Optimising medicine administration in patients with swallowing difficulties

BY DR SHANE JACKSON MPS & ASSOCIATE PROFESSOR MARK NAUNTON MPS

Many patients can struggle to swallow tablets, capsules or other oral medicines.[1] Especially in an aged care environment, this can often result in practices such as crushing, and/or mixing with vehicles that can adversely affect the pharmacodynamics of the drug in an individual patient.[1] Dysphagia is the medical term used when a patient has difficulty swallowing. Patients with dysphagia may be at risk of aspiration.[2]

Unfortunately, many healthcare professionals are unaware when a patient may be having difficulties with swallowing their medicines.[3] Swallowing difficulties are more prevalent in older patients.[4] Individuals who do not have a problem with swallowing food and drink can still manifest a psychological aversion to swallowing solid dosage forms.[5] Patients living in the community may not report dysphagia to their general practitioner (GP) or pharmacist.[6] A key message for pharmacists is that it is important to ask all patients if they have any difficulties in swallowing their medicines.

If patients experience difficulty swallowing their medicines, they may completely avoid taking the medicine, add them to food substances that may reduce the effectiveness of the medicine, and/or modify the dosage form.[3,7] The potential problems associated with medicine dosage form modifications are well reported in the literature, such as decreased efficacy and increased risk of side effects.[3] People with dysphagia experience problems with swallowing food, liquids and saliva. People without dysphagia can also have trouble when swallowing medicines, as swallowing solid dosage forms whole without chewing is a learned behaviour.[3]

Background

There is a paucity of research looking at the incidence of medicine-related swallowing difficulties in the general population. In a study of 792 older patients of community pharmacies in England who pharmacists suspected may have difficulties swallowing medicines, almost 60% acknowledged having problems with swallowing tablets or capsules.[7] Lau ETL, Steadman KJ, Mak M, et al attempted to quantify the prevalence of swallowing difficulties in patients attending community pharmacies in Australia.[3] Overall, 16.5% of people reported experiencing swallowing difficulties, and 10.6% of all respondents reported modifying medicine dosage forms. Almost half (44.2%) of those surveyed did not think there would be issues with modifying medicine dosage forms. Some consumers would not seek advice from health professionals if they experienced swallowing problems, and/or would not seek advice from health professionals before modifying their medicine dosage forms, regardless of their thoughts about any problems associated with this practice. The authors concluded that 'it is clear that health professionals need to be assertive in questioning patients about experiencing any difficulty with swallowing solid medication dosage forms, particularly as patients are not forthcoming with the information'.[3]

Aged care

Recent studies in nursing homes and hospitals suggest that between 0.5% and 10% of medicines are erroneously crushed.[8–12] In a Dutch intervention study in three nursing homes, a combination of warning symbols indicating whether or

Dr Shane Jackson is an accredited pharmacist and a Director of Consultant Pharmacy Services. *Dr Mark Naunton* is a practising accredited consultant pharmacist and Associate Professor at the University of Canberra. He is a Director of MedicineSmart@UC.

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LEARNING OBJECTIVES

After reading this article, pharmacists should be able to:

- Discuss medical conditions and medicines that increase the risk of swallowing difficulties and oesophageal irritation
- Describe the complexities associated with alteration of dose forms and the mixing of altered medicines with food vehicles
- Recommend practices that will reduce the risk of problems associated with alteration of dose forms.

Competencies addressed: 1.1.1, 1.2.1, 1.3.1, 1.3.2, 2.1.1, 2.1.3, 2.3.1, 2.3.2, 2.5.1, 2.6.1, 4.2.2, 4.2.3, 4.3.3, 6.2.1, 6.2.2, 6.2.3, 6.3.3, 7.1.2, 7.1.3, 7.1.4, 7.2.2.

