Medication management of patients with nasogastric (NG), percutaneous endoscopic gastrostomy (PEG), or other enteral feeding tubes

Guidelines

summarising clinical guidelines for primary care

MGP Ltd identified a need for clinical guidance in this area and approached Rosemont Pharmaceuticals Ltd for an educational grant to support the development of a working party guideline.

This working party guideline was developed by MGP, the publisher of *Guidelines,* and the working party group chair and members were chosen and convened by them. The content is independent of and not influenced by Rosemont Pharmaceuticals Ltd who checked the final document for technical accuracy only.

0.5 CPD CREDITS

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Medication management of patients with nasogastric (NG), percutaneous gastrostomy (PEG), or other enteral feeding tubes

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Introduction

Patients with long-term conditions requiring feeding tubes, such as advanced dementia[1], head and neck cancers[2], neurological disorders[3], or stroke[4], for example, are frequently managed in the community and looked after by primary care clinicians. As populations age and people become more frail and their conditions more complex, the use of enteral tubes within primary care is becoming more common.

Elderly patients with swallowing difficulties are increasingly being discharged from hospital to be cared for at home and in the community. Increasing numbers of patients receiving home enteral nutrition support are reported as either having limited activity or being housebound.[5] Primary care clinicians are therefore looking after increasing numbers of people on enteral feeding.[6] Carers are also increasingly involved in the administration of medicines in the community instead of nurses.[7]

Enteral tubes are primarily designed for food and liquid administration: the administration of medicines via enteral tubes is complex and potentially prone to error. Blockage of enteral tubes is a common problem[8] and can have negative impacts for patients and healthcare professionals (Box 1).

Box 1: Impact of blocked feeding tubes on patients, prescribers, and healthcare professionals

Patients

- Reduced quality of life as the patient is unable to receive liquids, foods, or medicines delivered via this route until the tube is unblocked or replaced
- Increased risk of morbidity due to lack of access to medicines for symptomatic conditions (e.g. epilepsy or Parkinson's disease)[9]
- Inconvenience of going into hospital to have a new tube fitted, with associated implications of further risk to health, psychology of readmission, and mental anguish
- Additional radiation exposure due to x-rays to inform the re-siting of the new tube.

Prescribers/healthcare professionals

- Additional call-out to visit individual with blocked tube and time required to unblock tube[10]
- Additional costs associated with enteral tube feeding[11]
- Hospitalisation cost associated with admission to unblock or replace tube[11]
- Cost of purchasing and fitting new tube.[11]

Risk of enteral tube blockage has been shown to be 4.8 times more likely in patients prescribed more than five medicines, 5.3 times more likely for patients prescribed more than 13 doses in a day, and 2.6 times more likely in those who receive medicines by enteral tube for longer than 10 days.[12] This evidence strongly suggests that, at the point of enteral tube initiation, medicines should be reviewed to ensure that the number of medicines and administrations are minimised and that the risks and benefits of each individual medicine are considered.

Most medicines are not licensed or designed for administration via enteral tubes and, therefore, evidence to support delivery via this route is frequently limited and guidance is based on best practice. Where tablets and capsules are prescribed, these have to be reformulated by crushing or dispersing the contents in liquid prior to dosing. In some instances (for example, modified release or enteric-coated medicines), this may be clinically unsafe;[13] in other instances, inadequate or inappropriate crushing or dispersing can result in tube blockage.[14,15] While the use of liquid medicines may result in fewer tube occlusions,[16] adequate flushing of tubes before, during, and after administration is recommended for all medication formulations when administered via this route.[16] A large-scale observational study in the East of England found that the risk of a medication administration error (MAE) was significantly higher in patients with enteral tubes than in patients without (56% vs 25.3%, $p<0.001$) and this was frequently due to failure to flush tubes adequately.[17]

