the British Hospital using WSDDS, 5.1% in the German Hospital using WSDDS, and 2.4% in the German Hospital using UDDDS (Taxis, Dean and Barber, 1999).

According to the findings of a study conducted in Western Australia to determine the rate of medication administration errors in a teaching hospital using WSDDS and a private hospital using UDDDS, the rate of medication administration errors was significantly lower in the private hospital than it in the teaching hospital. Thus UDDDS had a lower medication errors rate than the WSDDS (Mc Nally, Page and Bruce, 1997).

Chapter 3: Methodology

This chapter illustrates the research methodology which was used to conduct this study. The chapter presents the study design, study population, study setting, and the ethical procedures that were considered in the study. Tools and instruments that were used in the study, their validity and reliability, piloting, data collection and analysis processes are also presented in this chapter. The chapter also presents the selection criteria and the limitations of the study.

3.1 Study design

The design of the study is a quantitative, comparative, cross-sectional one as it compares between two drug dispensing systems in order to clarify which works better. Cross-sectional design was chosen because it is cheap, easy, and enables the researcher to meet the study objectives over a short period of time. Although cross-sectional design is weak in indicating causation relationships, it is highly useful and sometimes used for comparison purposes (Cherry, 2007).

3.2 Study population

The study population was diverse and included three sub-populations, the first study population was all the files of the patients who were admitted and discharged from the four selected departments at the two hospitals in July 2008. They were 327 files obtained from both hospital archives. All pharmacy record papers in which drugs dispensed for the selected departments in July 2008 were also included.

The second study population was the drug administration's observations that were done for nurses while administering drugs in the selected departments. The observations were done at 12 and 2 pm every other day in each selected department. 1096 drug administration observations were seen in July 2008 in the selected departments at both hospitals, in order to determine the rate of medication errors in each drug dispensing system.

The third study population was all pharmacists and head nurses working in different departments at both Al Shifa Hospital and the EGH. They were requested to fill a structured interview questionnaire to assess their perceptions about drug dispensing systems in their hospitals in general, and to see the extent of pharmacists involvement in clinical interventions in particular. The total number of pharmacists and head nurses at both sites was 92 (61 at Al Shifa and 31 at EGH).

3.3 Study settings

The study was mainly conducted in both the medical department (women ward) and the surgical department (women ward) at both Al-Shifa Hospital and the EGH. Al-Shifa Hospital and EGH are the two largest hospitals utilizing the two concerned drug dispensing systems all over the Gaza Strip, and thus they were chosen to reflect representative results that will help much in clarifying the differences between the utilized DDSs at both hospitals. The differences in the utilized management styles between the two hospitals may have an effect on the provided pharmacy services as a whole, and on the utilized DDS in particular.

3.4 Selection criteria

3.4.1 Inclusion criteria

3.4.1.1 Inclusion criteria for the questionnaire

- All formally employed pharmacists and head nurses at both Al Shifa Hospital and the EGH were considered eligible.

3.4.1.2 Inclusion criteria for patients files

- All files of patients who were whether admitted in or discharged from the concerned departments in July 2008 were eligible for this study.

3.4.1.3 Inclusion criteria for the drug observation sheet

- All drug administration processes that took place in the medical department (women ward) and the surgical department (women ward) at 12 and 2 pm at both hospitals were eligible.

3.4.2 Exclusion criteria

3.4.2.1 Exclusion criteria for the questionnaire

- Pharmacists and head nurses who were not formally employed or who had an experience of less than one year in the utilized drug dispensing system, were not eligible to fill in the study questionnaire.

3.4.2.2 Exclusion criteria for patients files

- Files of patients who were discharged at the beginning of July 2008 or admitted at the end of the same month were treated precisely, where drugs taken before 1/7/2008 or after 31/7/2008 and registered in those files were excluded.

3.4.2.3 Exclusion criteria for the drug observation sheet

- Drug administration processes that took place in medical department (women ward) and surgical department (women ward) at times other than 12 and 2 am at both hospitals were excluded from observation.

3.5 Ethical and administrative measures

The study highly respected the research ethical principles so before conducting the study, the researcher obtained an ethical approval from both the School of Public Health-Al Quds University and the Helsinki Committee (Annex 3). The researcher also obtained an administrative approval from both the General Directorate of Hospitals (Annex 4) and the General Directorate of Pharmacy. The researcher attached an explanatory letter that clarifies the purpose of the study, study confidentiality, and the voluntary right of participation in the study to each person who was eligible to participate.

3.6 Period of the study

The study was conducted in the year 2008, started with the literature review in February 2008. The proposal was approved by the School of Public Health-Al Quds University in May 2008. An administrative approval from the General Directorate of Hospitals and an ethical approval from Helsinki Committee were obtained in June 2008. Pilot study was

conducted in June 2008, while actual data collection took place in July 2008. Data analysis was completed by September 2008 and the final results were available by November 2008.

3.7 Study instruments

Three research tools were used for data collection in this study. The tools were drug administration errors observation sheet (Annex 5), missed drug registration sheet (Annex 6), and structured interviewed questionnaire (Annex 7).

The interviewed questionnaire was used to ensure the highest possible response rate. It was administered by the researcher himself, who was showing each participant the accompanied explanatory letter (Annex 8) that clarifies the study objectives and other needed information. The questionnaire designed for pharmacists and head nurses to assess their perceptions about the utilized drug dispensing systems in their settings in general and to explore in which drug dispensing system, pharmacists can practice a higher level of clinical pharmacy interventions and therefore higher level of physician-pharmacist contact.

Drug Administration Errors Observation Sheet was used to check the number of drug administration errors out of the observed drug administration processes during the study period in the selected departments at both hospitals. Using the number of observed medication errors out of the total observations, the rate of medication errors was calculated in each hospital.

Name and Quantity of each drug given to patients during the study period (July 2008) obtained from the patients files (obtained from hospital archives) of all the selected departments and documented in the missed drug registration sheet and then to be compared with those amounts of drugs dispensed from the pharmacy to the same departments

(obtained from pharmacy records) at the same period. The dispensed drugs from the pharmacy to the departments must be either registered in patients files or added to previous stock in order not to be considered missed drugs. Thus stocks in each selected department were counted at the beginning of the study month and at the end of the same month in order to calculate the amount of drugs that added to or decreased from the ward stock. Any drug that was dispensed from the pharmacy and neither registered in the patients files nor added to the stock, then this drug is considered a missed drug and used in the calculation of the percentage of missed drugs. The percentage of missed drugs was obtained by dividing the amount of missed drugs in the target department by the total amount of drugs dispensed to that department from the pharmacy and multiplied by 100.

3.8 Construction of the study instruments

In this study more than one instrument were designed in order to meet the study objectives and these were an interviewed questionnaire, missed drug registration sheet, and drug administration errors observation sheet. All these tools were self-constructed and designed to meet the objectives of the study.

The questionnaire was developed based on literature review, field observation, and consultation with experts in both pharmacy and public health fields. The questionnaire consisted of 61 questions that was categorized into 4 main parts. The first part included the characteristics data of the respondents like gender, age, current and previous place of work, marital status, title, qualifications and experiences. The second part was about the commodity management. Some of these questions were general to be answered by both pharmacists and head nurses such as questions about experiencing drug shortage and drug storage places in hospitals, whereas other questions were specific for nurses or

pharmacists such as questions about drug expiry at nursing sites and the pharmacy. The third part was about the perceptions of pharmacists and head nurses about drug dispensing systems utilized in their settings. This part included general questions for all respondents such as questions about advantages and disadvantages of the used dispensing system in general, other questions were specific for either pharmacists or head nurses. The last part was about the practices of both pharmacists and head nurses. In this part the questions were specific for each group of respondents. Questions about documenting medication orders, drug administration processes, time spent on managing medications and others were examples of questions specific for nurses, while questions about number of wards visits by pharmacist, clinical pharmacy interventions, pharmacists participation in teaching programs in hospitals, and others were examples of pharmacists specific questions.

The medication errors observation sheet was also developed to allow the observer to tick on wrong drug administration processes out of the total drug administration processes observed during the study period. Wrong drug administration processes included wrong drug, wrong dose, wrong time, wrong patient, and wrong route.

The missed drug registration sheet was developed to include the name and quantity of any drug that was administered for the patients in the selected departments during the study period. Then, the amount of these drugs compared with the amount of drugs dispensed from the pharmacy to that departments in order to assess the percentage of missed drugs.

3.9 Pilot study

After revision and modification of the study questionnaire by field-related specialists, a pilot study was conducted on 5 interviewees to detect its suitability and appropriateness and to detect if there were further needed modifications. Missed drug registration sheet

was also piloted using 10 patient files from the archive of each hospital to ensure the ease and fitness of that sheet for missed drug registration. Also the drug administration errors sheet was piloted at 12 and 2 pm for a day in each department of the four selected departments at both hospitals to see the extent of appropriateness of such tools for medication errors collection. Participants of the pilot study were asked about any ambiguities and their opinion about the questionnaire and the other tools. Some vague questions in the questionnaire were changed to be more accurate after the pilot study which was a helpful exercise for the later data collection process. Then actual data collection began at both Al Shifa Hospital and the EGH.

3.10 Data collection

The interviewed questionnaire with pharmacists and head nurses was collected by the researcher himself at both Al-Shifa Hospital and the EGH. The collected questionnaires were checked and overviewed for completeness, then entered into the computer for statistical analysis.

Drug administration observation sheets were collected by the researcher at Al Shifa Hospital and by the researcher and a trained assistant (pharmacist) at the EGH. The researcher trained his assistant about the five rights of drug administration and the observation technique for nurses while administering drugs for patients. Also the assistant was trained about how to fill in the drug administration observation sheets accurately. The collected data was entered into Statistical Package of Social Sciences (SPSS) software for analysis.

Drugs that were registered in patients files and drugs that were dispensed from pharmacies to the selected departments were counted by the researcher and a trained assistant with the help of another pharmacist at both Hospitals, then all collected data entered into the computer to undergo statistical analysis.

3.11 Response rate for the questionnaire

The total number of pharmacists and head nurses was 92 at both hospitals (61 at Al Shifa and 31 at EGH). Out of the 92 pharmacists and head nurses, 87 responded to the questionnaire which means that the response rate was 94.5%.

3.12 Data management

3.12.1 Data entry

Filled questionnaires were checked and overviewed again, and also the same thing done for both the missed drug registration sheets and the medication errors observation sheets. Then after that, data was entered into the computer using SPSS software version 13 to be analyzed. After finishing the data entry process, data cleaning was done to guarantee that all data were entered accurately and in appropriate way. Data cleaning was conducted through selecting and checking out a random number of the filled questionnaires, and also through operating frequencies and descriptive statistics for most variables.

3.12.2 Data analysis

Data analysis was conducted by the researcher with the support of a statistician and the supervisor. Means and Standard Deviations (SD) were computed for the continuous numeric variables. Frequency tables were used to show the main characteristics of the respondents. Cross tabulations between the place of work and other variables were conducted to show the differences between the two hospitals through percentages. Also, t-test was conducted to compare the means of missed drugs and the means of medication administration errors between the two hospitals. P value was considered statistically significant when it is lower than 0.05.

3.13 Reliability and validity

3.13.1 Reliability

The researcher regarded reliability of the used instruments as an important issue and tried to guarantee it through filling the whole number of questionnaires by himself using the same way in asking questions for the respondents. For the missed drug registration sheet , the researcher was the principal investigator and also used the same way in data collection. Also the same method of data collection of the medication errors observation was used by training the assistant in that part about how to use that sheet accurately. The same tools was used for all respondents and after data collection completion, all filled forms were checked for completeness. Tools and implementations were standardized and training was provided for the assistants. Field checking and data entry day by day also took place in order to guarantee that the reliability of the tools was appropriate.

3.13.2 Validity

Face validity:

The study tools were checked for face validity when the pilot study was conducted. The researcher asked the pilot study respondents to give their opinions about the format, layout, structure and typewriting clarity of the study instruments.

Content validity:

The interviewed questionnaire, missed drug registration sheet, and the medication errors observation sheet were sent by the researcher to 12 experts to assess these instruments from clarity, relevancy to the topic, and holism points of view. The experts were persons who have a good experience in the field of pharmacy, public health, management, and research and they were asked to add any suggested modifications that could enrich the research tools. Experts were asked to score each question of the questionnaire by numbers from 1 to 4 where 1 indicates that the question was related and no changes are required, 2 means that the question required minor changes, 3 indicates that the question required fundamental changes, and 4 means that the question was not related and should be deleted. Most comments of the experts were considered and some modifications were introduced.

3.14 Limitations of the study

The researcher considered the following points as limitations he faced during conducting his study :

- The unsettled general political situation in the Gaza Strip and political conflict between Palestinian factions which influenced the health sector may affect the way in which some employees responded to the questionnaire.

- Limited scientific resources and few literature on drug dispensing systems at hospitals faced the researcher during the literature review writing.

- Long distance of the European Gaza Hospital made it difficult for the researcher to observe drug administration processes at the night shift to explore and compare between the rate of medication errors at different shifts.

- The design is Cross-Sectional and the situation could vary from time to time, therefore further assessment may be needed.

Chapter 4: Results and Discussion

This chapter presents the results of the study and discusses its key findings. This chapter shows the descriptive analysis of the study findings in general, and of the respondent's characteristics in particular. Also, it presents important differences between drug dispensing systems utilized at both Al-Shifa Hospital and the European Gaza Hospital.

4.1 Findings derived from the questionnaire

4.1.1 Subjects characteristics

The total number of pharmacists and head nurses at both Al-Shifa Hospital and the EGH was 92. Out of them, 87 (94.5%) positively responded and filled the study questionnaire. The study respondents were having a diverse socio-demographic characteristics as shown in Table 4.1.

As illustrated in Table 4.1, the greater proportion of the study respondents were males who represented about 63.2% of the total respondents while females represented only 36.8%. This result indicates that males are more involved in the working force than females in hospitals as with other sectors in the Palestinian health care system where males usually constitutes the greater portion of the workforce and this is somewhat consistent with the level of women involvement in workforce (11.5%) at the Gaza Strip (PCBS, 2007).

