

**Research Article**

# Impact of drug information services on patient safety at East Jeddah Hospital in Saudi Arabia; a retrospective study.

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## ABSTRACT

One of the actions that used by drug information center to improve the quality outcomes of patient safety at East Jeddah hospital was sharing the Pharmaceuticals and Therapeutics Library on each desktop inside the hospital. Pharmaceuticals and Therapeutics Library is an updated electronic library consisting of textbooks, national and international journals, frequently asked questions and other electronic databases such as UpToDate, Lexicomp and Micromedex. This study aimed to evaluate the contribution of the Pharmaceuticals and Therapeutics Library as an implemented quality improvement tool on the incidence of medication errors which in turn affect the patient safety and overall healthcare outcomes. Medication errors data was derived from the electronic reporting and recording system (called weqayah). The retrospective analysis of medication errors carried out from July to December 2018. The incidences of medication errors were compared three months before sharing the Pharmaceuticals and Therapeutics Library in the EJH and three months thereafter. The secondary data was represented by the development of a questionnaire to ensure or exclude the contribution of Pharmaceuticals and Therapeutics Library as a quality improvement tool on the patient safety. The analysis of extracted records was result in 22% reduction of medication errors post introduction of Pharmaceuticals and Therapeutics Library. The comparison of the effectiveness of Pharmaceuticals and Therapeutics Library implementation between the pre- and post- medication errors events showed a decline in the average number of medication errors but did not reach statistical significance ( $p>0.05$ ). Therefore, Pharmaceuticals and Therapeutics Library might be improves patient safety and healthcare outcomes.

**Keywords:** Drug information services, patient safety, medication errors.

## INTRODUCTION

Patient safety is a central concern of current healthcare facilities and systems. Several studies initiated by the Institute of Medicine (IOM) have found the high incidence of medical error and large gaps in healthcare quality including medication errors, postsurgical complications, inadequate cancer screening, inadequate care following a heart attack and patient death (Toruner & Uysal, 2012)

Medication error is preventable event which may result due to the administration of inappropriate medication or any form of patient harm after taking medication (Hamilton et al., 2011). Medication errors account for up to 30% of the harmful events that occur during hospitalization (Assiri et al., 2018). Williams, D. J. P. 2007, stated that the medication error has been

estimated to kill 7,000 patients per annum and accounts for nearly 1 in 20 hospital admissions in the US (Williams, 2007). It is difficult to estimate the exact number of Medication error in the Kingdom. However, studies have reported a prescribing error incidence of 8–56 per 100 medication orders in hospitalized patients (Al-Dhawali, 2011, Al-Jeraisy, Alanazi and Abolfotouh, 2011). In 2015, The Saudi Central Board for Accreditation of Healthcare Institutes (CBAHI) released forty-one standards related to medication management; three of them are national essential safety requirements (CBAHI, 2020). Maximizing the patient safety through improving the judicious use of medications and minimizing medication errors have always been key areas of study and research for those working in medical facilities (Benjamin, 2003).

Drug Information Center (DIC) or Drug and Poison Information Center (DPIC) is a subdivision of pharmaceutical care services that offers trusted accurate, scientific, and timely information regarding disease management, medications and poison cases (Esmaili et al., 2014). The main objectives of the DICs are to respond to the inquiries on a therapeutic drug, pharmacotherapy, promote the rational use of drugs, improve the patients' quality of life, optimize the use of medications, provide information regarding medications to the healthcare providers and to promote adherence to medication among patients with chronic illnesses (Nova Manosalva, López Gutiérrez & Cañas, 2016)(Ghaibi, Ipema & Gabay, 2015). Saudi Arabia has several DICs in private or public hospitals, universities and other governmental agencies. The DICs recommends that hospitals should have systems for monitoring and preventing future cases of medication errors. The general goal of the systems is to ensure that the hospitals develop high-quality practices to ensure adequate and rational use of medications to ensure the safety of the patients (Ahmed Alomi et al., 2018)(Bond & Raehl, 2008).

