Appropriateness of medication administration via nasogastric tube in the general wards at Livingstone Tertiary Hospital

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Introduction

Administration of medication via nasogastric tube (NGT) offers an alternative in patients who are unable to swallow oral solid or liquid dosage forms safely.[1] Pharmacists have a deep understanding and knowledge base in terms of pharmaceutical formulations and are therefore key role-players when it comes to assessing the appropriateness of medication selection for NGT administration. The challenges identified in a state hospital setting include the lack of a multi-disciplinary approach when it comes to administration of medication via NGT, the restriction by a medication formulary, and the lack of data and practice guidelines on this topic.

During clinical ward rounds in the general wards of Livingstone Tertiary Hospital, a significant number of medication errors in patients receiving medication through nasogastric tubing were identified. Common problems identified included incorrect dosage forms prescribed and nursing staff having inadequate knowledge on appropriate manipulation techniques. As a result, a study assessing the appropriateness of medication selection for NGT administration together with an evaluation of nurses' knowledge and practices in this regard was necessary.

Methods

The study comprised of two phases and was performed within the general wards of Livingstone Tertiary Hospital. Phase 1 focussed on evaluating prescription charts of patients receiving their medication via NGT in order to assess whether prescribing errors were present and to identify challenges faced by prescribers when needing to select medications and dosage forms for NGT administration. A total number of 60 prescription charts of adult patients (over the age of 18 years) receiving their medication via NGT were assessed through a data collection tool between March and September 2018. Patients admitted to the intensive care unit (ICU), high care ward and oncology units were excluded from the study, as they were expected to be more highly controlled and specialised environments and the patients more closely monitored.

Phase 2 of the study focussed on assessing nurses' knowledge and practices with regards to this topic. A convenience sample of 20 registered nurses working within the general wards of the hospital were interviewed through structured questionnaire surveys. Phase 2 was conducted between June and July 2018. Approval to conduct the study was granted by hospital management.

Results and discussion

A total number of 60 prescription charts of patients receiving their medication via NGT were evaluated in Phase 1. However, because the activity of manipulating formulations for administration via NGT is an unlicensed activity in most instances,[2] finding sufficient, relevant data to assess the appropriateness and safety of manipulating each of the dosage forms proved to be a major challenge. As a result of the vast grey area in terms of literature, two groups of dosage forms were identified. These groups are presented in Table I. Out of the 60 prescription charts assessed, it was found that 17 (28.3%) included one medicine listed in Group 1. Four (6.7%) of the prescription charts were found to have two or more medicines listed in Group 1. More than a third (35.0%) of the prescriptions included at least one medicine that could be considered cause for concern as the crushing/manipulation of that medicine could lead to problems such as inactivity of the drug, inappropriate doses received and toxicity, which may even be fatal.[3] Thirty-four (56.7%) of the prescription charts were noted to have at least one medicine listed in Group 2, whereas 5 (8.3%) had two or more medicines listed in Group 2. It is apparent from these results that a substantial proportion of medications prescribed are tablets which have a non-functional film coating. There is no data available on the PIs of these medications which gives any information of the effect of manipulating these dosage forms prior to administration. There is therefore a great need for studies to be undertaken in this particular area, in order to assess the effects of manipulating such dosage forms. At the very least, there may be challenges with palatability, if not with bioavailability.

The proton pump inhibitors (PPIs) accounted for 10 (50%) of the interventions made. PPIs are acid-labile, lipophilic, weak bases.[4] For this reason, they are formulated as delayed-release capsules containing enteric coated granules of the active drug.[4] Therefore, by crushing these granules, the active ingredient is exposed to the highly acidic stomach environment and becomes inactivated.[4] An alternative formulation recommended for these patients was the omeprazole