Table (4.1): Distribution of the study respondents by their characteristics

Item	No	Percentage
Gender		
Male	55	63.2
Female	32	36.8
Total	**87**	**100**
Age		
30 Years and less	14	16.1
From 31 to 40 Years	44	50.6
41 Years and more	29	33.3
Total	**87**	**100**
Marital Status		
Not Married	6	6.9
Married	81	93.1
Total	**87**	**100**
Qualification		
Diploma	9	10.3
BSC	70	80.5
Postgraduate diploma or above	8	9.2
Total	**87**	**100**

The age range of the study respondents varied from 26 to 56 years and the vast majority of the respondents lie in the 31-40 years age group who represented about 50.6% of the total respondents. About 16.1% of the respondents were less than 30 years in age, while 33.3% of them were above 41years old. This means that most head nurses and pharmacists were below 40 years in age, and so it reflects the expansion trend in the health services which took place after the establishment of the Palestinian National Authority in 1994. The expansion in the health services was associated with the recruitment of relatively young human resources. This generation provides an opportunity for the health care system in term of building capacity because it is a relatively young generation who deserve investing in them as they will work for relatively long periods.

Regarding the marital status of the respondents, almost all of them (93.1%) were married and nearly 6.9% were not. Also as shown in table 4.1, the majority of the respondents (80.5%) were having a bachelor degree in their majors (pharmacy or nursing), while 10.3% of them were holding diploma -all of them were head nurses- and 9.2% a higher diploma or above. This result of the study is consistent with previous studies conducted in Palestinian settings where most pharmacists and nurses hold a bachelor degree (Turban, 2007, Al Afifi, 2008). It could be seen that most respondents had a close level of education which supported the results of the study.

The percentage of male head nurses (76.5%) was higher than it for female head nurses (23.5%), while the percentage of female pharmacists (55.6%) was higher than it for their male counterparts (44.4%), and this is similar to pharmacists gender distribution in Primary health care sector where the percentage of female pharmacists is higher than it for male pharmacists (Al Afifi, 2008). Regarding the specific characteristics for nurses and pharmacists, the majority of head nurses and pharmacists were married, having a bachelor degree in their majors, and mainly concentrated in the 31-40 years age group (Annex 9).

4.1.2 Subjects work-related characteristics

As shown in Table 4.2, 66.7% of the respondents were from Al-Shifa Hospital while 33.3% were from the EGH. This difference goes with the size of the two hospitals (MOH, 2003). As illustrated in Figure 4.1, 41.4% of the respondents were pharmacists while 58.6% of them were head nurses.

Table (4.2): Distribution of the study respondents by work-related variables

Item	No	Percentage
Hospital		
AL Shifa	58	66.7
EGH	29	33.3
Total	**87**	**100**
Department		
Surgical	19	21.8
Medical	14	16.1
Pharmacy	36	41.4
Maternity	18	20.7
Total	**87**	**100**
Profession		
Head nurse	51	58.6
Pharmacist	36	41.4
Total	**87**	**100**
Years of experience in current organization		
Less than 5 Yrs	16	18.4
From 5 to 10 Yrs	39	44.8
More than 10 Yrs	32	36.8
Total	**87**	**100**
History of previous work		
Yes	53	60.9
No	34	39.1
Total	**87**	**100**
Sector of the previous work (for yes responses from the above item)		
Government	22	41.5
Private	21	39.6
NGO's	10	18.9
Total	**53**	**100**

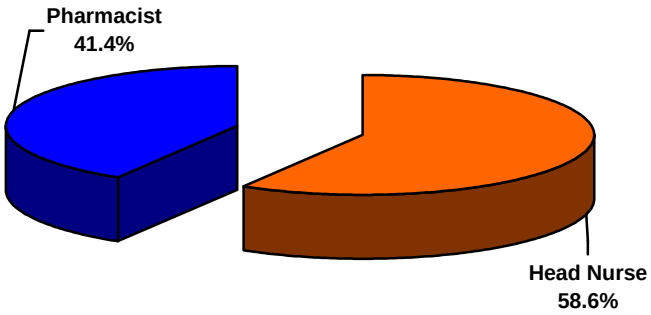


Figure (4.1): Distribution of respondents by profession

As Table 4.2 presents, 18.4% of the respondents were employees with limited experience as they were working in their organizations for less than 5 years, while 81.6% of the respondents were working in their organizations for more than 5years. About 61% of the respondents reported that they were working in other organizations before working in their current ones, while 39% didn't. Among the respondents working in previous organizations, 41.5% had worked in other governmental organizations while the remaining 58.5% had worked in the private sector prior to their current organizations and this indicates that many health workers were preferring governmental jobs over the other private ones due to the perceived higher employment security at the governmental sector.

4.1.3 Commodity management

As illustrated in Table 4.3, the majority of the respondents at both hospitals (73.6%) reported that they had sometimes experienced drug shortage in the previous year, and about 13.8% of them reported that they had often experienced that. This result of this study is consistent with the findings of Fattouh study (2005), which found that 94% of her study respondents had experienced drug shortage at the PHC facilities and this requires serious intervention that could help in reducing such frequently occurring problem.

As shown in Table 4.3, when respondents were asked about reasons of drug shortage at their facilities, the majority of the respondents at both hospitals (86.2% at Al-Shifa and 93.1% at the EGH) reported that the main reason of drug shortage was the shortage at MOH central drug stores, while 5.7% answered that drug overuse was the main reason of drug shortage. The shortage of drugs at the MOH central drug stores could be attributed to the general political situation of the Gaza Strip, and this was conformed with the United

Nation Office for the Coordination of the Humanitarian Affairs (OCHA) situation report on the Gaza Strip 2007. The OCHA's report indicated that due to the current political situation in Gaza, there was a nearly 25% shortfall in the essential drug list supplies at the central drug store in Gaza City (OCHA, 2007). Drug shortage might negatively affect the work in many essential departments in the MOH facilities and hospitals.

Table (4.3): Distribution of the responses by commodity-management related variables by hospital

Variable	AL Shifa		EGH		Total	
	No.	**%**	**No.**	**%**	**No.**	**%**
Experiencing drug shortage in the last year						
Never	1	1.8	1	3.4	**2**	**2.3**
Seldom	3	5.2	6	20.8	**9**	**10.3**
Sometimes	43	74.1	21	72.4	**64**	**73.6**
Often	9	15.5	1	3.4	**10**	**11.5**
Always	2	3.4	0	0	**2**	**2.3**
Total	**58**	**100**	**29**	**100**	**87**	**100**
Possible reasons for drug shortage						
Shortage at MOH store	50	86.2	27	93.1	**77**	**88.5**
DDS	2	3.4	0	0.0	**2**	**2.4**
Drug Overuse	5	8.6	0	0.0	**5**	**5.7**
Other	1	1.8	2	6.9	**3**	**3.4**
Total	**58**	**100.0**	**29**	**100.0**	**87**	**100.0**
The mostly affected patients from drug shortage						
Newly admitted cases	18	31	22	75.9	**40**	**46**
Previously admitted	3	5.2	0	0	**3**	**3.4**
Both	37	63.8	7	24.1	**44**	**50.6**
Total	**58**	**100**	**29**	**100**	**87**	**100**
Presence of high number of missed drugs						
Strongly disagree	0	0.0	2	6.9	**2**	**2.3**
Disagree	26	44.8	22	75.9	**48**	**55.2**
Neither agree nor	13	22.4	4	13.8	**17**	**19.5**
Agree	19	32.8	1	3.4	**20**	**23.0**
Total	**58**	**100.0**	**29**	**100.0**	**87**	**100.0**
Status of drug storage places						
Bad	15	25.9	0	0.0	**8**	**9.2**
Neither Good nor bad	11	19	3	10.4	**21**	**24.1**
Good	30	51.7	21	72.4	**51**	**58.6**
Very Good	2	3.4	5	17.2	**7**	**8.0**
Total	**58**	**100.0**	**29**	**100.0**	**87**	**100.0**

As presented in Table 4.3, 75.9% of the respondents in the EGH reported that drug shortage was mostly observed with the newly-admitted cases while the remaining 24.1% reported that drug shortage affected and mostly seen with both the previously and the newly-admitted cases. Also Table 4.3 illustrates that most respondents at Al-Shifa Hospital (63.8%) reported that drug shortage was mostly observed with both the previously-admitted and the newly-admitted cases, while 31% of them reported that drug shortage was mainly observed and affecting the newly-admitted cases. This means that pharmacists at the EGH don't permit the starting of the therapeutic courses unless they were sure that the available amount of that course is enough for the available patients. On the contrary, patients at Al-Shifa Hospital may start their therapeutic courses from drugs that are available at nursing sites and when nurses order the same drug from the pharmacy to complete the already started course, they found it deficient. So, the newly-admitted cases are more affected by drug shortage at the EGH while both the newly and previously-admitted cases are affected at Al-Shifa Hospital. This result reflects a more effective usage of pharmacy and nursing personnel in direct patient-care and some involvement of pharmacists in therapeutic decisions, which is considered as an advantage of the UDDDS over the traditional drug dispensing systems (Stewart, Kelly and Dinel, 1999).

Among the respondents of Al-Shifa Hospital, nearly 44.8% disagreed that there was a high number of missed drugs within their drug dispensing system, while 32% agreed. In the EGH, 82.8% of the respondents disagreed that the number of missed drugs in their settings was high, only 3.4% agreed. A higher percentage of respondents at the EGH disagreed that there was a high number of missed drugs in their settings than those at Al-Shifa Hospital and this means that the utilized DDS at the EGH (UDDDS) characterized by a

lower number of missed drugs than that utilized at Al-Shifa Hospital (WSDDS). This result was consistent with the literature which indicates that UDDDS implementation usually leads to a rationalization of drug consumption and great savings (Vrca, Bozikov, Crncec, Sutlic, Simic and Becirevic, 2000). This gives indication that UDDDS is less likely associated with missed drugs which call for adoption.

As shown in Table 4.3, drug storage places were described as good by the majority of respondents at both hospitals. Most respondents at the EGH (89.6%) reported that drug storage places at wards of their hospital are good and 10.4% of them reported that drug storage places are neither good nor bad. At Al-Shifa Hospital, 55.1% of the respondents described the drug storage places at wards as good, 19% described them as neither good nor bad, and 25.9% described them as bad. The percentage of respondents at the EGH who described the drug storage places as good was higher than that at Al-Shifa Hospital and this may be related to the fact that the EGH is a newly-established and modernly-constructed hospital compared with Al-Shifa Hospital which is an old and traditionally-constructed one, that need comprehensive reengineering process. From this result it could be concluded that the probability of drug deterioration at Al-Shifa Hospital is higher than it at the EGH so implementing a system that reduces ward stock is a top priority for Al-Shifa Hospital. Also, storage conditions at Al-Shifa Hospital need to be urgently improved because relatively large amount of medications are stored there and so may be considered liable for deterioration or losing activity with the current storing conditions.

4.1.4 Perceptions of respondents about their drug dispensing systems

Table (4.4): Distribution of respondents by their perceptions about DDS by hospital

Variable	AL Shifa		EGH		Total	
	No.	**%**	**No.**	**%**	**No.**	**%**
Drugs availability to patients when needed						
Yes	54	93.1	27	93.1	**81**	**93.1**
No	1	1.7	1	3.4	**2**	**2.3**
DK	3	5.2	1	3.4	**4**	**4.6**
Total	**58**	100.0	**29**	100.	**87**	**100**
Perceptions about productivity						
Very High	4	6.8	1	3.4	**5**	**5.7**
High	40	69.0	21	72.4	**61**	**70.1**
Normal	11	19.0	6	20.8	**17**	**19.5**
Low	3	5.2	1	3.4	**4**	**4.7**
Total	**58**	100.0	**29**	100.	**87**	**100**
The available DDS requires extra staff						
Disagree	16	27.6	12	41.4	**28**	**32.2**
Neither agree nor disagree	8	13.8	6	20.7	**14**	**16.1**
Agree	33	56.9	11	37.9	**44**	**50.6**
Strongly Agree	1	1.7	0	0.0	**1**	**1.1**
Total	**58**	100.0	**29**	100.	**87**	**100**

As shown in Table 4.4, nearly all respondents (93.1%) at each hospital reported that medications are easily accessed and usually available for patients when needed. This indicates that pharmacists and nurses highly cooperate with each other to put the patients' needs first and to offer them their medications as possible as they can. Regarding their productivity, Table 4.4 illustrates that 75.8% of respondents at both Al-Shifa Hospital and the EGH perceived that their productivity was high, 19% at Al-Shifa and 20.8% at the EGH reported that their productivity was normal, and around 4.7% of them at both hospitals perceived their productivity as low. High productivity indicates that there is a big concern of work and achievement.

Also Table (4.4) illustrates that the percentage of respondents at Al-Shifa Hospital who reported that the available DDS at their setting requires more staff (58.6%) was higher than that at the EGH (37.9%). Al-Shifa Hospital utilizes the WSDDS in drug dispensing process which make nurses spend long time on drug management process so most of them reported that they are in need for more nurses, while the situation was contradicting at the EGH which utilizes the UDDDS in which nurses send the patient cardix to the pharmacy without rewriting the drugs on another order sheet. Reducing nursing time spent on drug management leads to more nurses concern in patient care (Stewart, Kelly and Dinel, 1999). These results can be considered as signals of which system is more appropriate and worthwhile considering in other hospitals.