Guidance from NICE recommends medication review in people with dysphagia to ascertain whether the current drug formulation, route and timing of administration remains appropriate and is without contraindications for the feeding regimen or swallowing process.[18,19] This also ties in with the agenda for deprescribing—the process of tapering, withdrawing, discontinuing or stopping medicines to reduce potentially problematic polypharmacy,

adverse drug effects, and inappropriate or ineffective medicine use by regularly re-evaluating the ongoing reasons for and effectiveness of medication.[20]

Manipulated formulations may have unanticipated interactions with feeding products that are not covered by the summary of product characteristics, as they were not intended to be given in this manner.[21,22] Even simple and seemingly innocuous ingredients can cause problems when a drug is taken out of its capsule or a tablet is crushed, exposing the active ingredients before they reach the stomach and increasing the surface area available for drug interaction. Some drug particles may also adhere to the inside of the tube, reducing the dose actually received by the patient.[23]

Licensed formulations that have been tested specifically for use in enteral tubes to identify drug loss on administration, potential for blockage, and ideal/minimum flush volumes are increasingly available. It is important to note that licences for different drugs recommend different flush volumes to avoid blockages, reconstitution with different types of water, and the use of tubes composed of specific materials to minimise drug loss.

Crushing or dispersing most medicines prior to administration renders the medicine unlicensed as it no longer resembles the original licensed medication and has been 'assembled' by the administrator. As such, liability transfers from manufacturer to prescriber and administrator if the prescriber has authorised the process, or just to the administrator if authorisation has not been provided. Manipulation of oral medicines and their administration via enteral tubes without informing the patient could be misconstrued as covert administration. Box 2 summarises the legal implications of moving from oral administration of drugs to administration via enteral feeding tubes.

All of the issues described above increase the complexity of prescribing and administering drugs to patients with enteral tubes.

Box 2: Legal implications of moving from oral administration of drugs to administration via enteral feeding tubes

- Liability transfers from manufacturer to prescriber and administrator if authorised by the prescriber
- Manipulation of a medicine prior to administration which is outside of the summary of product characteristics and unauthorised by the prescriber contravenes the Human Medicines Regulation (2012) and leaves the administrant open to proceedings from their employer, professional regulator, and the law
- Administration of medicines via enteral tubes must be with the informed consent of the patient to avoid any suggestion of covert administration
- Administration of medicines via enteral tube to a patient who lacks capacity must be subject to a prescribing best interests decision and management plan (Mental Capacity Act 2005, section 4).

Rationale for the guideline

Guidelines has previously published guidance on medication management in adults with swallowing difficulties, adults with learning difficulties and swallowing difficulties, and use of unlicensed medicines in paediatric patients.[24–26] When the existing guidelines were updated in 2017, it became apparent that a guideline was needed specifically to support healthcare professionals managing medications in patients with nasogastric (NG), percutaneous endoscopic gastrostomy (PEG), or other enteral feeding tubes. National guidance currently published on enteral feeding has also become outdated with the increasing availability of licensed medicines for enteral administration.

This working party guideline is intended to complement existing guidance, including the recently updated NICE guideline on nutrition support for adults,[18,19] by providing a practical guide to prescribing and administering drugs to patients with NG, PEG, or other enteral feeding tubes, including algorithms as quick-reference guides to support decision-making and administration.

Box 3: Types of enteral tubes used in the UK for nutrition support and/or medication

Gastrostomy tubes

- Gastrostomy is the most common route of enteral nutrition support in primary care[5]
- These tubes directly access the stomach via the abdominal wall
- They are placed either endoscopically (percutaneous endoscopic gastrostomy; PEG) or radiologically (radiologically inserted gastrostomy; RIG).[27]

Jejunostomy tubes

- Jejunal tubes are often placed in patients who are unable to tolerate feeding into the stomach, often as a result of gastric atony, gastric surgery, pulmonary aspiration, or gastroparesis
- Jejunostomy tubes go directly into the jejunum and are placed either endoscopically, radiologically, or surgically
- Endoscopically placed jejunostomy tubes can be placed either via a gastrostomy tube placed into the stomach (PEG-J), or directly accessing the jejunum (percutaneous endoscopic jejunostomy; PEJ).

