



¹ Alberta Health Services, Calgary, Alberta, Canada

² Cumming School of Medicine, University of Calgary, Alberta, Canada

Correspondence to B Kaplan
kaplan@ucalgary.ca

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PRACTICE POINTER

Giving oral medicines and supplements to children

Deonne Dersch-Mills,¹ Bonnie J Kaplan²

What you need to know

- Oral liquid formulations of common medicines are often tolerated by children who cannot swallow pills but they carry a risk of measurement error as well as other challenges
- When medicines are not commercially available as oral liquids—or when the liquid formulation is unpalatable or unstable—short term goals of treatment are to make the dosage safe and precise, make liquid medications more palatable, and seek alternative formulations or medications when necessary
- Children needing long term medication or nutrient supplements that are easiest to give in pill form may be best off learning how to swallow pills, and evidence supports the use of head position training to learn this skill

A 6 year old boy undergoing treatment for acute myelogenous leukaemia is discharged from hospital to continue treatment from home. He is unable to swallow tablets or capsules and so must use compounded liquid formulations, some of which have only seven day stability. His family live in a remote area, two hours' drive to the nearest compounding pharmacy. They bring a cooler every week when they drive to obtain medication refills because the medications must be refrigerated at all times. The medications are unpalatable, and his parents are spending up to three hours three times a day, every day, trying to give him his medication.

Giving medications to children who cannot yet swallow tablets or capsules (hereafter referred to collectively as “pills”) is a common problem without a universal solution. Frequently, parents, clinicians, and pharmacists attempt to crush tablets, empty capsules into food, search for alternative dosage forms, or find a different medicine altogether. Unfortunately, finding alternative formulations that children will accept can be challenging. Oral liquid formulations are sometimes a viable solution, but many oral liquid preparations are not commercially available, can be difficult to measure and dose correctly, or may be refused or spat out by children, leaving parents unsure of the dose their child has actually consumed.

Swallowing pills is a particular challenge for young children, who have not yet developed oral motor skills for controlling the location of a pill on their tongue; however, problems can extend into adolescence and older ages. The prevalence of pill swallowing difficulty in the general public is uncertain. A 2008 survey of 308 parents of 702 children found that more than half the parents had a child who was unable to swallow a standard size

pill, and up to 40% had a child who had rejected a pill or liquid medication.¹ This is consistent with data from primary care settings, where 46-64% of children receive at least one medication that is off-label, non-approved, or extemporaneously compounded, suggesting that those medications are neither marketed nor formulated for use in children.²

The aim of this article is to review the challenges associated with prescribing oral medications to children, especially those who cannot swallow pills, and to provide practical guidance on solutions. We conclude by discussing an evidence-based method for teaching children the important life skill of how to swallow whole pills.^{3 4}

Challenges of giving oral liquid medications

The most common and successfully utilised alternatives to pills for young children are oral liquid medications. Most children with a short term need for a common medication, such as an antipyretic or antibiotic, can be given an oral liquid formulation without difficulty. However, challenges arise with oral liquid medications when they are unavailable, unstable, or unpalatable.

Consumer availability

Although many common paediatric medications, including paracetamol, ibuprofen, amoxicillin, azithromycin, and ranitidine, are commercially available in palatable oral liquid forms, many others are not, including some anti-epileptic medications, proton pump inhibitors, and controlled release stimulants. Medications that are not available in commercially prepared oral liquid formulations require compounding, or manipulating the dosage form (eg, mixing a crushed tablet in a liquid to create an oral liquid form). This process carries several risks, including formulation failure (ie, the medication is rendered inert through the compounding process), microbial contamination, compounding error (ie, the compound is made with an incorrect medication or amount of medication), or dosing errors from the use of non-standard recipes (eg, a caregiver does not realise that one pharmacy compounds a different strength of oral liquid from another and delivers the wrong dose).^{5 6} While no data are available to quantify these risks, the US Food and Drug Administration has reported that up to 33% of pharmacy made compounds fail quality testing.⁷

Stability

Another challenge is that the stability of compounded medications is often short, resulting in increased pharmacy workload, costs, and inconvenience for patients who require frequent refills. For example, if a child with chronic kidney disease requires calcitriol

but cannot use the capsules, an oral liquid can be compounded. However, the stability of this formulation has been demonstrated only up to seven days, so the patient would require a refill every week. This may be especially difficult for patients who live in remote areas.