Table I: Categorisation of medication dosage forms	
Group 1: Dosage forms in which the professional information (PI) strictly specifies that they should not be crushed	**Notes**
Potassium Chloride (Ultipot K®)	Slow release, film coated tablet. Crushing of this dosage form may lead to oesophageal/gastric ulceration and/or gastric irritation. PI specifically states that tablets should not be broken or chewed before swallowing (must be swallowed whole).
Omeprazole (Nozer®) / Lansoprazole (Lansoloc®)	Enteric coated granules contained within capsules. PIs specify that these granules should not be chewed or crushed.
Sodium Valproate (Epilim CR®)	Film coated, controlled release formulation. PI specifies that tablets should be taken whole.
Tenofovir/Emtricitabine/Efavirenz (fixed-dose combination; FDC) (Tribuss®/Atroiza®)	Film-coated, PI specifies that tablets should be taken whole.
Lopinavir/ritonavir (Alluvia ®)	Film-coated. PI specifies that tablets should not be chewed, crushed or broken.
Group 2: Dosage forms with PIs that do not specify information about crushing	**Notes**
Simvastatin (Austell Simvastatin®)	Film-coated. No information in PI specifying that tablet should not be broken/crushed/chewed.
Rifampicin/Isoniazid/Pyrazinamide/Ethambutol (FDC) (Rifafour®)	Film-coated. No information in PI specifying that tablet should not be broken/crushed/chewed.
Rifampicin/Isoniazid (FDC) (Rifinah ®)	Film-coated. No information in PI specifying that tablet should not be broken/crushed/chewed.
Zidovudine/Lamivudine (Zovilam®)	Film-coated. Has score lines. No information in PI specifying that tablet should not be broken/crushed/chewed.
Ethambutol (Dyna Ethambutol®)	Film-coated. No information in PI specifying that tablet should not be broken/crushed/chewed.
Magnesium Chloride (Ultimag®)	Film-coated. No information in PI specifying that tablet should not be broken/crushed/chewed.
Clopidogrel (Clopidogrel 75 Biotech®)	Film-coated. No information in PI specifying that tablet should not be broken/crushed/chewed.

MUPS (Multiple Unit Pellet System) formulation which can easily be dispersed in water and administered via NGT.[5]

Six of the interventions (30%) involved slow-release potassium chloride tablets (Ultipot K®). According to the United States Food and Drug Administration (FDA), gastro-intestinal (GI) bleeding and ulceration have frequently been reported in patients treated with crushed slow-release potassium chloride tablets, thus the syrup formulation is preferable.[6] For all of the patients for which interventions were made, potassium chloride solution (250 mg/5 ml) was recommended as an alternative.

Four (20%) of the total number of interventions made involved sodium valproate controlled release tablets. Crushing this formulation can lead to a phenomenon known as "dose dumping" that can lead to toxicity which may even be fatal.[7] For all of these interventions, the formulation was changed to the sodium valproate syrup formulation (200 mg/5 ml).

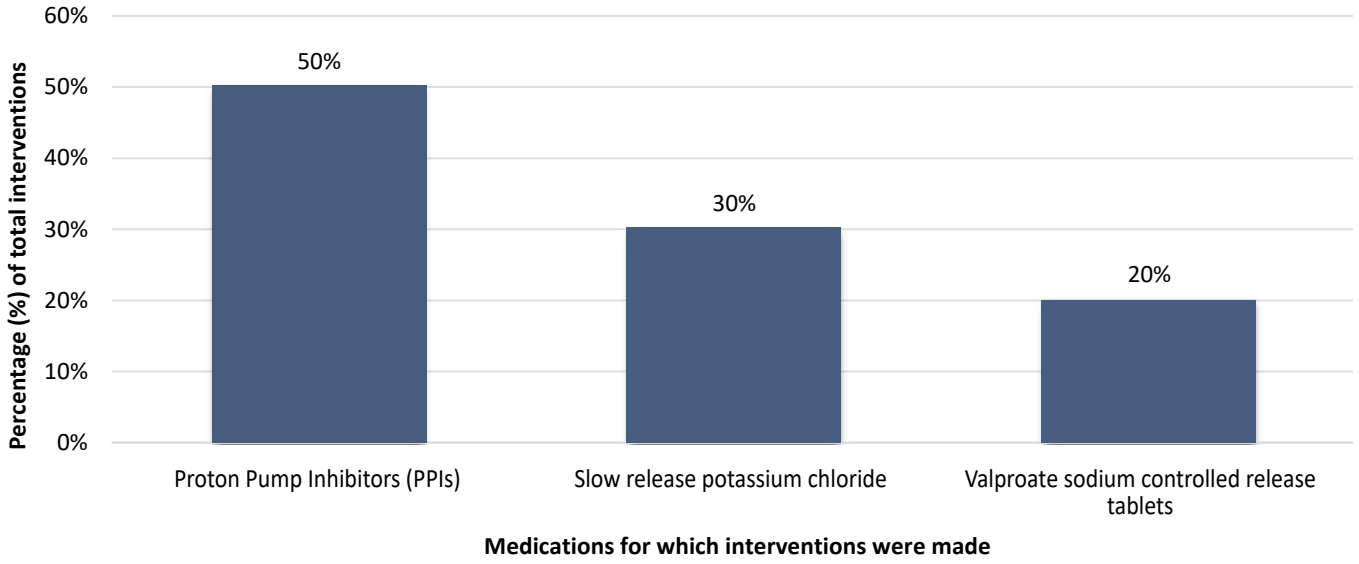

Figure I: Distribution of medicines for which interventions were made

In Phase 2, a total number of 20 registered nurses, permanently employed at Livingstone Tertiary Hospital, were interviewed over a five-week period. Two nurses from each of the general wards of the hospital were included in the study. Table II depicts the results derived from some of the key questions asked during the interview process.

