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Evaluation of Nurses' Knowledge and Current Practice of Drug Administration in Admitted Patients with Swallowing Difficulties and Those with Feeding Tube

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Abstract:

Administering oral medication to patients with swallowing difficulties and those with enteral feeding tubes is a challenging patient care concern and surrounded by many errors. It has been found in certain researches that nurses' knowledge of correct administration of medication, knowledge of control release medication code, Knowledge of possible interactions with enteral feed or feeding tube and correct crushing of solid preparations are very low. In addition, nurses' adherence to proper drug administration through enteral feeding is questioned. This can result in medication errors, tube obstruction, reduced drug effectiveness, and increase risk of toxicity.

Methods

The research was using an ethnographic design using unstructured interview and structured observation method.

Results:

The prescriber stated the route of administration via NGT tube in the drug chart in 42 % of the prescriptions only. During the preparation of the medication to be administered by the patients, 87.5% of the prescriptions with more than one medication were crushed or opened all together by nurse. The tube was not flushed between each medicine and afterwards with at least 15ml of water in 91% of the prescriptions with more than one medication. 90% of nurse has low knowledge about the pharmaceutical dosage forms with the direct interview group. Most of the nurses stated that they can dissolve any medicine in water then administered through feeding tube. Most of Them stated that they should not wait for 30 minutes before administering medication after food. 60% of them stated that Medication should be mixed with enteral feeding formula and the Medication can be prepared and administered together with other medications through feeding tube.

Conclusion:

This study showed that nurses do not have sufficient baseline knowledge about rules of drug administration via enteral feeding tubes. However, integrated educational program by clinical pharmacists that focus on promoting correct administration of drugs via enteral feeding tube will improved knowledge and practice of nurses. A theory–practice gap was found in this study that may be related to the authority of physicians not nurses in ordering rules for medication administration through enteral tube. The pharmacist should have a role in medication administration to admitted patient especially those with swallowing difficulties. The nurse study curriculums should be revised and updated. Administrating guideline should be available. The pharmacist should have a role in medication administration to admitted patient especially those with swallowing difficulties. The nurse study curriculums should be revised and updated. Administrating guideline should be available.

Background:

Administering oral medication to patients with swallowing difficulties and those with enteral feeding tubes is a challenging patient care concern and surrounded by many errors. Improper prescribing manners and inappropriate practice extemporaneous preparation of oral suspensions given through feeding tubes may lead to considerable risk to patients. As per Hanssens et al (2006), it has been found in Qatar that nurses' knowledge of correct administration of medication was 32%, knowledge of control release medication code was 0%, Knowledge of possible interactions with enteral feed or feeding tube was 51% and correct crushing of solid preparations was 35%. Furthermore, in Spain was estimated that 44.5% of nursing staff had a deficient knowledge of proper administration techniques, 69.7% of nursing staff stated to have grinded tablet with enteric coat, and 66.2% a tablet with modified release (Chicharro et al., 2012). However, no drug company or manufacturer is responsible for failure of therapy or any side events related to such preparations. In addition, the responsible professional of prescribing (doctor), supplying (pharmacist and administering (nurse) the medicine is implicated and liable for any patient

experience of adverse or harmful events (White &Bradnam, 2007). Moreover, nurses' adherence to proper drug administration through enteral feeding is questioned. This can result in medication errors, tube obstruction, reduced drug effectiveness, and increase risk of toxicity (Bankhead et al, 2009). However, no study has been done in Oman to evaluate the current practice of drug administration through enteral feeding tubes in hospitals. Furthermore, no available guidelines in the Ministry of Health in Oman in regard to drug administration through enteral feeding tubes. It is important to ensure that the patients with swallowing difficulties and those with enteral feeding tubes are receiving safe medications. Therefore, the purpose of this study is to explore and to evaluate the knowledge and current practice of nurses regarding drug administration in patients with swallowing difficulties and those with enteral feeding tube at Rustaq Hospital.

Method:

The research used an ethnographic design using questionnaire to evaluate staff level of self-perceived knowledge of medication and practice carried on while administering medication through feeding tube. It also used structured observation method to explore the nurses' current practice of drug administration in patient with swallowing difficulties and those with tube feeding. Furthermore, a list of medications which can be use with feeding tube and their suitability was identified and created.

This study was conducted in one of the MOH, Sultanate of Oman; secondary institution (Rustaq Hospital).It evaluated the knowledge of the nurses who are working in adult medical wards, high dependency unit, surgical wards and intensive care unit (ICU) and current Practice of drug administration in admitted patients with swallowing difficulties and those with feeding tube. The wards had the most patients with swallowing difficulties are admitted.

The result of this study will help to come up with recommendations that can help to establish standard guidelines and a protocol for practical aspect of administration. The guideline will enable the nurse and other health providers to determine the correct working methods used at derivation, dilution, and administration of medicines through enteral feeding tube.

