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Evaluation of Medication Administration Process in a Paediatric Ward

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***Abstract*—**Children are more susceptible to medication errors than adults. Medication administration process is the last stage in the medication treatment process and most of the errors detected in this stage. Little research has been undertaken about medication errors in children in the Middle East countries. This study was aimed to evaluate how the paediatric nurses adhere to the medication administration policy and also to identify any medication preparation and administration errors or any risk factors. An observational, prospective study of medication administration process from when the nurses preparing patient medication until administration stage (May to August 2014) was conducted in Saudi Arabia. Twelve paediatric nurses serving 90 paediatric patients were observed. 456 drug administered doses were evaluated. Adherence rate was variable in 7 steps out of 16 steps. Patient allergy information, dose calculation, drug expiry date were the steps in medication administration with lowest adherence rates. 63 medication preparation and administration errors were identified with error rate 13.8% of medication administrations. No potentially life-threating errors were witnessed. Few logistic and administrative factors were reported. The results showed that the medication administration policy and procedure need an urgent revision to be more sensible for nurses in practice. Nurses' knowledge and skills regarding to the medication administration process should be improved.

***Keywords*—**Double checking, Medication administration errors, Medication safety, Nurses.

I. Introduction

MEDICATION safety issues are an important aspect of the medication use process in hospitals. Medication treatment process is a complicated process because it involves different stages and the chance of mistake is possible. These stages involve prescribing, transcribing, dispensing, administration and monitoring patient response. Medication Errors (MEs) can be occurred unintentionally at any stage of medication use process. Paediatric patients are more susceptible to MEs than other population [1]. The great majority of MEs in children are relating to the stages of prescribing and administration [2]–[5]. Preventing MEs from reaching the patient is an important part of improving the safety and quality of patient care in paediatric population [6]. A recent systematic review conducted on the medication errors studies in the Middle East countries reported that the incidence rate of Medication Administration Errors (MAEs) was estimated from 9.4% to 80%, in addition, there is lacking in numbers of MEs studies in this region particularly on paediatric patients [7]. Paediatric clinical pharmacologists or clinical pharmacists in Saudi Arabia have limited role which is an interaction with prescribers, but does not go beyond the nurses during their medication administration policy. As step in this way, the aims of this study were to evaluate how the paediatric nurses adhere to the medication administration policy and also to identify any medication preparation and administration errors or contributory factors during the observation process period.

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II. Methods

Different methods are used to detect MEs in different hospitals. Direct observation has been described as one of the best methods to evaluate the medication administration process and detect errors that may occur in the practice [8], [9]. Our study was a prospective, direct observational study of paediatric nurses administering medication that prescribed for paediatric inpatients, as part of their routine medical care service in the hospital. According to the hospital policy and procedures, all medications should be double checked by two nurses before administering to the patients, in addition to that there were 15 steps followed by nurses during medication administration process. The researchers observed and documented how paediatric nurses adhered and implemented to each step of the double checking process for medication preparation and administration.

The process of observation was conducted during weekdays (Sunday - Thursday). Two observers attended at different work shifts of the day in order to observe the medication administration process by different paediatric nurses and shift patterns (7 am, 12 pm, 2 pm, 4 pm, 6 pm, 8 pm). The researchers observed each drug administration process and documented all the steps of the double checking and drug administration process on a data collection form. For each observation, demographic information was recorded as well. In addition, adherence to the double checking steps was recorded on the data collection form that designed for this purposes. During the observation process the observers tried to avoid interrupting or disturbing the nurses during their routine drug round time.

All the data that was collected from this observational study was completely anonymous and confidential.

Data analysis was performed using SPSS version 17. Numbers of drug doses that were observed and administered were documented and the adherence rate to the hospital policy

was calculated from the total drug doses observed. For IV medications, the adherence rate was calculated according to the total number of IV drugs observed during the study period. Identified MAEs were categorized according to their type and frequency. The incidence rate was calculated by dividing the total number of MAEs by the total number of drug doses observed during the study period multiplied by 100.

All paediatric nurses in the ward were informed about the study by the principle investigator during a nurses meeting. All of them were agreed to participate in our study. We asked all participants to sign the consent form for their official participation in our study.

The investigators explained to all participants, that entry into the study was entirely voluntary, their work would not be affected by their decision to participate or not and that they could withdraw from the study at any time. It was explained that if a participant wanted to withdraw part way through the study the data already collected would be used in analyses. Documented MAEs were classified according to their type and frequency. Incidence rate of MEs was calculated as a percentage of the total drug doses observed in our study.

Ethical approval was obtained from the local research and ethics committee in Alkharj Military Hospital, Saudi Arabia.

III. Results

A. Demographic Data

456 drug doses were observed and evaluated in terms of the adherence of paediatric nurses to the medication administration procedure. This observation process involved 90 paediatric patients and 12 paediatric nurses with patient nurse ratio 5:1. Demographic information of these patients is described in Table I. The mean rate of drug doses observed was 5.1 administered doses per child.