Nasal tubes

- Nasogastric (NG) tubes are located from the nasal cavity through to the stomach and are used for short-term feeding[27]
- Nasojejunal (NJ) tubes are located from the nasal cavity through to the jejunum and are used for short-term feeding in patients who are unable to tolerate feeding into the stomach.[27]

Guideline for medication management of patients with NG, PEG, or other enteral feeding tubes

Recording patients with enteral feeding tubes

- When a patient is discharged from hospital with an enteral feeding tube, it is important to record this in their notes and check that sufficient information has been provided to continue prescribing and make new prescribing decisions:
  - code patient as having enteral tube feeding
  - check that discharge letter provides essential information (see Box 4) and contact discharging hospital for clarification if not.

Box 4: Essential information for patient discharged from hospital to community on tube feeding

Enteral tube feeding
- Date feeding tube was placed
- Method of placement (endoscopically/radiologically/surgically)
- Feed tube type (including manufacturer, material, and lumen size—often stated in French Gauge (Fr))
- Feed type
- Formulation being used (brand and strength)
- Timing of administration
- Need for and timing of feed breaks relative to medication administration.

Care arrangements
- Care arrangements that have been made
- A named point of contact for the patient or carer.

Medicines
- What medications the patient is expected to receive post-discharge
- Which medicines have been stopped during admission and should not be restarted
- Which medicines should be stopped post-discharge and at what time point
- A medication administration plan, including:
  - route of administration—enteral feeding tube or alternative route
  - name of manufacturer for licensed medicines and specials where required to ensure treatment consistency
  - formulation and strength of medicines—to ensure consistency
  - guidance on which medicines require manipulation prior to administration
  - information as to whether the patient and carer have been shown how to administer medicines
  - information as to whether a 'best interests' meeting has taken place for patients without capacity to ensure that the administration is legal.

Prescribing medicines for patients with enteral feeding tubes

- Review patients' medications, reducing the number of medicines and number of doses per day as much as possible to reduce the risk of blockage
  - NB there is evidence that there are fewer MAEs when patients receive fewer than five medicines and fewer than 13 doses per day[12]

- When choosing a new drug, follow due diligence and use clinical judgement:
  - medicines licensed for administration by enteral feeding tube should be used first line, as use of drugs off-label or specials over other products must be justifiable
  - if a licensed medicine is not available, seek evidence supporting the use of manipulated medicines (see 'Useful resources', p. 9)
  - medicines may need to be prescribed by brand and strength due to differences in absorption, bioavailability, and drug–feed interactions
    - be clear about the decision to use a particular drug and formulation, and that the formulation needs to be administered by enteral tube
  - seek advice from medicines information or the dietitian if you are not confident or comfortable making the decision
  - if a drug is changed to another product or formulation, monitor for changes in response and side-effects
  - have a low threshold for reporting adverse events with off-label and manipulated drugs administered via enteral feeding tubes to the Yellow Card Scheme (yellowcard.mhra.gov.uk)

- Consider increased risks and issues associated with drugs not intended to be administered by tubes:
  - drug interactions:
    - intervals between drugs may need to be factored into the care plan to avoid interactions
  - feed interactions may mean that the medicine needs to be administered when the feed is stopped (Table 1) or immediately after a feed in order to optimise bioavailability or protect the patient:
    - be aware that feeds and drug formulations given in hospital might be different to those prescribed in the community, particularly if the patient is from a different area with a different homecare company
    - any medicines labelled 'take with or after food' should be administered immediately after the feed and not during a feed break
    - refer to Table 2 for more information
  - drug loss in the tube:
    - adjustment to doses may be required
  - risk of blockage:
    - do not assume that a liquid will automatically be suitable for administration by enteral tube, as consistencies can differ and liquids can still block tubes
    - review enteric-coated and gastro-resistant

Table 1: Drugs to be given during a feed break (contact dietitian for advice)[28]