A pilot study was carried out on 5 nurses for data collection tool (questionnaire) and observational methods for three medication rounds over a period of one month. Questions were asked in a questionnaire to assess nurses' knowledge about drug administration via enteral tubes. For observational data collection tool, a checklist was used to explore the current practice of nurses related to administration of medication through enteral tube.

To identify the type of medicines, use with feeding tube and their suitability each the medicines were collected from the prescriptions of the patients with NGT tube. Each medication was studied and compared with the used reference book. Finally, the list was created and approved the research group.

Results:

We used two stages of data collection, questionnaire and the structured observation. The first stage of data collection was a questionnaire. This stage was done for 55 cases and through monkey questionnaire. The 69% (n=38) of nurse has low knowledge about the pharmaceutical dosage forms. However, we found that most of the nurses have low knowledge about medicines' formulations and the methods of administrating the different types of drug formulations (Table 1).

In addition, the knowledge of nurses was good regarding the flushing of tube before and after administrating the medicines. 78% (n=43) of the nurse stated that it is necessary to flush the feeding tube after the administration of all medications.

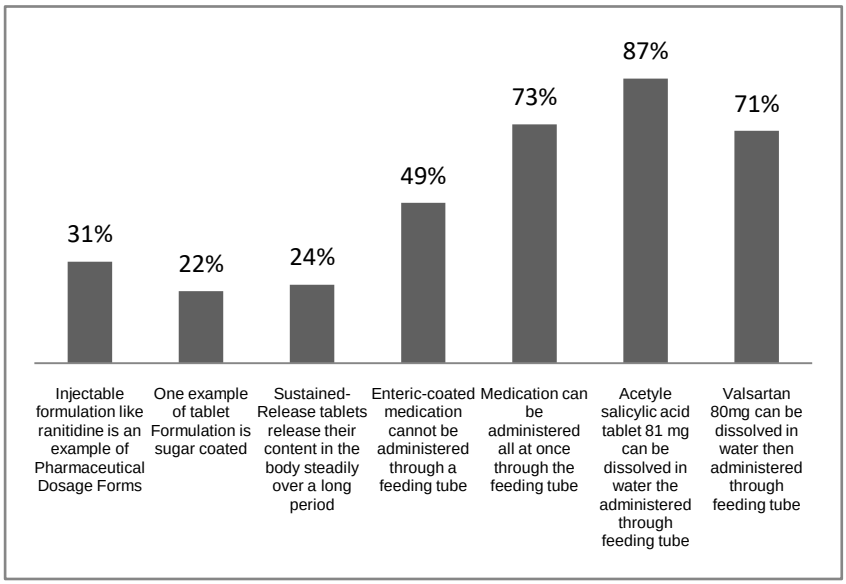
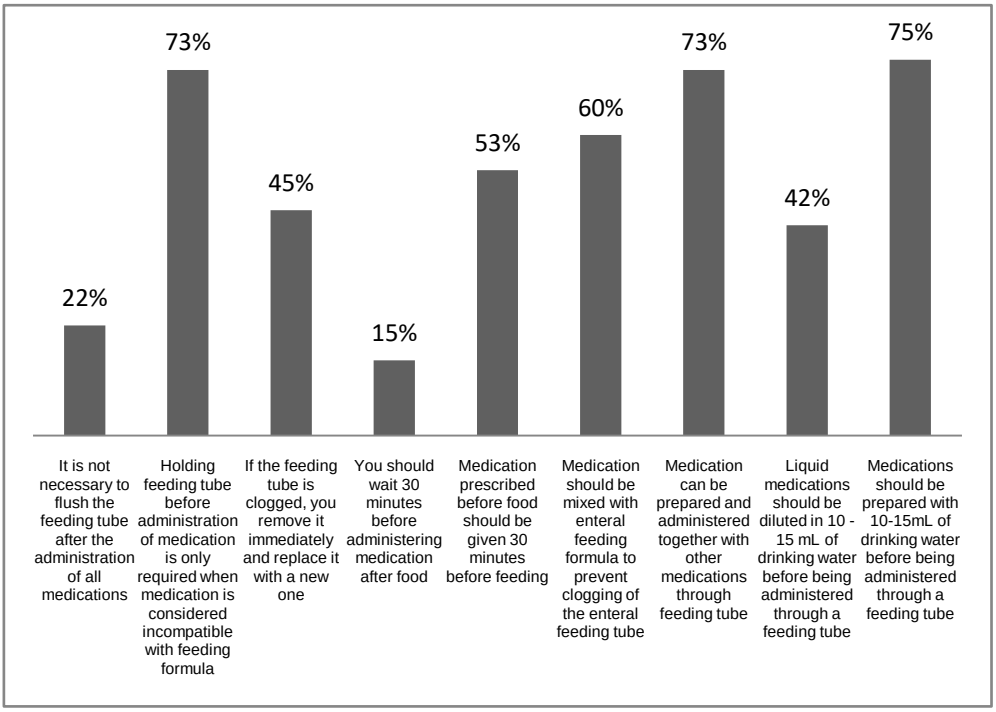


Figure-1: Illustrate percentage of the knowledge of nurses on pharmaceutical dosage forms, about medicines' formulations and the method of administrating the different types of drug of drug formulations.