The most common dosage forms that were observed were intravenous (IV) forms 193 administrations (42.3%), followed by 145 oral formulations (31.7%) and 118 inhaler drugs (26%) was also observed.

TABLE I
DEMOGRAPHIC INFORMATION

Characteristic	Ward
Number of patients	90
Age (months), median (range)	27.6 (0.2 - 126)
Weight (in kg), median (range)	11 (2.3 - 51)
Number of oral drugs (% total)	145 (31.7%)
Number of IV drugs (% total)	193 (42.3%)
Number of inhaler drugs (% total)	118 (26%)
Total number of drugs administered	456 (100%)

B. Types of Drugs

Antibacterial drugs were the most common drug class administered and observed in this study (41%) followed by bronchodilators drugs (26%). Vitamins, anticonvulsants, antihistamines and antihypertensive drugs were also administered during the study period: 6%, 5.3%, 1% and 0.4% respectively (Fig. 1).

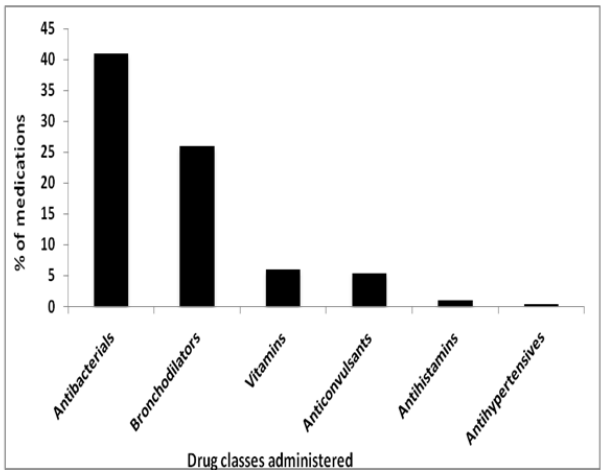

Fig. 1 Types of drug classes observed

C. Nurses Adherence Rate to Medication Administration Policy

Twelve steps for medication administration process were observed and evaluated (Table II). For IV medications, there were an additional four steps, which were assessed and evaluated. Compliance rate to these steps was erratic between the nurses. Out of 16 steps observed, 7 steps were reported to have lower adherence rate compared to other steps. Patient allergy to drugs or foods was only checked in 7 drug doses administered (1.6%), followed by drug doses calculation which checked in 63 drug doses (14%), drug expiry date was checked in 283 drug doses administered (62.7%). During the observational study period, we did not observe any IV bolus drug given to the patients, and when we asked the nurses they told us that we are giving all IV medications as infusion over 30 minutes unless that written by the doctor in the drug chart.

TABLE II
ADHERENCE RATE TO DRUG ADMINISTRATION POLICY

Policy steps	Adherence rate n = 456	Adherence rate %
Two nurses	448	99.1
Vital signs	10	26.4
Drug name	446	98.7
Correct drug	456	100
Correct dosage form	456	100
Drug dose calculated	161	35
Expiry date	283	62.7
Correct volume	358	78.5
Correct IV rate	185	41.2
Correct time	425	94.2
Correct label	416	91.2
Correct route	440	96.4
Patient ID	439	96.2
Allergy	7	1.6
Admin to the patient	398	87.2
Sign to MAR	428	93.8

TABLE III
MEDICATION ADMINISTRATION ERRORS DETECTED

Type of error	Examples	No. of errors
Drug drops out	Nurses drop out few drops of Vancomycin IV dose before administer to the patient	19
Wrong time	Augmentin IV dose was given 2:18 hr late from prescribed time.	18
Drug given to mothers	Two nurses prepared the domperidone dose and gave it to the mother without observing	15
Preparation errors	Predinosolone tablet was crushed to be prepared a solution, nurses did not add enough quantity of water and also did not mix the content properly.	5
Wrong doses	Ceftriaxon IV 300 mg dose was given by nurses instead to 150 mg in drug chart (dose reduced by doctor in drug chart).	2

D.Risk Factors Affect Nurses' Adherence to Policy

During the observation period, some risk factors were identified that affected the nurses' adherence to the medication administration policy. Some of the logistics and administrative issues affects on the nurses' compliance to the medication administration policy give the drugs at time as prescribed by doctors. Shortage in syringe drivers, drugs arrived late to the ward either due to pharmacy or porters man. Shortage of paediatric nurses in the ward (with ratio 1 nurse to each 5 patients) is also identified as a risk factor.

E. Medication Administration Errors Rate

In total, we detected 63 MAEs during the study observation period, which giving an incidence error rate 13.8% of medication administrations (Table III).

