Medication Errors in Voluntary Reported Incidents at a Jordanian Hospital

Khawla Abu Hammour [1], Mariam H. Abdel Jalil [2]*

Abstract

Medication incident reports may help organizations to prevent medication errors and to improve patient outcomes.

Aims: To assess the prevalence, origin, type, and severity of reported medication incidents at Jordan University Hospital, utilizing a voluntary non-punitive reporting system.

Materials and Methods: The present study is of a retrospective design. All voluntary non-punitive incident reports that occurred between January 2014 to March 2015 at Jordan University Hospital were retrieved from the quality department of the hospital. Detailed content analysis was conducted to obtain all relevant information. Data were coded anonymously and analyzed using SPSS version 20.

Results: There was an increase in reporting of medication errors overtime and almost all of the reporters were nurses. A total of 58 medication error reports including 86 medications were related to errors in medication management process starting from prescribing, dispensing to administration of medications. Two-thirds of those reports originated from the internal medicine department and the neonatal intensive care unit. The most common drug classes associated with those reports were anti-infectives, antivirals, antifungals, cardiovascular medications and chemotherapy agents. The majority of errors occurred during the administration phase where missed doses and wrong time accounted for more than 52% of the reported incidents. Around 98.8% of reported incidents did not cause major harm to patients.

Conclusion: Results of this study showed low percent of a broad variety of medication errors in multiple hospital departments. Additional research is required to identify possible improvements to optimize reporting and to enhance the response to each report.

Keywords: Medication error, incident reports, medication class, severity, voluntary, non-punitive, Jordan.

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Introduction

For most diseases, pharmacotherapy is supposed to improve health related quality of life. However, using medications inappropriately could be harmful and

1. **Lecturer, Clinical Pharmacy, Department of Biopharmaceutics and Clinical Pharmacy, Faculty of Pharmacy, The University of Jordan.**
2. **Assistant Professor of Clinical Pharmacy, Department of Biopharmaceutics and Clinical Pharmacy, Faculty of Pharmacy, The University of Jordan.**

**** Correspondence should be addressed to:***
Khawla Abu Hammour;
E-mail: k.hammour@ju.edu.jo

consequently may evoke new signs and symptoms. Drug therapy is becoming very complex, thus making the process of appropriate drug prescribing, dispensing and administration increasingly challenging. Accordingly, in clinical practice, a wide range of medication errors may arise. Medication errors were defined by Bates and his colleagues as "errors occurring at any stage in the ordering or delivering processes of medications"[1] and were also defined as a failure of completion of planned action of the medication as intended or the use of a wrong plan to achieve the aim. It has been found that 1-10% of medication errors are associated with patient harm[2-4].

These errors are considered a widespread issue even in developed countries such as the United State of America (USA), for instance the Joint Commission on Accreditation of Healthcare Institutions indicated that medication errors were the fifth in the sentinel events[5]. The seriousness of this issue and its global nature was reflected in part by the establishment World Health Organization (WHO) World Alliance for Patient Safety in 2004 with the aim of developing a worldwide evidence based standards of patient safety this included different aspects of patient care including medication use[6].

The majority of medication errors occur during drug prescription, dispensing and most importantly during drug administration. For instance, in the United Kingdom (UK), the National Patient Safety Agency reported that medication errors in all care settings were detected at a rate of 16% in drug prescribing, 18% in drug dispensing and preparation and almost 50% in medication administration[7]. Drug administration errors are categorized by the American Society of Health-system Pharmacist (ASHP) into nine error groups: omission, wrong administration technique, wrong time, wrong dosage-form, unauthorized drug, wrong dose, wrong drug-preparation, deteriorated drug and other medication errors not fitting into the predefined categories[8].

The incidence and types of medication errors in healthcare settings have been reported in many countries but mainly in high income countries such as the USA, the UK and other European countries, on the other hand, data in developing countries such as Jordan are sparse[9]. Without such specific basic data, the efficiency of various solutions implemented in high income countries to reduce medication errors cannot necessarily be generalized to other countries. Thus, understanding the nature and epidemiology of medication errors at a local setting may help to improve quality of care and enhance patient safety, through designing prudent quality improvement projects suitable for that specific setting.