73% (n=40) of the nurse stated that they should hold feeding before administration of medication is only required when medication is considered incompatible with feeding formula and *45%* (n=25) stated if the feeding tube is clogged they will remove it immediately and replace it with a new tube. Furthermore, most of the nurses stated that they can dissolve any medicine in water then be administered through feeding tube.

Most of the nurses 85% (n=47) stated that they should not wait for 30 minutes before administering medication after food. In addition, 53% (n=29) of the nurses stated that the Medication prescribed before food should be given 30 minutes before feeding. Furthermore, *60% (n=33)* of nurses stated that Medication should be mixed with feeding formula to prevent clogging of the enteral feeding tube and 73% (n=40) stated that the Medication can be prepared and administered together with other medications through feeding tube.

Figure-2: Illustrate the percentage of nurses who agreed on the statements of flushing feeding tube (before and after) and handling feeding tube, time interred between administrations and feeding, mixing drugs preparation, administration and feeding, and dilution of drug before administration.



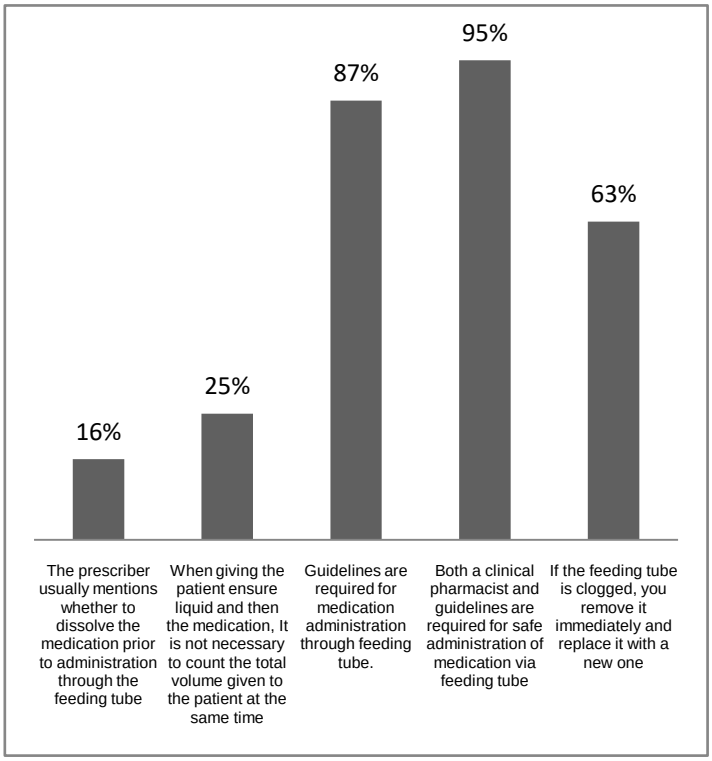


Figure-3: Illustrate the percentages of nurses who agreed on the statements of prescriber responsibility, calculating the intake volume of liquid via NGT, need for guideline, need for clinical pharmacist and nursing responsibility in administering via NGT.

Only 42% (n=23) of the nurses agreed to dilute the Liquid medications in 10 -15 mL of drinking water and 75%(n=41) agreed to prepare the solid Medications with 10-15mL of drinking water before being administered through a feeding tube.

Most of the nurse 84% (n=46) stated that the prescribers never mentioned whether to dissolve the medication prior to administration through the feeding tube or not. Furthermore, 75% (n=41) the nurses stated that It is not necessary to count the total volume given to the patient at the same time When giving the patient ensure liquid and then the medication.

In addition, most of the nurses 87% (n=48) stated that the Guidelines are required for medication administration through feeding tube. Moreover, most of the nurses 95% (n=52) stated that both of a clinical pharmacist and guidelines are required for safe administration of medication via feeding tube. The nurse is responsible for removing the tube immediately and replacing it with a new one if the feeding tube is clogged. This statement was agreed by only 63%(n=13) of the nurses

The second stage of data collection was the observation. It was done for 45 cases, 21prescriptions with single medication and 24 prescriptions with more than one medication. During the observation stage we revealed that the prescribers stated the rout of administration through NGT tube in the drug chart in only 42 % (n=19) of the prescriptions. Furthermore, only 66% (n=30) of the prescriptions contained medications which can be crushed, dispersed or opened to be administered via feeding tube. During the preparation of the medication to be administered by the patients, 87.5% (n=21) of the prescriptions with more than one medication were crushed or opened all together by staff nurse and only 12.5% (n=3) were crushed or opened separately. Furthermore, Each drug was not administered separately as a sediment-free liquidas well as the tube was not Flushed between each medicine and afterwards with at least 15ml of water in 91% (n=22) of the prescriptions of more than one medication.

In addition, the feed infusion was stopped when administrating the drug in only 64.4% (n=29) prescriptions and the tube was flushed slowly with at least 15 ml of water before start administering the medicines in 82.2% (n=37) of the prescriptions. Finally, the total volume of fluid given (including flushes) on a fluid balance chart was documented only with 17% (n=8) of the prescriptions.