It is noteworthy that when respondents were asked about the main advantages and disadvantages of their drug dispensing system, most pharmacists at Al-Shifa Hospital reported that easiness and availability of medications constantly at nursing sites as key advantages of their drug dispensing system, while they considered too much paper work, minimal pharmacists-doctor contact, and somewhat high opportunity for drug pilferage as the main disadvantages of the utilized DDS at their setting. Nurses at Al-Shifa Hospital considered easiness, availability of medications constantly at nursing sites, and low number of orders per day as an important advantages of their DDS. In contrary, most of them considered too much paper work, long time spent on drug management, and rewriting physicians orders by nurses as the main disadvantages of their DDS. Most advantages cited by pharmacists and head nurses at Al-Shifa hospital were congruent with Asiri (2003) who reported that WSDDS has some advantages such as easiness, availability of medicine at nursing sites, reduction in number of pharmacy personnel, and reduction in the number

of orders received in the pharmacy. The same congruency was seen between respondents opinions and Stewart, Kelly and Dinel, (1999) regarding the advantages of UDDDS. At the EGH, most pharmacists considered easiness, low missed drugs, reasonable pharmacists-physician contact, and good drug control by pharmacists as positive points of their DDS, while the majority of them considered too much paper work and the problem of drug return to the pharmacy as the weakness points of their DDS. Nurses at the EGH considered that easiness, no need for rewriting physicians orders by nurses, and time saving for nurses concerning drug management as the main advantages of their DDS, while nearly all of them considered too much paper work and lack of 24-hour pharmacy service as the main disadvantages of their DDS (Annex 10). So, it could be concluded that the UDDDS is more positively perceived by nurses and pharmacists than the WSDDS. This result may call for implementing the UDDDS in other MOH hospitals, because positive perceptions are usually associated with positive outcomes.

As illustrated in Table 4.5, 60.3% of respondents at Al-Shifa Hospital were satisfied about their drug dispensing system, while 39.7% were not. At the EGH, the vast majority of respondents (93.1%) reported that they were satisfied with the utilized drug dispensing system and 6.9% were not. Collectively, 71.3% of all respondents at both hospitals were satisfied about the used drug dispensing systems, and 28.7% were not. When the unsatisfied respondents were asked about reasons of dissatisfaction, there were some variations in their answers as summarized in Table 4.5.

Table (4.5): Distribution of respondents by satisfaction about their DDS by hospital

Variable	AL Shifa		EGH		Total	
	No.	%	No.	%	No.	%
Satisfaction about the utilized DDS						
Yes	35	60.3	27	93.1	62	71.3
No	23	39.7	2	6.9	25	28.7
Total	**58**	**100.0**	**29**	**100.0**	**87**	**100.0**
Reasons of dissatisfaction:						
More Opportunity for drug pilferage						
Yes	6	26.1	0	0.0	6	24.0
No	17	73.9	2	100.0	19	76.0
Total	**23**	**100.0**	**2**	**100.0**	**25**	**100.0**
Long nurses time is spent on drug management						
Yes	10	43.5	0	0.0	10	40.0
No	13	56.5	2	100.0	15	60.0
Total	**23**	**100.0**	**2**	**100.0**	**25**	**100.0**
High drug return to the pharmacy						
Yes	1	4.3	0	0.0	1	4.0
No	22	95.7	2	100.0	24	96.0
Total	**23**	**100.0**	**2**	**100.0**	**25**	**100.0**
Too much paper work						
Yes	18	78.3	2	100.0	20	80.0
No	5	21.7	0	0.0	5	20.0
Total	**23**	**100.0**	**2**	**100.0**	**25**	**100.0**
Waste of time for pharmacist						
Yes	1	4.3	0	0.0	1	4.0
No	22	95.7	2	100.0	24	96.0
Total	**23**	**100.0**	**2**	**100.0**	**25**	**100.0**
Minimal pharmacist – doctor contact						
Yes	6	26.1	0	0.0	6	24.0
No	17	73.9	2	100.0	19	76.0
Total	**23**	**100.0**	**2**	**100.0**	**25**	**100.0**
Pharmacists can't control drugs properly						
Yes	7	30.4	0	00.0	7	28.0
No	16	69.6	2	100.0	18	72.0
Total	**23**	**100.0**	**2**	**100.0**	**25**	**100.0**

Some respondents reported more than one answer, therefore the total exceeded 100%

As illustrated in Table 4.5, 26.1% of the unsatisfied respondents at Al-Shifa Hospital reported that high opportunity for drug pilferage as the main reason of dissatisfaction about their DDS, while no one reported that at the EGH. No one reported that long time spent by

nurses on drug management as a reason of dissatisfaction at the EGH, while 43.5% of the unsatisfied respondents at Al-Shifa Hospital reported yes. Table 4.5 also shows that 78.3% of the unsatisfied respondents at Al-Shifa Hospital referred to " too much paper work" as the main reason of their dissatisfaction, while 100% of them at the EGH reported the same reason. Minimal pharmacist-doctor contact was considered as a reason of dissatisfaction by 26.1% of unsatisfied respondents at Al-Shifa Hospital, almost all of them pharmacists because hospital pharmacists always hope to play a deeper role in patient care especially in WSDDS. Also as presented in Table 4.5, 30.4% of unsatisfied respondents at Al-Shifa Hospital reported that improper drug control by pharmacists as the reason of their dissatisfaction. As mentioned previously, the majority of unsatisfied respondents were from Al-Shifa Hospital which utilizes WSDDS for drug dispensing, so it is of key importance for the interested persons to track and analyze the dissatisfying points at this system and try to correct them. The majority of the respondents at the EGH were satisfied with the utilized UDDDS and that's why it should be considered at other hospitals.

Table (4.6): Distribution of respondents by desire to change their DDS by hospital

Variable	AL Shifa		EGH		Total	
	No.	%	No.	%	No.	%
Desire to change the current DDS						
Yes	27	46.6	2	6.9	29	33.3
No	31	53.4	27	93.1	58	66.7
Total	**58**	**100.0**	**29**	**100.0**	**87**	**100.0**
Change direction						
To WSDDS	0	0.0	0	0.0	0	0
To UDDDS	10	37.0	0	0.0	10	34.5
DK	2	7.4	0	0.0	2	6.9
Others	15	55.6	2	100.0	17	58.6
Total	**27**	**100.0**	**2**	**100.0**	**29**	**100.0**

As shown in Table 4.6, 46.6% of the respondents at Al-Shifa Hospital reported that they prefer to change their DDS compared to only 6.9% of respondents at the EGH. This means

that more respondents want to change the WSDDS because they were not satisfied with it, particularly pharmacists who want a drug dispensing system that enables them to be more involved in medical teams, and so be able to practice more clinical activities and more involvement in patient care. These findings clarifies that pharmacists and nurses at Al-Shifa Hospital were hoping to find a more pharmacy-coordinated method of dispensing and controlling medications (Evans, Stuart and Christopher, 1998). Since perceptions of peoples are very important and responding to them is also more important, management should think in changing the utilized DDS at Al-Shifa Hospital.

4.1.5 Head nurses perceptions and practices

Table 4.7 illustrates that all head nurses at the EGH and 91.7% at Al-Shifa Hospital reported that their staffs check medications carefully before the administration process, and this is considered as one of the basis of medication administration processes because nurses must check that they are administering the right drug, right dose, to the right client at the right time, by the right route (The 5 rights rule). Adherence to this policy of medications administration process decreases the opportunity of medication errors (College of Nurses of Ontario, 2006). When head nurses were asked how many times medications are checked by nurses before the administration process, 16.7% at Al-Shifa Hospital and 13.3% at the EGH reported once, 58.3% at Al-Shifa Hospital and 53.3% at the EGH reported twice, and 25% at Al-Shifa and 33.3% at the EGH reported three times. The majority of head nurses in general reported that medications checking takes place two times at their settings, but this may increase the chance of medications errors because nurses at least have to check the medication 3 times before its administration (Barbara, 2003). Thus to avoid errors, this area requires more attention and follow up.

Table (4.7): Distribution of head nurses by practices related variables by hospital

Variable	AL Shifa		EGH		Total	
	No.	%	No.	%	No.	%
Checking the drug before its administration						
Often	3	8.3	0	00	3	6.9
Always	33	91.7	15	100	48	94.1
Total	**36**	**100.0**	**15**	**100.0**	**87**	**100.0**
Number of checks						
Once	6	16.7	2	13.4	8	15.7
Two times	21	58.3	8	53.3	29	56.9
Three times	9	25	5	33.3	14	27.4
Total	**36**	**100.0**	**15**	**100.0**	**51**	**100.0**
Checking for patient identify before drug preparation						
Often	3	8.3	0	0.0	3	5.9
Always	33	91.7	15	100.0	48	94.1
Total	**36**	**100.0**	**15**	**100.0**	**51**	**100.0**
Documenting the drug administration process						
Immediately after admin	36	100.0	15	100.0	51	100.0
Checking the ward stock of drugs before writing the order						
Sometimes	3	8.4	0	0.0	3	5.9
Often	17	47.2	3	20.0	20	39.2
Always	16	44.4	12	80.0	28	54.9
Total	**36**	**100.0**	**15**	**100.0**	**51**	**100.0**
Responsibility of writing the medication order						
Head Nurse	36	100.0	13	86.7	49	96.1
Other Nurse	0	0.0	2	13.3	2	3.9
Total	**36**	**100.0**	**15**	**100.0**	**51**	**100.0**
Time needed for nurses to manage medications						
Long	24	66.7	0	0.0	24	47.1
Normal	12	33.3	15	100	27	52.9
Total	**36**	**100.0**	**15**	**100.0**	**51**	**100.0**
Receiving training on the utilized DDS						
Yes	0	0.0	2.0	13.3	2	4.0
No	36	100.0	13	86.7	49	96
Total	**36**	**100.0**	**15**	**100.0**	**51**	**100.0**
The presence of guidelines about drugs preparation and administration						
Yes	0	0.0	11	73.3	11	21.6
No	36	100.0	4	26.7	40	78.4
Total	**36**	**100.0**	**15**	**100.0**	**51**	**100.0**
The presence of drugs guidelines is important						
Agree	6	16.7	2	50.0	8	20.0
Strongly agree	30	83.3	2	50.0	32	80.0
Total	**36**	**100.0**	**4**	**100.0**	**40**	**100.0**
Checking expiry date of drugs at ward stock						
Often	5	13.9	0	0.0	5	9.8
Always	31	86.1	15	100.0	46	90.2
Total	**36**	**100.0**	**15**	**100.0**	**51**	**100.0**
Amount of expired drugs at wards						
High	1	2.8	1.0	6.7	2	3.9
Low	13	36.1	6.0	40.0	19	37.3
Very low	22	61.1	8	53.3	30	58.8
Total	**36**	**100.0**	**15**	**100.0**	**51**	**100.0**
Dealing with unused drugs at the wards						
Returned to pharmacy	13	36.1	13	86.7	26	51.0
Remain in the ward	23	63.9	2	13.3	25	49.0
Total	**36**	**100.0**	**15**	**100.0**	**51**	**100.0**

As illustrated in Table 4.7, all head nurses at both Al-Shifa Hospital and the EGH reported that nurses always check for patient identity before drug preparation, and this will help in reducing the probability of medication errors because this make them sure that drugs are administered to right patients (College of Nurses of Ontario, 2006). As shown in Table 4.7, all head nurses at both hospitals reported that the documentation of drug administration process takes place immediately after administering the drugs which mean that there is no any difference between the two hospitals in this point. This finding is a positive signal because documenting the drug administration as soon as possible prevents medication errors as it demonstrates that the medication order has been implemented (Barbara, 2003).

As illustrated in Table 4.7, the majority of head nurses at both hospitals reported that they often check their ward stock before preparing the medication orders to be aware of the needed amount of each item which is based on the rate of consumption of that item. This indicates that those persons are skillful and experienced in the drug management process, and that they try to order the needed amount of drugs rather than accumulating them at their wards. The aforementioned description reflects experience and familiarity of head nurses with drug handling because as seen in Table 4.7, writing the ward medication orders is assigned to the head nurses at Al-Shifa Hospital and to 86.7% of them at the EGH.

Table 4.7 clarifies that 66.7% of the head nurses described the time spent in managing medication at their wards as long and 33.3% described it as normal, while all head nurses (100%) at the EGH described that time as normal. This finding indicates that the time spent in managing medications at the EGH was perceived as shorter than it at Al-Shifa Hospital, and this is considered an advantage of the UDDDS utilized at the EGH over the

WSDDS utilized at Al-Shifa Hospital (Murray and Shojania, 2000). Again this gives an indication of appropriateness and calls for the adoption of the UDDDS.

As illustrated in Table 4.7, no one of the head nurses at Al-Shifa Hospital reported that he had received training on drug dispensing systems, and only 13.3% of them at the EGH received training about drug dispensing systems. All persons who received training on DDSs said that they received their training while working abroad and before being employed by the Palestinian MOH. The literature reveals that training has a positive impact in improving the quality of most provided services as it increases the level of awareness of the trainees and deepen their perceptions, so it is very important for the policy makers to focus on training (Turban, 2008).

As elucidated in Table 4.7, all head nurses at Al-Shifa Hospital reported that they don't have guidelines about drug preparation and administration, while only 26.7% of the head nurses at the EGH reported that they don't have these guidelines. The greater part of head nurses at the EGH (73.3%) reported that they had drug preparation and administration guidelines. Although those guidelines were just separated papers sent by the pharmacy and hanged like posters, head nurses considered them much helpful and of high importance for effective nursing practice. All the head nurses who reported that they don't have drug administration and preparation guidelines agreed that the presence of these guidelines is very important for improving the provided services. The desire for having guidelines about drug preparation and administration means that the hospital administration must develop medical guidelines concerning the hospital pharmacy related issues (Debbie,2006).

As illustrated in Table 4.7, almost all head nurses in general (90.2%) reported that they always check the drugs expiry date at wards. At the EGH, all of the head nurses reported that they always check the expiry date of the drugs at wards, while 86.1% of them at Al-Shifa Hospital always check for the expiry date of the drugs and 13.9% of them often check for the expiry date of drugs. Checking the expiry date of drugs continuously is an important issue in hospitals and reflects the high concern of nurses about the good drug management as the percentage of expired medications is considered a valid sensitive indicator of measuring the quality of drug management (Pudjaningsih and Santoso, 2002). As a result of constant checking for drug expiry at wards by nurses and as illustrated in Table 4.7, most head nurses at both hospitals (96.1%) reported that the probability of drug expiry at wards level is considered low.