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not a medicine could be crushed and an education intervention reduced the rate of inappropriate crushing from 3.1% to 0.5%.[13] In Australia, crushing, or alteration of dose forms of medicines has been found to occur frequently in the aged care setting. Paradiso LM, Roughead E and Gilbert AL observed 1,207 medicine administrations, across 10 facilities, including 586 residents.[14] Of the high care residents, 46% of observations had at least one medicine altered. Of concern, 17% of medicine alterations had the potential for detrimental outcomes (e.g. increased toxicity, unpalatability, decreased efficacy), and in 70% of cases where medicines were altered, spillage and therefore potentially some lost dose occurred. A more recent study conducted in the Australian Capital Territory (ACT) observed 160 medicine administrations across six medicine rounds in two residential care facilities (RCFs). It was identified that 32% of medicine alterations were identified as inappropriate, which included issues such as drug mixing, spillage and incomplete dosing.[15]

There also should be consideration given to the occupational health risks associated with altering medicines such as inhalation of fine powders (e.g. cytotoxics).[16] The flowchart in Figure 1 can be used by pharmacists to assist in implementing a procedure in a RCF to optimise appropriate use of medicines and to minimise risks of problems associated with alteration of dose forms within this setting.

When a medicine needs to be altered for a patient, active consideration needs to be given as to whether alternative methods of administration are available (e.g. transdermal patches or liquids). If this is not suitable, consideration should be given as to whether deprescribing is a suitable option for the patient.[2] Monitoring the patient's clinical signs and symptoms may offer insight as to whether the altered medicine is providing benefit, or whether it is responsible for adverse effects in its altered form.[17]

Who is affected?

Examples of the types of patients who may have difficulties with swallowing medicines include children and those with[18–20]:

- neurological problems such as cerebrovascular accident, Parkinson's disease
- diminished consciousness
- dry mouth (which can often be caused by medicines)
- large tablets/capsules
- multiple medicines
- radiation therapy to the head and neck and chemotherapy, which can impair saliva production.

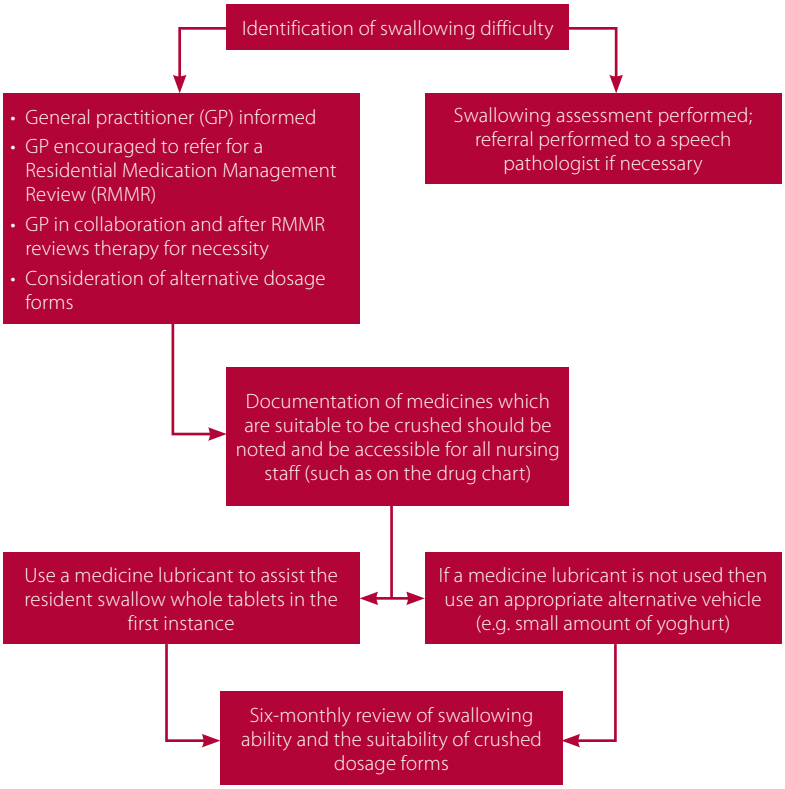

Figure 1. Flowchart for the alteration of medicine in an aged care setting

Signs and symptoms

Anyone can have a problem with swallowing medicines, and it is important to assess if a patient is having difficulties with swallowing of medicines, because these issues often go unreported.[3] Some signs and symptoms indicating that a patient may have trouble swallowing medicines include[19,21,22]:

- painful swallowing or chewing
- dry mouth
- difficulty controlling liquid or food in the mouth
- choking/coughing during or after swallowing
- hoarse or wet voice
- feeling of obstruction
- unexplained weight loss
- regurgitation of undigested food
- recurrent chest infections (resulting from aspiration).

