

Original Article

PHARMACIST INTERVENTION AND PREPARATION OF MANUAL IN THE ADMINISTRATION OF DRUGS THROUGH ENTERAL FEEDING TUBE

L. INDUJA, ASLAM TA, CHITHRA S, G. ANDHUVAN*

Affiliated to PSG College of Pharmacy, Department of pharmacy practice, Coimbatore
Email: andhuvangandhi@gmail.com

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ABSTRACT

Objective: To monitor errors in current practice and prepare a manual for proper drug administration through the enteral feeding tube.

Methods: It is a prospective observational study conducted for a period of 6 mo in eight departments. The current drug administrations were monitored and checked for the errors which include crushed non crushable solid dosage forms, each drug is not prepared separately, incorrect solution used for dilution, drugs mixed with feeding formula, each drug is not administered separately, not flushed before administration of each drug, not flushed after administration of each drug and others (tablets are not crushed with proper device, motors and pestles are not cleaned frequently, spillage during crushing). Using the data, a manual was prepared and submitted to the physicians of each department.

Results: The most prominent error was found to be that the drugs were not prepared and administered separately, tube not flushed before drug administration. Uses of noncrushable tablets were high in neurology. Pantoprazole (enteric coated) and prazosin (modified release) tablets were the most commonly used noncrushable drugs.

Conclusion: The study observed the need for developing a standard protocol for drug administration through enteral feeding tube by the pharmacist along with the physician, nursing team to improve the quality of enteral therapy.

Keywords: Enteral feeding tube, Drug administration, Errors, Standard protocol

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INTRODUCTION

Enteral tube feeding (ETF) refers to the delivery of a nutritionally complete feed (containing protein or amino acids, carbohydrate, fat, water, minerals and vitamins) directly into the gut via a tube. It is the preferred method of nutrition support in patients who have a functioning gastrointestinal tract but who are unable to be fed orally. This method of delivering nutrition is also commonly used for administering medications when patients cannot swallow safely [1]. The correct administration of oral drugs to patients on enteral tube feeding presents a special challenge. The key to managing medications in enterally fed patients is to focus on prioritizing therapeutic goals [2].

Giving medications through a feeding tube can be fraught with errors that occur more often than they are recognized and reported. These mistakes are often the result of administering drugs that are incompatible with administration via a tube, of not preparing the medications properly, administering a drug using improper administration techniques. These inaccuracies can result in an occluded feeding tube, a reduced drug effect, or drug toxicity. These potential adverse outcomes can lead to patient harm or even death [3].

The enteric coated medications are designed to prevent drug dissolution in the stomach and to promote absorption in the small intestine. If the tablet is crushed and passed down the enteral feeding tube, undesirable side effects may occur. These could include stomach irritation and a decrease in drug effectiveness. Modified release medications are drugs which are intended to be released gradually over time, and often have a special coating to enable the property. If the tablet is crushed and passed down the enteral feeding tube, an increase in the expected peak plasma level may occur. The patient will be initially exposed to significantly higher-than-normal levels which will increase the chance of side effects [17].

All healthcare professionals especially clinicians and nurses should be aware of the importance of selection of drugs for enteral feed which will help to minimize or prevent the occurrence of errors. The pharmacist play a vital role in minimizing the errors by providing

educational programs including preparing evidence-based booklet and classes for case group nurses. An integrated educational program by clinical pharmacists that focus on promoting the correct administration of drugs via enteral feeding catheters significantly improve the knowledge and practice of nurses [4].

Keeping these facts in mind, this study was undertaken to assess the quality of oral drug administration in patients with enteral feeding tubes and to provide a general overview of enteral feeding tube administration, considering dosage form selection. The main aim of the study was to prepare a manual for safe administration of drugs through the enteral feeding tube. Their objective was to monitor drug administration procedure through the enteral feeding tube and to identify errors on the current practice of drug administration through the enteral feeding tube.

MATERIALS AND METHODS

This is a prospective observational study which was conducted in 8 departments (Cardiology, Gastroenterology, General medicine, General Surgery, Nephrology, Neurology, Neurosurgery, and Paediatrics) of a tertiary care teaching hospital after getting approval from an Institutional Human Ethical Committee with their approval number of 17/056. The patients were selected during the time period of February to July 2017.

Calculation of the sample size was done based upon the number of inpatients with the enteral feeding tube in each department. A total number of 646 drug administrations were monitored in 200 patients based on predetermined inclusion and exclusion criteria. All adult, pediatric and geriatric patients on enteral feeding who receive at least one oral dosage forms through enteral feeding tube were included in the study. Patients receiving nutrition alone through enteral feeding tube were excluded from the study.

A specially designed data collection form was used to enter all study required details like patient name, age, sex, inpatient number, date of admission, date of discharge, department, complaints on admission, type of tube used, drugs prescribed during treatment

Provision is given in the format to tick the type of error that occurred during drug administration procedure. The current administration procedures were monitored and analyzed to identify errors. The errors include crushed non crushable solid dosage forms, each drug is not prepared separately, incorrect solution used for dilution, drugs mixed with feeding formula, each drug is not administered separately, not flushed before administration of each drug, not flushed after administration of each drug and others (tablets are not crushed with proper device, mortars and pestles are not cleaned frequently, spillage during crushing).