As elucidated in Table 4.7, 36.1% of head nurses at Al-Shifa Hospital reported that they return the unused drugs to the pharmacy, while 63.9% of them keep it in the wards for other cases. Most head nurses at the EGH (86.7%) reported that they return the unused drugs to the pharmacy, while 13.3% of them keep it in wards. It could be concluded from this finding that much unused drugs returned to the pharmacy at the EGH than it at Al-Shifa Hospital. This is considered a negative point of the UDDDS by some pharmacists due to the difficulty of its re-registration, while others see it as a positive point that contributes to drug use rationalization and decrease the probability of drug deterioration at wards, and a solution could be found for the unused drugs re-registration problem.

Table (4.8): Distribution of head nurses by their perceptions about DDS by hospital

Variable	AL Shifa		EGH		Total	
	No.	%	No.	%	No.	%
Nurses are available for patient care rather than for drug management						
Disagree	6	16.7	0.0	0.0	6	11.8
Neither agree nor disagree	9	25.0	1.0	6.7	10	19.6
Agree	21	58.3	14.0	93.3	35.0	68.6
Total	**36**	**100.0**	**15.0**	**100.0**	**51**	**100.0**
Relation of nurses with pharmacy team						
Neither Good nor bad	4	11.1	0	0.0	4	7.8
Good	17	47.2	4	26.7	21	41.2
Very Good	15	41.7	11	73.3	26	51.0
Total	**36**	**100.0**	**15**	**100.0**	**51**	**100.0**
The rate of medication errors at your department is described as						
High	1	2.8	0	0.0	1	2.0
Low	15	41.7	9	60	24	47.0
Very Low	20	55.5	6	40.0	26	51.0
Total	**36**	**100.0**	**15**	**100.0**	**51**	**100.0**
Number of medication errors took places in the last year						
None	4	11.1	2	13.3	6	11.8
One	13	36.1	9	60.0	22	43.1
Two	8	22.2	4	26.7	12	23.5
Three	6	16.7	0	0.0	6	11.8
Four and more	5	13.9	0	0.0	5	9.8
Total	**36**	**100.0**	**15**	**100.0**	**51**	**100.0**
Reporting medication errors that was happened						
Never	27	84.4	9	69.2	36	80.0
Seldom	5	15.6	2	14.4	7	15.6
Sometimes	0	0.0	2	15.4	2	4.4
Total	**32**	**100.0**	**13**	**100.0**	**45**	**100.0**

As clear in Table 4.8, 58.3% of head nurses at Al-Shifa Hospital reported that their DDS increases the availability of nurses for patient care rather than for drug management process. At the EGH 93.3% of the head nurses reported that the DDS at their setting increases nurses availability for patient care and no one reported not. This result means that the DDS utilized at the EGH (UDDDS) helps in saving the nurses time spent in drug

management and thus increases their availability for patient care, and that's an important point of why the UDDDS was introduced in 1960s (Murray and Shojania, 2000).

Also Table 4.8 illustrates that almost all head nurses at both hospitals were having an good relations with pharmacy teams, and this is considered a very important issue because pharmacists and nurses complementing each other and they have to cooperate on providing good patient care. Excellent relations between health teams like pharmacists and nurses reflect a high cooperation level between the teams at both hospitals.

As shown in Table 4.8, the rate of medication errors was described as being high by 2.8% of head nurses at Al-Shifa Hospital and low by 97.2%. At the EGH, the majority of the head nurses reported that the rate of medication errors is low. When they were asked about the number of medication errors that happened in the last year, the answers were variant between nurses at both hospitals and also among nurses in the same hospital. At Al-Shifa Hospital 11.1% of the head nurses reported that they hadn't experienced medication errors in the last year, 36.1% had experienced them one time, 22.2% experienced them twice, 16.7% thrice, and 13.9% experienced medication errors at least four times. At the EGH, no one reported experiencing medication errors more than two times in the last year, 26.7% of the head nurses reported experiencing medication errors two times in the last year, 60% reported one time medication errors experience, and 13.3% had never experienced medication errors in the last year. The researcher claims that training activities about medication errors are urgently needed for nurses as medication errors are one of the most common types of medical errors as medication is the most common health care intervention, and in recent years medication errors were was responsible of the death of some patients all over the world (Ghaleb and Wong, 2005). So, the MOH must start

suitable measures to make the health professional and especially nurses more aware of the medication errors concept and to monitor the occurrence of them.

As illustrated in Table 4.8, when the head nurses who reported that they had experienced medication errors were asked about documenting medication errors, the majority of them at both hospitals (80%) reported that they had never documented any medication error that happened, among them 84.4% at Al-Shifa Hospital and 69.2% at the EGH. Even the head nurses who reported that they had sometimes documented the medication errors were not able to show any of the medication errors reports when asked by the researcher and told that documentation was done by writing the medication error as a nursing note on the patient file. Neglecting the documentation of medication errors is a serious problem and contradicts the basic principles of health profession ethics because when a medication error happened, nurses have an ethical and legal responsibility to report it, so the patient's safety is maintained (Barbara, 2003). Also the shortcoming in reporting medication errors reflects the carelessness of health professionals on that serious issue, so much more concern is needed for focusing on medication errors handling. Medication errors reporting is very important issue that help in understanding the nature and type of these errors to be properly treated and to be avoided in the future.

4.1.6 Pharmacists perceptions and practices

This section illustrates the pharmacists perceptions and practices within their drug dispensing systems at both Al-Shifa Hospital and the EGH. It will clarify the major differences between the UDDDS and the WSDDS from pharmacists point of view.

Table (4.9): Distribution of pharmacists by practices related variables by hospital

Variable	AL Shifa		EGH		Total	
	No.	%	No.	%	No.	%
Frequency of visits for wards per month						
From 1-3	21	95.5	13	92.9	34	94.4
From 4-6	1	4.5	1	7.1	2	5.6
Total	**22**	**100.0**	**14**	**100.0**	**36**	**100.0**
Checking the prescriptions for the conformance of drug therapy with diagnosis						
Never	16	72.8	1	7.1	17	47.2
Sometimes	3	13.6	7	50.0	10	27.8
Often	3	13.6	6	42.9	9	25.0
Total	**22**	**100.0**	**14**	**100.0**	**36**	**100.0**
Checking the prescriptions for suitable drug dose						
Never	4	18.2	1	7.1	5	13.9
Sometimes	5	22.7	0	0.0	5	13.9
Often	13	59.1	13	92.9	26	72.2
Total	**22**	**100.0**	**14**	**100.0**	**36**	**100.0**
Checking the prescriptions for drug – drug interaction						
Never	17	77.4	2	14.3	18	50.0
seldom	3	13.6	11	78.6	15	41.7
Often	2	9	1	7.1	3	8.3
Total	**22**	**100.0**	**14**	**100.0**	**36**	**100.0**
Checking the ward stock before dispensing the order						
Never	16	72.7	6	42.9	22	61.1
seldom	6	27.3	8	57.1	14	38.9
Total	**22**	**100.0**	**14**	**100.0**	**36**	**100.0**
Preparing guidelines about drugs						
Never	20	91	1.0	7.1	21	58.3
Sometimes	1	4.5	10.0	71.4	11	30.6
Often	1	4.5	3.0	21.5	4	11.1
Total	**22**	**100.0**	**14.0**	**100.0**	**36**	**100.0**
Checking and supervising the work						
Never	1	4.5	2	14.3	3	8.3
Sometimes	4	18.1	5	35.7	9	25.0
Often	9	40.9	6	42.9	15	41.7
Always	8	36.5	1	7.1	9	25.0
Total	**22**	**100.0**	**14**	**100.0**	**36**	**100.0**
Participation in teaching programs in hospital about drugs						
Never	20	90.9	10	71.4	30	83.3
seldom	2	9.1	4	28.6	6	16.7
Total	**22**	**100.0**	**14**	**100.0**	**36**	**100.0**

As illustrated in Table 4.9, 95.5% of the pharmacists at Al-Shifa Hospital reported that they visit the hospital wards 1 to 3 times per month, while the remaining 4.5% reported

visiting the wards 4 to 6 times per month. At the EGH, 92.9% of the pharmacists reported visiting the hospital wards 1 to 3 times monthly and 7.1% of them reported that the number of their visits to the hospital wards ranged from 4 to 6 times monthly. This means that most hospital pharmacists at both hospitals visit their wards nearly once every 10 days, and there was no clear difference between the two hospitals in that point. It is better for hospital pharmacists to increase the frequency of visits for the hospital wards because in modern pharmacy practice, pharmacists are advised to visit each hospital ward daily to maximize the benefit of the medications and also to promote the pharmacists role in the direct patient care (Bryony, Achere, Gallivan and Barber, 2004).

Table 4.9 illustrates that 72.8% of Al-Shifa Hospital pharmacists never checked the patients charts for conformance of drugs with the diagnosis, 13.6% of them reported that they sometimes check the patients charts for the conformance of drugs with the diagnosis, and 13.6% often do such an activity. At the EGH, 42.9% of the pharmacists reported that they often check the conformance of the drugs with the diagnosis, 50% of them reported sometimes, and 7.1% reported never. From this finding, it is clear that the percentage of pharmacists at the EGH who check the conformance of drug therapy with diagnosis was higher than it at Al-Shifa Hospital. This is considered a logic result because the nature of the DDS utilized at the EGH permits the pharmacists to see the cardix of every patient when they received the Cardix for drug dispensing, while such process was absent at Al-Shifa Hospital where pharmacists can't see patients Cardix except if they visited the wards and reviewing the Cardixes. Thus it could be said the DDS at the EGH gives a better chance for pharmacists to carry out some of the main activities of clinical pharmacy than it at Al-Shifa because giving instructions and consultations to patients, reviewing the patients charts for drug history, suitable drug, suitable dose, and possible drug interactions, and

managing drug information are considered among the main clinical pharmacy activities (Hamai, Kimura, Suzuki and Misaki, 2001). Due to the abovementioned reasons and as illustrated in Table 4.9, most pharmacists at the EGH (92.9%) reported that they often check the patients charts for suitable drug dose and 7.1% reported never, while at Al-Shifa Hospital 59.1% reported often, 22.7% sometimes, and 18.2% reported that they never checked the patients charts for suitable drug dose. Regarding drug-drug interaction, most pharmacists at the EGH (78.6%) reported that they seldom check the patients charts for drug-drug interaction, while the largest part of pharmacists at Al-Shifa Hospital reported never checking the drug-drug interaction in the patients charts. Although the concern about drug-drug interaction by pharmacists is low in general at both hospitals, it is somewhat better at the EGH where the UDDDS was utilized. This indicates that UDDDS was better to prove that the right drug was administered to the right patient and thus usually accompanied with lower rate of medication errors and a better level of pharmacist interventions in patient care than the WSDDS (Callaert, 2000).

Table 4.9 illustrates that 72.7% of pharmacists at Al-Shifa Hospital and 42.9% of them at the EGH never checked the ward stock before dispensing the medication order, while 27.3% of the pharmacists at Al-Shifa Hospital and 57.1% at the EGH reported that they seldom check the ward stock before dispensing the medication order. It is clear that there was a low level of checking wards before dispensing the medication, and it is better to be increased as its presence help in motivating nurses to write reasonable orders.

As illustrated in Table 4.9, the majority of pharmacists at Al-Shifa Hospital (91%) reported that they had never prepared written guidelines about drug use, 4.5% of them reported sometimes, and 4.5% reported that they often write such guidelines. At the EGH, 21.5% of the pharmacists reported that they often prepare guidelines about drug use, 71.4% reported sometimes, and only 7.1% reported never. Pharmacists at the EGH who are preparing drug

use guidelines and manuals were more than those at Al-Shifa Hospital and this means that there was a higher involvement in hospital pharmacy activities at the EGH than it at Al-Shifa Hospital.

Regarding supervising the work of the less experienced staff, 36.5% of pharmacists at Al-Shifa and 7.1% at the EGH reported doing that always, 40.9% at Al-Shifa Hospital and 42.9% at the EGH reported often, 18.1% at Al-Shifa Hospital and 35.7% at the EGH reported sometimes, and the rest at both hospitals reported never because they were newly-employed. In general, a good percentage of pharmacists at both hospitals reported they supervise the less experienced colleagues as possible as they can and this is consistent with main activities of hospital pharmacists (Debbie,2006).

Table 4.9 also illustrates that nearly there was no participation of pharmacists in teaching programs about drugs at both hospitals since 71.4% of pharmacists at the EGH never participated and 28.6% rarely participated, while 90.9% of pharmacists at Al-Shifa reported never and 9.1% reported rare participation. The level of participation of pharmacists is considered low despite of being slightly higher at the EGH than it at Al-Shifa Hospital. The low level of participation in teaching lectures about drug in the hospitals setting is inconsistent with the main activities of hospital pharmacists (Debbie,2006).

Table 4.10 illustrates that 63.6% of pharmacists at Al-Shifa Hospital and 57.1% of them at the EGH perceived their workload as high, while 36.4% of pharmacists at Al-Shifa Hospital and 42.9% of them at the EGH perceived their workload as normal. The majority of pharmacists at both hospitals perceived their workload as high. This requires more in-depth analysis and may indicates that the number of pharmacists at both hospitals was not

enough to meet the pharmaceutical care needs of the hospitals, so a course of actions must be started to hire new pharmacists or redistribute currently-employed pharmacists in order to improve the quality of pharmaceutical care at hospitals.

