Original Article

Evaluation Nurses' Practices for Medication Administration Via Enteral Feeding Tube

Nurcan Uysal, PhD, RN
Assistant Professor, Gediz University Faculty of Health Science, Department of Fundamentals Nursing, Seyrek, Izmir, Turkey

Hatice Yildirim Sari, PhD, RN
Associate Professor, Katip Çelebi University Faculty of Health Science, Department of Pediatric Nursing, Çiğli, Izmir, Turkey

Derya Demir Gok, RN
Dr. Behcet Uz Children's Hospital, Nursing Department, Izmir, Turkey

Oznur Ozsoy Maslak
Menemen Government Hospital, Nursing Department, Izmir, Turkey

Correspondence: Nurcan Uysal, Assistant Professor, Gediz University Faculty of Health Science, Department of Fundamentals Nursing, Seyrek, Izmir, Turkey e-mail: nurcan.uysal@gediz.edu.tr uysalnurcan@gmail.com

Abstract

Background: Administering medication via enteral tube is a complex application and nursing responsibility across countries. There are a series of knowledge and skills, which nurses must possess for this application. Any mistake made by nurses during medication administration can constitute a life threat for the patient. It is necessary to use the evidence-based guidelines from the aspect of providing for patient safety in the enteral medication administrations.
Objectives: This study's objective was to evaluate nurses according to evidence-based practice recommendations for medication administrations from an enteral feeding tube.
Methodology: This descriptive research was implemented on nurses working at treatment units with beds of two state hospitals in Izmir Province. Data were obtained between May-July 2014 from 184 nurses who participated voluntarily. Based on the literature, researchers developed "The Survey for Evaluation of Nurses for Medication Administrations from a Enteral Feeding Tube" for data collection. The percentage calculation was used in data analysis.
Results: There were no enteral feeding support units nurses at the study hospitals. Of the nurses, 64.1% stated that they had not received enteral feeding training and 81.0% stated that there was no written guideline at their clinics. Of the nurses, 98.9% checked feeding tube placement before medication administration: 54.9% used the auscultation method and 27.7% used the aspiration method. Of the nurses, 70.1% opened capsule drugs, 96.2% gave tablet drugs and 79.3% gave film coated pills by crushing and diluting in water.
Conclusion: Majority of the nurses' feeding tube medication administrations did not coincide with evidence-based practice recommendations. It was proposed that enteral medication administration guidelines should be used at hospitals. According to this study, patient safety may be compromised by nurses administering medication through enteral tubes. This study highlights evidence-based guidelines should be used in the enteral medication administration.

Keywords: evidence-based practice, enteral feeding, medication administration.

Introduction

A physician determines the medicinal treatment that will be administered to a patient, but nurses are responsible for the administration of these drugs in a safe manner (Official Gazette- 8 March 2010, No. 27515). Drugs are administered

to patients by different routes. One of these route is giving the drugs enterally from a feeding tube to patients who have an enteral feeding tube attached to them. If the drugs are not given enterally in the appropriate manner, then it can be the cause of negative results for the patient. Some of these are respiratory complications, such as occlusion of the tube and reattachment of the tube, diarrhea and aspiration pneumonia, remaining in the hospital for a long period of time and moreover, it can cause mortality (Phillips & Nay 2008).

Occlusion of the feeding tube and removal and reattachment of the tube have the meaning of upsetting the comfort of the patient, morbidity and increase in cost (van den Bemt et al. 2006). Drugs given from the feeding tube can be in solid or liquid dosage forms. If there is no alternative liquid dosage form of the solid dosage form drugs or it cannot be obtained, then giving it from a feeding tube by crushing it is a method used extensively by nurses (Williams 2008, Seifert & Johnston 2005).

According to the national study results made by Seifert and Johnston (2005), in case modified release dosage forms are administered, especially by crushing routinely, then it has been determined that the ratio of tube occlusion exceeds 10%.