Drug class	Drug	Timing of administration with respect to feed (before/after)				
		30 minutes/ 30 minutes	1 hour/ 1 hour	1 hour/ 2 hours	2 hours/ 1 hour	2 hours/ 2 hours
Antibiotics	Azithromycin capsules				✓	
	Ciprofloxacin[29,30]					✓
	Co-fluampicil	✓				
	Demeclocycline				✓	
	Doxycycline				✓	
	Flucloxacillin				✓	
	Levofloxacin				✓	
	Metronidazole suspension				✓	
	Norfloxacin				✓	
	Ofloxacin[29]					✓
	Oxytetracycline				✓	
	Phenoxymethylpenicillin				✓	
	Tetracycline				✓	
	Trimethoprim	✓				
Other antimicrobial agents	Didanosine				✓	
	Efavirenz tablets/capsules				✓	
	Fluconazole (holding feed is preferable but not essential)				✓	
	Isoniazid	✓				
	Itraconazole				✓	
	Pyrazinamide	✓				
	Rifampicin				✓	
	Rifater®	✓				
	Stavudine				✓	
	Voriconazole				✓	
Gastrointestinal agents	Cimetidine		✓			
	Lansoprazole	✓				
	Propantheline				✓	
Cardiac agents	Captopril	✓				
	Celiprolol	✓				
	Digoxin (high-fibre feeds)				✓	
	Dipyridamole	✓				
	Lercanidipine	✓				
	Methyldopa (some feeds)				✓	
	Nimodipine capsules				✓	
	Perindopril erbumine	✓				
	Warfarin			✓ (1–2 hours before, 1–2 hours after)		
Endocrine agents	Alendronic acid					✓
	Budesonide	✓				
	Disodium etidronate					✓
	Glipizide	✓				
	Risedronate					✓
	Sodium clodronate					✓
Respiratory and allergy	Fexofenadine	✓				
	Montelukast				✓	
	Sodium cromoglicate	✓				
	Zafirlukast				✓	
Urinary disorders	Bethanechol	✓				
	Trospium				✓	
Nutrition and anaemia	Calcium gluconate		✓			
	Deferasirox	✓				
Malignant disease and immunosuppression	Etoposide				✓	
	Tacrolimus				✓	
Other	Distigmine	✓				
	Lithium[31]			✓		
	Morphine (certain feeds)				✓	
	Penicillamine	✓				
	Pseudoephedrine			✓		

formulations, as they tend to form clumps and so are more prone to blocking tubes
    - seek advice if product is enteric-coated and licensed for tube feeding—e.g. lansoprazole fast disintegrating tablet
  - sugar- and film-coated tablets need to be crushed finely and flushed well post-dose to avoid blockage:
    - consider alternative product
- adverse drug reactions:
  - seek evidence that the prescription is going to be 'safe' (see 'Useful resources', p. 9)
- differences in excipients between formulations—for example:
  - liquid formulations may contain alcohol, which can be a problem for certain patients
  - liquid formulations may contain sorbitol, which can cause adverse gastrointestinal effects
  - syrups may interfere with feeds and cause clumping and blockage
  - dispersible formulations may contain large amounts of sodium
- special considerations:
  - modified- and slow-release medicines are rarely suitable for enteral tube administration
  - some medicines are only licensed for certain tube sizes (see Table 3) and types of material
  - effervescent tablets may require a large volume of water to allow them to effervesce and so total water

Table 2: Other information relating to feeds (contact pharmacy for advice)[28]

Drug	Notes
Co-beneldopa	Give at same time each day in relation to feeds, as feed can affect absorption
Co-careldopa	Give at same time each day in relation to feeds, as feed can affect absorption
Glibenclamide	Give at start of feed
Gliclazide	Give at start of feed
Hydralazine	Absorption may be affected by feeds If necessary, stop feed for 2 hours before and 1 hour after each dose
Ketoconazole	Possible reduced bioavailability Consider stopping feed 2 hours before and 2 hours after each dose
Levothyroxine	Enteral feeds, particularly soya-based feeds, may increase faecal elimination of levothyroxine
Phenytoin	Giving phenytoin via enteral feeding tube is **highly discouraged**
Propranolol	Give at the same time of day each day in relation to feeds
Sucralfate	Giving sucralfate to patients receiving enteral feeds is **highly discouraged**
Theophylline	Possible interaction with feeds Monitor for clinical effect
Warfarin	Take care with feeds with high vitamin K content—e.g. Ensure®, Isocal®, Nutrilite 330®, Osmolite®, and Ensure Plus® Avoid feeds containing soya protein