Failure to control medication errors represents not only an individual failure but also a system failure. Even though medication error reports provided by doctors nurses and pharmacists are a fundamental tool of error reduction, an integrated system of error reporting needs to be developed in each country and each hospital based on site specific variables.

Jordan is a Middle Eastern country that is well known for its advanced medical technology and skilled physicians, which made it an attraction for medical tourism from various adjacent countries[10]. These advanced technologies took place in parallel with an increase in hospital accreditation movement in

Jordanian hospitals, as a result this lead to establishment of different processes to enhance reporting of medication errors. In the Jordan University Hospital (JUH) the Quality department in 2012 developed and implemented a penalty free voluntary incident reports. The quality department or patient safety office usually oversees incident reporting process. They conduct investigation, analysis, and plan quality improvement projects.

A limited number of studies have addressed medication errors in Jordan[11-13], these researches have focused mainly on administering surveys and questionnaires to nurses in order to understand factors contributing to medication errors, differences in medications errors amongst various types of hospitals (i.e. governmental vs. university hospitals) and barriers of medication error reporting. The current study enriches the available literature by investigating for the first time the voluntary incidence reports at JUH.

The primary aim of this study was to assess the prevalence, types, patient demographics and origin of medication errors in voluntary reported incident reports in hospitalized patients. The specific objectives were:

- To examine the prevalence and nature of medication errors in voluntary reported incident reports
- To identify the most prevalent drug classes associated with medication errors in these reports
- To classify medication errors according to severity, using the classification index mentioned in the methodology section bellow.

Methods

This is a retrospective analysis of voluntarily reported medication errors occurring from January 2014 till March 2015 at the Jordan University Hospital (JUH); a 570 beds teaching hospital in Jordan. The study obtained ethical approval from the institutional human research review board at JUH.

Medication errors affecting the patients were categorized based on the origin, severity, and drug class, location of the error, the month in which they occurred, and the age of the patients involved.

Medication errors severities were classified into the following categories[14]:

All errors rated as serious/major/moderate are classed as 'clinically important' errors. Insignificant and minor: one which if omitted would probably have no effect on patient's outcome.

Moderate: one which if current practice continued could be potential undesirable for patient's outcome.

Major and serious: one which if current practice continued could be determinable for patient's outcome.

Database was collected from incident medication error reports files. Those reports were reviewed to gather information on patient demographic, nature of medication errors, origin, and medication associated with medication errors. Any missed information was obtained from the hospital database. Very few reports had missed data which were mainly related to sex and age of the patient (4, 6.9%), and only one report did not have full information regarding the names of medications that were given to a patient at an inappropriate time (wrong time).

Clinical significance was determined independently by two health care professionals as reported by Westbrook *et al*.[14], one of them was the person who reported the incident, and the other was the first author of this paper. In the case of disagreement, a discussion of the medication errors were held until agreement was reached. If disagreement occurred it was settled by consensus with input from a clinical pharmacologist when required.

Data Analysis

Data were coded and analyzed using the Statistical Package for Social Sciences version 20 (IBM Corp, 2011)[15]. Categorical data was expressed as (number, %).

Results

A total of 86 medications were associated with 58 voluntarily reported medication errors from January/2014 to March/2015 compared to 33 and 35 medication errors reported during 2012, 2013 correspondingly. Almost half of the reported medication errors (27, 46.6%) included in the study were reported between March and May 2014. The majority of incidents have been reported by nurses (57, 98.3%).

Nearly third of the patients who were exposed to the reported medication errors were less than one year old (19, 32.8%), whereas 12 patients were more than 60 years old (20.4%), and the rest were between 13-59 years old.

Two-thirds of the reported medication errors originated from the internal medicine department (20, 34.5%) and the neonatal intensive care unit (19, 32.8%), while only 10 reports were received from surgical department's staff, 6 reports from obstetrics and gynecology, 2 from cardiac centre and only one report was received from the psychiatric unit.