Furthermore, it was stated that giving the solid dosage form of drug by crushing upsets the controlled release of enteric-covered dosages, produces an initial high level of drugs in the blood and the appearance of greater side effects and is the cause of drug at a low level in the blood at the end of the dosage intervals.

As a result of crushing the enteric-covered drugs, it has been disclosed that mucosal irritation develops or that the effect of the drug is lost within the stomach fluids (van den Bemt et al. 2006).

Administering medication via enteral tube is a complex application. There are a series of knowledge and skills, which nurses must possess for this application. Some of these knowledge and skills are as follows: verifying the placement of the tube, flushing the tube, preparing and administering the drugs proposed in an appropriate manner, especially the drugs in the form of tablets and preventing and following-up the complications related to treatment (Phillips & Nay 2007, Phillips & Endacott 2011).

Any mistake made by nurses during medication administration can constitute a life threat for the patient. It is necessary to use the evidence-based guidelines from the aspect of providing for patient safety in the enteral medication administrations. According to the guideline published in 2009 by the American Society for Parenteral and Enteral Nutrition (ASPEN), liquid dosage forms of drugs should be preferred to the extent possible to be given from the enteral feeding tubes, and if absolutely necessary, then tablets should be made into the form of powder and given by diluting with 30-50 cc of sterile water, feeding should be stopped prior to medication administration, the feeding tube should be flushed with a minimum of 15 ml of sterile water and tap water should definitely not be used in flushing. Since it could be the cause of a physical-chemical interaction of more than one drug at the same time, the drugs should not be mixed and every drug should be given one by one (Bankhead et al. 2009).

According to the studies made, it was stated that a majority of the problems developing in patients fed enterally develop connected to nurses not receiving special training in this field or that was slight or insufficient (van den Bemt et al. 2006). Nurses, especially in intensive care units, apply medication administrations through enteral tubes frequently. However, it has been determined in the studies made that nurses display approaches, which do not conform to standards, when administering medication with this method (Joos et al. 2015, Guenter & Boullata 2013, Mota et al. 2010, Phillips & Endacott 2011, Idzinga, Jong, van den Bemt 2009, Heydrich, Heineck, Bueno 2009, Phillips & Nay 2008, Seifert & Johnston 2005).

Aim

The objective of this study was to evaluate according to the evidence-based practice recommendations the medication administrations of nurses from an enteral feeding tube.

Method

Design

The study was planned as a descriptive research. The study was made at two state hospitals in Izmir Province. The first hospital is a state hospital, which provides services to all age groups. The hospital has 180 beds and provides services for an average of 15,000 patients admitted and 600,000 outpatiens/annum. Whereas, the second hospital is a Children's Hospital. The Children's Hospital has a bed capacity of 371, of which 80 are in the intensive care unit. It provides services for an average of 582,216 outpatients and 18,133 patients admitted/annum. The hospital is one of the referenced hospitals in Izmir Province in the field of childhood diseases.

Sample and Participants

The nurses working in the bed treatment units at both hospitals were included in the study. Approximately 180 nurses and midwives are engaged in duties at the Adult Hospital. Approximately 120 of the nurses and midwives work in the bed treatment units. Of these nurses and midwives, 58 (48.33%) participated in the study. Approximately 400 nurses work at the Children's Hospital. Of these nurses, approximately 270 are working in the intensive care units and bed clinics. Of these nurses, 126 (46.66%) participated in the study.

A total of 184 nurses participated in the study. The ratio of participation in the study was low due to the fact that it was at the beginning of the annual leave periods of the nurses.

Data Collection Tools

Data was collected between May-July 2014. The "Sociodemographic Questionnaire Form" and "The Survey for Evaluation of Nurses for Medication Administrations from a Feeding Tube", which was developed by the researchers based on information in the literature, were used in the collection of data. A total of 26 questions were on the survey, which included administrations related to verification of the placement of the feeding tube, preparation and medication administrations and flushing of the tube before and after medication administrations.

Information was given to the nurses working in the clinics and intensive care units and the survey form was given to the nurses who volunteered to participate in the study. The nurses themselves filled out the survey forms and the researchers collected them later. The percentage calculation was used in the analysis of the data.