Table 3: Considerations for tube size for medications given by enteral tube[28]

Drug	French size/notes
CellCept® suspension	8 Fr[32]
Esomeprazole	8 Fr for 20 mg tablets* 14 Fr for 40 mg tablets*
Nexium® granules	6 Fr[33]
Pancreatic enzymes	>10 Fr†
Slozem® capsules	12 Fr‡
Zomorph® capsules	16 Fr[34]

*Local guidelines, as summary of product characteristics does not specify[28,35]
†Not specified in licence, but recommended that medicine is not used through tubes small than 10 Fr[36]
‡Information supplied by manufacturer

NB Tables 1, 2, and 3 do not constitute exhaustive lists. They are correct at the time of publishing. In the case of any uncertainty, please refer to the cited references.

volume and sodium load should be considered, particularly if they need to be given repeatedly during the day
    - consider switching medicine if the patient reports that it tastes unpleasant with burping and indigestion
    - check guidelines for specific water requirements, as some products may need to be given with deionised water

- Involve a multidisciplinary team in decision-making for patients who require administration of drugs via enteral tubes:
  - discuss available options with patient and carers, including the risks of administration and adverse drug interactions as part of the informed consent process
  - undertake a formal needs assessment in patients without mental capacity, e.g. those with dementia, as dosing via enteral tube could be misconstrued as covert administration
    - if the patient is unable to offer consent, a 'best interests' meeting should be arranged
  - review the care package, as timings of visits may need to be altered to allow feed breaks for some drugs and avoid drug interactions with concomitant administration

- Provide all necessary information for the dispensing pharmacist to enable them to consider the suitability of the recommendation and whether a specific formulation is required to maintain consistency
  - state 'to be administered by enteral tube' on the prescription
  - request an enteral syringe bottle adapter for administration of liquid medicines, where possible
    - all liquid medicines should be drawn up using a bottle adapter or straw to prevent liquid medicine filling the dead space at the tip of the enteral syringe

- Create a formal management plan to ensure obligations are covered and patients are informed
  - include agreed tube type and size, feed intervals, and flushing volumes
    - ensure overall fluid volume required for medicines is considered alongside feed and liquid requirements so as not to overhydrate the patient; seek advice from the dietitian or pharmacist if you are unsure
    - increase water intake if the patient reports being thirsty and seek advice
  - include a plan should the tube become blocked and not cleared with simple measures
  - ensure the patient has named points of contact within the trust and in the community
  - include advice for the patient and carer regarding administration of occasional prescribed drugs, such as antibiotics, and over-the-counter medicines

Figure 1 provides an algorithm to guide prescribing decisions in patients discharged with NG, PEG, or other enteral feeding tubes.

Safe administration of medicines via enteral feeding tubes

- Refer to the medication administration plan

- Assemble the necessary equipment

- Stop feed at agreed time
  - take into account the need for feed breaks before and after administration for drugs that need to be given on an empty stomach or those that interact with food (see Table 1 and Table 2)

- Flush tube with 30 ml of water to ensure it is clear and not blocked:
  - if medication is changed, check whether water flushing volume also needs to change
  - if product is licensed, check manufacturer's guidance, as volumes may be different