The reports were analyzed, documented and then presented. The data entry and statistical analysis were done using software SPSS version 20. Later based of standard guidelines such as American Society for Parenteral and Enteral Nutrition (A. S. P. E. N.), The National Institute for Health and Care Excellence (NICE) etc. and based on observed errors a manual for the proper administration of drugs through enteral feeding tube was prepared and submitted to the physicians and nurses of each department.

RESULTS

In the study, 646 drug administrations were monitored in 200 patients. Out of total population, 67.5% constituted male and 32.5% constituted female. Majority of patients fall in the category 41-60 y (37%) followed by 61-80 y (34%), 21-40 y (17%), 81-100 y (6.5%) and 0-20 y (5%). Majority of drug administrations were observed in the Neurology department followed by General medicine, Gastroenterology and Surgery departments. Among 200 patients, 182 were receiving drugs through the nasogastric tube and 18 patients were receiving drugs through the nasojejunal tube.

A total of 205 oral drugs were observed (184-solid form, 21-liquid form). Solid dosage forms included uncoated (70%), modified (6%), enteric coated (2%) tablets, granules (3%) and capsules (19%). Liquid dosage forms included suspensions (33%), solutions (10%), elixirs

(19%) and syrups (38%). Out of 128 solid dosage forms, 55 solid dosage forms can be substituted with liquid dosage forms (fig. 1).

The most common error was found to be, not flushed before administration of each drug (99.5%), each drug not prepared separately (96.5%), not administered each drug separately (96.5%). The average number of errors in each prescription was found to be 4.69. Percentage distribution of each error is depicted in table 1. Noncrushable medications were crushed during several drug administrations and were observed to be a major error (table 2). Most of the modified release and enteric coated tablets crushed during administration are mentioned in fig; 2 and 3 respectively. Among modified release tablets Prazosin was present in a maximum number of prescriptions compared to other modified release tablets and about 79 prescriptions contained pantoprazole enteric-coated tablet. Among capsules, Aspirin+Atorvastatin capsules (EC) was found to be crushed in a maximum number of prescriptions compared to other noncrushable capsules (table 3).

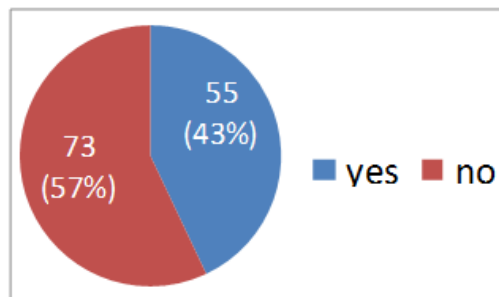


Fig. 1: Availability of alternative liquid dosage forms for solid dosage forms

Table 1: Percentage distribution of errors (n=646)

Type of errors	Number of administrations	Percentage (%)
Each drug is not prepared separately	623	96.5
Crushed noncrushable solid dosage forms	332	51.5
The Incorrect solution used for dilution	203	31.5
Drugs mixed with feeding formula	138	21.5
Not administered each drug separately	623	96.5
Not flushed before administration of each drug	643	99.5
Not flushed after administration of each drug	197	30.5
Others	377	58.5

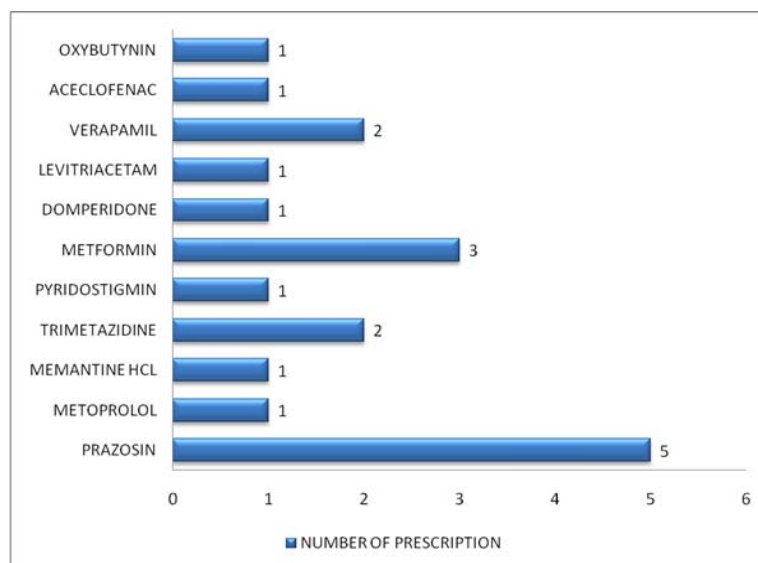
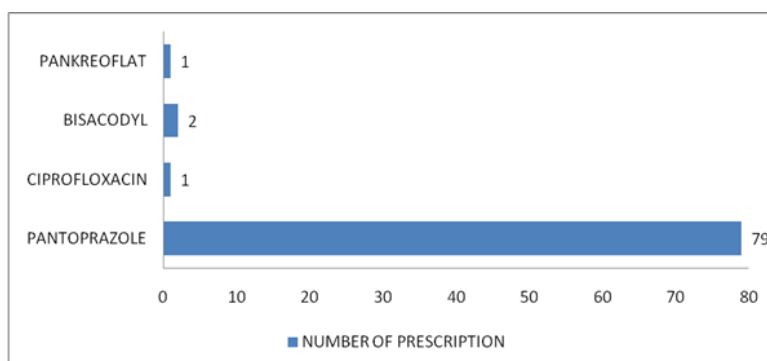