The most frequent type of MAEs involved nurses drop out few drops of IV medications before administration, wrong time of administration and medicine being given to the mothers to administer to the child without a witness from the nurses. The other MEs detected included preparation errors and incorrect drug doses.

F. Severity of Errors

Twenty – one errors were classified as potentially harmful (21, 33%), which involved wrong drug doses administered and nurses drop out few drops of the IV drugs syringes before administration, which is a place of concern. These could have resulted in that the child patients may not receive the medication doses as prescribed. In addition, there were 2 cases the child patients have received the inhalers with poor administration technique. These could have clinical impact on the patients treatment resulted in uncontrolled symptoms and also were not a good example to mothers who were likely to have to administer drugs at home. No other potentially life-threatening errors were witnessed during our study period.

IV. DISCUSSION

This study has focused rigorously on the medication administration policy in paediatric ward and the nurses' adherence to the policy steps. As mentioned earlier, the direct observational method has been shown to be more objective and reliable than other methods for medication administration process [3]-[9] to evaluate the nurses' adherence rate to medication administration policy and MAEs rate in paediatric ward.

A. Compliance to Medication Administration Policy

According to the hospital medication administration policy, the nurses have to check a series of steps, each of which should be double checked to assure safe and accurate drug administration. There was a wide spectrum variation between nurses in their adherence to the administration steps, ranging from 1.6% to 100% adherence. The reported adherence range in this study is wider than that reported in previous study, which was from 30% to 100% of adherence [10]. This inconsistency may have resulted from the differences among nurses in their knowledge of the medication administration policy or due to inadequacy in an information clarification.

Previous studies have reported low adherence rates of nurses in the drug dose calculation and drug administration to the patients 30%, 83% respectively [11], in terms of the patient identity the adherence rate was inconsistence in different studies 17% [12], 41% [13] and 96% in recent study [10]. Our study results reported a slightly higher adherence rate to drug dose calculation and drug administration steps 35% and 87.2% respectively. The nurses' adherence rate to the patient identity step (96.2%) in our study was similar to the other previous study.

Drug dose calculation according to the hospital policy should be performed independently (which mean that each nurse should calculate the dose separately and confirm the result with another nurse). This scenario was often not visible in practice during observational period. Drug allergy step and drug expiry date were also another problem area in this study. The adherence rate to these steps was lower than other steps 1.6% and 62.7% respectively. In the drug administration record there was no specific place or task for drug or food allergy which may affect on the nurses adherence rate to this step. These findings are inconsistence with the previous study, which was conducted in children hospital in the UK [10]. The adherence rate to these steps was 93% and 95% of adherence, respectively.

B. Medication Administration Errors (MAEs)

In this study, 63 MAEs were detected at an error rate 13.8% The more frequent type of error (19 errors) was related to the little quantity of IV medications drained out before administration. The nurses in this step did not use any flush solution to check the line of the pump. So, this step needs to be clarified and state to all nurses in the policy and they should use the flush solution before each IV drug administration. Drug given to the mothers for administration without observation from nurses (15 errors), can be considered as deviation from the medication administration hospital policy rather than an actual MAEs. The MAEs rate reported in our study (13.8%) is within the range that has been reported in previous studies in paediatric patients 5–27% [5], [10], [11].

C.Study Implications

The low adherence rate of few steps involved 1.6% drug allergy, 35% drug dose calculation and 62.7% with drug expiry date steps were of most concern among other steps. Drug dosing errors were reported as the most common type of MEs in children [1], [5], [6]. In this study we only detected 2 dosing errors and this may due to that the paediatric clinical pharmacologist joined the pediatricians during the medical round and correct the mistakes before they reached the pharmacy department or the patients.

Medication administration policy need to be revised by nurses and pharmacist to be more clear, specific, reliable and realistic for nurses in their practice.

A specific intensive educational and training programme for paediatric nurses for importance of the adherence to medication administration policy (drug allergy, drug dose calculation and drug expiry date) may will improve the nurses adherence rate to the policy and that can improve the patient safety.

D.Study Limitations

This study has several limitations. It was conducted in paediatric ward only, which may not be representative of other wards in our hospital or other hospital in Saudi Arabia. As the objective of this research was to find out and evaluate the practical situation of medication administration as it is, so the presence of the observer may have had an effect on the nurses and the way that they administered medicines.

V. Conclusion

In conclusion, this study showed that there was wide variation in adherence rate to the medication administration policy among paediatric nurses. The results showed that the medication administration policy and procedure need an urgent revision to be more applicable for nurses in practice. Also, this study showed that the MAEs rate was 13.8% of drug administration. This is lower than in other studies in this field. Few logistics and administrative issues were reported as the most common contributory factors that affected the nurses' adherence to medication administration policy. Nurses' knowledge and skills regarding to the medication administration process should be improved.

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Conflict of Interest

The authors have no conflict of interest.

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