- Administer one drug at a time as per best-practice guidelines (see 'Useful resources', p. 9):
  - never mix drugs
    - use disposable tablet crushers (not pestle and mortar) to crush one medicine at a time and wash between crushes
      - never crush a mixture of tablets together
    - open capsules into the barrel of a syringe and draw up water into the syringe
      - never crush capsules; some capsules can be opened and the contents dissolved but the plastic capsule must be removed
      - never combine drugs in the syringe
    - never mix liquid formulations
  - flush with an appropriate volume of water before administering another drug
    - flush volume between drugs is usually 10 ml but volumes do vary, so check licence or best-practice guidelines (see 'Useful resources', p. 9)
    - flush tube even if the drug is licensed for administration by enteral feeding tube or if the drug was given as a liquid formulation
    - if the tube is blocked, attempt simple measures to unblock the tube (see 'Blocked feeding tubes', p. 10)
    - if a blocked tube cannot be unblocked, seek advice urgently
  - repeat until all drugs have been administered

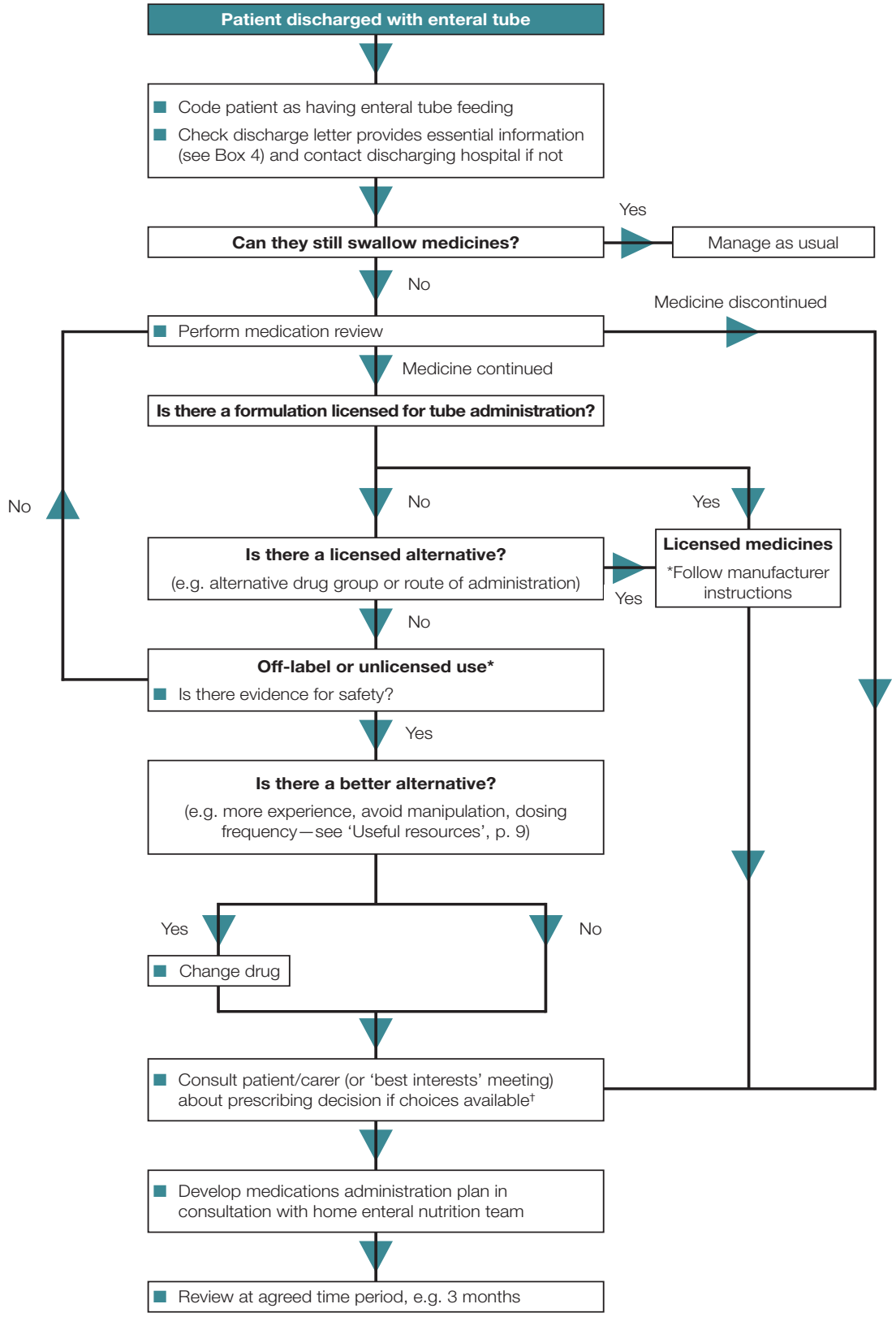
- Once all drugs have been given, flush the tube with 30 ml of water