Table (4.10): Distribution of pharmacists by their perceptions about DDS by hospital

Variable	AL Shifa		EGH		Total	
	No	**%**	**No.**	**%**	**No.**	**%**
Perception of workload						
High	14	63.6	8	57.1	**22**	**61.1**
Normal	8	36.4	6	42.9	**14**	**38.9**
Total	**22**	**100.0**	**14**	**100.0**	**36**	**100.0**
Adaptability of utilized DDS to computerized procedures						
Disagree	12	54.5	2	14.3	**14**	**38.9**
Neither agree nor disagree	3	13.7	5	35.7	**8**	**22.2**
Agree	7	31.8	7	50	**14**	**38.9**
Total	**22**	**100.0**	**14**	**100.0**	**36**	**100.0**
There is a good drug control and monitoring within the utilized DDS						
Yes	3	13.6	13	92.9	**16**	**44.4**
No	19	86.4	1	7.1	**20**	**55.6**
Total	**22**	**100.0**	**14**	**100.0**	**36**	**100.0**
Good contribution of the utilized DDS to rational use of drugs						
Disagree	12	54.5	0	0.0	**12**	**33.3**
Neither agree nor disagree	8	36.4	1	7.1	**9**	**25.0**
Agree	2	9.1	13	92.9	**15**	**41.7**
Total	**22**	**100.0**	**14**	**100.0**	**36**	**100.0**
Degree of involvement in patient care						
High	2	9.1	5	35.7	**7**	**19.4**
Normal	11	50.0	7	50.0	**18**	**50.0**
Low	9	40.9	2	14.3	**11**	**30.6**
Total	**22**	**100.0**	**14**	**100.0**	**36**	**100.0**
Good contribution to the quality of pharmacy services in general						
Disagree	12	54.6	0	0.0	**12**	**33.3**
Neither agree nor disagree	5	22.7	1	7.1	**6**	**16.7**
Agree	5	22.7	13	92.9	**18**	**50.0**
Total	**22**	**100.0**	**14**	**100.0**	**36**	**100.0**
Presence of effective communication channels between pharmacists & physicians						
Yes	3	13.6	14	100.0	**17**	**47.2**
No	19	86.4	0	0.0	**19**	**52.8**
Total	**22**	**100.0**	**14**	**100.0**	**36**	**100.0**
Level of pharmacy – physicians interaction						
High	1	4.5	8	57.2	**9**	**25.0**
Normal	6	27.3	5	35.7	**11**	**30.6**
Low	15	68.2	1	7.1	**16**	**44.4**
Total	**22**	**100.0**	**14**	**100.0**	**36**	**100.0**

Regarding adaptability of DDSs to computerized procedures, 54.5% of Al-Shifa Hospital pharmacists and 14.3% of the EGH pharmacists disagreed that their dispensing systems are adaptable for computerization, while 31.8% of them at Al-Shifa Hospital and 50% at the EGH agreed. This indicates that the UDDDS utilized at the EGH is more adaptable for computerized system than other systems, and that point is an advantage of the UDDDS over other drug dispensing systems (Asiri, 2003). With the current computerization trial in the MOH, this result gives another credit for the UDDDS adoption.

As illustrated in Table 4.10, 86.4% of the pharmacists at Al-Shifa Hospital reported that their DDS didn't improve the drug monitoring and control by pharmacists, while the remaining 13.6% believed that their DDS enhanced the drug control and monitoring process. At the EGH, 92.9% of the pharmacists reported that their DDS improved the drug control and monitoring process while 7.1% didn't. This result of the study shows that pharmacists at the EGH more involved in drug control and monitoring process than those at Al-Shifa Hospitals and this also an advantage of the UDDDS over the WSDDS (Stewart, Kelly and Dinel, 1999).

As elucidated in Table 4.10, 9.1 % of the pharmacists at Al-Shifa Hospital agreed that their DDS contributes to rational drug use and 54.5% of them disagreed, while 92.8% of the pharmacists at the EGH agreed that their DDS contributes to drug use rationalization and no one reported that he disagreed. This result of the study clarifies that the contribution of the DDS at the EGH was more touchable by pharmacists than it at Al-Shifa Hospital. So UDDDS helps more in preventing drug losses and in enhancing drug rationalization (Barker and Heller, 1994).

As shown in table 4.10, 9.1% of pharmacists at Al-Shifa Hospital and 35.7% of them at the EGH described their involvement in patient care as high, 50% of the pharmacists at each

hospital described their involvement in patient care as normal, and 40.9% of them at Al-Shifa and 14.3% reported that their involvement in patient care as low. So the degree of pharmacists involvement in patient care was more associated with the use of UDDDS rather than the WSDDS and that's why UDDDS was developed in 1960s (Murray and Shojania, 2000).

Also Table 4.10 shows that when pharmacists were asked whether their DDS had improved the quality of pharmaceutical care or not, 54.6% of the pharmacists at Al-Shifa Hospital reported disagree, 22.7% reported neither agree nor disagree, and 22.7% reported agree. At the EGH, 92.9% of the pharmacists reported agree and 7.1% reported neither agree nor disagree. This means that the quality of pharmaceutical care was better in the UDDDS than in the WSDDS, and this could be explained by that the unit-dose dispensing of medications is a standard of practice at hospitals in many countries around the world (Murray and Shojania, 2000).

As illustrated in Table 4.10, all pharmacists at the EGH (100%) agreed that their DDS helps in opening communication channels with physicians, while 13.6% of pharmacists at Al-Shifa Hospital agreed on that point and the majority of them (86.4%) disagreed. This clarifies that the contact between pharmacists and physicians was higher in the UDDDS utilized at the EGH than it at Al-Shifa Hospital (WSDDS). This result of the study is congruent with the results of a study conducted in Croatia to test the effects of the implementation of UDDDS compared with the WSDDS in the same hospital which found that pharmacist-physician interactive role began to emerge as a direct result of UDDDS implementation (Vrca, Bozikov, Crncec, Sutlic, Simic and Becirevic, 2000). Pharmacists-physicians interaction is a positive point of the UDDDS and help in providing a better quality of the services, so MOH must support any activity or mechanism that could help in raising the level of pharmacists-physicians interactions.

Table (4.11): Distribution of pharmacists by commodity management related variables by hospital

Variable	AL Shifa		EGH		Total	
	No.	**%**	**No.**	**%**	**No.**	**%**
Amount of drug expired at the pharmacy						
Low	5	22.7	5	35.7	**10**	**27.8**
Very Low	17	77.3	9	64.3	**26**	**72.2**
Total	**22**	**100.0**	**14**	**100.0**	**36**	**100.0**
Approximate No. of drugs expired in the last year (recorded or memory)						
None	5	22.7	0.0	0.0	**5**	**13.8**
One	10	45.5	10.0	71.4	**20**	**55.6**
Two	7	31.8	4.0	28.6	**11**	**30.6**
Total	**22**	**100.0**	**14**	**100.0**	**36**	**100.0**
The main reason of drug expiry						
Decreased use	6	31.6	3	21.4	**9**	**27.3**
Received with short Life	13	68.4	11	78.6	**24**	**72.7**
Total	**19**	**100.0**	**14**	**100.0**	**33**	**100.0**
Checking the ward stock drugs for expiry						
Yes	12	54.5	14	100.0	**26**	**72.2**
No	10	45.5	0	0.0	**10**	**27.8**
Total	**22**	**100.0**	**14**	**100.0**	**36**	**100.0**
Amounts of drugs expired at wards						
Low	5	41.7	5	35.7	**10**	**38.5**
Very Low	7	58.3	9	64.3	**16**	**61.5**
Total	**12**	**100.0**	**14**	**100.0**	**26**	**100.0**

As illustrated in Table 4.11, almost all pharmacists at both hospitals considered the amount of drugs expired in the pharmacy as low, and no one at both hospitals reported that he had experienced drug expiry in the last year more than two times which is relatively considered an acceptable indicator of good quality drug management process as the percentage of expired drugs is valid sensitive indicator of measuring the quality of drug management (Pudjaningsih and Santoso, 2002). According to the pharmacists, the frequency of drug expiry was very low, but more effort should be exerted to make that low frequency become zero.

Also as shown in Table 4.11, 72.7% of pharmacists who experienced drug expiry at both hospitals considered receiving short-life drugs as the main reason of drug expiry, while 27.3% of them considered decreased drug use as the main reason of drug expiry, and nearly there was no differences between the two hospitals regarding this point. Some drugs were received from the central drug stores with short life expiry because these drugs were donated for the Palestinian MOH, so the presence of these expired drugs at hospitals doesn't necessarily mean that there was a weakness in the drug management process.

As elucidated in Table 4.11, all pharmacists at the EGH reported that they check the expiry date of drugs at wards, while only 54.5% of Al-Shifa Hospital pharmacists check the ward stock drugs for expiry and 45.5% don't. When pharmacists, who reported checking the expiry date of drugs in the wards at both hospitals, were asked about the amount of expired drugs at the wards, nearly all of them considered that amount as low. This result of the study reflects the proper drug management practiced by pharmacists who are keen to reduce the amount of expired drugs not only at pharmacy level, but also at wards level (Pudjaningsih and Santoso, 2002).

4.2 Records Review

In this section results of the study concerning percentage of missed drugs in the two different utilized drug dispensing systems at Gaza governmental hospitals are presented. The percentage of missed drugs will clarify which DDS contributes more to the rational drug use, and therefore reflects the more appropriate system from this point of view.

4.2.1 Percentage of missed drugs at Al-Shifa Hospital and the EGH

Here the mean and percentage of missed drugs at each hospital are presented to clarify the differences between both hospitals in this point, and t-test was used to examine if the differences between the two hospitals had reached a statistical significance level or not.

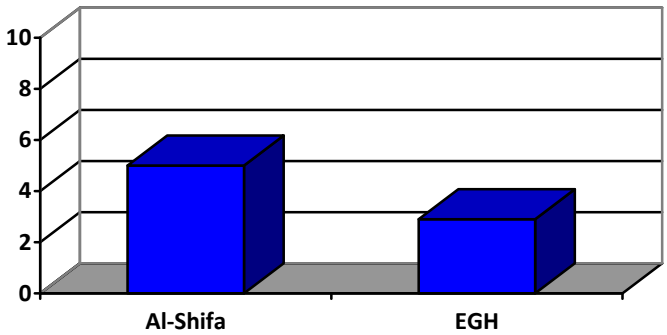


Figure (4.2): Percentage of missed drugs by Hospital

Table (4.12): Differences in the missed drugs by hospital

Hospital	No. of Dispensed drug Items	Mean of missed units per drug item	Std.	t	P Value
AL – Shifa	162	3.4	3.7	2.45	0.015
EGH Hosp.	202	1.8	4.3		

As shown in Figure 4.2, the percentage of missed drugs at Al-Shifa Hospital utilizing the WSDDS (5%) was higher than it at the EGH utilizing the UDDDS (2.9%).

Table 4.12 illustrates that the mean of missed drugs (missed units per drug item) at Al-Shifa Hospital (3.4) was higher than it at the EGH (1.8). The differences between the two hospitals were statistically significant with a P value equal to 0.015. This result of the study is consistent with the results of a study conducted in Croatia which found that

UDDDS implementation leading to a rationalization of drug consumption and great savings in the missed drugs (Vrca, Bozikov, Crncec, Sutlic, Simic and Becirevic, 2000). Also this result of the study is consistent with the results of a study conducted in the United States and found that drug losses were higher in WSDDS than in UDDDS (Barker and Heller, 1994). The consistency between results supports the results of this study and attracts the attention of the key figures to implement the UDDDS in other Palestinian hospitals.

4.2.2 Percentage of missed drugs at Al-Shifa Hospital and the EGH by department

In this part, the means and percentages of missed drugs in each selected department at both hospitals are presented for possible further investigation.

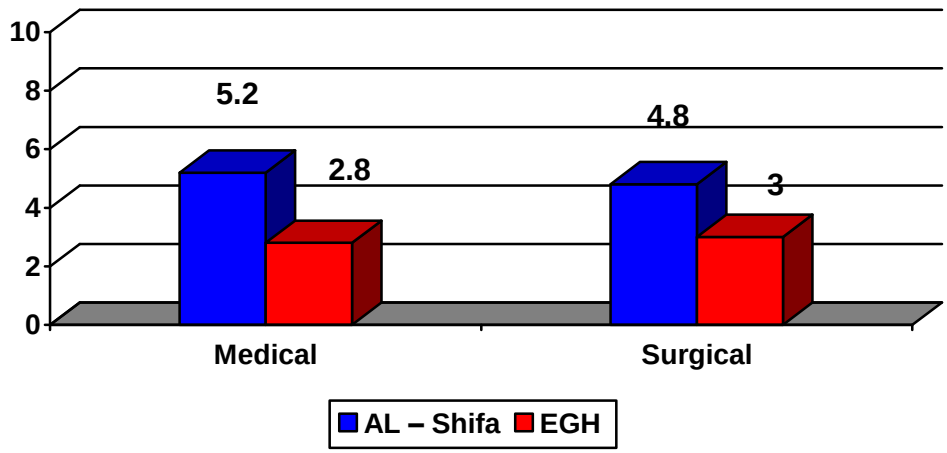


Figure (4.3): Percentage of missed drugs at both hospitals by department

As illustrated in Figure 4.3, the percentage of missed drugs was 5.2% at the medical department of Al-Shifa Hospital, while it was 4.8% at the surgical department of the same hospital. In contrary at the EGH, the percentage of missed drugs at the medical department was 2.8%, while it was 3% at the surgical department.

Table (4.13): Differences in missed drugs at both hospitals by department

Hospital Dep.	No. of dispensed drug items	Mean of missed units/item	Std.	t	Sig.
Medical (Al-Shifa)	91	3.8	8.6	2.1	0.038
Medical (EGH)	114	1.4	3.5		
Surgical (Al-Shifa)	71	2.8	5.2	0.672	0.503
Surgical (EGH)	88	2.3	5.2		

As illustrated in table 4.13, the mean of missed drugs at Al-Shifa medical department (3.8) was higher than the mean of missed drugs at the EGH medical department (1.4), and the differences between the two means reached a statistically significant level (P value=0.038). The mean of missed drugs at Al-Shifa surgical department (2.8) was also higher than it at the EGH surgical department (2.3), but the differences between the two means were not statistically significant (P value=0.503). This result is consistent with the trends reported in the literature as the aforementioned departments utilize the UDDDS at the EGH and WSDDS at Al-Shifa Hospital, and the later is usually accompanied by a higher rate of missed drugs than the UDDDS (Asiri, 2003).

