



Difficulties experienced during preparation and administration of oral drugs

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Abstract

Aim: It was aimed to determine the difficulties experienced by pediatric nurses working in the wards of a university hospital during preparation and administration of drugs and to determine solution recommendations.

Material and Methods: One hundred and eight nurses who accepted to participate in the study constituted the sample of the study. Open-ended questions were asked in order to obtain detailed information about the attitudes and views of the participants and face to face interview was used. The problems experienced during preparation and administration of drugs were collected using the data collection form prepared by the investigators. Institution approval, ethics committee approval (HEK12/193) and written informed consent from the nurses who wished to participate in the study were obtained to conduct the study. The data obtained were expressed as figures and percentages.

Results: The most commonly reported problems in preparation of drugs included incomplete dissolution of tablets or non-homogeneous distribution in fluids (54.6%) and difficulty in breaking tablets in appropriate doses (45.3%). The most commonly reported problem experienced during administration of drugs was rejection of drugs which tasted bad by babies/children or spitting out the drug (75.9%). In our study, the nurses also mentioned the problems related with drug administration equipment. These problems included fear of injectors (25.9%), escape of the drugs into the respiratory way (15.7%) and lack of appropriate equipment for administering the drugs (7.4%).

Conclusions: In our study, it was found that all nurses experienced difficulty in preparing and administering drugs. The problems experienced by the nurses and solution recommendations for these problems were reported to the hospital administration.

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Key words: Child, pediatric nursing, drugs, administration

Introduction

Preparation of drugs in a safe way and administration of these drugs to children is one of the important and risky areas in practices of pediatric nurses. Children have different physiological properties compared to adults, since they have not completed their maturation fully. This special status results in hypersensitivity against drugs and low tolerance to medical errors (1). Therefore, drug administration is one of the most worrisome positions for both hospital administrators and healthcare workers performing the administration. It is known that hospital administrators try to develop politics and methods directed to drug preparation and administration with the aim of risk management in prevention of drug errors in hospitals and to adapt these methods and politics to their systems (2).

It is thought that definition of the problems in two settings (house and hospital) where drugs are administered is important and essential to determine the difficulties experienced in drug administration practices and especially in oral administration

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and to develop solution suggestions. In this context, the study entitled "definition of practices related with oral administration of drugs in children and development of solution suggestions" was developed and it was aimed to determine the problems experienced by nurses and parents in the stage of drug preparation and administration. In this article, the part of this project which was conducted with nurses was presented. It is being planned to develop efficient risk management methods related with preparation and administration of oral drugs together with the hospital administration in the light of the data obtained from this study.

Material and Methods

The study was conducted with nurses who worked in the wards of a Children's hospital. The hospital yearly gives service to approximately 210 000 outpatients, 5 000 inpatients and 60 000 patients in the pediatric emergency department with 280 beds. A total of 234 nurses work in the hospital. During the period when the study was conducted, 144 of 167 ward nurses were working actively. 108 nurses who accepted to participate in the study constituted the sample of the study. Open-end questions were asked and face-to-face interview method was used to obtain detailed information about the attitudes and views of the participants. In collection of the data, questionnaire forms prepared by utilizing the literature were used (1,3-5). The questionnaire form included questions related with the difficulties experienced by the nurses in drug administration and descriptive properties. the questionnaire was applied to 10 nurses working in the hospital to determine the comprehensibility of the questions included in the data collection form and these nurses were kept outside the sample. In evaluation of the data, open-end questions were listed and similar answers were grouped. At this stage, views of two experts were obtained. Approval was obtained from The Hacettepe University Non-invasive Clinical Researches Ethics Committee for the study (HEK12/193). Written consent was obtained from the nurses who were willing to participate in the study. The data obtained were expressed as numbers and percentages.

Results

It was observed that 94% of the nurses who participated in the study were undergraduates and 42% had a working time of 0-60 months. The wards in which the nurses worked are listed in Table 1.

As observed in Table 2, a total of 1 838 drugs are administered in the Children's hospital a day. 884 of these drugs (48%) are oral drugs (Table 2) and half of the oral drugs can be adjusted (Table 3).