The most frequent drug classes associated with those medication errors were antibiotics, antifungal, antiviral medications (23, 26.7%), cardiovascular medications (18, 21.0%), chemotherapy agents (14, 16.3%), opioid and non-opioid analgesics (8, 9.2%), hypoglycemic agents (6, 7.0%), intravenous fluids (5, 5.8%), anesthetic agents (2, 2.3%), and 10 other classes.

Medication errors occurred more abundantly during the administration phase 75.5%, whereas 12.8% of those errors were detected during the dispensing phase, and 10.5% were reported during the prescribing phase. Table 1 portrays the exact types of medication errors. As noted from the table the majority of types of reported medication errors were associated with missed doses (30, 34.9%), followed by wrong time (15, 17.4%).

The severity of reported medication errors was assessed, and the results revealed that the majority of these errors did not cause permanent harm to patients (64, 74.4%), whereas twenty one medication errors (21, 24.4%) resulted in temporary patient harm which required more frequent monitoring and laboratory testing. Unfortunately, major harm was caused by one medication error (1, 1.2%).

Discussion

Mandatory reporting could be intimidating for health care professionals; for instance a survey study conducted on general practitioners (GPs) working in Scotland found that as much as 75% preferred a local anonymised system of reporting. Moreover, they found the idea of obligatory reporting is

threatening and 73% of the surveyed GPs reported that they would be discriminatory in their reporting in a mandatory system[16]. Such selectivity in reporting will jeopardize the whole purpose of medication errors reporting. In the Middle East, one study investigated medication errors utilizing mandatory incident reports[17] at King Fahd University Hospital in Saudi Arabia, the incidence of medication errors was only 0.15%, the authors attributed this low incidence to under-reporting in mandatory and punitive reporting systems. Advocates of the mandatory reporting system on the other hand, argue that the rate of reporting is higher in mandatory and non-punitive systems, for example in Australia only 1-10% of reported adverse events came from Australian doctors, where the reporting system is voluntary, in contrast almost 50% of the reported adverse events were submitted by doctors in Denmark, where the reporting system is obligatory and doctors are protected[18].

Table 1. Types of reported medication errors during January 2014- March 2015

Type	N	%
Missed doses	30	34.8
Wrong time	15	17.4
Wrong doses	9	10.5
Hold and discard chemotherapy after preparation	9	10.5
Wrong medication	8	9.3
Wrong patient	5	5.8
Adverse drug events	4	4.6
Inappropriate storage	3	3.5
Wrong route	1	1.2
Duplication of medication	1	1.2
Incomplete label	1	1.2
Total	86	100.0

Although under-reporting has been detected in voluntary reporting systems[19], the data obtained from non-punitive and voluntary reports may reflect the actual medication errors if they are critically analysed. Moreover, they may help in correction of error prone processes. Other systems such as chart review, electronic monitoring, or an audit could be applied hand to hand with voluntary reporting system to improve the quality of health services[20].

Several studies emphasizes the fact that many medication errors are not reported due to different individual and on the context reasons, and therefore these errors go undetected[21]. In Jordan, similar to other countries, health care providers are afraid of being punished or stigmatized as professionally incompetent[12, 22], to banish this "shame and blame" culture hospitals need to modify their policy when responding to a medication error. In the present research although the number of reported medication errors during the study period was relatively low, it has been noted that there was a yearly progress in reporting medication errors from 33, 35 during 2012 and 2013 correspondingly up to 58 during the study

period (66% increase in reporting compared to 2013). This increase is noteworthy and might reflect an initial success of the penalty free voluntary reporting system. To continue witnessing such an increase we might have to adopt the voluntary non-punitive reporting system, at least until the culture of reporting is well established at JUH to a degree that there is a radical move to a safer environment that allows health care providers to learn from their mistakes.

Interestingly, 46.6% of medication errors included in the present study were reported between March and May 2014, this could be due to awareness programs and lectures held in the hospital in this regard, in addition to several quality programs such as Joint Commission International (JCI) and National accreditation programs. The JCI was established in 1998 as a division of Joint Commission Resources, Inc. (JCR), a none-profit, private affiliate of The Joint Commission. The Joint Commission's mission worldwide is to improve the quality of care for patient by helping international health care organizations, public health agencies, ministries of health and others evaluate, demonstrate and improve the quality of patient care and enhance patient safety all over the world[23]. Although this result calls attention to the success of these educational programs, it seems that round-the year education is required to continuously train newly appointed staff and sharpen the skills of other staff members.