Ethics of the Study

Written permissions were obtained from the Non-invasive Clinic Research Studies Ethics Board of the Izmir Kâtip Çelebi University and from the hospital administrations and approval was received from the nurses by giving verbal information about the study.

Results

Characteristics of the Participants

The average age of the nurses participating in the study was 34.68±6.50 and the average years worked was 13.63±7.47. Of the nurses, 50.5% had a bachelor's degree. The demographic characteristics of the nurses have been given in Table 1.

At both hospitals where the study was made there was no enteral feeding support units/nurses. A 44.0% of the nurses said that they worked very frequently with patients fed enterally and 41.3% stated that they sometimes worked with patients fed enterally. A 64.1% of the nurses, stated that they had not received training for enteral feeding, 81.0% stated that there was no written enteral feeding guideline at their clinics and 65.8% stated that they had not read research related to the subject.

Table 1: Findings Related To The Demographic Characteristics Of The Nurses

Characteristics	**N**	**%**
Hospital		
General Hospital	126	68.5
Children's Hospital	58	31.5
Age (av.: 34.68±6.46, min: 19, max: 50)		
18-28 years of age	34	18.5
29-39 years of age	113	61.4
40-50 years of age	37	20.1
Education		
Health Vocational High School	21	11.4
Associate Degree	64	34.8
Bachelor's Degree	93	50.5
Postgraduate Education	6	3.3
Years Worked		
0-5 years	34	18.5
6-10 years	34	18.5
11-20 years	77	41.8
20 years or more	39	21.2
Clinic Worked		
Clinic with Beds	120	65.2
Intensive Care Unit	64	34.8
Total	184	100

Table 2: Nurses' Practices For Medication Administration Via Enteral Feeding Tube (n=184)

Methods	n	%
Verification of Tube Placement When The Tube Was First Placed		
Auscultation	152	82.6
pH	26	14.1
Auscultation and X-ray	6	3.3
Verification of Tube Placement Before Medication Administration		
Auscultation	101	54.9
Aspiration	51	14.5
Aspiration and auscultation	27	14.7
pH	5	2.7
Crushing Medication		
No crush	7	3.8
Crushed and diluted the drugs in tablet dosage form	177	96.2
Crushed and diluted the film covered tablets or sugar-coated pills	146	79.3
Opened the drugs in capsule dosage form	129	70.1
Flushing		
Flushed the feeding tube prior to medication administration	128	69.6
Flushed the feeding tube after the medication administration	171	92.9
Medication Administration		
Administered From The Feeding Tube One By One The Drugs	172	93.5
Administered Medications When A Break Was Given in Feeding İnterval Feeding Method	115	62.5
Administered Medications By Stopping The Feeding İf The Patient Was Fed With The Continuous Method	130	70.7

Verification of Tube Placement Before Medication Administration

Of the nurses, 82.6% stated that they verified the placement of the tube when the feeding tube was first placed on the patient with the auscultation method, pH measurement 14.1% and 3.3% stated that in addition to the auscultation method, an x-ray was taken.

When the evaluations were examined of what the nurses did prior to the enteral medication administration, it was stated that 98.9% checked the placement of the feeding tube prior to medication administration, but in checking the placement, 54.7% used auscultation, 27.5% used stomach contents aspiration, 14.5% used the aspiration and auscultation methods together and 2.7% used pH measurement (Table 2).

Crushing Medication and Dilution

When the drug preparatory stage administrations of the nurses were evaluated, 88.6% of the nurses stated that they evaluated the interactions of the drugs with each other, 87.5% stated that they crushed separately the drugs in solid dosage forms, which should be given at the same time and 83.7% stated that they diluted the drugs separately. Of the nurses, it was determined that 77.7% did not know with how much water the drug should be diluted, 48.9% used bottled water and 32.6% used sterile water for diluting drug. Of the nurses, 70.1% opened the drugs in capsule dosage form, 96.2% crushed and diluted the drugs in tablet dosage form and 79.3% crushed and diluted the film covered tablets or sugar-coated pills. Of the nurses, 57.1% stated that they

crushed the drugs in paper, 20.1% in packaging and 12.0% in metal mortars (Table 2).