In our study, it was found that all nurses experienced difficulty during preparation and administration of drugs. The most commonly reported difficulties included incomplete dissolution of tablets, non-homogeneous distribution in fluids (54.6%) and difficulty in breaking the tablets at appropriate doses (45.3%). Other problems included preparation of drugs in a very small and restricted area (27.7%) and distraction of nurses during preparation of drugs (18.5%). The most common solution suggestions for these problems expressed by the nurses included giving suspensions to young children (54%) and preparation of very small doses by the pharmacy (40.8%) (Table 4).

When the problems experienced by the nurses during administration of drugs were examined, the most common problem was found to be rejection of drugs which tasted bad by babies/children or spitting out the drug (5.8%). Among the problems related with drug administration tools, fear of children of injectors (25.9%) and escape of drugs into the air-

Table 1. Descriptive properties of the nurses

Education level	Number	%
Undergraduate	102	94
Post graduate	2	2
Medical vocational high school	4	4
Working times		
0-60 months	45	42
61-120 months	27	25
121-180 months	23	21
180 months and above	13	12
Wards in which the nurses have worked		
Adolescent ward	7	6.5
Child intensive care unit	14	13
Ortopaedics and urology ward	8	7.5
School age child ward	11	10.1
Neurosurgery and otolaryngology ward	7	6.5
Premature baby intensive care unit	6	5.6
Bone marrow transplantation unit	6	5.6
Pediatric emergency outpatient clinic	8	7.4
Child infection ward	9	8.3
Infant infection ward	12	11.1
Video EEG unit	4	3.7
Neonatal surgery	4	3.7
Infancy ward	6	5.5
Cardiovascular surgery	6	5.5
Total	108	100

EEG: electroencephalography

Table 2. The amount of drug given in one day in the hospital

Route of drug administration	Number	%
Oral	884	48
Intravenous	724	39
Inhalation	167	9
Into the eye, ear etc.	48	3
Subcutaneously or intramuscular	15	1
Total	1838	100

Table 3. Types of oral drugs given in one day and adjustment states

Types of oral drugs	Number	%
Tablet	365	41.2
Liquid	273	30.8
Capsule	90	10.1
Powder	156	17.6
Total	884	100
Preparation of oral drugs		
Crushing of tablets in full	182	45
Crushing of tablets in half or in quarter	175	43
Opeining of capsules	49	12
Total	406	100

way because of administration of drugs by injection (15.7%) (Table 5). In addition, the nurses also reported that they experienced problems arising from parents. The nurses recommended a total of 50 solutions for administration of drugs. The most frequently reported among these included good taste of drugs (60%), giving drugs as suspension (34%) and giving drugs with sweeteners, fruit juice or foods (20%).

Discussion

Since pediatric nurses are the healthcare workers who administer drugs to children, determining the difficulties they experience in the stages of preparation and administration of drugs is very important (6).

Many drug companies prepare drugs in such a way to be appropriate for adults. Therefore, drugs are used in pediatric wards without licenced tools, approved age groups, approved doses or approved administration methods (1). When it is impossible to administer the appropriate doses for children, some drugs are transformed by nurses to forms which can be administered to children (for example, breaking tablets or dissolving tablets in fluid to obtain the desired dose). In our

study, it was found that a great majority of the drugs were given by the oral route and approximately half of the drugs were given after crushing and or opening the capsule. In the study of Akram and Mullen (3), it was found that one of 10 drugs needed adjustment and one of 10 children received drugs which were transformed into a state ready for administration. Crushing or breaking of drugs may appear to facilitate drug administration, but it may lead to intake of inadequate dose, negative effect on bioavailability and antagonistic effects (2-4, 7). In addition, the most time-consuming practice for nurses during the stage of preparation of drugs was found to be crushing, dilution and drawing the appropriate amount (3).

Another problem experienced during preparation of drugs for children is preparation of capsules. While administering these drugs, the capsules are opened, the content is dissolved in fluid and the solution is given to the child. This practice is time-consuming and may lead to potential errors and most importantly to difficulty in intake by children because of bad taste (3). In addition, some drugs should be administered only in the form of tablet or capsule; when they are crushed, dose loss may occur (4). In our study, it was found that capsules were used with a rate of 10.1% and approximately half of the drugs were transformed into a state which were ready to be used.