Medication errors reported in the present study occurred more frequently during the administration phase by nurses. This result was consistent with the finding of other researchers[13] and could be explained by the fact that nurses are the last health care professionals in the chain of medication provision, and probably have the greatest medical interaction with the patients. It has been reported elsewhere that physicians do not report incidents due to different reasons such as lack of time to fill the forms. The low participation rate in reporting medication errors by physicians and pharmacists in comparison to nurses in the current study or in other studies[24, 25], pinpoints the need for additional measures to encourage doctors and pharmacists not only to report errors but also to detect them and try to prevent them.

The most abundant type of medication errors was related to missed doses of drugs. In his systematic review regarding medications errors in the Middle Eastern countries Alsulami *et al*.[9] found that the most frequent type of medication errors was related to incorrect dosage, other frequent errors were improper strength or frequency, incorrect route, and improper duration of therapy. Direct comparison with the results of the present study is quite difficult as the studies included in the review utilized various definitions of medication errors and many methodologies were used to report such errors, none of these studies, however, used voluntary non-punitive incident reports.

An overview of the drug classes associated with the reported medication errors in the present research reveals similarities to other studies[9, 26]. As shown above, findings of the current study indicated that the most prevalent drug classes associated with medication errors were antibiotics followed by cardiovascular medications. In a multinational systematic review 50% of the reviewed studies (n=10) listed cardiovascular system medications as

one of the top three classes associated with medication administration errors, while 40% of the reviewed studies listed drugs belonging to the category of infections and central nervous system as one of the top three most commonly observed medication types involved with medication administration errors[27].

Findings of the present study revealed that almost all of the reports were related to inpatient services which is consistent with Jylha *et al.*[28] where nearly 80% of adverse drug events were reported from inpatient services. Explanation for this finding could be due to the fact that medications are prescribed, dispensed and administered in a unit dose system for inpatients.

Compared to adults, neonates pose a distinctive challenge to health care professionals in terms of prescribing, dispensing and provision of the drug. For instance, determining the exact dose for a neonate might be challenging to physicians as it will require in most cases the application of various mathematical equations. Pharmacists can be challenged when they dispense drugs to neonates as they will often be required to dilute medications to provide a low dose to the infant. Administering drugs to infants could be a source of error that can result in serious adverse events as infants can't communicate with health care providers regarding administration errors. As an example, an infant can tell the nurse that she administered the medication twice or that she forgot to give him his evening dose. Thus, it is quite understandable why almost one-third of the incidence reports in the present study originated from the neonatal intensive care unit. A method to decrease these errors might be in assigning a full time clinical pharmacist in the neonatal/pediatric intensive care units, as previous research has indicated that unit based clinical pharmacists can substantially decrease serious medication errors in such units[29].

A closer examination of the reported medication errors revealed that the majority of these errors did not cause harm to patients but has the potential to be harmful if not captured before reaching patients, those results were consistent with Miller *et al*. and Harkanen *et al.*[30, 31] both studies reported that less that 10% of the incidents caused severe harm to patients, whereas the majority caused no harm to patients.

The findings of the study should be interpreted with the following limitations in mind: Data were obtained from incident reports and hence, there may be incomplete documentation. Data were collected within one hospital; therefore, results might not be generalized to other settings without further investigation. Nonetheless, the obtained data are valuable for planning quality improvement programs that aim to reduce medication errors at the JUH.

