

Medication Safety, Assessment of Adequacy of Prescription in Royal Care International Hospital

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Abstract:

Aim: The aim of this study was to evaluate adequacy of prescription of in-patient prescriptions.

Method: This is across sectional retrospective study done in May 2019 in Royal Care international hospital. Data was collected from all inpatients' medication charts in critical care section (ICU and HDU) and all wards in the hospital. It included all prescriptions on the previous day to data collection day. Data resources were 1) physician order sheet, 2) clinical pharmacist medication sheet (ICU, HDU), 3) inpatients kardex and 4) pharmacy request sheet. We designed data collection sheet based on Australian National Inpatient Medication Chart (NIMC) which addressed data related to the patient, drug and prescriber. Data was analyzed by SPSS V22. The proposal was approved by Soba Center for Audit and Research.

Results: Total number of revised hand written prescriptions was 1162; prescribed for 71 patients. Around 25% of all prescriptions written in physician order sheets and pharmacy request sheets had no patient's name on it, half without patient's age, and nearly all prescriptions without patient's weight. Prescription date was written in all prescriptions in the clinical pharmacist sheets, more than 97% of prescriptions in pharmacy request sheet, and 85% of orders in the physician order charts and inpatient kardex sheets. Almost in 50% of all prescriptions drug name was written in generic form, 43.7% without route of administration, and 27% without frequency of administration especially prescriptions in the pharmacy request charts (50%). Drug indication was mentioned in less than 2% of prescriptions in pharmacy request sheets and clinical pharmacist charts in critical care area, and it was missed form more than 60% of prescriptions in physician order and inpatient kardex sheets. Less than 30% of prescriptions documented prescriber's names and signatures.

Conclusion: In this study hand-written prescriptions lacked most of the important information; hence this may increase the risk of medication errors. The use of structured drug order sheet may improve documentation and prevent such events. Prescription writing skills need to be improved through workshops and seminars to all health care providers. Moreover, the importance of medication safety should be highlighted.

Keywords: Medication safety, prescription, medication error, in-patient, quality improvement.

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I. Introduction

Medication use is the most common intervention in healthcare setting worldwide(1).With increased medication use, emerged the increasing importance of medication safety and errors recognition. Medication safety is defined as “freedom from preventable harm with medication use”(1). While medication error is any preventable medication-related event that may lead to inappropriate medication use or harm to the patient(2).

Medication errors can be classified according to the stage at which the error has occurred i.e. prescribing, dispensing and administration errors(3).

Though the prevalence of medication errors varies, a study in the United States estimated that 1-2% of patients admitted to hospital suffer the consequences of medication errors mainly prescribing errors. Moreover, it mentioned that medication errors are responsible for 5% of hospital admissions and up to 7,000 deaths per year in the United States(3).

Prescribing errors account for more than two thirds of medication errors (4). In United Kingdom , the prevalence of prescribing errors in 2014 was found to be 36% in patient prescription charts and 7.5% of items prescribed(5).Improper prescription can lead to errors in dispensing or administration of a drug. Poor hand writing and use of unauthorized abbreviations or symbols can lead to misinterpretation of a drug's name, dose, route or frequency(4).A systematic review was done in 2017where 51 studies in 9 African countries were investigated; itshowed that prescribing errors occurred in more than half of all prescriptions. This was attributed to prescriber factors; inadequate knowledge or training, high work load and other environmental factors(6).

Since prescribing errors are preventable in most cases, assessment of the situation and adequacy of prescription should be done first followed by designing and implementing suitable interventions; staff training , reviewing complexity of prescribing system or design of prescriptions and establishing or refining an error reporting system(4). In London teaching hospital, 59% of doctors involved in potential serious prescribing errors stated that the lack of skills and knowledge regarding prescribing medication is an important factor. Moreover, many studies showed that the use of educational activities can improve prescribing performance among doctors(7).

Prescribing mistakes can result in adverse events.Prescribers should be informed about any error that occurs in their environment ; therefore, reporting is very important for prevention of subsequent events (4). Assessing the magnitude of medication errors in Sudan remains a challenge; Sudan being a low resource country struggling with many challenges in health-care system. This study aims to evaluate adequacy of prescription of in-patient prescription charts in Royal Care International Hospital, Khartoum, Sudan.

II. Methodology

This is the first cycle of cross sectional quality improvement study conducted in May 2019. Study area was Royal Care International hospital, a specialized hospital in Khartoum-Sudan. This study was conducted to evaluate the adequacy of drug prescription in the hospital.

Study material was drug prescriptions for hospitalized patients.

Study Design: retrospective observational study.