As illustrated in Figure 4.3, the percentage of missed drugs at the medical department of Al-Shifa Hospital (5.2%) was higher than it at the surgical department (4.8%) at the same hospital, while on the contrary at the EGH where the percentage of missed drugs at the surgical department (3%) was higher than it at the medical one (2.8%). These small variations between different departments at the same hospital may be attributed to factors other than the utilized DDS such as the number of employees, the employees experinces, lack of supervision and monitoring by pharmacists, ……etc.

The items of the missed drugs in the four selected departments at both hospitals varied in their percentages from one department to another. At Al-Shifa Hospital, Diclofenac Sod. 75mg ampoules exhibited the highest missed drug percentage, while it was for Amoxycilline 500mg capsules at the surgical department. Antiacid tablets exhibited the highest missed drug percentage at the EGH medical department, while it was for Cefalexin 500mg capsules at the surgical department of the same hospital (Annex 11).

4.3 Field Observations

In this part, results of the observation technique concerning the medication errors are presented in order to highlight the DDS that is characterized by the lower rate of medication errors, and so to recognize the safer DDS.

4.3.1 Medication errors by Hospital

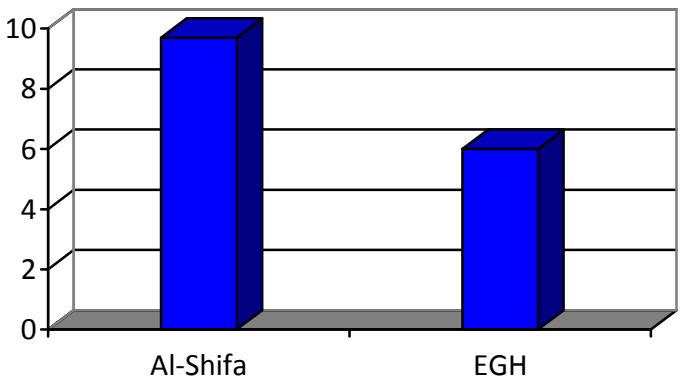


Figure (4.4): Percentage of medication errors by Hospital

Table (4.14): Differences in medication errors by Hospital

Variable	No. of observations	Mean of total wrongs	Std.	t	Sig.
AL – Shifa	600	1.8	1.3	**2.127**	**0.038**
EGH	496	0.9	0.6		

As illustrated in Figure 4.4 and Table 4.14, the mean of medication administration errors at Al-Shifa Hospital was 1.8 and 0.9 at the EGH. Therefore and as illustrated in Figure 4.4, the percentage of medication errors at Al-Shifa Hospital was 9.7%, while it was 6% at the EGH. This result of the study means that the rate of medication errors at Al-Shifa Hospital (WSDDS) was higher than it at the EGH (UDDDS), and the differences between the two hospitals reached a statistically significant level with P value equal to 0.038.

The results of this study were in full conformance with the results of Fontan, Maneglier, Nguyen, Loirate and Brion (2003) study that was conducted in France, the study of Taxis, Dean and Barber (1999) that was conducted in both Germany and Britain, and McNally, Page and Bruce (1997) study that was conducted in Australia. The study results also consistent with the saying that UDDDS is considered as an important intervention for reducing the rate of medication errors at hospitals. Since the rate of medication errors is considered as a quality indicator of the different processes of the medication use system, so it is of key importance for the policy makers in the MOH to pay their attention for that point and try to adopt the DDS that exhibited a lower rate of medication errors to be implemented in other MOH hospitals.

This result of this study was contradicted with the results of a study conducted to compare the rate of medication errors at an American hospital using the UDDDS and a British hospital using the traditional WSDDS and found that the rate of medication errors was

higher at the American hospital than it at the British one. This contradiction between results may be due to different settings at which the studies were conducted or due to factors other than the utilized DDSs themselves.

4.3.2 Medication errors at Al-Shifa Hospital and the EGH by medication error type

The types of medication errors at each hospital are presented here to see the most frequently observed ones at each hospital and also to compare this result of the study with the results of other studies.

Table (4.15): Distribution of medication errors at both hospitals by their type

Medication error	Hospital	No. of observations	No. of wrong observations	Mean	Std.	t	Sig.
Wrong Drug	**AL–Shifa**	600	1	0.03	0.2	**-0.64**	**0.524**
	EGH	496	2	0.07	0.3		
Wrong Dose	**AL–Shifa**	600	9	0.3	0.5	**1.43**	**0.158**
	EGH	496	4	0.1	0.4		
Wrong Time	**AL–Shifa**	600	48	1.5	2.2	**1.82**	**0.073**
	EGH	496	22	0.7	0.7		

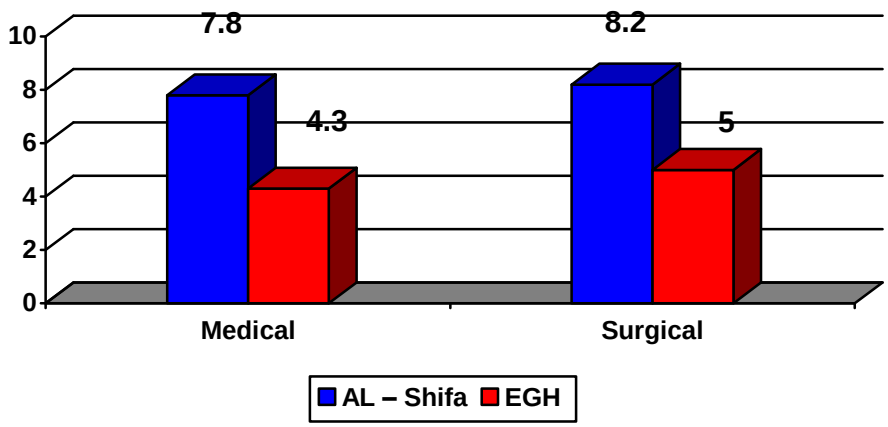


Figure (4.5): Percentage of time errors by Hospital departments

As illustrated in Table 4.15, the mean of the wrong drugs at Al-shifa Hospital (0.03) was lower than it at the EGH (0.07) and this may be attributed to factors other than system related factors such as human factors or the confusion between trade names of drugs or others.

Table 4.15 also illustrates that the mean of wrong doses was higher at Al-Shifa Hospital than at the EGH, and this is conformed with the general results of this study (medication errors are higher at Al-Shifa than it at the EGH) , but it was contradicted with the results of Fontan, Maneglier, Nguyen, Loirate and Brion (2003), who found that dose errors were more frequent in the UDDDS than in the WSDDS.

As elucidated in Table 4.15 and Figure 4.5, time errors were the most frequently observed type of all medication errors and represented 7.8% at Al-Shifa medical department and 8.2 at the surgical department in the same hospital. At the EGH, the percentage of medication time errors at the medical department was 4.3% and 5% at the surgical department. This means that in general the time errors were higher at Al-Shifa Hospital than it at the EGH and this result of the study is consistent with a study results which found that time errors were the most frequent errors at both UDDDS and WSDDS (Fontan, Maneglier, Nguyen, Loirate and Brion, 2003). Although the time errors in particular and medication errors in general were minor and seemed to have little consequences, some serious errors may be life-costing ones (Council of Europe, 2006). That's why MOH has to support any effort that could help in reducing the rate of medication errors, or any activity that could increase the general awareness of health workers about medication errors and mainly time errors.

Chapter 5: Conclusion and Recommendations

This chapter provides the main conclusions of this study as well as some recommendations for decision makers that may help in adopting the better DDS based on the results of this study. Recommended studies for further investigation are also provided in this chapter.

5.1 Conclusion

In the Palestinian health system, there are two types of drug dispensing systems utilized at governmental hospitals. These systems are the UDDDS which is currently utilized at the EGH and the WSDDS utilized at Al-Shifa and most other hospitals. Although many international studies proved that UDDDS is safer, more effective and more efficient than other drug dispensing systems in general and WSDDS in particular (Jackson and Reines, 2003), there is a current debate in the Palestinian MOH of whether the UDDDS is more suitable and could be implemented successfully in the Palestinian hospitals or not. Furthermore, pharmacists nowadays are more concerned with clinical pharmacy interventions which are provided more with utilizing the UDDDS rather than with the WSDDS. Accordingly, this study tried to answer the remained unanswered question about which DDS is more effective, safer for patients, more efficient, providing a better chance for clinical pharmacy interventions and fitting the Palestinian health system.

The researcher assessed the perceptions of pharmacists and head nurses at both Al-Shifa Hospital and the EGH about their DDS in order to compare between the WSDDS and the UDDDS. Moreover, the researcher observed the medication administration process at each drug dispensing system in order to calculate the rate of medication errors at each system

and thus to clarify which one is safer than the other. Percentage of missed drugs at each DDS was also calculated so as to know the system that contributes the most to the rational use of drugs.

Through a triangulated design, 87 pharmacists and head nurses out of 92 at both Al-Shifa Hospital and the EGH filled in the study questionnaire, while the medication administration errors were observed for 15 days at each hospital to determine the safer DDS and the percentage of missed drugs at certain month was calculated to compare between the two DDSs from efficiency point of view.

The study demonstrated that most respondents at both hospitals had sometimes experienced drug shortage mainly as a result of drug shortage at the MOH central drug stores which is to a high extent attributed to current political situation in the Gaza Strip. At the EGH, the newly-admitted cases are perceived to be more affected by drug shortage than the previously-admitted ones, while most respondents at Al-Shifa Hospital reported that both newly and previously-admitted cases are nearly affected the same. When the newly-admitted cases are more affected with drug shortage than others, this mean that pharmacists are more involved in patient care by securing the full therapeutic course for all the previously-admitted cases, and this is an advantage of the UDDDS.

The study demonstrated that all head nurses at the EGH (100%) considered nurses time spent on managing medication as normal, while 66.7% of them at Al-Shifa Hospital reported that nurses time spent on managing medication as long and 33.3% of them considered it as normal. Saving nursing time that is spent on drug management is an advantage of the UDDDS as it results in more concern for patient care.

The study also revealed that all head nurses at Al-Shifa Hospital reported not having guidelines about drug preparation and administration processes, while 73.3% of them at the EGH reported that they had such guidelines. All head nurses who reported absence of drug

preparation and administration guidelines at both hospitals agreed that the presence of such guidelines is very important to reduce medication errors and thus to improve the quality of pharmacy services. Also the study exhibited that 80% of all nurses at both hospitals had never reported any medication error that may happened, while 15.6% of them seldom reported the occurred medication errors. Absence of medication errors reporting system is contradicted with the legal and ethical codes that required reporting any medication error that may take place in order to improve the quality of health services in general.

The study also exhibited that most nurses at the EGH (86.7%) return the unused drugs to the pharmacy and 13.3% keep them at wards, while 63.9% of head nurses at Al-Shifa Hospital reported that they keep the unused drugs at their wards to be used for other patients without pharmacy supervision. Regarding pharmacists checking of prescriptions for conformance of drug therapy with diagnosis, suitable drug dose and possible drug-drug interaction, the situation was slightly better at the EGH than Al-Shifa Hospital, but more support for pharmacists is needed in this area.

The study showed that 92.9% of the pharmacists at the EGH usually conduct good drug control and monitoring through their DDS, while 86.4% of the pharmacists at Al-Shifa Hospital reported that they weren't able to make good drug control and monitoring within their DDS, and this indicates that UDDDS is more efficient than WSDDS.

The study revealed that the percentage of missed drugs was 5% at Al-Shifa Hospital and 2.9% at the EGH, and that the differences between the two hospitals in the missed drugs were statistically significant ($P = 0.015$), this means that UDDDS contributes more to rational use of drugs than its WSDDS counterpart.

The study also confirmed that the mean of medication errors at Al-Shifa Hospital was 1.8 (9.7%), while it was 0.9 (6%) at the EGH, and the difference between the two means were

statistically significant (P = 0.038). So, UDDDS is safer than the WSDDS and MOH could do better by adopting it.

In conclusion, UDDDS is better than WSDDS from many points of view, and that's why MOH should start a course of actions to implement that system at most Palestinian hospitals.

5.2 Recommendations

5.2.1 Study recommendations

- The study provided a clear evidence that the use of UDDDS was associated with less medication errors, less missed drugs and more clinical pharmacy related activities; therefore the Palestinian MOH could do better by adopting this drug dispensing scheme as a standard of practice at the MOH hospitals.

- Nurses and pharmacists' positive perceptions and appropriate practices were more associated with the UDDDS than the WSDDS; hence, UDDDS reflects the two important dimensions of quality; quality of facts and quality of perceptions and this gives a clear indication for implementing it in other MOH hospitals.

- MOH needs to hold courses about medication errors, their types, and how to avoid them as possible as could be, for physicians, pharmacists, and nurses in order to raise their level of awareness about medication errors and; therefore contribute more to a safer health care system.

- Medication error reporting system is needed to be available at all hospitals and nurses and other health professionals should be trained on that system. Monitoring and responding to the occurrence of medication errors is very essential.

- The presence of national guidelines about drug preparation and administration is an urgent priority. These guidelines should clarify the ways of preparing, administering, storing and the stability of medications and so on.

- Hospital pharmacists are required to increase their involvement in the continuous education programs to enrich their knowledge and enhance their practices.

- Regulatory and managerial support for pharmacists is needed to increase their involvement in clinical pharmacy related activities in general and in medication management and therapy in particular.

- Hospital pharmacists have to reinforce their follow up and supervision activities to ensure the appropriateness of drug management cycle (particularly dispensing medications) through increasing the frequency of their visits to the hospital wards, maintaining appropriate storage sites, designing tools and systems and so on.

5.2.2 Recommendations for future research

- Further studies are needed to estimate the cost of missed drugs at both Al-shifa Hospital and the EGH in order to know which drug dispensing system is more cost-effective than the other.