Conclusion and Impact for Practice

The present study has several valuable findings that are very important and should be taken into consideration in order to improve the quality of the health care service at JUH (despite the study's limitations mentioned below). Although most of medication error reports were not classified as major or serious errors; some of these errors, if not resolved, can results in significant harm. Based on the results of the current study, medication errors can be minimized by focusing efforts on two

main pathways: The first pathways is education; the importance of continuous awareness programs can never be over-emphasized, these programs should be designed to motivate health care providers and train them to detected medication errors early and report them, and should be repeated as necessary until reporting becomes a blame free culture and a learning experience. The second pathway involves developing reliable and easy to use reporting systems that are supported with adequate infrastructure to enable quick feedback and action from responsible personnel. The hospital's experience over the past few years revealed that an integrated penalty free voluntary reporting system is being increasingly used by health care professionals at JUH to report medication errors. This initial success needs to be further investigated to determine possible aspects of improvement, for instance would computerizing incidence reports encourage more health care professionals to report medication errors? Would it enable quicker feedback and result in less patient harm? It is clear that there is a need for further research based site specific strategies to prevent medication errors and provide patients with safe and effective care.

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الأخطاء الدوائية في الحوادث الطوعية في مستشفى أردني

خولة محمد أبو حمور[1]، مريم هنطش عبد الجليل[2]

1، 2– قسم الصيدلة الحيوية والسريرية، كلية الصيدلة، الجامعة الأردنية، الأردن.

الملخص

قد تساعد تقارير الحوادث العرضية المتعلقة بالأدوية المؤسسات الطبية في منع الأخطاء وتحسين النتائج العلاجية المرجوة في مستشفى الجامعة الأردنية.

الهدف: تهدف هذه الدراسة الاسترجاعية إلى تقييم مدى انتشار الأخطاء الدوائية، أنواعها، وتحديد شدتها والقسم الذي حدثت به داخل مستشفى الجامعة الأردنية خلال الفترة الواقعة ما بين كانون الثاني 2014 وآذار 2015 من خلال تحليل تقارير الحوادث العرضية للأدوية المبلغ عنها بطريقة طوعية وغير عقابية.

الطريقة: تم تحليل كافة الحوادث العرضية المتعلقة بالأدوية المبلغ عنها ذاتيا للفترة الزمنية المذكورة أعلاه والبالغة 58 حادثاً تضمنت 86 دواء، وتتعلق تلك الحوادث بأخطاء في عملية إدارة الدواء بدء اً من وصف الدواء، وصرفه حتى إعطائه للمريض. تم إجراء تحليل لمحتوى تلك الحوادث بطريقه تفصيله للحصول على جميع المعلومات المتعلقة بالدراسة حيث تم ترميز البيانات وتحليلها باستخدام SPSS (النسخة 20.0).

النتائج: أشارت النتائج إلى وجود زيادة في الإبلاغ عن الأخطاء الدوائية مع مرور الزمن كما أن غالبية الكوادر الطبية التي وثقت تلك التقارير كانت من الكوادر التمريضية . لوحظ من خلال نتائج الدراسة أن ثلثي الأخطاء الدوائية التي وثقت خلال فتره الدراسة نشأت من قسم الطب الباطني ووحدة العناية المركزة لحديثي الولادة . من حيث الأدوية المرتبطة بغالبية الأخطاء الدوائية فهي المضادات الحيوية، مضادات الفطريات، الأدوية المضادة للفيروسات والأدوية القلبية الوعائية والعلاج الكيميائي. شكلت الأخطاء المتعلقة بعدم إعطاء الجرعة أو إعطائها بوقت خاطئ لأكثر من 52% من الحوادث المبلغ عنها. كما وجدت الدراسة أن الغالبية العظمى (98.8%) من تلك الحوادث المبلغ عنها لم تسبب ضررا كبيرا للمرضى.

الخاتمة: ساعدت هذه التقارير الطوعية التي لا يترتب عليها عقاب في التعرف إلى مجموعة واسعة من الأخطاء الطبية في أقسام المستشفى المتعددة. لتحسن الرعاية الطبية للمرضى يجب إجراء بحوث إضافية لتحديد التحسينات التي يمكن إدخالها على نظام الإبلاغ الحالي من أجل تشجيع الكوادر الطبية على الإبلاغ عن الأخطاء الطبية وتعزيز الاستجابة السريعة لهذه البلاغات وخاصة في وحدة حديثي الولادة حيث تم رصد تكرر الأخطاء الدوائية.

الكلمات الدالة: الأخطاء الدوائية، تقارير الحوادث، الأردن.