Study Location:Royal Care International hospital, a specialized hospital in Khartoum-Sudan

Study Duration: 25 May – 1 June 2019

Sample size: all in-patients in the critical care area (ICU and HDU) and all hospital wards.

Inclusion criteria: all drug prescriptions written on the day prior to data collection day.

Exclusion criteria: prescriptions written on days other than the selected date.

Procedure methodology:Data was collected from inpatients' medication charts in critical care section (ICU and HDU) as well as all hospital wards. All patients present on collection day were selected and data about all medications prescribed in the previous day was obtained. Data resources were 1) physician order sheet, 2) clinical pharmacist medication sheet (only available in ICU, HDU), 3) inpatients kardex and 4) pharmacy request sheet. According to hospital policy, when a drug is prescribed by a doctor, it should be written in physician order sheet and copied to in-patient Kardex and pharmacy request sheet. The clinical pharmacist medication sheet is only available for patients in critical care area.

We designed data collection sheet based on Australian National Inpatient Medication Chart (NIMC). It consists of three parts; the first section addresses patients' personal information which is essential for drug prescription such as patient's name, ID number, age, weight, sex, and allergy status. The second part covers information about prescribed drug; like prescription date, drug name, route, frequency, indication and correct dosing (using the metric units, leading zero, trailing zero and expression of dose in weight and volume for liquid preparations). Regarding abbreviations and symbols, we relied on the hospital policy for acceptable abbreviations and symbols as stated by the medical records department. The third part captures information about the prescriber, including prescriber's name, level and signature.

Statistical analysis:Data was analyzed using SPSS statistics version 22.

Ethical approval:The proposal of this study was approved by Soba Center for Audit and Research (SCAR).

III. Results

Total number of revised hand written prescriptions was 1162; prescribed for 71 patients. Data resources were physician order sheet (395), pharmacy request sheet (279), inpatient kardex (389) and clinical pharmacist medication sheet in ICU and HDU (99). Around 25% of all prescriptions written in physician order sheets and

pharmacy request sheets had no patient's name on it. Nearly half of prescriptions were written without indicating patient's age. Patient's weight was written in 4.4% of total prescriptions, and specifically 0% in pharmacy request sheets and clinical pharmacist sheet.

About two third of inpatient kardex sheets mentioned the patient's sex, on the other hand none of clinical pharmacist charts mentioned it and less than 4% in the rest of charts. Only 13.9% of prescriptions revealed the allergy status of patients, mainly inpatient kardex chart (39.1%). As shown in (table 1).

Regarding data about prescribed medications, we found that prescription date was written in around 85% of prescriptions in physician order charts and inpatient kardex sheets compared to more than 97% in pharmacy request sheet and clinical pharmacist sheets. Almost in half of all prescriptions drug name was written as generic name. A great number of revised medications requests were written without pointing out of the exact route (43.7%) and the frequency of administration (27%). With detailed review we found that 50% of prescriptions in the pharmacy request charts had been written without identifying frequency of administration, even then it was more of mentioning the amount needed per day rather than the exact dose and frequency. Drug indication was mentioned in less than 2% of prescriptions in the pharmacy request sheets and clinical pharmacist charts in critical care area, while more than 60% of those written in physician order sheets and inpatient kardex had no clue about drug indication. According to hospital's policy regarding acceptable symbols and abbreviations, it was found that unacceptable symbols and abbreviations were used in 25% and 73% of all prescriptions respectively. 3.4% of all medications were written without mentioning the exact dose of the drug. However, more than 90% of doses were quantified correctly. As shown in (table 2).

Data about prescribers were suboptimal. Less than 30% of prescribers wrote their names and signatures. Furthermore, there were no signatures in the clinical pharmacist charts at all. Only 5% of prescribers documented their level, whereas none did in the inpatient kardex. This is shown in (table 3).

Table 1: Patient's personal information in medication charts.

No.	Variables	% (N)	Physician Order sheet	pharmacy request sheet	Inpatient kardex sheet	clinical pharmacist sheet ICU,HDU)(All sheets
1.	Patient name	Yes	73.3% (291)	76% (212)	100% (389)	100% (99)	85.3% (991)
		No	26.3% (104)	24% (67)	0% (0)	0% (0)	14.7 % (171)
2.	Patient age	Yes	54.9% (217)	3.2% (9)	96.4% (375)	9.1% (9)	52.5% (610)
		No	45.1% (178)	96.8% (270)	3.6% (14)	90.9% (90)	47.5% (552)
3.	Patient weight	Yes	1.8% (7)	0% (0)	11.3% (44)	0% (0)	4.4% (51)
		No	98.2% (388)	100% (279)	88.7% (345)	100% (99)	95.6% (1111)
4.	Patient sex	Yes	3.3% (13)	0.4% (1)	69.2% (269)	0% (0)	24.4% (283)
		No	96.7% (382)	99.6% (278)	30.8% (120)	100% (99)	75.6% (879)
5.	Allergy status	Yes	2% (8)	0.4% (1)	39.1% (152)	0% (0)	13.9% (161)
		No	98% (387)	99.6% (278)	60.9% (237)	100% (99)	86.1% (1001)

Table 2: Data about prescribed drug in medication charts.