Don't rush to crush

While it is generally recognised by health professionals that tablets or capsules that have modified-release properties should not be crushed due to the potential for toxicity, other 'standard' or immediate-release medicines that may be altered may also result in effects that are not intended.[16] Immediate-release solid medicines are designed to disintegrate and dissolve quickly in the gastrointestinal tract, so crushing may be expected for some medicines to result in faster absorption due to faster dissolution.[23] As shown in Figure 2 this could be an issue for medicines such as antihypertensive or oral hypoglycaemic agents in older people, who may be more sensitive to faster absorption, with potential for higher peak serum concentrations of the drug.[23] However, for some medicines crushing may also lead to sub-therapeutic drug levels due to loss of the dose during crushing and transfer to the patient,[15] as well as some drugs being exposed to low gastric pH which could reduce drug effectiveness.

Mixing vehicles

It is recognised that delivering medicines with food or drink may impact drug bioavailability, with fruit juices such as grapefruit, orange or apple juice affecting absorption of numerous medicines,[24] and foods potentially affecting physiologic conditions such as gastric emptying. Many medicines marketed in Australia with approved product information do not provide clarity around the effects of mixing crushed tablets or capsule contents with a small quantity (e.g. two tablespoons) of food such as pudding, yoghurt or apple sauce, which occurs commonly within an aged care setting. There is an assumption that altering medicines and administering it with a small quantity of food vehicle doesn't significantly affect absorption rates and/or bioavailability, though the effect may be quite variable in individual patients and may have clinical consequences for some patients, depending on the drug used.[23]

There is little data to demonstrate the effects of crushing a medicine and mixing it with a food vehicle. Manrique YJ, Lee DJ, Islam F, et al analysed dissolution rates of a variety of crushed immediate-release medicines in simulated gastric fluid, when mixed with food vehicles such as orange juice, honey, strawberry jam and vanilla yoghurt.[23] They assessed (in vitro) what proportion of the drug was dissolved at certain time intervals, compared to whole tablets, with an abbreviated display of results after 30 minutes in Table 1.

Atenolol dissolution was unaffected by mixing crushed tablets with food mixers in comparison to whole tablets or crushed tablets in water, but amlodipine was delayed by mixing with jam. Mixing crushed warfarin and carbamazepine tablets with honey, jam or yoghurt caused them to resemble the slow dissolution of whole tablets, rather than the faster dissolution of crushed tablets in water or orange juice.[23] Due to a lack of information regarding the absorption and overall bioavailability of drugs, and variability in the dissolution of drugs when used with vehicles to assist with administration, the best advice is that given by the *Australian Don't Rush to Crush Handbook*[16]:

> *'First consider if the person can swallow the tablet or capsule whole with the aid of an oral medication lubricant. A medication lubricant is a gel that is thick and easy to swallow and moistens the mouth and throat. The whole tablet or unopened capsule is placed in a spoonful of the gel and swallowed. This may not be suitable for people with more severe swallowing difficulties.'*

If you need to alter the dose form, nursing staff and carers should be advised to crush or disperse each medicine one at a time to reduce the chance of incompatibility.[16] If there is a clinical requirement to administer all modified medicines together, then the advice should be to crush the tablets first, then open the capsule and add the powder or pellets, to avoid crushing enteric-coated or sustained-release pellets.[25]