Flushing

When the initiatives of the nurses prior to medication administration were evaluated, it was stated that 69.6% of the nurses flushed the feeding tube prior to medication administration, but they used different amounts of water for flushing (min.: 1 ml, max.: 60 ml). Of the nurses, 44.0% stated that they used bottled water and 31.5% stated that they used sterile water for flushing the feeding tube. Of the nurses, 92.9% stated that they flushed the feeding tube after the medication administration, 81.5% flushed the feeding tube between every drug when more than one drug was administered, but they did not use a certain amount of water (For babies, min.: 1 ml, max.: 20 ml; for children, min.: 2 ml, max. 40 ml; for adults, min.: 5 ml, max.: 60 ml) (Table 2).

Medication Administration

Of the nurses, 93.5% stated that they administered from the feeding tube one by one the drugs they crushed in the form of solid doses. Of the nurses, 62.5% stated that they administered medications when a break was given in feeding if the patient was fed with the interval feeding method and 70.7% stated that they administered medications by stopping the feeding if the patient was fed with the continuous method. However, the nurses did not administer a certain interval period before and after feeding. Of the nurses, 56.0% stated that they did not start feeding immediately after medication administration and 38.0% stated that they started feeding immediately (Table 2)

Tube Occlusion

To the question of what would you do if the patient's feeding tube occluded, 38% of the nurses responded that they would inform the physician, 25.5% that they would remove the tube and attach a new one and 9.2% that they would flush and if it did not open, then they would inform the physician.

Discussion

It was determined that the results obtained based on the announcements of the nurses were incompatible with the evidence-based practice recommendations. The auscultation method used by nurses to check the placement of the feeding tube is an unreliable method. In the study made by Turgay and Khorshid (2010) it was stated that the auscultation method is unreliable and that the pH test is more reliable. In the study by Phillips and Endacott (2011), they stated that nurses used the auscultation method most frequently with the objective of checking the placement of the nasogastric (NG) tube. The National Patient Safety Agency (NPSA) (2008) recommended that the pH value of the fluid aspirated in verifying the placement of the feeding tube should be 5.5 or lower or that an x-ray should be taken. The American Association of Critical-Care Nurses (AACN) (2009) has banned the use of the auscultation method. The Joanna Briggs Institute (2010) stated that the auscultation and aspiration methods are not reliable in verifying the placement of the NG tube.

It was determined that a majority of the nurses in our study crushed the tablets and film covered pills and opened and diluted the capsule drugs. A definite amount of water was not used in the dilution of drugs and tap water was among the liquids preferred for dilution. It was determined that the tube was not flushed before and after each medication administration, more than one drug was crushed together at the same time and given to the patient and a sufficient interval of time was not given to stop feeding for preventing a nutrient-drug interaction. These results display a similarity with the study results in the literature (Joos et al. 2015, Guenter & Boullata 2013, Phillips & Endacott 2011, Mota et al. 2010, Heydrich et al. 2009, Seifert & Johnston 2005). In the observational study made by Joos et al. (2015), it was determined that the suitable dosage forms were not selected in the medication administrations made enterally, that the feeding tube was not flushed with a minimum of 15 ml of water and that liquid drugs were not diluted. In the study made on 823 nurses by Guenter and Boullata (2013), they stated that nurses administered drugs by crushing those in a solid dosage form. Of the nurses, it was determined that 13% mixed two or more drugs, that 28% added and administered the medications to the feeding solution, that 95% stopped feeding before administering medications, that 89% flushed the tube before medication administration, that 98% flushed the tube after medication administration and that 70% used tap water in the flushing procedure. In the study made by Phillips and Endacott (2011), it was determined that almost all of the nurses crushed