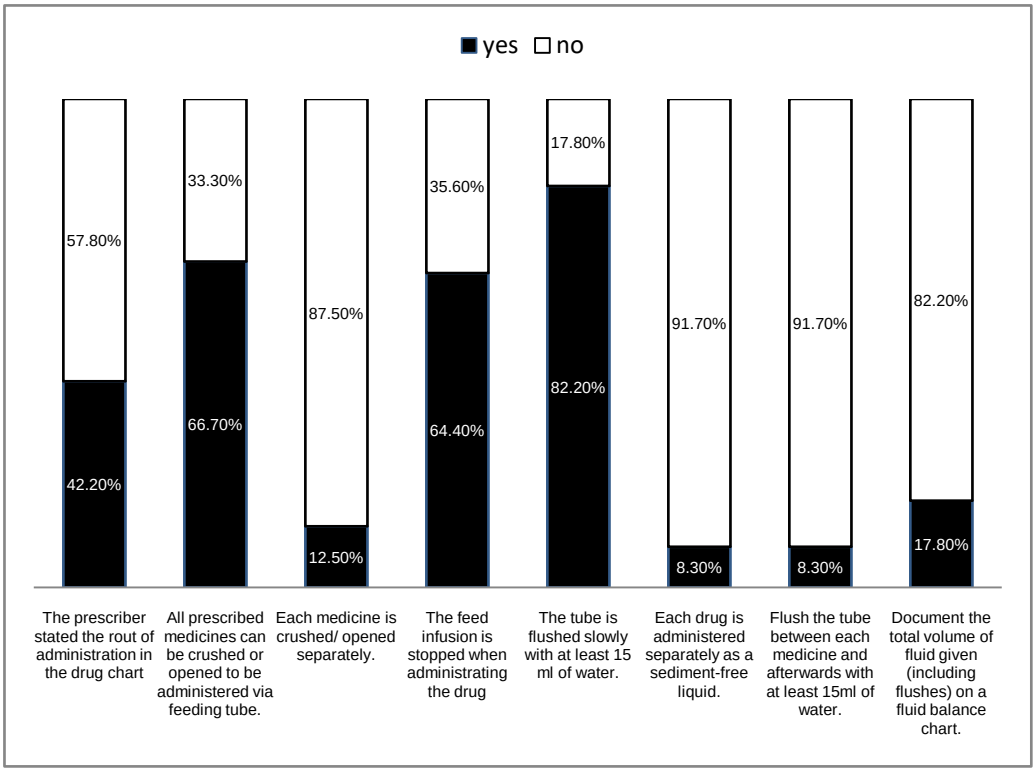


Figure 4: illustrate the result of observation stage.

Discussion

The research revealed that they are many problems related to prescribing and administering medications to patients with feeding tube exist in daily practice of nurses and doctors at Rustaq hospital. The prescribers did not state the route of administration via NGT tube in the drug chart in 58 % of the prescriptions which can be considered as a missed information and lead to serious consequences. The 100% of the participants in this research stated that the prescribers do not mention whether to dissolve the medication prior to administration through the feeding tube or not. Almost 50% of the prescriptions contained medications which cannot be crushed, dispersed or opened and the nurses were crushing or opening them together in the same mortar to be administered via feeding tube to the patients. Furthermore, the tube was not Flushed between each medicine and afterwards with at least 15ml of water in 91% (n=22) of the prescriptions with more than one medication.

Furthermore, in this research we found that all the nurses stated that they can dissolve any medicine in water then administer it through feeding tube. However, not all medications can be crushed or dissolved such as sustained released tablet and enteric coated tablets. Therefore, such information should be corrected and the pharmacist should have a role in this situation.

In addition, this research revealed that about 90% of nurses have knowledge deficit about medicines formulations and the methods of administration of the different types of drug formulations to patient of swallowing difficulties and those with feeding tube. These results were almost similar to the results found in Qatar (Hanssens et al -2006) and Spain (Chicharro et al., 2012).

In this research the nurses stated that the medication prescribed before food should be given 30 minutes before feeding. This is very important information to avoid drug & food interaction, to prevent tube obstruction and other issues.

Most of the participants in this research stated that they need a clinical pharmacist and a local guideline for medication administration through feeding tube. The current practice need to be revised and re-organised. The availability of official local guideline will help to improve the service and increase the patient safety level. Furthermore, the clinical pharmacist will act as a back-up and drug information support for other health care providers.

Limitations:

The interview approach posed a heavy demand in terms of time and availability of staff; therefore, it was required to shift data collection method to questionnaire. Most of the members of team were transferred to other institutions, which affected the work flow of research process. We did not measure any clinically relevant end points such as patient morbidity and/or mortality.

Due to researches' unavailability at the institution, the research process took very long time between data collection, analysis and dissemination. Therefore, the results may be affected by time.