Children are in a very special condition in terms of medical errors because of their immature and special physiological development. Heavy work load of nurses, insufficient time management, drug orders during intensive periods, crowded areas and distractions during preparation of drugs predispose to errors of drug administration (2). In one study, it was reported that drawing of attention to another direction, distractions and work load were the most important causes of medical errors (8). It has been found that drug administration errors in children occur mostly in day time because of drawing of attention to another direction and distractions (9). In our study, 18.5% of the nurses reported that distractions during the stage of drug preparation constituted a problem for them. Distractions of nurses in order to eliminate malfunctions and problems disrupt the concentration of nurses and this leads to delayed care of patients and consumption of hospital sources (10). As a solution for preventing distractions of nurses and drug errors, establishment of drug preparation stations has been recommended. It has been reported that these drug preparation stations should be considerably sheltered and silent (10, 11). This solution process was recommended by 7.1% of the nurses in our study.

Children experience more problems when receiving oral drugs compared to adults. Studies have shown that children

Table 4. Problems experienced by nurses during preparation of oral drugs and solution suggestions for these problems (n:108)*

Problems experienced	Number	%
Lack of full dissolvment of tablets or non-homogeneous distribution of tablets in fluid	59	54.6
Difficulty in breaking tablets in appropriate doses	49	45.3
Dose loss because of breaking of tablets	35	32.4
Dose loss because of extraction of drugs inside capsules and dilution	33	30.5
Preparation of drugs in a very small and restricted area	30	27.7
Adherence of tablets to cup or injector when diluted	28	25.9
Multiple distractions of nurses during preparation of drugs	20	18.5
Difficulty in calculating small doses	18	16.6
Too much time loss because of preparation of tablets	18	16.6
Contamination while separating small pieces of tablets or capsules	10	9.2
Absence of appropriate devices for dividing drugs	10	9.2
Inability to properly administer drugs which should be given as a whole	9	8.3
Excessive drug loss because of preparation of tablets in small amount	8	7.4
Lack of a method to prepare drugs in the hospital	7	6.4
Exposure to chemotherapeutic drugs during preparation of oral chemotherapy	7	6.4
Solution suggestions (n:98)*		
Giving drugs as suspension to young children	53	54
Preparation of very small doses of drugs by pharmacy	40	40.8
Production of tablets in forms for newborns and infants	28	28.5
Providing qualified and functional crusher and breaker devices	24	24.4
Closed preparation rooms which prevent distraction	7	7.1
Development of methods related with drug preparation in hospital	5	5.1
Easily dividable forms of tablets	3	3.1

*Since more than one answer were received, the percentages were calculated over n.

usually have a negative attitude in terms of drug usage or have fear of drugs (12). These difficulties are primarily related with the taste of tablets and swallowing of tablets (13, 14). In our study, the most frequent problems experienced by the nurses during administration of drugs included rejection of drugs because of bad taste (75.9%) and difficulty in swallowing the drugs experienced by the children. Children have difficulty in taking drugs orally even if the drugs are in liquid form (15). When the literature is examined, it is observed that especially children with chronic diseases experience difficulty in swallowing tablets (14, 16, 17). There are some behavioral educations given to solve the problems experienced by children in administration of oral drugs and to make them swallow tablets. It has been reported that children take drugs more easily and treatment compliance increases with these educations (14). Kaplan et al. (18) arranged a 14-day education program related with oral drug intake and found that the children could swallow their drugs successfully at the end of this education. In addition to these educations, wrapping/encapsulation of drugs to prevent bad taste may be a solution

for the problem. However, these kinds of interventions affect the bad taste, but render swallowing of the drug difficult at the same time (4).

Sweetening drugs which is another suggestion may also have some drawbacks. One of these drawbacks is increased consumption because of like of the taste by children and the negative effect of sweeteners on the enamel (19). The ideal approach in administration of drugs in children is giving drugs in accordance with the preferences of children (5).

Not only children, but also adolescents experience problems in intake of drugs. In one study, a semi-structured interview was performed with 89 adolescents aged between 11 and 20 years. In this study, the adolescents reported that the taste and size of drugs were obstacles for them in intake of drugs, the main method used to solve this problem was breaking or dividing tablets and another method was mixing with yogurt or other fluids (13).