No.	variables	% (N)	Physician Order sheet	pharmacy request sheet	Inpatient kardex sheet	clinical pharmacist sheet ICU,HDU)(All sheets
1.	Use clear language	Yes	72.2% (285)	67% (187)	82.5% (321)	100% (99)	76.8% (892)
		No	27.8% (110)	33% (92)	17.5% (68)	0% (0)	23.2% (270)
2.	Prescription date	Yes	86.1% (340)	97.8% (273)	84.1% (327)	100% (99)	89.4% (1039)
		No	13.9% (55)	2.2% (6)	15.9% (62)	0% (0)	10.6% (123)
3.	Use of generic or brand name	Brand	45.3% (179)	56.6% (158)	51.7% (201)	45.5% (45)	50.2% (583)
		Generic	54.7% (216)	43.4% (121)	48.3% (188)	54.5% (54)	49.8% (579)
4.	Route of administration	Yes	54.7% (216)	43.9% (123)	65.6% (255)	60.6% (60)	56.2% (654)
		No	45.3% (179)	55.7%	34.4%	39.4%	43.7% (508)

				(156)	(134)	(39)	
5.	Frequency of administration	Yes	78% (308)	49.5% (138)	85.6% (333)	71.7% (71)	73.1% (850)
		No	22% (87)	50.5% (141)	14.4% (56)	28.3% (28)	26.9% (312)
6.	Indication for prescription	Yes	20.3% (80)	1.8% (5)	39% (152)	2% (2)	20.6% (239)
		No	79.7% (315)	98.2% (274)	61% (237)	98% (98)	79.3% (922)
7.	Avoidance of symbols	Yes	75.4% (297)	60.9% (170)	80.7% (314)	91.9% (91)	75.0% (872)
		No	24.8% (98)	39.1% (109)	19.3% (75)	8.1% (8)	25.0% (290)
8.	Avoidance of acronyms and abbreviations	Yes	29.4% (116)	35.5% (99)	17.5% (68)	30.3% (30)	26.9% (313)
		No	70.6% (279)	64.5% (180)	82.5% (321)	69.7% (69)	73.1% (849)
9.	Avoidance of fractions	Yes	94.7% (374)	97.8% (273)	98.2% (382)	99% (98)	97% (1127)
		No	5.3% (21)	2.2% (6)	1.8% (7)	1% (1)	3% (35)
10.	Correct written dose	Correct	95.2% (376)	95% (266)	94.9% (369)	97% (96)	95.2% (1107)
		Wrong	1.8% (7)	0.7% (2)	2.1% (8)	0% (0)	1.5% (17)
		Missed	3% (12)	4.3% (12)	3.1% (12)	3% (3)	3.4% (39)

Table 3: Prescriber's information in medication charts.

No.	Variables	% (N)	Physician Order sheet	pharmacy request sheet	Inpatient kardex sheet	clinical pharmacist sheet ICU,HDU)(All sheets
1.	Prescriber's name	Yes	69.1% (273)	16.1% (45)	5.7% (22)	6.1% (6)	29.8% (349)
		No	30.9% (122)	83.9% (234)	94.3% (367)	93.9% (93)	70.2% (816)
2.	Prescriber's signature	Yes	57.7% (228)	19.7% (55)	0.5% (2)	0% (0)	24.5% (285)
		No	42.3% (166)	80.3% (224)	99.5% (387)	100% (99)	75.5% (877)
3.	Prescriber's level	Yes	13.6% (54)	1.1% (3)	0% (0)	4% (4)	5.2% (61)
		No	86.3% (341)	98.3% (276)	100% (289)	96% (95)	94.8% (1101)

IV. Discussion

In this study we aimed to evaluate prescription writing in Royal Care International Hospital in Khartoum-Sudan. Drug prescriptions in this hospital are mainly hand-written. Drug errors can occur due to individual failure but it may also be created by system failure. Many factors can contribute to prescribing errors in hospitals such as heavy work load, dealing with stressful condition, lack of communication between doctors and not being in good physical and mental status. Other factors that might contribute to this is lack of cooperation between health care personnel (4).