In 2018, one of the actions that used by DIC to improve the quality outcomes of patient safety at East Jeddah hospital was sharing the Pharmaceuticals and Therapeutics Library (PTL) on each desktop inside the hospital. PTL is an updated electronic library consisting of textbooks, national and international journals, frequently asked questions and other electronic databases such as UpToDate, Lexicomp and Micromedex.

The aimed of this work is to evaluate the contribution of the PTL as an implemented quality improvement tool on the incidence of medication errors which in turn affect the patient safety and overall healthcare outcomes.

## MATERIALS AND METHODS

**Design:** A retrospective study involves the use of a survey in the form of a questionnaire to gather information about study variables.

**Ethical approval:** This study initiated after obtaining an ethical approval from the local institutional ethics committee in directorate of Health Affairs in Jeddah (H-02-J-002) and informed consents from all the study participants.

**Study population & sample:** All healthcare staffs who worked in East Jeddah hospital, Jeddah, Saudi Arabia, were invited to participate in this study.

**Retrieval and analysis of data:** In this research, there are two main methods of collecting data,

primary and secondary data. The primary data was derived from the electronic reporting and recording system (called weqayah). The retrospective analysis of medication errors carried out from July to December 2018. The incidences of medication errors were compared three months before sharing the PTL in the EJH and three months thereafter. The secondary data was represented by the development of a questionnaire to ensure or exclude the contribution of PTL as a quality improvement tool on the patient safety. To make sure the questionnaire is reliable and measures what it was made to, the questionnaire was subjected to the scale reliability procedure using the Cronbach's Alpha criterion to assess the internal consistency and reliability of the studied construct. The questionnaire was distributed manually among the healthcare workers in December 2018 and recollected two weeks later.

## Statistical analysis

All data were analyzed using SPSS version 23.0 and presented as percentages or mean  $\pm$  SEM. The Cronbach's alpha was used as indicator of internal consistency of questionnaire. A paired t-test was used to evaluate the effectiveness of the sharing PTL; Descriptive analyses were used to compare the frequencies of medication error before and after sharing of PTL and to assessment the questionnaire data. Association between profession and utilization of Pharmaceuticals and Therapeutics library were evaluated by a two-sided Fisher's exact test. P value  $<$  0.05 was considered for significance.

## RESULTS AND DISCUSSION

**Medication errors pre and post PTL implementation:** The analysis of extracted records were result in 93 medication errors along three months precede the introduction of PTL while were 72 events occurred over the same period after the introduction of PTL. However, the comparison of the effectiveness of PTL implementation between the pre- and post-medication errors events showed a non-significant decline in the average number of medication errors ( $p > 0.05$ ) (**Error! Reference source not found.**). Moreover, in pre PTL, Figure 2 demonstrated that 47 cases (50.5%) of the medication errors occurred during prescribing of the medication and the least medication errors (2.2%) were found as a result of drug preparations. While, on the post PTL, it was found that most of the medication errors 47.2% occurred during prescribing and the least errors 1.4% occur during monitoring. The percentage changes were in both directions and didn't

exceed 4.4%. These reductions can be attributed to increase the utilization and awareness of PTL among healthcare providers. This finding agrees with Bond & Raehl (2008) who argues that DIC services improve the knowledge among healthcare workers which in turn reduces the number of medication errors in the health facilities (Bond & Raehl, 2008). This finding also concurs with Hamilton et al., (2011) who found that the sharing information and obtaining the required information from DIC was a significant aspect that reduces the number of medication errors in hospitals (Hamilton et al., 2011). In line, Benjamin, (2003) noted that sharing therapeutic and drug information by the DIC reduces the number of medication cases during dispensing, transcribing, and administration of the medications (Benjamin, 2003) (Benjamin, 2003). Regarding to the type of medication error, figure 3 illustrated that the most of the errors (22.6%) were due to wrong drug as the standard form of a medication error that was addressed in the pre PTL introduction and The least form of medication errors reported were drug-drug interaction (1.1%) as the standard form of medication error. While, on the post PTL, a high number of cases reported were due to wrong documentation 14 (19.4%) as the most common type of medication error and the least form of medication errors (2.8%) reported was wrong patient as the standard form of medication error. These findings are consistent with previous work which revealed that DIC should share the necessary information or databases with the healthcare providers to reduce various forms of medication errors (Hamilton et al., 2011). Several categories of medication errors were established, in pre PTL, 54.8% of medication errors was category B errors, while the least number of cases (1.1%) reported category E error. Almost the same percentages were recorded in post PTL period (