The results obtained from the questionnaires showed that there is poor awareness and understanding concerning medication administration via NGT on the part of nursing staff. This can be attributed to the lack of guidelines available to nursing staff on this topic and the lack of involvement of pharmacists in performing educational interventions.

Along with the significant lack in resources available to address the topic of medication administration via NGT, the questionnaire results also showed significant problems and areas of concern relating to the practical aspects of medication administration via NGT.

Infection control through proper hand hygiene is critical to minimise the spread of infections and to reduce the chances of patients contracting nosocomial infections. Hand washing and proper hand hygiene is therefore essential when crushing and administering medications to patients via NGT. Only 7 (35%) agreed that it was always necessary to disinfect the hands or wear gloves. A startling 50% (n = 10) of nurses reported that although it is necessary to disinfect the hands or wear gloves when needing to crush tablets for example, it was not always possible due to time constraints. A noteworthy proportion (15%, n = 3) of nurses had reported that they did not believe that it is necessary to wash their hands or wear gloves prior to crushing medication for administration via NGT. This is another cause for concern which shows that more emphasis is needed to outline the potential risks and consequences this may have.

Based on the findings of Phase 2 of the study, two major interventions were carried out. Firstly, a guideline, aimed at nursing staff and addressing the basics of medication administration via NGT, was designed for implementation at the hospital. Secondly, interactive training sessions with nursing staff on medication administration via NGT, which were based on the guideline, were offered.

Based on this study, the following recommendations were developed:

- A pharmacist should perform a full medication review and advise on the most suitable dosage forms before a patient starts to receive medication via NGT.

Table II: Data derived from questionnaires concerning professional nurses' knowledge base and practices relating to medication administration via NGT

Questions	Percentage (%)	Number of respondents (n)
1) Do you feel confident about your knowledge regarding medications which should/should not be crushed for administration via NGT:		
Yes, I'm very confident	5	1
I know of very few such medications	20	4
No, I am in need of more guidance/training	75	15
2) Have you ever crushed an enteric coated tablet (i.e.: a tablet that has a film coating surrounding it, which protects it from releasing the contents into the stomach acid) or a modified release tablet for NGT administration, e.g.: sodium valproate (Epilim CR®, Slow K®)?		
Yes, very often	65	13
Yes, a few times	15	3
No, never	10	2
I'm often unsure about what type of tablet it is that I am administering	10	2
3) Is there any standard operating procedure (SOP) or guideline that is relevant to this hospital, which you can consult for more information on drug administration via NGT?		
Yes	0	0
No	70	14
I'm not sure	30	6
4) When in doubt with regards to medication administration via NGT, whom do you consult?		
Co-workers	10	2
Doctors/prescribers	10	2
Pharmacists	75	15
Guidelines	0	0
I am usually unsure as to where it would be best to seek information/assistance	5	1
5) Have you ever been offered a course/workshop or received any guidance on medication administration via NGT at this institution?		
No	100	20
Yes	0	0
6) Are you hoping to get guidance from pharmacists with regards to medication administration via NGT through a written protocol or an information session(s) for example?		
Yes, it will really improve my practice	100	20
No, I am not in need of any guidance	0	0

- More extensive practical workshops/training and information sessions to all nursing staff with regards to medication administration via NGT should be implemented.
- The hospital management should also ensure that each ward is equipped with the basic equipment, i.e.: mortar, pestle, syringes, which are to be used solely for crushing medication that needs to be administered via NGT.
- Prescribers should clearly note on prescription charts when the medication is intended for administration via NGT. Pharmacy staff may not always see the patient face-to-face, thus, when files are sent to the pharmacy for dispensing without adequate notes or indication that the patient is receiving medication via NGT, it becomes difficult to identify inappropriate dosage forms.
- There is also a great need for more studies to be performed in the South African setting on this particular topic, and a dire need for a detailed, comprehensive hospital-wide protocol developed through a multi-disciplinary effort, in collaboration with other state hospitals, to help overcome the various challenges faced with regards to medication administration via NGT.

Conclusion

The two-phased study conducted at Livingstone Tertiary Hospital has highlighted various pitfalls and gaps in nurses' knowledge and practice with regards to medication administration via NGT.

Overall, the study indicated poor awareness concerning medication administration via NGT on the part of prescribers and nurses. This prompted the design of the basic guideline and information session for nursing staff on this topic, in order to help improve knowledge and practice.

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