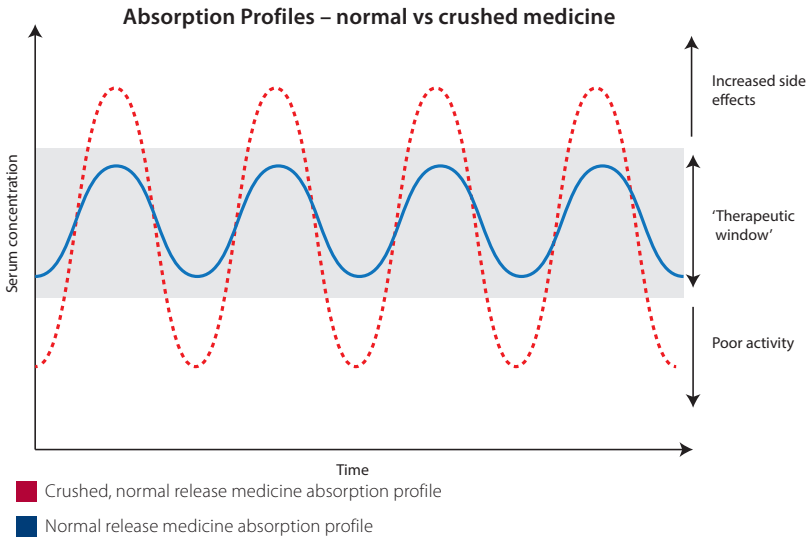

Figure 2. Comparison of unaltered versus altered immediate-release medicine

Table 1. Effect of food vehicles on dissolution rates (results rounded to the nearest whole figure)[23]

	Percentage of drug dissolved at 30 minutes			
	Amlodipine	Atenolol	Carbamazepine	Warfarin
Whole tablets (reference value)	100	98	57	45
Orange juice	100	100	79	79
Honey	94	99	40	44
Strawberry jam	68	100	37	38
Yoghurt	83	100	51	53
Easythick thickener (Level 900)	52	50	13	15

Risk of oesophagitis

There are reports that drug-induced oesophagitis is predominantly found among elderly patients as they are more likely to spend time in the recumbent position, consume more medicines (including oral bisphosphonates or non-steroidal anti-inflammatory drugs [NSAIDs]), have more oesophageal motility problems or cardiac enlargement with mid-oesophagus compression, and are less aware of the drug instructions.[26] Considerations for medicine-induced oesophagitis and oesophageal motility disorders include[27]:

- taking medicines with adequate water (at least 240 mL) to minimise the risk of the tablet getting stuck
- using a slippery lubricating gel to minimise the risk of a tablet getting stuck
- ensuring the patient takes their medicine in an upright position
- where appropriate, advising the patient to consume some food or water after the intake of their medicine.

Medicines which are associated with oesophagitis include NSAIDs, antibiotics and oral bisphosphonates.[26,27]

Medicine lubricants

Where possible, dose alteration (e.g. crushing medicines) should be avoided and alternate dose forms or routes of administration should be found.[16] One of the advantages of using a medicine lubricant is that it may reduce the need for alteration of the medicine, as it may allow the patient to swallow the medicine without the need for crushing.[16] *Gloup* is the first purpose-designed medicine lubricant, and is available in Australia.

Some preliminary work from The University of Queensland has assessed the effect of *Gloup* on drug dissolution.[28] They concluded that *Gloup* is consistent with Level 400 (moderately thick) in the dysphagia-oriented product classification.[29] It has no effect on drug dissolution, unlike some gum-based thickeners designed to ensure safe fluid delivery in dysphagia. However, due to Gloup's slipperiness and propensity for the tablet to separate from the gel (intentionally designed this way to have minimal impact on medicine absorption), the authors concluded that further work is required to determine whether it will safely transport medicines without risk of aspiration, before *Gloup* is recommended in patients with dysphagia.[28] Consultation with a speech pathologist is generally recommended for these patients.

The *Australian Don't Rush to Crush Handbook*, the *Australian Pharmaceutical Formulary and Handbook*, and the *Australian Medicines Handbook* are mandated by the Pharmacy Board of Australia as required texts for pharmacists. These texts, as well as the *MedeCrush* application, may be useful resources for pharmacists when assessing suitable management options for medicines in patients with swallowing difficulties.

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QUESTIONS

UP TO 1.5 CPD CREDIT GROUP 2

Each question has only one correct answer.

1. Which of the following conditions or symptoms is LEAST likely to increase the risk of swallowing difficulties?
a) Cerebrovascular accident.
b) Parkinson's disease.
c) Xerostomia (dry mouth).
d) Ischaemic heart disease.

2. Which of the following medicines is LEAST likely to cause oesophagitis?
a) Doxycycline.
b) Diclofenac.
c) Perindopril.
d) Risedronate.

3. Which of the following substances can affect the dissolution of medicines?
a) Strawberry jam.
b) Orange juice.
c) Apple juice.
d) All of the above.

4. The Society of Hospital Pharmacists of Australia recommends what vehicle to assist in swallowing of medicines prior to alteration of the dose form?
a) Medicine lubricant.
b) Yoghurt.
c) Apple sauce.
d) Chocolate pudding.