Conclusion

This study showed that the nurses do not have sufficient baseline knowledge about rules of drug administration via enteral feeding tubes. However, integrated educational program by clinical pharmacists that focus on promoting correct administration of drugs via enteral feeding tube will improved knowledge and practice of nurses. A theory–practice gap was found in this study that may be related to the authority of physicians not nurses in ordering rules for medication administration through enteral tube. The pharmacist should have a role in medication administration to admitted patient especially those with swallowing difficulties. The nurse study curriculums should be revised and updated. Administrating guideline should be available.

Recommendations:

The current nursing curriculums should be revised and updated. Administrating guideline should be available. The guideline should be implemented and clinical pharmacist services should be activated. This research should be repeated in different institutions and fill the gaps which are not covered.

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Table 1: the results of interviews stage

	statements		*Monkey questioner*	
			yes	*no*
1	knowledge on pharmaceutical dosage forms	Injectable formulation like ranitidine is an example of Pharmaceutical Dosage Forms	*17 (31%)*	*38(69%)*
2	Knowledge about medicines formulations	One example of tablet Formulation is sugar coated	*12 (22%)*	*43 (78%)*
		Sustained- Release tablets release their content in the body steadily over a long period	*13 (24%)*	*42 (76%)*
		Enteric-coated medication cannot be administered through a feeding tube	*27 (49%)*	*28 (51%)*
3	The methods of administrating the different types of drug formulations	Medication can be administered all at once through the feeding tube	*40 (73%)*	*15 (27%)*
		Acetyle salicylic acid tablet 81 mg can be dissolved in water the administered through feeding tube	*48 (87%)*	*7(13%)*
		Valsartan 80mg can be dissolved in water then administered through feeding tube	*39(71%)*	*16 (29%)*
4	Flushing feeding tube (before and after) and Handling feeding tube	It is not necessary to flush the feeding tube after the administration of all medications	*12(22%)*	*43(78%)*
		Holding feeding tube before administration of medication is only required when medication is considered incompatible with feeding formula	*40(73%)*	*15(27%)*
		If the feeding tube is clogged, you remove it immediately and replace it with a new one	*25(45%)*	*30(55%)*
5	Dissolving drug formulation	Acetyl Salicylic Acid 81 mg tablet can be dissolved in water then administered through feeding tube	*48(87%)*	*7(13%)*
		Valsartan 80 mg tablet can be dissolved in water then administered through feeding tube	*51(93%)*	*4(7%)*
		Isosorbide Dinitrats 40 mg SR tablet can be dissolved in water then administered through feeding tube	*50(91%)*	*5(9%)*
		4Carbamazepine C5R 200 mg tab6let can be dissolved in wate8r then administered through feeding tube	*51(93%)*	*4(7%)*
		Theophylline SR 300 mg tablet can be dissolved in water then administered through feeding tube	*48(87%)*	*7(13%)*
		Omeprazole capsule can be dissolved in water then administered through feeding tube	*39(71%)*	*16(29%)*
6	Time interred between administrations and feeding	You should wait 30 minutes before administering medication after food	*8(15%)*	*47(85%)*
		Medication prescribed before food should be given 30 minutes before feeding	*29(53%)*	*26(47%)*
7	Mixing drugs preparation, administration & feeding	Medication should be mixed with enteral feeding formula to prevent clogging of the enteral feeding tube	*33(60%)*	*22(40%)*
		Medication can be prepared and administered together with other medications through feeding tube	*40(73%)*	*15(27%)*
8	Dilution of drugs before administration.	Liquid medications should be diluted in 10 -15 mL of drinking water before being administered through a feeding tube	*23(42%)*	*32(58%)*
		Medications should be prepared with 10-15mL of drinking water before being administered through a feeding tube	*41(75%)*	*14(25%)*
9	Prescriber responsibility.	The prescriber usually mentions whether to dissolve the medication prior to administration through the feeding tube	*9(16%)*	*46(84%)*

10	Calculating the intake volume of liquid via NGT	When giving the patient ensure liquid and then the medication, It is not necessary to count the total volume given to the patient at the same time	*14(25%)*	*41(75%)*
11	Need for guidelines medication	Guidelines are required for medication administration through feeding tube.	*48(87%)*	*7(13%)*
12	Need for clinical pharmacist	Both a clinical pharmacist and guidelines are required for safe administration of medication via feeding tube	*52(95%)*	*3(5%)*
13	Nursing responsibility in administering via NGT	If the feeding tube is clogged, you remove it immediately and replace it with a new one	*13(63%)*	*7(37%)*