- Further research studies are needed in Palestinian hospitals to determine the rate of medication errors concerning prescription and dispensing errors at all the utilized drug dispensing systems in Palestine.
- A study to assess the degree of health workers' satisfaction at the EGH about the UDDDS is needed and a similar study at Al-Shifa Hospital concerning WSDDS also may be needed.
- A similar study that compares drug dispensing systems at governmental and private hospitals is needed in order to exploit any positive points that might be present at the private hospitals and that can be beneficial to the governmental ones.

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Annexes

Annex 1

Map of Palestine

Source: MOH, 2000

Annex 2

Map of Gaza Strip

Source: www. Islamonline.net

Annex 3

Helsinki Committee Approval Letter

Palestinian National Authority
Ministry of Health
Helsinki Committee

السلطة الوطنية الفلسطينية
وزارة الصحة
لجنة هلسنكي

Date: 15/8/2008

Name: Mokhlis Al Adham

I would like to inform you that the committee has discussed your application about:

Drug Dispensing Systems at Al-shifa Hospital and the European Gaza Hospital: A Comparative Study

In its meeting on August 2008
and decided the Following:-
To approve the above mention research study.

التاريخ:١٥/٨/٢٠٠٨

الاسم: مخلص الأدهم

نفيدكم علماً بأن اللجنة قد ناقشت مقترح دراستكم حول:-

و ذلك في جلستها المنعقدة لشهرأغسطس ٢٠٠٨

و قد قررت ما يلي:-

الموافقة على البحث المذكور عاليه.

Signature
توقيع

Member
عضو

Member
عضو

Chairperson

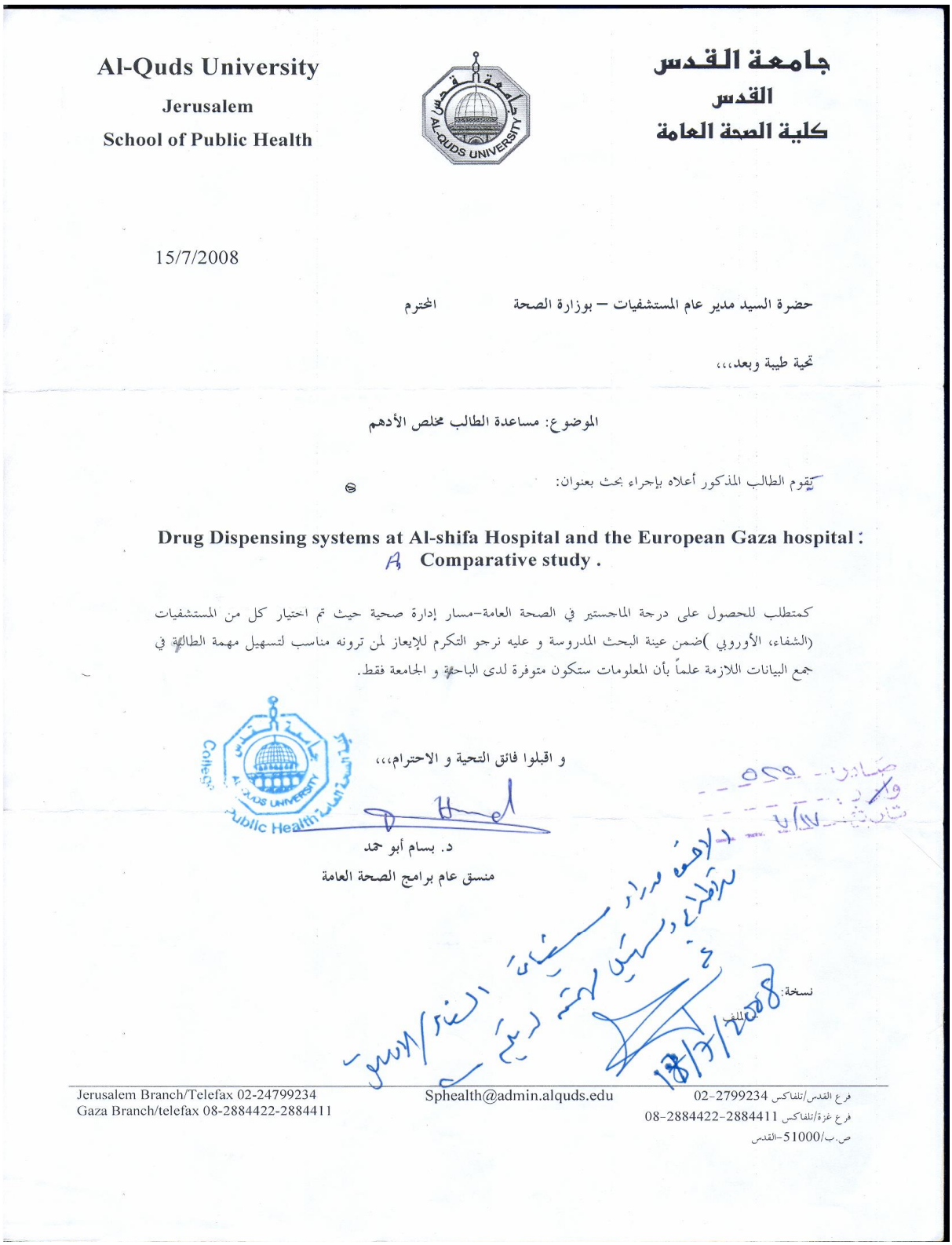
Conditions:-

- Valid for 2 years from the date of approval to start.
- It is necessary to notify the committee in any change in the admitted study protocol.
- The committee appreciate receiving one copy of your final research when it is completed.

Gaza Etwam – Telefax 972-7-2878166

Annex 4

Agreement Letter from the Ministry of Health



Al-Quds University
Jerusalem
School of Public Health

جامعة القدس
القدس
كلية الصحة العامة

15/7/2008

حضرة السيد مدير عام المستشفيات – بوزارة الصحة المحترم

تحية طيبة وبعد،،،

الموضوع: مساعدة الطالب مخلص الأدهم

يقوم الطالب المذكور أعلاه بإجراء بحث بعنوان:

Drug Dispensing systems at Al-shifa Hospital and the European Gaza hospital : A Comparative study .

كمتطلب للحصول على درجة الماجستير في الصحة العامة-مسار إدارة صحية حيث تم اختيار كل من المستشفيات (الشفاء، الأوروبي)ضمن عينة البحث المدروسة و عليه نرجو التكرم للإيعاز لمن ترونه مناسب لتسهيل مهمة الطالبة في جمع البيانات اللازمة علماً بأن المعلومات ستكون متوفرة لدى الباحثة و الجامعة فقط.

و اقبلوا فائق التحية و الاحترام،،،

د. بسام أبو حمد
منسق عام برامج الصحة العامة

نسخة: للملف

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Annex 5

Drugs Administration Observation Sheet

Hospital a- Al Shifa **Time** _____
b- EGH
Department a- Surgical
b- Medical
Name of the Observer _____

Gender of the Observed Nurse a- Male **Nurses Category** a- LPN
b- Female b- RN
c- Bsc.

Observed case No.	Wrong Drug	Wrong Dose	Wrong Time	Wrong Route	Wrong Patient	Total Observations
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
27						
28						
29						
30						
SUM						

Annex 6

Missed Drug Registration Sheet

Hospital a- Al Shifa
b- EGH

Department a- Surgical
b- Medical

Patient File No.	Drug 1 Name/ Quant.	Drug 2 Name/ Quant.	Drug 3 Name/ Quant.	Drug 4 Name/ Quant.	Drug 5 Name/ Quant.	Drug 6 Name/ Quant.	Drug 7 Name/ Quant.	Drug 8 Name/ Quant.
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								

Annex 7

Pharmacists and Head Nurses Questionnaire

Characteristics Data

1- Gender
a- Male b- Female
2- Hospital
a- Al Shifa Hospital b- EGH
3- Department
a- Surgical b- Medical c- Others, Specify _____

4- Age in years _____
5- Marital Status
a- Single b- Married c- Divorced d- Others, specify _____
6- Title
a- Head nurse b- Pharmacist

7- Last Qualifications Obtained.
a- Diploma b- Bachelor c- High Diploma d- Master or above
8- Years of Experience in this organization_____
9- Have you worked in other organizations before?
a- Yes b- No
If yes, Name the organization _____ Duration in years _____

Commodity Management (General)

10- Have you experienced drug shortage in last year?
a- Never b- Seldom c- Sometimes d- Often e- Always
If Never, Skip to 13

11- Drug shortage in your settings was attributed to
a- Shortage at MOH stores b- DDS c- Drug Overuse d- Others, _____

12- Drug shortage in your setting is mostly observed with
a- Newly-admitted cases b- Previously-admitted cases c- both

13-Within your (Drug Dispensing System) DDS, amounts of missed drugs is high
a- Strongly disagree b- Disagree c- neither agree nor disagree d- agree e- strongly agree
14- Drug Storage places inside the wards is described as
a- Very bad b- Bad c- neither good nor bad d- good e- very good

Perception about the Utilized DDS (General)

15-Within your DDS, drugs are available to patients at right time.
a- Yes b- No c- DK
16-The available DDS requires extra staff.
a- Strongly disagree b- Disagree c- neither agree nor disagree d- Agree e- Strongly agree
17-Within your DDS, you perceive your productivity as.
a- Very high b- High c- Normal d- Low e- Very low

18- In your opinion, the main advantages of your DDS are

No.	System Advantages	Yes (NP)	Yes (P)	No	N/Applicable
1	Easy				
2	Low Medication Errors				
3	Low Missed Drugs				
4	No need for rewriting physician orders by nurses				
5	High pharmacists-physician contact				
6	Reduction of inventories in the wards				
7	High concern for pt. care and monitoring				
8	Time saving for nurses				
9	Reduction in the NO. of required pharmacists				
10	Reduction in the NO. of orders received in the pharmacy				
11	Reduction in the drug return to the pharmacy				
12	Availability of drugs constantly at nursing sites				
13	Improve drug use control by pharmacists				

19- In your opinion, the main disadvantages of your DDS are

No	System Disadvantages	Yes (NP)	Yes (P)	No	N/Applicable
1	High Medication Errors				
2	More Opportunity for drug pilferage				
3	Long nurses time is spent on drug management				
4	Require high number of Pharmacists				
5	High drug return to the pharmacy				
6	Too much paper work				
7	Waste of Time of pharmacists				
8	High initial cost				
9	Increase hazards associated with drug expiry				
10	Minimal Pharmacists-doctor contact				
11	Pharmacists can't make proper drug control				
12	High drug inventories in the wards				

20-Are you satisfied with your DDS?

a- Yes b- No

If No, Give reasons (non prompted)

a- High Medication Errors **b-** More Opportunity for drug pilferage

c- Great nurses time is spent on drug management **d-** Require high number of Pharmacists

e- High drug return to the pharmacy **f-** Too much paper work

g- Waste of Time for pharmacists **h-** High initial cost

i- Increase hazards associated with drug expiry **j-** Minimal Pharmacists-doctor contact

k- Pharmacists can't make proper drug control **l-** High drug inventories in the wards

m- Others, _____

21-Do you prefer to change your DDS?

a- Yes b- NO

If yes, for what?

a- WSDDS b- UDDDS c- DK d- Others, specify _____

Section A: Head nurses Section

Practice

22-Within your Drug Dispensing System (DDS), your staff check the drug carefully before drug administration process?

a- Never b- Seldom c- Sometimes d- Often e- Always

If you check, how many times?

a- 1 b- 2 c- 3 d- More, ____

23- Within your DDS, your staff check for patient identity before drug preparation

a- Never b- Seldom c- Sometimes d- Often e- Always

24-In your ward, the drug administration process is documented .

a- before admin. b- During admin. c- Immediately after admin. d- Others, …

25-You check your ward stock of drugs before writing the order.

a- Never b- Seldom c- Sometimes d- Often e- Always

26- Documenting the medication requisition is assigned to

a- Head nurse b- Special nurse c- Available nurse

27- Within your DDS, time spent in managing medications in your department is considered

a- Very long b- Long c- Normal d- Short e- Very short

28-Did you receive training on drug dispensing systems?

a- Yes b- No

29- Do you have guidelines for the preparation and administration of medications?

a- Yes b- No c- DK

If No, the presence of such guidelines will be critical to improve the provided service.

a- Strongly disagree b- Disagree c- neither agree nor disagree d- agree e- strongly agree

Perception about the utilized DDS

30-Your DDS increases nurses availability for patient care rather than drug manag.

a- Strongly disagree b- Disagree c- neither agree nor disagree d- agree e- strongly agree

31-You describe your relation with pharmacy team as.

a- Very bad b- Bad c- neither good nor bad d- good e- very good

32-You describe the rate of medication errors in your department as.

a- Very high b- High c- Normal d- Low e- Very low

33- How many times medication errors took places in the last year (R or M)?

a- None b- 1 c- 2 d- 3 e- 4 or above

If non, Skip to 35

34- Do you report any medication errors that may happen?

a- Never b- Seldom c- Sometimes d- Often e- Always

Commodity management

35-You are checking expiry date of drugs in your ward stock.

a- Never b- Seldom c- Sometimes d- Often e- Always

36-Probability of drugs expiry in your ward is described as.

a- Very high b- High c- Normal d- Low e- Very low

37-How do you deal with unused drugs?

a- Returned to the pharmacy b- Remain in the ward c- Others, ……..