- Make sure to leave a feed break if required (see Table 1, and Table 2)

- Resume feed when appropriate

Figure 2 provides an algorithm to guide enteral tube administration of medicines.

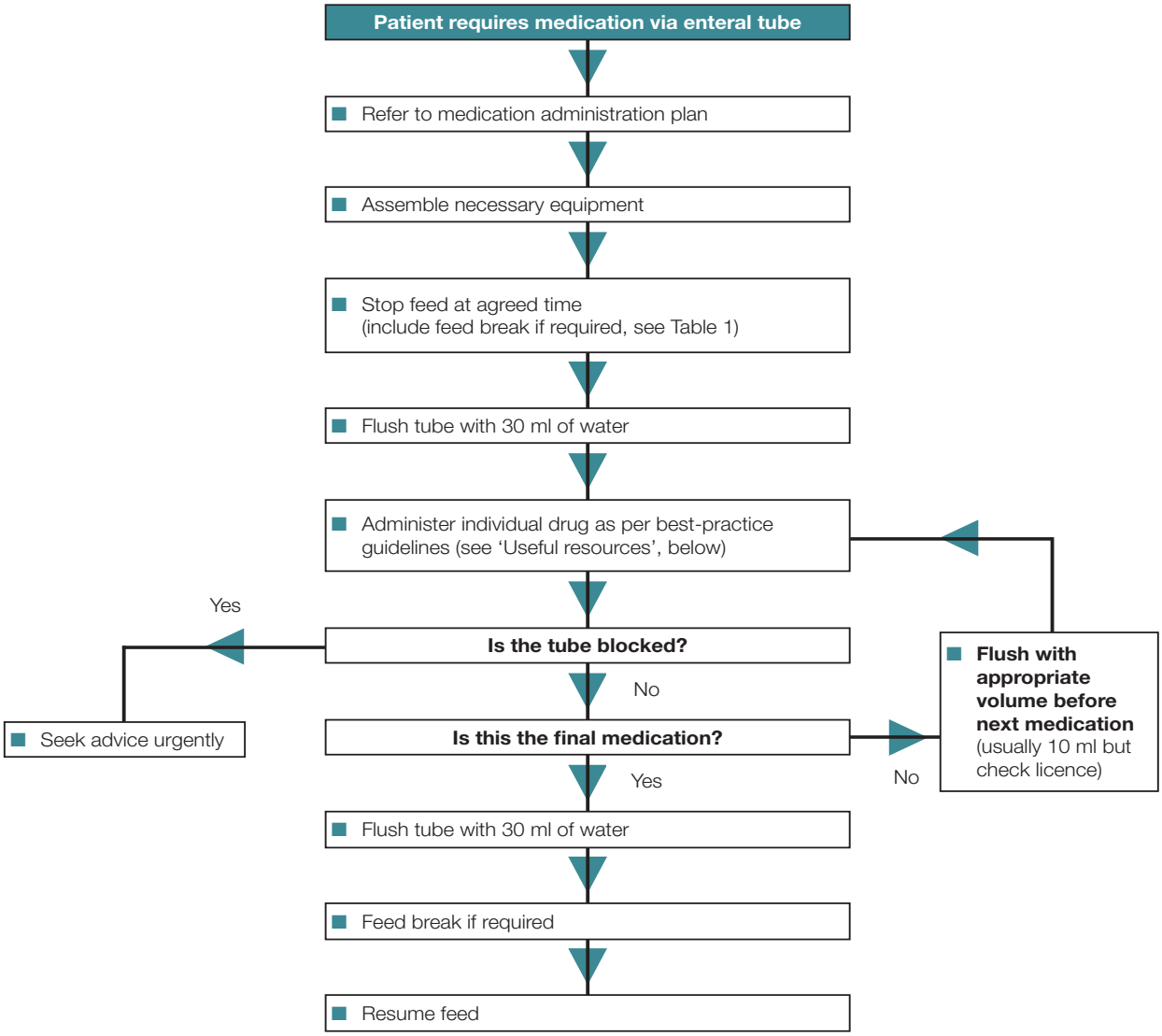
Figure 1: Algorithm on prescribing and choosing drugs for patients with enteral feeding tubes