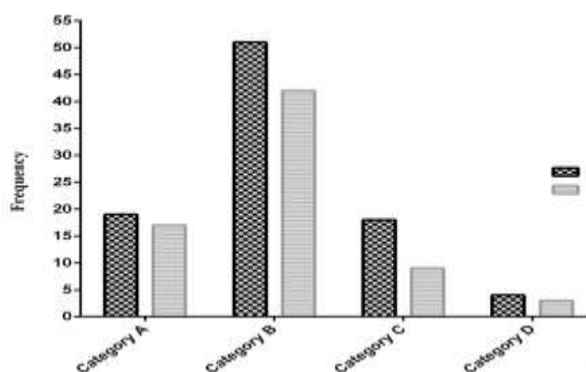


Fig). This decline in medication errors can be attributed to the increased awareness among the healthcare providers and the ability to get appropriate information regarding drugs. These

findings agree with Entezari-Maleki et al., (2014) who found that the awareness among healthcare workers on medication errors can significantly reduce the chances of medication errors (Esmaeili et al., 2014).

In addition, the medication errors comparison was made also based on the class of medication and

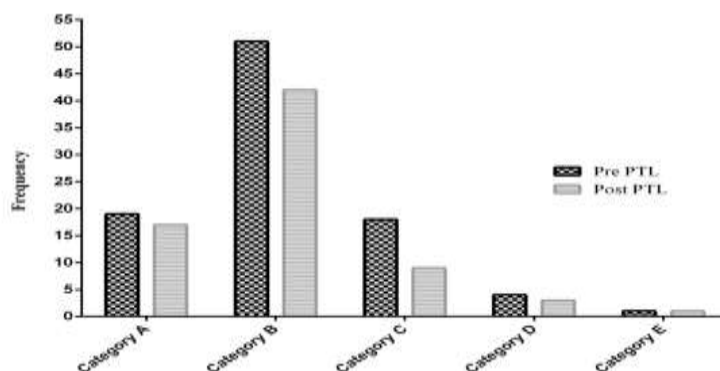
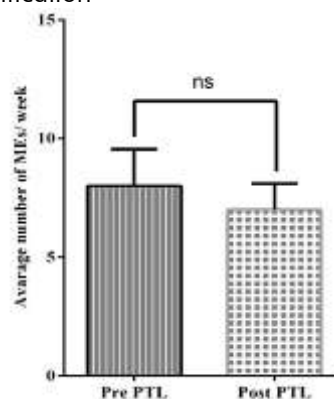


Fig demonstrated that 33 cases (35.5%) were antibiotic in the pre PTL while the least number of cases (1.1%) were narcotic and analgesic drug. On the post PTL, it was noted that most of the cases (25.4%) were antibiotic while the least number of cases (1.6%) reported were GI drug. The findings concur with Benjamin, (2003) who argues that the antibiotics are considered the sources of medication errors and they are often abused due to low levels of knowledge among the healthcare providers (Benjamin, 2003). The increased awareness and using of PTL among the healthcare explain the reasons why there was a reduction in the number of medication errors per drug classification



**Fig.1: Comparison of the Average number of medication error event per week between pre and post PTL implementation. ns P > 0.05; by paired T test. Data expressed as the mean ± SEM. PTL- Pharmaceuticals and Therapeutics Library**

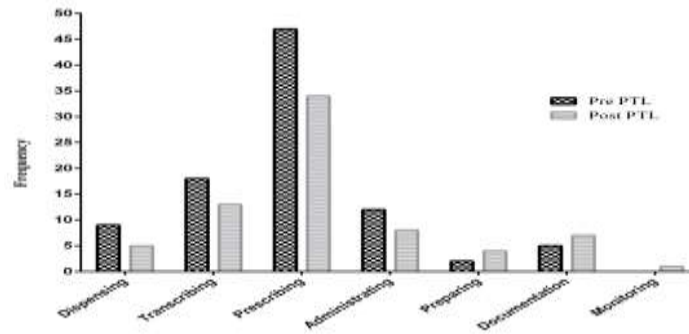


Fig.2: Medication errors according to the stages of medication use process. PTL- Pharmaceuticals and Therapeutics Library