Table 5. Problems experienced by nurses during preparation of oral drugs and solution suggestions for these problems (n:108)*

Problems experienced	Number	%
Rejection of drugs with bad taste by infants/children or vomiting/taking out of mouth	82	75.9
Inability of children to ingest tablets/capsules	23	21.5
Inability to know how much drug is received when taken out of mouth	13	12
Difficulty in giving drug if infant/child is sleeping/agitated at drug time	17	15.4
Increased amount given when too much water is given to dilute the drug	10	9.2
Time loss because of inability of infants/children to ingest drugs	8	7.4
Rejection of tablets and capsules by infants/children with mucositis	7	6.4
Pretending as if ingesting or ingested tablets and taking them out	5	4.6
Inability to give drugs to patients with clouding of consciousness (not cooperated) or mental retardation	4	3.7
Inability to allow time for drug administration because of heavy work in clinic	3	2.7
Problems related with drug administration materials		
Fear of injectors because of giving drugs with injectors	28	25.9
Inhalation of drugs by children because of giving drugs with injectors	17	15.7
Absence of appropriate devices to give drugs	8	7.4
Problems related with parents		
Disruption of treatment when help is asked from mothers in cases of difficulty in giving drugs to infants	10	9.2
Uncertainty if drugs are given by mothers	8	7.4
Lack of support by mothers during drug administration	5	4.6
Rejection of awakening children by mothers	5	4.6
Nursing of infants by mothers soon after drug administration leading to drug interaction	4	3.7
Solution suggestions (n:50)*		
Good tasting drugs	30	60
Giving drugs as suspension	17	34
Giving drugs with sweeteners. fruit juice or foods	10	20
Giving drugs intravenously	8	16
Giving drugs by nasogastric or orogastric tubes	3	6

*Since more than one answer were received, the percentages were calculated over n.

Mixing of drugs with foods is one of the common practices performed in pediatric wards. Children experience difficulty in swallowing drugs because of large size or sour and bad taste when they are diluted. Many parents and ward nurses break capsules or tablets into pieces and mix them with yogurt or foods before giving them to children. In this way swallowing becomes easier or the bad taste is masked. In a study of Arkam and Mullen (3), it was reported that all of the nurses preferred to mix drugs with fluids rather than with foods, they were sure that the full dose was given in this way and intake of drugs was easier this way. In our study, it was observed similarly that the nurses mixed the drugs with fluids and recommended to mix drugs with foods as a solution suggestion. However, it was found that a great portion of nurses had no adequate knowledge about drug-food interactions in one study (3).

Lan et al. (1) examined the difficulties encountered by nurses in practice in their study. The most commonly expressed ones by nurses among these difficulties include lack of knowledge (61.5%), mistaking the order (53.8%) and insufficiency in calculating doses (27.9%). Similarly, difficulty in calculating small doses (16.6%) was also expressed as a problem in our study.

In one study, all nurses reported that administration of oral drugs to children required much and excessive time and this exhausted them. In addition, they reported that not all children were willing to take drugs, they spent much effort time to convince them and this time loss prevented timely administration of drugs (3). In our study, 7.4% of the nurses reported that administration of oral drugs to children caused to loss of time.

In contrast to the findings of other studies, in our study, difficulties experienced with parents in administration of oral drugs were reported by the nurses. In the direction of family-centered care, it is a desirable approach that parents stay with their children, participate in the care and prepare for care at home. However, it was observed that the mothers were expressed as an obstacle rather than a facilitator factor in administration of oral drugs in our study.

Children frequently use drugs including analgesics, antibiotics and vitamins or antipyretics after administration of vaccines even if they have no chronic disease. Considering that experiences during drug usage may affect the future attitudes of children, interventions to prevent these difficulties experienced by children gain importance. Therefore, it is important for healthcare workers and health educators to determine the knowledge, attitude, practice and beliefs of children about drugs and the problems experienced by nurses and parents during these practices. In this context, lacking information of children should be completed in educations planned for children, their questions should be answered and education should be given to eliminate their potential concerns considering the properties of their developmental period. The main source of knowledge of children related with drugs is parents and especially mothers. Therefore, if mothers have erroneous information and attitudes, this may affect the child negatively. Especially mothers are determinative in orientation and expectation of children related with drug intake (12).

In the light of the results of this study, it was observed that the nurses experienced problems in the stages of both administration and preparation of drugs. The problems experienced by the nurses and solution recommendations were communicated to the hospital administration.

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of Hacettepe University Non-interventional Clinical Researches Ethics Board.

Informed Consent: Written informed consent was obtained from nurses who participated in this study.

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