We revised 1162 hand-written drug prescriptions. The average number of prescriptions for each patient was 16. A study done by *Velo GP* and *Minuz P* mentioned that the risk of medication errors increased with larger number of prescriptions(4).

Patient's name was written in 85.3% of prescriptions compared to 100% in an Ethiopian study in 2010 done by *Abdella SH* and *Wabe NT* in which 818 prescriptions were revised(8). We wonder if the use of 4 sheets is contributing to this along with lack of training and failure to implement policies.

Patient's age and sex were written in 52.5% and 24.4% of prescriptions respectively. Both patient's age and sex are important for correct prescription. The percentages in our study are less than that found in Ethiopia with patient's age and sex present in 81.8% and 76.3% of prescriptions respectively(8). While *Mekonnen AB et al* reported that half of prescriptions was written without mentioning of the age and sex (6). Patient weight was listed in less than 5% of prescriptions and two of the revised medication sheets (pharmacy request sheet and clinical pharmacist sheet) had no data about patient's weight at all. The use of structured drug order sheet might improve documentation of such essential data(4).

The use of clear language and clear hand-writing was noted in 76.8% of drug orders. In a study done on inpatients at a hospital in USA, 10.9% of medication orders had illegible hand writing which had been reduced

to (0%) after implementation of education session(9). Poor and unclear hand writing may lead to dispensing of incorrect medication by the pharmacy which can cause adverse effects or even patient death as documented by Charatan F(10). About half of drugs name in prescriptions was written in generic form (49.8%) while the other half was in brand form. This is in contrast to a study conducted in an Ethiopian teaching and referral hospital where generic name was used in 98.7% of prescriptions(11). The WHO recommended that generic name should be used in all (100%) prescriptions because the use of brand name may lead to a higher health care cost since the patient can get another available and affordable equivalent of the same medication if the drug is prescribed in generic name (12).

Drug indication was stated clearly in only 20.6% of ordered medications; in a more detailed view, drug indication was mentioned in pharmacy request sheet and clinical pharmacist sheet in about 2% or less. In a study done in Sweden, medication error rate was 42%, most of it occurred due to failure to state drug indication or purpose in the prescription(2).

56.2% of prescriptions stated the route of administration. The prevalence of injections use in Africa in primary care was estimated to be 28%(13). In our study 43.8% of prescribers mentioned only the form of the drug as tablet, syrup or injection but they didn't document the exact route of drug administration. Patel *et al* mentioned that about 91% of medication errors occurred with intravenous route while 6% occurred with oral route(14).

In comparing drug prescription details with hospital's acceptable abbreviations and symbols, it was found that 37.1% of abbreviations and 25% of symbols were unacceptable and this could potentially lead to misinterpretation by other health care personnel. Prescription errors such as poor hand writing, use of unacceptable abbreviation or omitting some component of the prescription will lead to drug errors. To reduce such type of errors it is advisable to avoid use of abbreviations and symbols in addition to regular check and evaluation of prescriptions(4).

Correct dose and frequency of medication were written in about 95% and 73% of all prescriptions. In critical care area the clinical pharmacist revises all medications written by physicians in the order sheet for correct dose, route, frequency, indication and special preparation of drugs. Our results were similar to what had been stated by Abdella SH and Wabe NT in which drug frequency was written in 76.3% of orders, but different regarding drug dose which was only mentioned in about 39% of prescriptions(8). Both variables were missing in more than one third of prescriptions in a review done by Sirisha S *et al* in India(15)

On the subject of prescriber's information, only less than one third of prescriptions had prescriber's name on it with about 6% of prescriptions in in-patient kardex sheet and clinical pharmacist sheet documenting prescriber's name. Prescriber's signature and level was found in 24.5% and 5.2% of revised data respectively. In a study done in Saudi Arabia in 2005, Irshaid Y *et al* reported that Prescriber's name and signature were found in about 83% and nearly 82% of prescriptions respectively and these were considerably higher percentages than what we found in our study (16).

V. Conclusion

Most of the information written in the prescriptions in this study was suboptimal and may have a risk of medication errors. Our health-care providers need to pay more attention to filling-in prescription details. Workshops and seminars are needed for all front line health-care providers to highlight the importance of good prescription writing in regards to medication safety and also to improve their prescription writing skills. Consolidation of the four sheets in one sheet might be of benefit to improve medication safety.

Future actions & interventions

Report was submitted to hospital administration.

SCAR will consolidate the 4 medication-sheets into one sheet.

Half a day workshop will be designed and delivered to frontline healthcare provider.

2nd cycle audit will be conducted after implementation of the above interventions.

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