Table 2: The results of observation stage

	Statements	yes	no	total	Remarks
1	The prescriber stated the rout of administration in the drug chart	19 (42.2%)	26 (57.8%)	45	
2	All prescribed medicines can be crushed or opened to be administered via feeding tube.	30 (66.7%)	15(33.3%)	45	
3	Each medicine is crushed/ opened separately.	21 prescriptions with single medication 3 (12.5%) prescriptions with more than one medication	21(87.5%)	24	24 Rx with more than one medication and 21 single medicine
4	The feed infusion is stopped when administrating the drug	29 (64.4%)	16 (35.6%)	45	
5	The tube is flushed slowly with at least 15 ml of water.	37 (82.2%)	8 (17.8%)	45	
6	Each drug is administered separately as a sediment-free liquid.	21 prescriptions with single medication 2(8.3%) prescriptions with more than one medication	22 (91.7%)	45	24 Rx with more than one medication and 21 single medicine
7	Flush the tube between each medicine and afterwards with at least 15ml of water.	21 prescriptions with single medication 2(8.3%) prescriptions with more than one medication	22 (91.7%)	24	24 Rx with more than one medication and 21 single medicine
8	Document the total volume of fluid given (including flushes) on a fluid balance chart.	8(17.8%)	37 (82.2%)	45	

Table3 : Medication for patients with swallowing Difficulties

No.	Generic Name	Trade Name	Dosage form	Can be used with feeding tube/ Not	Alternatives
Cardiovascular System					
	Acetyl salicylic Acid	Aspirin 75mg,81mg,300mg	Dispersible Tablet	Suitable for use via enteral feeding tube	
	Amiodarone	Cordarone 100mg 200mg	Tablet	Tablet can be crushed Tablets do not disperse well but can be crushed and mixed with water to form suspension, an extemporaneous formulation can be made (Contact Pharmacy) Injection cannot be administered via a feeding tube.(irritant)	In the acute setting the parenteral route can be used
	Amlodipine	Istin, Norton 5mg, 10mg	Tablet	Tablet can be crushed Either the tablets dispersed in water or the extemporaneous suspension can be used.	Non
	Atenolol	Tenormin 25mg 50mg 100mg	Film-coated Tablet	Either the tablets dispersed in water or the Extemporaneous suspension can be used (contact pharmacy) No specific data on enteral tube administration are available Do not disperse readily in water, Film coat may clog tube	Parenteral route if available syrup
	Atorvastatin	Lipitor 20mg,40mg,80mg	Film coated Tablet	Disperse the tablet in water and immediately administer via feeding tube	Non
	Bisoprolol	Cardicor (Merck Serono)	Film-coated tablet	Cardicor tablets are film-coated and scored but can be crushed if necessary. Tablets disintegrate rapidly in 10 mL of water to form a fine suspension that flushes down an 8Fr NG tube without blockage.	Use the oral solution if available, it may need to be diluted with water immediately prior to administration to decrease the resistance to flushing. • Otherwise disperse tablets in water (preferably Merck or Lederle brand) immediately prior to administration. • A prolonged break in feeding is not required.

	Captopril	Capoten	Tablet	Tablet can be crushed Is freely soluble in cold water	
	Carvedilol	12.5mg 25mg	Tablet	Can be crushed. The tablets should be crushed immediately before administration. The tablets will not dissolve in water but will form a suspension of small particle size. The tablets will disperse in 10 ml of water if shaken for 5 minutes; the resulting dispersion has visible particles.	Other Beta-Blockers
	Cilazapril	2.5mg	Film-Coated Tablet	Limit data available, consider changing to alternative	Other ACE Inhibitors
	Clopidogrel	Plavix 75mg	Film-coated tablet	The tablets can be crushed and mixed with water and flushed down a feeding tube.	Non
	Digoxin	Lanoxin 62.5microgram 125 microgram	Tablet	No specific data on enteral tube administration are available for this formulation.	Digoxin Liquid Parenteral route (the dose reduction of 33% when changing from oral to IV route)
	Diltiazem	Tildiem 60mg	Tablet	Tablet may be crushed	Other Calcium-Channel Blockers
	Enalapril	2.5mg, 5mg	tablet	Tablets can be crushed / suspended and administered via feeding tube	Other ACE inhibitors
	Frusemide	Lasix 40mg	Tablet	No specific data on enteral tube administration are available for this formulation.	Use a liquid preparation. Flush the tube with water prior to administration Parenteral route
	Fluvastatin	Lescol 20mg 40mg	Hard gelatin capsules	Capsules can be opened. The powder pours easily from the capsule and mixes readily with 10ml of water to form a pale yellow, milky dispersion that that flushes easily down a feeding tube 80mg MR tablet not suitable for administration via feeding tube.	
	Hydralazine	Apresoline 25mg 50mg	Sugar-coated Tablet	No specific data on enteral tube administration are available for this formulation	Parenteral route Consider changing therapy
	Isosorbide dinitrate	Isordil 10mg	Tablet	Crushing the tablet is not recommended Modified- release 40mg tablet not suitable for crushing and unsuitable for administration via enteral feeding tube.	
	Labetalol	Trandate 100mg	Film-coated Tablet	The tablets should not crush for administration via a feeding tube.	Injection can be given orally but has a bitter