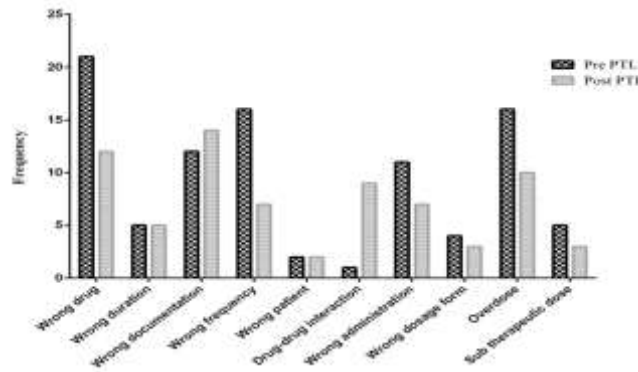


Fig.3: Medication errors according to the types. PTL- Pharmaceuticals and Therapeutics Library.

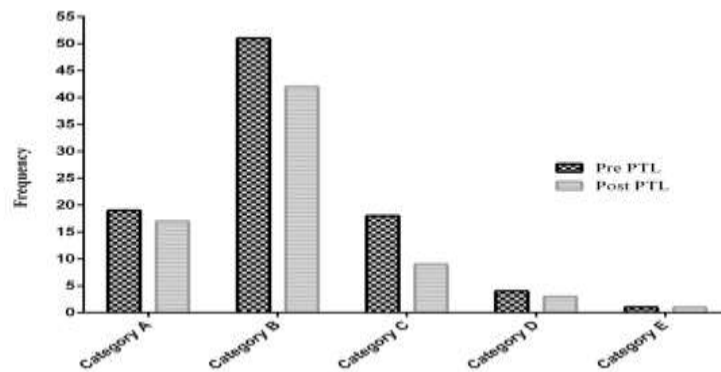


Fig.4: Medication errors according to the categories. PTL- Pharmaceuticals and Therapeutics Library.

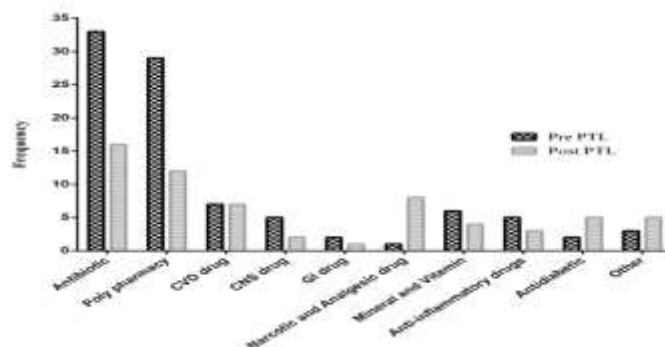


Fig.5: Medication errors according to the Classifications. PTL- Pharmaceuticals and Therapeutics Library. CVD- cardiovascular disease, CNS- central nervous system, GI-gastrointestinal

**Evaluation of the quality of drug information service from the receiver's perspective**

The Cronbach' Alpha coefficient reaches 0.78 which is above the accepted cut-off value 0.70. This indicates that each item is internally consistent and highly reliable. A total of 93 questionnaires were collected and 7 questionnaires have been neglected due to uncompleted answers, 86 questionnaires data were suitable to be analyzed. The analysis of data obtained by questionnaire showed that each of physicians and nurses were represented one-third of total respondents while the pharmacists represented one-fourth while 7% of respondents were allied health (Table1). Around 87% of respondents were aware about the DIC services in the health facility and majority (75.6% ) of them have ever utilized the services of DIC in the hospital while a minority (24.4%) did not ever utilize the DIC services. The finding was in accordance with that reported by Hamilton et al., (2011) who found out that a majority of the healthcare workers are aware of DIC (Hamilton et al., 2011). Also, of 89.5 % of the respondents reported that they were aware about the PTL at