and administered the solid drugs, that they flushed the tube after the medication administration with the enteral tube, but that they did not flush the tube between two drugs and before administering the medication. In the study by Mota et al. (2010), only 28.57% of the nurses working in the third level intensive care unit in Brazil were of the opinion that it is necessary not to crush the drugs in a solid dosage form, sustained-release and sublingual tablets or capsules. While 18.30% of the nurses stated that they crushed each drug separately, 32.65% stated that they administered drugs by diluting them with 20 ml water and that they flushed the tube after each drug administration, 51.0% of the nurses stated that they gave the drugs from the NG tube at the same time and with the same syringe. In the study made by Heydrich et al. (2009), it was determined that almost all of the nurses administered the solid dosage form drugs by crushing them, that 91.1% prepared and administered the drugs that would be given to the patient at the same time, that 78.3% preferred tap water for diluting the drugs and 75.0% flushed the feeding tube after medication administration. In the study made at a national scale by Seifert and Johnston (2005) it was determined that 55.2% of the nurses were of the opinion that the solid dosage form drugs could be given by crushing for patients in long-term care environments. When solid dosage form drugs are ordered, only 61.4% of the nurses use liquid dosage forms. Of the nurses, 49.1% administer more than one drug at the same time and 95.7% do not flush the tube routinely before medication administration.

According to the "Enteral Feeding Practice Recommendations" published by the American Society for Parenteral and Enteral Nutrition (ASPEN-2009):

- The auscultation method is not reliable in determining the placement of the feeding tube in adult patients, but it can be used as an auxiliary method in pediatric patients (Level of Evidence A);
- Only drugs that can be broken and crushed should be crushed and by opening compressed tablets and hard gelatin capsules, they can be administered by diluting the drug in the form of fine powder with sterile water. The amount of dilution should be determined according to the amount of drug and the condition of the patient. Drugs should be given one by one, not by mixing and liquid drugs should be preferred to the extent possible (Level of Evidence B);
- Feeding should be stopped before medication administration. According to the volume condition of the patient, the tube should be flushed with a minimum of 15 ml sterile water before and after medication administration. The amount of water for flushing in pediatric patients should be slight, if there is no restriction of liquids, then flushing should be made with a minimum of 5 ml of water (Level of Evidence A);
- The tube should be flushed with sterile water for adult and neonatal/pediatric patients before and after medication administration. The lowest amount of water should be used for neonatal and pediatric patients (Level of Evidence C); and
- Feeding should be stopped for 30 minutes or a longer period of time after medication administration for not being the cause of changes in the bioavailability of the drug (Level of Evidence A).

Conclusions

According to the results of the study, it was determined that a majority of the nurses were not trained related to medication administrations in patients fed enterally, that they did not read research studies and that there was no written guideline in the clinics. When the medication administrations by nurses from a feeding tube are evaluated according to the "Enteral Feeding Practice Recommendations" published by the American Society for Parenteral and Enteral Nutrition (ASPEN-2009), it was determined that the administrations made did not coincide with the evidence-based practice recommendations. Especially, the use of the auscultation method, which is unreliable in checking the of placement of the feeding tube, administering to patients of solid dosage forms of drugs that should not be crushed, the use of tap water in the dilution of drugs and not flushing the tube in an appropriate manner can be the cause of various complications and are putting patient safety at risk. The hospital administration is also responsible for patient safety to the extent that nurses are responsible. Consequently, the recommendations made based on the conclusions of this study are not only for nurses, but also include administrators.

According to the study conclusions, the following have been proposed as necessary:

- To organize education programmes for nurses for safe enteral medication administration,
- To prepare an enteral medication administration guideline at hospital according to the evidence-based practice recommendations,
- To follow-up the written guideline of nurses in the enteral medication administrations,
- To establish enteral feeding support units, especially at children's hospitals, and
- To ensure cooperation of physicians, nurses, pharmacists and hospital administrations in safe enteral medication administrations.

Implications

According to the results of study, patient safety may be compromised by nurses administering medication through enteral tubes. Nurse managers should be organize education programmes and the written guideline for nurses for safe enteral medication administration. This study highlights evidence-based guidelines should be used in the enteral medication administration.

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