				Tablets do not disperse in water. Adequate time must be allowed for the coating to dissolve. The resulting suspension can be administered via feeding tube. Extemporaneous suspension can be made.	taste, which can be masked using fruit juice.
	Lisinopril	Zestril 5mg 10mg	Tablet	Tablets disperse in 10ml of water within 2 minutes to give a very fine dispersion that flush easily via a feeding tube.	
	Metolazone	Metenix 5mg	Tablet	Tablets do not disperse readily, but will disintegrate if shaken in 10ml of water for 5 minutes.	Other diuretics
	Nifedipine	Adalat retard 20mg	Modified-Release tablet	Tablets should not be crushed and are unsuitable for enteral tube administration. Adalat retard tablets can be crushed and disperse in water and must be given immediately. Dose adjustment is needed.	
	Pravastatin	Lipostat 20mg	Uncoated tablets	Disperse tablet in water immediately before administration	
	propranolol	Inderal 10mg 40mg	Tablet	Tablet can be crushed. Tablets are very slow to disperse in water; 10mg tablet takes 5 minutes to disperse in 10ml water when shaken continuously.	Parenteral route
	Simvastatin	Zocor	Film-coated Tablet	Crush the tablets and mix or dispersed in 10 ml of water	
	Spironolactone	Aldactone 25mg 100mg	Tablet	Tablets can be crushed and dispersed in water and shaken for 2-5 minutes immediately prior to administration	
	Valsartan	Diovan 80mg	Hard gelatin Capsule	Capsules can be opened; the white granules contents pour easily and disperse well in 10ml of water. granules settle quickly, but the dispersion draws into the syringe and flushes down tube without blockage.	
	Warfarin	1mg 2mg 5mg	Tablet	Tablets can be crushed and suspended in water. Disperse the tablets in water immediately prior to administration.	Heparin parenteral anticoagulant
Endocrine system					
	Carbimazole	Neo-Mercazole 5mg 20mg	Tablet	The tablets can be crushed and dispersed in a suitable suspending agent, e.g. methylcellulose. Tablets will disperse in 10ml of water if shaken vigorously for 5 minutes. Immediately prior to use.	Non
	Glibenclamide	Daonil 5mg	Tablet	Caution because of the unknown effect of crushing tablet on efficacy. Tablets disperse in water within 5 minutes to give a very fine dispersion that flush down on feeding tube.	

	Gliclazide	Diamicron 80mg	Tablet	Tablets can be crushed and dispersed in water immediately prior to administration. M/R tablets should not be crushed.	
	Glimepiride	Amaryl 1mg 2mg	Tablet	Tablets disperse within 5minutes when placed in 10ml of water, to form a very fine dispersion that flushes down a feeding tube.	
	Metformin	Glucophage 500mg	Film-coated Tablet	Can be crushed Tablets do not disperse well in water, but do crush easily and disperse well in water to form a fine suspension that flush easily via feeding tube	
	Levothyroxine (Actavis, Amdipharm, Teva, Wockhardt)	Tablet 25 micrograms, 50 micrograms, 100 micrograms		Tablets can be crushed.2 Care should be taken to avoid third-party contact.3 Tablets disperse in 10 mL of water if shaken for 3–5 minutes to give a fine dispersion that flushes via an 8Fr NG tube without blockage	*Extemporaneous levothyroxine suspension 25 micrograms/mL:* Levothyroxine tablets 100 mcg: 30 tablets Glycerol: 48 mL Sterile water for irrigation to 120 mL Label 'Shake well before use'. Store in refrigerator; 8-day expiry.
Gastrointestinal Tract					
	Bisacodyl	Dulcolax 5mg	Enteric-coated Tablet	Do not crush	Other laxative
	Hyoscine Butylbromide	Buscopan 10mg	Sugar-Coated Tablet	Tablet may be crushed but are sugar-coated Soluble 1:1 in water Injection can be given orally	Parenteral formulation can be given IV or IM
	Ispaghula Husk	fybogel	Granules 3.5g/sachet	Not recommended for use via the feeding tube owing the risk of blockage as the suspending agent begins to thicken	
	Lactulose	Duphlac	Syrup	Lactulose liquid is sticky and may need to be diluted with water. Dilution with 2-3 times the volume of water produces a solution that can be flushed down the tube.	
	Metoclopramide	Primperan 10mg	Tablet	Tablets can be crushed	Parenteral route
	Omeprazole	-Losec -Omapro	-Hard gelatin -Capsule with Enteric coated granules	Capsule contents must not be crushed. The Extemporaneous preparation should be used	Parenteral route