EJH and 81.3 % of them who were aware of PTL reported that they have ever utilized it while a minority 8.1 % reported that they have never used it. Moreover, Seventy-five of the respondents who represent 87.2% felt that PTL was useful in medication improvement, updating knowledge and offering better patient care while 9.3% felt that the DIC improved the medication safety only. The findings are in concurrence with Bond & Raehl (2008) who observes that DIC and its services are useful in creating public awareness on the safety of medication, ensuring better patient care, improving medication and updating knowledge among the healthcare providers (Bond & Raehl, 2008). Furthermore, More than 55% of the respondents rated it as excellent and very good while a 28% rated as good and less than 5% rated the DIC services as unacceptable. The findings on the advantage of PTL agree with Sarkar et al., (2011) in their study in the USA (Sarkar et al., 2011). However, the study disagrees with Vassilev et al., (2009) who observed that DIC services especially in developing countries does not perform well (Vassilev et al., 2009).

**Table 1: Assessment of drug information services provided by drug information center at east Jeddah Hospital, 2018 (N=86).**

Variables	Frequency (%)
Profession	
Physician	30 (34.9%)
Pharmacist	23 (26.7%)
Nurse	27(31.4%)
Allied health	6 (7%)
Awareness about the DIC services in the health facility	
Yes	75 (87.2%)
No	11(12.8%)
Utilization the DIC services in the hospital	
Yes	65 (75.6%)
No	21(24.4%)
Awareness about the PTL at EJH	
Yes	77(89.5%)
No	9(10.5%)
Utilization of PTL at EJH	
Yes	70(81.4%)
No	7(8.1%)
Not applicable	9(10.5%)
Impact of PTL	
Medication safety improvement	8(9.3%)
Better patient care	1(1.2%)
Updating Knowledge	2(2.3%)
All of above	75 (87.2%)
Rating the PTL at EJH	
Excellent	22 (25.6%)
Very good	26 (30.2%)
Good	24(27.9%)

Adequate	10 (11.6%)
Unacceptable	4 (4.7%)

PTL- Pharmaceuticals and Therapeutics Library. DIC-drug information center

Association between Profession and Utilization of Pharmaceuticals and Therapeutics library:

Statistical analysis (two-sided Fisher's exact test) confirmed a significant association between profession and utilization of Pharmaceuticals and

Therapeutics library. Table 2 showed that utilization of PTL by pharmacists was more frequently (91.3%) than Physician, Nurse and Allied health (73.3%, 85.2% and 66.7%, respectively) ( $P < 0.015$ )

**Table 2: Association between Profession and Utilization of Pharmaceuticals and Therapeutics library,**

Profession	Have you utilized this facility (PTL)?			Total	P value \$
	Yes	No	Not applicable		
Physician	73.3 % (22)	20 % (6)	6.7% (2)	100.0% (30)	0.042 *
Pharmacist	91.3 % (21)	4.3% (1)	4.3% (1)	100.0% (23)	
Nurse	85.2% (23)	0.0% (0)	14.8%(4)	100.0% (27)	
Allied health	66.7% (4)	0.0% (0)	33.3%(2)	100.0% (6)	

\$ Two sided fishers exact test, \*  $P = < 0.05$ ,  $n=86$ . PTL- Pharmaceuticals and Therapeutics Library

### CONCLUSION

In conclusion, the implementation of PTL was found to reduce medication errors and might be considered an applicable quality improvement tool that improves patient safety and overall healthcare outcomes. More efforts are required to encouragement the healthcare professionals to use the PTL for better patient safety. This approaches to preventing medication errors are inadequate and more attention and alternative approaches should be applied on some classes of medication that having a high potential for error. Because of the complexity of this issue, a multidisciplinary approach is required to effectively minimize the potential for medication errors.

There are two drawbacks related to this work should be considered and could impact the generalizability of the results; 1) the detection of medication errors relies on the data recorded in the hospital record and on willingness of healthcare providers to reporting the medication errors, which may result in underestimating some types of errors. 2) this work evaluated a small sample size in a single hospital which may not be representative of all hospitals or other medical centers.

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