Palatability

Lastly, some oral liquid formulations can be unpalatable. Refusal of oral liquid medications or spitting out not only raises questions about dose delivery and effectiveness of therapy, but also can be messy and emotionally draining for parents and children.⁸ It is generally safe to repeat the full dose of a medication if the child vomits within 30 minutes of the dose, but a pharmacist should be consulted on re-dosing medicines where an overdose could cause harm (eg, those with a narrow therapeutic window such as digoxin). Additionally, liquid formulations often contain preservatives or other additives that are best avoided in infants and young children because of adverse effects (eg, ethanol) or that parents may wish to avoid (eg, artificial colouring or sweeteners).⁹

Finally, even when liquid preparations are commercially available, each dose requires measuring a liquid volume, which caregivers have been shown to do incorrectly as often as 54–84% of the time.^{10–12}

What can parents and caregivers do to encourage children to take oral medicines in the short term?

Key strategies to help administer medications to children who cannot swallow pills are to find safe and precise formulations, make liquid medications more palatable, and seek alternative formulations or medications when necessary. General practitioners and caregivers are encouraged to work with pharmacists to identify the

formulations and strategies that work best for the medication and patient.

Maximise safety

When liquid formulations are needed, use commercially available liquids wherever available to limit the risks associated with compounding. To reduce measurement errors, medications should be measured using oral syringes, and pharmacists can demonstrate the appropriate volumes for administration each time a prescription is filled.¹⁰ When necessary, compounded medications should be made in licensed compounding pharmacies (local regulations vary) that use well referenced, standardised recipes and employ rigorous checking processes.⁶ Clinicians and caregivers are encouraged to call and ask pharmacies about the availability of oral liquids and the compounding practices at individual pharmacies. When challenges arise regarding the availability of a compounded oral liquid, clinicians working in specialty care areas can act as a resource as they have likely encountered the same issue before.

Mask or improve taste

Table 1 summarises several strategies to help parents or caregivers administer unpalatable oral liquid medications.^{8–13} Depending on the medication and the age of the patient, mixing the medication in a palatable food or liquid can be effective, although this should always be done with a small amount of food/liquid to ensure the full dose is taken. Likewise, giving ice or a frozen food before the medication to numb the taste buds or giving a palatable “chaser” after a dose can reduce a bad taste. With older children, giving them choices regarding the methods of taking the medication (eg, spoon or cup), or using rewards may help support the process of taking medication.

Table 1 | Approaches to helping children take medications and supplements

Masking taste	Medication options*	Other
Palatable “chasers” (eg, chocolate syrup, strong cheeses, candies, gum, salty crackers/crisps)	See if chewable tablets, quick dissolve, or “melting” dosage forms are available	Try administering medication into different areas of the mouth to assess patient preference (eg, into cheek, on to back of tongue—not throat to avoid choking)
Frozen foods given immediately before to freeze taste buds (eg, popsicles)	Administering injectable formulations orally can reduce volume required	Involve older children by explaining the benefits/rationale for using the medication, and allow them to choose administration techniques (syringe, cup, straw, spoon after first measuring the medicine with a syringe)
Keeping medications in the refrigerator (if appropriate)*	Investigate dose rounding to permit use of whole or partial tablets or capsules	Teach pill swallowing with head position training video
Mixing a liquid, crushable tablet, or capsule medication in a small amount of palatable food/liquid (eg, jam, honey, pudding)*	Consider alternative medications that	Positive reinforcement: offering praise and/or rewards for successful medication administration; avoid forcing the medication
Commercial medication flavouring products are available but no data support the long term stability of medications when mixed with these; they are best added just prior to administration	- require fewer daily doses	Swallowing aid/glide products may help make capsules/tablets easier to swallow
Plugging the nose or holding a strongly scented item under the nose	- require lower volume of liquid	Introduce pill swallowing with small candies and working up in size
	- are available in more palatable liquid form	

* Check with a pharmacist.

Find an alternative

Physicians, pharmacists and caregivers can collectively consider alternative formulations or even alternative medications to support medication taking.^{8–14} Examples of alternative formulations include (where appropriate) using an injectable product orally to permit smaller required volumes (eg, dexamethasone injection 4 or 10 mg/mL instead of 0.1 mg/mL oral liquid), rectal formulations especially for younger children (eg, dimenhydrinate suppositories), tablets that can be cut and/or crushed, or opening capsules and sprinkling on food (when the dosage permits). Selection of an equally appropriate alternative medication may expand the

formulation options to include chewable or quick dissolve tablets, or even suppositories. Alternative medications may also allow for less frequent administration.