	Ranitidine	Zantac 150mg 300mg	Tablet	Tablets do not disperse readily in water.	Injection 25mg/ml (GSK) can be administered enterally Liquid preparation
Neuromuscular system					
	Carbamazepine	Tegretol 200mg	Tablet	Tablets disintegrate rapidly when placed in 10 ml of water to give a coarse dispersion; this draws up easily into a syringe but the risk of blocking a fine-bore tube. The modified-release preparation do not crush.	The sugar-free liquid contains sorbitol. There are data to suggest that the liquid preparation may adsorb onto tube and reduce the dose administration. Diluting with equal volume of water immediately prior to administration appears to prevent this. Doses above 800mg/day may cause bloating due to the sorbitol content of the liquid.
	Haloperidol	Tablets 1.5mg, 5mg		No specific data on enteral tube administration are available for this preparation	• Use the oral liquids; all brands are oral solutions and do not require further dilution prior to administration. • A prolonged break in feeding is not required. Injection is available for intravenous or intramuscular use. Following intramuscular administration of 2 mg, peak plasma concentrations were similar to oral administration but were reached after 20

					minutes.6
	Lamotrigine	Lamictal 5mg 50mg	Dispersible tablets	The tablet should be dispersed in a minimal amount of water and taken immediately. Tablets disintegrate rapidly when placed in 10ml of water	
	Levetiracetam	Keppra 500mg	Fil-Coated Tablet	Tablets are immediate-release and therefore may be crushed and sprinkled on food or given via enteral feeding tube.	Use liquid preparation
	Phenytoin	Epanutin 50mg 100mg	Capsule	The powder can be poured from the capsules and mixed with 10ml of water. The powder does not mix initially but if left for 5 minutes and then stirred it forms a fine dispersion.	Suspension can be used. Convert the dose from the usual preparation using the formula: 100mg phenytoin sodium=90mg of phenytoin base
	Pyridostigmine	Mistinon 60mg	Tablet 60mg	Crush tablets using a crushing syringe (or suitable alternative device) and suspend in at least 10 mL of water. Pyridostigmine (as bromide). Tablets can be halved or quartered to administer paediatric doses. Pyridostigmine bromide is highly soluble in water (>1 in 1). Pyridostigmine bromide tablets do not disperse well in water and give a coarse dispersion that may block fine-bore feeding tubes; however, the tablets crush to a fine powder which suspends in water to give an even dispersion which flushes via an 8Fr NG tube without blockage. Contains lactose.	Pyridostigmine bromide is not available via any other route. Neostigmine is available for parenteral use but has more muscarinic side-effects and a shorter duration of action.
	Sodium valproate	Depakin 200mg 500mg	Enteric-coated Tablet	Do not crush	Use the liquid preparation and dilute with water immediately prior to administration
Pain Killer					
	Diclofenac	Olfen 50mg 100mg	Modified release Enteric-coated Capule/Tablet	Do not crush	Parenteral Route
	Ibuprofen	Brufen 400mg	Sugar-Coated Tablet	Tablet should not be crushed.	Use liquid preparation; dilute with an equal volume of water immediately prior to administration where possible.

	Mefenamic Acid	Ponstan 500mg	Tablet	No specific data on enteral tube administration are available for this formulation	Consider changing to an alternative NSAID if clinically appropriate
	Paracetamol	Panadol	Tablet	Use Tablets dispersed in 50ml water.	Liquid formulation Suppositories injection
Other					
	Alfacalcidol	One-Alpha (Leo) 250 ng, 500ng, 1 microgram	Soft gelatin capsule	The company does not recommend opening the capsules owing to the risk of administration an incomplete dose Injection can be administered orally or via a feeding tube	Oral Drops (2microgram/ml) 1 drop =100 nanogram (put the required number of drops into a medicine pot and add a small amount of water (e.g.10ml)) Parenteral route (2microgram/ml)
	Ascorbic Acid	100mg 500mg	Chewable tablets	No specific data on enteral tube administration available for this formulation	Effervescent tablet can be used for enteral tube feeding Parenteral formulation can be used in acute situations.
	Bromocriptine	Parlodel 1mg 2.5mg	Scored tablet Hard Gelatin Capsules	Disperse tablet In water or open capsules and disperse contents in water immediately prior to administration	Non
	Calcium		Effervescent Tablet (Cacit-calcium Citrate) Chewable tablet (calcium Carbonate)	Tablet effervesces and dissolves in 30-50ml of water. Can be administering via a feeding tube, once dissolved. The chewable no specific data on enteral tube administration are available	Parenteral route can be used NOTE: calcium may bind to phosphate in the enteral feed
	Calcium resonium		powder	When mix with water, the resulting pastes are too thick to administer via feeding tube. The rectal route should be used Oral adult dose15g/ Rectal adult dose 30g	Rectal route
	Calcium with Vit-D		Chewable tablet	no specific data on enteral tube administration are available	Parenteral route Use the effervescent granules; dissolve in 30-50 ml of water.
	Fluconazole	Diflucan	Capsules	If the suspension is not available , the capsules can be	Suspension should be

		50mg		opened and washed down the tube with plenty of water	used and the tube flushed well with water after the dose. Parenteral Route
	Ferrous sulphate	200mg	Sugar-Coated Tablet	Tablet should not be crushed.	Use a liquid preparation. The viscosity may necessitate dilution of the dose with water immediately prior to administration. Parenteral route
	Folic Acid	5mg	Tablet	No specific data on enteral tube administration are available for this formulation	Liquid preparation
	Ferrous Sulphate and folic Acid	Fefol Ironic	Capsules	The content should not be crushed Specially formulated for sustained release over a period of several hours	Liquid preparation of each product.

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