*Off-label use of licensed medicine administered via enteral tube or involving formulation manipulation, i.e. crushing tablets or opening capsules.

†It is important to be clear about administration of medicines by enteral tube to avoid misunderstandings around covert administrations of medicines, particularly if the patient has no capacity to understand or consent.

Figure 2: Algorithm for administration of drugs via enteral feeding tubes



Useful resources

Resources for healthcare professionals

- British Association for Parenteral and Enteral Nutrition (BAPEN): www.bapen.org.uk
  - *Administering drugs via enteral feeding tubes. A practical guide* www.bapen.org.uk/pdfs/d_and_e/de_pract_guide.pdf
  - *Drug administration via enteral feeding tubes: a guide for general practitioners and community pharmacists* www.bapen.org.uk/pdfs/d_and_e/de_gp_guide.pdf
- The NEWT Guidelines: www.newtguidelines.com
- Swallowing difficulties website: www.swallowingdifficulties.com

Resources for patients

- British Association for Parenteral and Enteral Nutrition (BAPEN): www.bapen.org.uk
  - *Tube feeding and your medicines. A guide for patients and carers* www.bapen.org.uk/pdfs/d_and_e/de_pat_guide.pdf
- myNEWT guides for patients and carers giving medicines through enteral tubes:* www.newtguidelines.com/myNEWT.html
- Swallowing difficulties website for patients: www.swallowingdifficulties.com/patients

*myNEWT guides are available through subscription to The NEWT Guidelines website.

Blocked feeding tubes

- Blockages are difficult to clear, so steps should be taken to avoid them, where possible:
  - flush daily if the tube is not in use
  - check with dietitians how much water should be used to flush, as flushing water should be included as part of the patient's daily requirements

- If a tube does become blocked:
  - blockages become harder to unblock over time, so try to clear as soon as possible
  - flush with warm water using gentle force with a push-and-pull approach
    - other liquids that may be tried include sparkling water, soda water, and a solution of bicarbonate of soda
  - the Clog Zapper Kit, which involves inserting a fine tube inside the feeding tube and administering a mixture designed to unblock tubes may be useful, but this is primarily intended to break up blocks caused by feeding formulas and is not widely used in practice

When to seek advice and refer for specialist help

- If a PEG, PEJ, or RIG tube falls out, it needs to be reinstated quickly before the holes close up, so urgent referral is vital
  - consult local guidelines due to differences in service agreements—for example, homecare provider and nursing support may vary

- If a PEG, PEJ, RIG, or NJ tube is blocked and cannot be cleared with simple flushing measures, refer the patient to hospital (NG tubes can be reinstated in the community)

- If there is a problem with the medicine, contact pharmacy or medicines information for support

Conflicts of interest

David Wright is in receipt of unrestricted education grants from Rosemont Pharmaceuticals Limited and regularly undertakes consultancy work for Rosemont Pharmaceuticals Limited and Fresenius-Kabi.

David Smithard is an unpaid member of an Advisory Board for Invisio, has delivered lectures for Fresenius Kabi, and is a member of the Care Home Charter Board.

Natalie Welsh has undertaken advisory work for Enteral UK (March 2018) and Nutricia UK Ltd (February 2019).

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