Learning to swallow pills

For many children with chronic conditions resulting in the need to take medications and nutrient supplements that are often in fairly large capsules, the best long term solution is to learn to swallow pills.¹⁵ Pill swallowing is an important life skill, but learning how can be a challenge, even for people with normal neurologic development and no apparent reason for their difficulties.

Several strategies for learning how to swallow pills have been studied, including various behavioural approaches and head position training. Behavioural approaches such as positive reinforcement, stimulus shaping (beginning with pill substitutes such as small candies, and gradually progressing to larger ones), and relaxation training for those who are anxious have assisted some individuals with learning to swallow pills. However, implementing these methods can be time consuming for clinic staff and caregivers (up to 57 appointments consuming 10 hours of staff time in one case¹⁶), and they are rarely effective for most patients. The exception appears to be head position training. A 2015 systematic review of five studies including patients from infancy to age 21 found success rates varied from 58% for behavioural shaping and reinforcement to 100% for head position training.¹⁷ In that review, the study on head position training was the only good quality study carried out on a behavioural approach.

The rationale for learning to swallow pills with varying head posture is based on endoscopic studies in healthy adults, which found that head position alters swallowing dynamics: lateral rotation of the head increases the cricopharyngeal opening and decreases the upper oesophageal sphincter pressure.^{18 19} This was the basis for a series of studies investigating head position during pill swallowing in both children and adults.⁴ In three observational studies with 348 individuals aged 8-40, participants who could already swallow pills were taught five head positions for pill swallowing (up, down, left, right, centre). Daily reports on comfort were collected from all 348 participants for each of the five positions. Those studies demonstrated that two weeks of practice in all positions were required for most people to habituate to the novel sensations of off-centre swallowing. Given that these individuals had no difficulty swallowing pills at study entry, and they had all previously relied on the conventional centre position, one unexpected finding was that after two weeks of practice, about 75% of participants reported that they had found a new, off centre position that they preferred.⁴

Subsequently, in a prospective case series, 33 children ages 2-17 who had never successfully swallowed a pill were taught the five head positions and were asked to practise each position at home for two weeks using small hard candies.⁴ After two weeks, 100% of participants were successful in at least some of the head positions. Many had taught their siblings and parents how to swallow pills, and all children reported feeling empowered by their new skill.⁴ All participants with a chronic illness (26 of the 33) successfully transferred their skill from hard candies to their prescribed medications. These results suggest that head position training is a well tolerated and effective strategy for children to learn how to swallow pills.¹⁷

The experience of the 6 year old boy with acute myelogenous leukaemia illustrates the value of teaching head positions for learning how to swallow pills. After he underwent head position training and two weeks of practice with small hard candies, he was able to successfully swallow his medication in pill form. He taught all the children in his school class how to swallow pills as well. Until manufacturers develop a broader range of acceptable paediatric formulations, clinicians can support medication use in young children in the short term by suggesting individualised strategies to safely administer medicines, and in the long term by encouraging families to learn to swallow pills with head position training.³

Education into practice

Think about the last time you prescribed an oral medication to a paediatric patient. Did you ask the child or their caregivers whether the child can

swallow pills? What strategies can you suggest to help with giving oral medicines to a child? What kind of preventive guidance could you give regarding learning to swallow pills?

How patients were involved in the creation of this article

Parents of children with chronic diseases being seen in a tertiary care paediatric hospital were invited to review the manuscript and offer comments. As a result of that patient input we added details regarding parental concerns about additives and frequent refills.

How this article was made

We performed a literature search in Medline and Embase using MeSH terms: "child" or "infant". Keywords: "medication", in title: "giv\$", "admin\$", "pill swallow\$", and included a review of references from accessed titles.

The first author had previously published four studies developing a new method of teaching pill swallowing based on altered head position. The second author is a senior clinical pharmacist with experience supporting children's medication use in a paediatric hospital. This article is based on a literature review as well as use of the authors' personal literature collections

Additional information resources

- Training video "Better than a spoonful of sugar" www.research4kids.ucalgary.ca/pillswallowing
- Helping medications taste better <https://ken.childrenshealthcare-canada.ca/xwiki/bin/view/PatientSafety/Helping+Medication+Taste+Better>

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