Fig. 2: Number of prescriptions with modified release tablets

Table 2: Percentage distribution of prescriptions with noncrushable solid dosage forms

Departments	N	Number of prescription		Percentage (%)	
		EC	MR	EC	MR
Neurology	96	43	20	44.7	20.8
General Medicine	33	11	7	33.3	21.2
Gastroenterology	24	12	2	50	8.3
Neurosurgery	21	9	2	42.8	9.5
Surgery	19	8	2	42.1	10.5
Cardiology	2	1	2	50	100
Pediatrics	3	0	0	0	0
Nephrology	2	2	1	100	50
Total	200	86	36		

**Fig. 3: Number of prescriptions with enteric coated tablets****Table 3: Number of prescriptions in individual noncrushable capsules**

Drugs	Number of prescriptions	Percentage (%)
Ambroxol	2	1
Aspirin+atorvastatin	4	2
Clopidogrel+aspirin	3	1.5
Esomeprazole+domperidone	2	1
Indomethacin	1	0.5
Metoprolol	1	0.5
Tamsulosin	2	1

Correlation between the number of drugs prescribed per patient and number of medication errors per patient using Pearson's correlation method was found to statistically significant at p-value of 0.000.

DISCUSSION

In our study, a total of 205 oral drugs were used of which 184 were solid dosage forms and 21 were liquid dosage forms. It was found that most of the drugs were administered in solid dosage forms and nearly 43.3% of them could be substituted by injection or oral liquid formulations, which was supported by the study of Seyed Mojtaba *et al.*, where they concluded that 41 (35.34%) out of 116 different solid drugs (except effervescent tablets and powders) could be substituted by liquid or injectable forms [18]. A study conducted by Barbosa *et al.* reported that 72.7% of studied cases were receiving solid medications, and it was possible that some of the drugs could be substituted by intravenous formulations [12].

Among the administered medicines, pantoprazole was the most frequently prescribed and had the highest percent of wrong dose preparation. Our results were contrary to most studies in Brazil where the liquid dosage form of proton pump inhibitors were used [6-8].

During the prescription analysis, it was observed that some drugs that are critical to the administration via feeding tubes were prescribed, including enteric coated tablets (in 83 patients) controlled release tablets (19 patients) which was found to be consistent with the study conducted by Presoti *et al.* where 24 patients were prescribed with controlled-release tablets [7].

Among 200 patients, 43(21.5%) patients received medications mixed with their feed. Our results were inconsistent with the study

conducted by Heydrich J *et al.* were enteral nutrition feed was stopped at the moment of drug administration in majority of the cases [12].

In our study, only 0.5% of tubes were washed before administration of a drug and 69.5% of tubes were washed after administration of drugs. A pattern similar to this has been reported in a Brazilian study [12]. Out of 50 patients with more prescribed drugs only in 4 patients the drugs were prepared and administered separately in the study of Heydrich J *et al.* [12] but in our study, nearly 100% of the patients received drugs which were not prepared and administered separately. It was found that separate preparation and administration of drugs through enteral feeding tube was not observed in 100% of the cases in this study which was inconsistent with the observations of Heydrich *et al.* study [12].

The number of drugs prescribed to the patient and the total number of errors occurred to each patient was correlated, which was found to be significant at 0.01 level, from which it can be concluded that as the number of drugs prescribed to each patient increases the risk of errors also increases.

CONCLUSION

Based on the results obtained during the study and standard guidelines, a manual for the proper administration of drugs through the enteral feeding tube was prepared and submitted the physicians and nurses of each department. The rational approach to decrease

these inappropriate practices and risks to patients with enteral feeding tubes should include an in-service training program for nursing staffs, and obtaining assistance from the pharmacy service. Close cooperation between medical teams including pharmacists, physicians, and nurses can result in correct administration of drugs through enteral catheters. The study observed the need for developing a protocol for drug administration in patients on enteral therapy along with the physician, nursing team to improve the quality of enteral therapy.

The limitation of their study was the inability to identify the osmolality and sorbitol content of the liquid dosage forms administered through the enteral feeding tube.

S. Chithra, Aslam. T. A, L. Induja were involved in designing the protocol, screening of patients, data collection and monitoring, interpretation of data, maintaining patient file and master file of the project, submission of final report to IHEC and publication. Dr. G. Andhuvan was involved in designing the protocol, interpretation of data, maintaining patient file and publication.

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AUTHORS CONTRIBUTIONS

All the author have contributed equally

CONFLICT OF INTERESTS

Declared none

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