38-Add any additional comments about DDS in your hospital

..……
……
……

Section B: Pharmacists Section

Practice

39- How many visits do you do for wards monthly?

a- None b- 1-3 c- 4-6 d- more than 6

40- Do you check the Prescriptions for the conformance of drug therapy with diagnosis?

a- Never b- Seldom c- Sometimes d- Often e- Always

41- Do you check the Prescription for suitable drug dose?

a- Never b- Seldom c- Sometimes d- Often e- Always

42- Do you check the Prescription for drug-drug interaction?

a- Never b- Seldom c- Sometimes d- Often e- Always

43- Do you check the ward stock before dispensing the order?

a- Never b- Seldom c- Sometimes d- Often e- Always

44- Do you prepare guidelines about drug use for nurses?

a- Never b- Seldom c- Sometimes d- Often e- Always

45- Do you check and supervise the work of the less experienced staff?

a- Never b- Seldom c- Sometimes d- Often e- Always

46- Do you participate in teaching programs in your hospital about drugs?

a- Never b- Seldom c- Sometimes d- Often e- Always

Perception of the Utilized DDS

47- Within your DDS, you perceive your workload as.

a- Very high b- High c- Normal d- Low e- Very low

48- Your DDS is of great adaptability to computerized procedures.

a- Strongly disagree b- Disagree c- neither agree nor disagree d- agree e- strongly agree

49- Within your DDS, is there a good drug control and monitoring?

a- Yes b- No

50- Your DDS contribute to rational use of drugs.

a- Strongly disagree b- Disagree c- neither agree nor disagree d- agree e- strongly agree

51- You describe your involvement in patient care as.

a- Very high b- High c- Normal d- Low e- Very low

52- Your DDS improve the quality of pharmacy services in general.

a- Strongly disagree b- Disagree c- neither agree nor disagree d- agree e- strongly agree

53- The nature of DDS in your hospital help in maintaining opened communication channels with physicians.

a- Yes b- No

54- The frequency of discussing physicians about drugs is described as.

a- Very high b- High c- Normal d- Low e- Very low

55- You describe the level of Pharmacy-physicians interaction in your DDS as.

a- Very high b- High c- Normal d- Low e- Very low

Commodity management

56- Amounts of drug expired in the pharmacy is considered as .

a- Very high b- High c- Normal d- Low e- Very low

57- How many times Drugs expired in the last year (Recorded or Memory**)?**

a- None b- 1 c- 2 d- 3 e- 4 or above

If Non, Skip to 59

58- The main reason of drug expiry in your setting is

a- Decreased use b- Received with short life c- Others, _____

59- Do you check up the ward stock drugs for expiry

a- Yes b- No

If Yes, Amounts of drugs expired in ward stock is considered as.

a- Very high b- High c- Normal d- Low e- Very low

60- Do you think that there is a misuse of drugs in the wards?

a- Yes b- No c- DK

61- Write any additional comments about DDS in your hospital?

……
……
……
……

Thank you for your participation.

Annex 8

Explanatory Letter

Health Care Providers Questionnaire

Dear Participant

Thank you for your participation in this research; you were selected because you met the selection criteria of participation.

This study is carried out as a part of the requirements for the master degree in Public Health/Health Management at Al Quds University-Palestine.

This study aims to assess drug dispensing systems utilized in MOH Gaza hospitals and recognize the appropriate drug dispensing system, based on a comparison between the Unit Dose Drug Dispensing System and the Ward Stock Drug Dispensing System.

Your participation is voluntary, and you have the right to withdraw at any time during data collection. Your answers will be kept confidential and only it is requested from you to answer the questionnaire that may not take more than15 minutes of your time.

If you have any inquiry about the questionnaire, don't hesitate to call (0599768799).

Researcher: Mokhlis Al Adham

Annex 9

Characteristics of respondents by profession

	Head nurses		Pharmacists		Total	
	No.	**%**	**No.**	**%**	**No.**	**%**
Gender						
Male	39	76.5	16	44.4	**55**	**63.2**
Female	12	23.5	20	55.6	**32**	**36.8**
Total	**51**	100	**36**	100	**87**	**100**
Age in years						
Less than 30 years	4	7.8	10	27.8	14	16.1
From 31 to 40 years	30	59	24	66.6	44	50.6
More than 40 years	17	33.2	2	5.6	29	33.3
Total	51	100	36	100	87	100
Marital status						
Married	50	98	31	86.1	81	**93.1**
Not married	1	2	5	13.9	6	**6.9**
Total	**51**	**100**	**36**	**100**	**87**	**100**
Qualifications						
Diploma	9	17.6	0	0	9	10.3
BSc.	34	66.7	36	100	70	80.5
High diploma or above	8	15.7	0	0	8	9.2
Total	**51**	**100**	**36**	**100**	**87**	**100**

Annex 10

Perceived advantages and disadvantages of the utilized drug dispensing systems

	advantages	Yes (NP)		Yes (P)		No		N/A		Total	
		No.	%	No.	%	No.	%	No.	%	No.	%
1.	**Easy**										
	Al Shifa	0	0.0	55	94.8	3	5.2	0	0.0	58	100.0
	EGH	3	10.3	25	86.2	1	3.4	0	0.0	29	100.0
	Total	**3**	**3.4**	**80**	**92.0**	**4**	**4.6**	0	0.0	**87**	**100.0**
2.	**Low Medications errors**										
	Al Shifa	53	91.4	5	8.6	0	0.0	0	0.0	58	100.0
	EGH	27	93.1	1	3.4	0	0.0	1	3.4	29	100.0
	Total	**80**	**92.0**	**6**	**6.9**	**0**	**0.0**	**1**	**1.1**	**87**	**100.0**
3.	**Low missed drugs**										
	Al Shifa	0	0.0	29	50.0	19	32.8	10	17.2	58	100.0
	EGH	14	48.3	15	51.7	0	0.0	0	0.0	29	100.0
	Total	**14**	**16.1**	**44**	**50.6**	**19**	**21.8**	**10**	**11.5**	**87**	**100.0**
4.	**No need to rewriting physician orders by nurse**										
	Al Shifa	0	0.0	3	5.2	54	93.1	1	**1.7**	58	100.0
	EGH	2	6.9	25	86.2	0	0.0	2	**6.9**	29	100.0
	Total	**2**	**2.3**	**28**	**32.2**	**54**	**62.1**	**3**	**3.4**	**87**	**100.0**
5.	**High pharmacist – physician contact**										
	Al Shifa	1	1.7	3	5.2	35	60.3	19	32.8	58	100.0
	EGH	7	24.1	9	31.0	0	0.0	13	14.9	29	100.0
	Total	**8**	**9.2**	**12**	**13.8**	**35**	**40.2**	**32**	**36.8**	**87**	**100.0**
6.	**Reeducation of inventories in the wards**										
	Al Shifa	1	1.7	23	39.7	32	55.2	2.0	3.4	58	100.0
	EGH	1	3.4	28	96.6	0	0.0	0	0.0	29	100.0
	Total	**2**	**2.3**	**51**	**58.6**	**32**	**36.8**	**2**	**2.3**	**87**	**100.0**
7.	**High concern fot pt. care and monitoring**										
	Al Shifa	2	3.4	37	63.8	15	25.9	4	6.9	58	100.0
	EGH	0	0.0	24	82.8	1	3.4	4	13.8	29	100.0
	Total	**2**	**2.3**	**61**	**70.1**	**16**	**18.4**	**8**	**9.2**	**87**	**100.0**
8.	**Time saving for nurses**										
	Al Shifa	0	0.0	8	13.8	48	82.8	2	3.4	58	100.0
	EGH	7	24.1	18	62.1	2	6.9	2	6.9	29	100.0
	Total	**7**	**8.0**	**26**	**29.9**	**50**	**57.5**	**4**	**4.6**	**87**	**100.0**
9.	**Reduction in the No. of required pharmacist**										
	Al Shifa	2	3.4	33	56.9	5	8.6	18	31.0	58	100.0
	EGH	0	0.0	0	0.0	17	62.1	12	41.4	29	100.0
	Total	**2**	**2.3**	**33**	**37.9**	**22**	**25.3**	**30**	**34.5**	**87**	**100.0**
10	**Reduction in the No. of orders received in the pharmacy**										
	Al Shifa	0	0.0	21	36.2	7	12.1	30	51.7	58	100.0
	EGH	0	0.0	3	10.3	15	51.7	11	37.9	29	100.0
	Total	**0**	**0.0**	**24**	**27.6**	**22**	**25.3**	**41**	**47.1**	**87**	**100.0**
11.	**Reduction in the drug return to the pharmacy**										
	Al Shifa	0	0.0	43	**74.1**	10	**17.2**	5	**8.6**	58	100.0
	EGH	0	0.0	2	**6.9**	25	**86.2**	2	**6.9**	29	100.0
	Total	**0**	**0.0**	**45**	**51.7**	**35**	**40.2**	**7**	**8.1**	**87**	**100.0**
12.	**Availability of drugs constantly at nursing sites**										
	Al Shifa	2	3.4	46	79.3	10	**17.2**	0	0.0	58	100.0
	EGH	0	0.0	9	31.0	19	**65.5**	1	**3.4**	29	100.0
	Total	**2**	**2.3**	**55**	**63.2**	**29**	**33.3**	**1**	**1.1**	**87**	**100.0**
13.	**Improve drug use control by pharmacist**										
	Al Shifa	1	1.7	10	**17.2**	38	**65.5**	9	**15.5**	58	100.0
	EGH	1	3.4	24	**82.8**	0	**0.0**	4	**13.8**	29	100.0
	Total	**2**	**2.3**	**34**	**39.1**	**38**	**43.7**	**13**	**14.9**	**87**	**100.0**

	Disadvantages	Yes (NP)		Yes (P)		No		N/A		Total	
		No.	%	No.	%	No.	%	No.	%	No.	%
1.	**High medication error**										
	Al Shifa	0	0.0	6	10.3	52	89.7	0	0.0	58	100.0
	EGH	0	0.0	0	0.0	28	96.6	1	3.4	29	100.0
	Total	0	0.0	6	6.9	80	92.0	1	1.1	**87**	**100.0**
2.	**More Opportunity for drug pilferage**										
	Al Shifa	3	5.2	15	25.9	30	51.7	3	5.2	58	100.0
	EGH	1	3.4	0	0.0	28	96.6	1	3.4	29	100.0
	Total	4	4.6	15	17.2	58	66.7	4	4.6	**87**	**100.0**
3.	**Long nurses time is spent on drug management**										
	Al Shifa	4	6.9	43	74.1	9	15.5	2	3.4	4	100.0
	EGH	0	0.0	2	6.9	25	86.2	2	6.9	0	100.0
	Total	4	4.6	45	51.7	34	39.1	4	4.6	4	**100.0**
4.	**Require high number of pharmacist**										
	Al Shifa	1	1.7	5	8.6	34	58.6	18	31.0	58	100.0
	EGH	1	3.4	15	51.7	0	0.0	13	44.8	29	100.0
	Total	2	2.3	20	23.0	34	39.1	31	35.6	**87**	**100.0**
5.	**High drug return to the pharmacy**										
	Al Shifa	0	0.0	3	5.2	49	84.5	6	10.3	58	100.0
	EGH	1	3.4	18	62.1	3	10.3	7	24.1	29	100.0
	Total	1	1.1	21	24.1	52	59.8	13	14.9	**87**	**100.0**
6.	**Too much paper work**										
	Al Shifa	2	3.4	54	93.1	2	3.4	0	0.0	58	100.0
	EGH	1	3.4	11	37.9	17	58.6	0	0.0	29	100.0
	Total	3	3.4	65	74.7	19	21.8	0	0.0	**87**	**100.0**
7.	**Waste of time of pharmacist**										
	Al Shifa	1	1.7	14	24.1	24	41.4	19	32.8	58	100.0
	EGH	5	17.2	12	41.4	1	3.4	11	37.9	29	100.0
	Total	6	6.9	26	29.9	25	28.7	30	34.5	**87**	**100.0**
8.	**High initial cost**										
	Al Shifa	0	0.0	8	13.8	29	50.0	21	36.2	58	100.0
	EGH	1	3.4	2	6.9	14	48.3	12	41.4	29	100.0
	Total	1	1.1	10	11.5	43	49.4	33	37.9	**87**	**100.0**
9.	**Increase hazards associated with drug expiry**										
	Al Shifa	0	0.0	7	12.1	50	86.2	1	1.7	58	100.0
	EGH	0	0.0	0	0.0	29	100.0	0	0.0	29	100.0
	Total	0	0.0	7	8.0	79	90.8	1	1.1	**87**	**100.0**
10	**Minimal pharmacist's – doctor contact**										
	Al Shifa	1	1.7	33	56.9	5	8.6	19	32.8	58	100.0
	EGH	0	0.0	0	0.0	16	55.2	13	44.8	29	100.0
	Total	1	1.1	33	37.9	21	24.1	32	36.8	**87**	**100.0**
11.	**Pharmacists can't make proper drug control**										
	Al Shifa	3	5.2	38	65.5	8	13.8	9	15.5	58	100.0
	EGH	0	0.0	1	3.4	25	86.2	3	10.3	29	100.0
	Total	3	3.4	39	44.8	33	37.9	12	13.8	**87**	**100.0**
12.	**High drug in inventors in the wards**										
	Al Shifa	0	0.0	28	48.3	29	50.0	1	1.7	58	100.0
	EGH	0	0.0	0	0.0	29	100.0	0	0.0	29	100.0
	Total	0	0.0	28	32.2	58	66.7	1	1.1	**87**	**100.0**

Annex 11

Drugs that exhibited the highest percentages of missing

Al-Shifa Hospital				**EGH**			
Medical dep.		**Surgical dep.**		**Medical dep.**		**Surgical dep.**	
Drug name	**%**	**Drug name**	**%**	**Drug name**	**%**	**Drug name**	**%**
Diclofenac sod.75mg Amp.	18.4	Amoxicillin 500mg caps.	25	Antiacid tab.	23	Cefalexine 500mg caps.	21
Metoclopromide tab.	17.5	Ciprofloxacin 500 tab	21	Ahiston tab.	22	Ahiston tab.	18
Ranitidine 150mg tab.	13	Baby aspirin tab.	16	Diclofenac sod. 50mg tab.	11	Prednisolone 5mg tab.	14
Heparin 5000 iu vial	12.5	Paracetamol 500mg tab.	14	Metronidazole 250mg tab.	8	Ciprofloxacin 500mg tab.	12
Hyoscine amp.	12.2	Clexane 40 amp.	12	Ranitidine 150mg tab.	7	Dexamethasone 4mg amp.	11