

Appropriate use of dose administration aids

Rohan A Elliott

Senior pharmacist
Pharmacy Department
Austin Health

Clinical senior lecturer
Faculty of Pharmacy and
Pharmaceutical Sciences
Monash University
Melbourne

Key words

drug labelling, medication
errors, medication reviews,
patient adherence

Aust Prescr 2014;37:46–50

SUMMARY

Dose administration aids can improve medicines management for some people. However, they have a number of limitations and are not suitable for all patients.

Patient assessment is required to identify factors contributing to non-adherence or medication errors. Strategies like simplifying the drug regimen, education and counselling, and a medicines reminder chart or alarm, should be considered before using a dose administration aid.

The patient's preferences and attitude to medicine-taking, and their suitability for a dose administration aid, should also be explored.

When dose administration aids are packed by a third party such as a community pharmacy, interdisciplinary communication and teamwork, patient education, monitoring and regular medicines reconciliation and review are vital to minimise the risk of problems.

Introduction

Dose administration aids organise doses of tablets and capsules according to when they should be taken (Table 1). The devices may be filled by the patient, or by a third party such as a community pharmacy.

Dosing aids may improve medicines management for some people, but they are not without limitations and problems (Table 2)^{1–13} and are not suitable for all patients. Careful patient selection and awareness of the limitations of dosing aids are vital for ensuring appropriate and safe use.

The evidence for using dose administration aids

There have been few well-designed controlled trials evaluating the impact of dosing aids on medication adherence and clinical outcomes. Most studies have had methodological flaws (for example inadequate randomisation, short duration, high loss to follow-up, and variations in concurrent adherence strategies provided with the device).^{14,15} Most trials have focused on a single health problem, for example hypertension, limiting their generalisability to typical users of dose administration aids (older people with multiple comorbidities).

A recent Cochrane review¹⁵ pooled data from several studies (none focusing on older people) and found that dose administration aids modestly increased the percentage of pills taken (mean difference of 11%, 95% confidence interval 6–17%). Meta-analyses of studies that focused on patients with hypertension or diabetes suggested some improvements in diastolic blood pressure and HbA1c in users of dose administration aids, but with low certainty.¹⁵ Only one

small study focusing on older people met the criteria for inclusion. This study reported a non-significant effect on the mean number of missed doses and clinical outcomes.¹⁶

The UK National Institute for Health and Clinical Excellence reviewed the use of dosing aids. It concluded that the evidence for their benefits was not strong enough to recommend widespread use and they should only be used to overcome practical problems if there is a specific need.¹⁷

There has been limited evaluation of sachet dosing aids and automated medication dispensing devices.¹⁵ A qualitative study of Danish patients using a sachet system found that it did not eliminate non-adherence, especially conscious non-adherence, or stockpiling of medicines in the home.¹⁸ A large, non-randomised, retrospective cohort study in the USA reported that a sachet dosing system combined with regular telephone follow-up improved medication refill adherence, but did not reduce health service use or costs in a middle-aged population with multiple comorbidities.¹⁹ Two low quality studies reported that automated dispensing devices led to fewer missed doses compared with manually operated dosing aids,^{16,20} but the differences were unlikely to be clinically important.

Few trials on dose administration aids have been conducted in Australia. However, unpublished Australian studies and clinical experience suggest that dosing aids provided as part of a medicines management service by community pharmacies may benefit appropriately selected patients (Box 1).^{5,10,21} These studies have led to government-subsidised dosing aid programs in Australia and professional practice standards to support this service.³

When should a dose administration aid be considered?

Australian guidelines recommend that dispensed medicines should be retained in their original packaging unless a dose administration aid could help to overcome specific problems.⁴ Practical aids or strategies such as simplifying the regimen, reminder charts, calendars and alarms should be considered before trying a dosing aid filled by a third party.^{1,17,22} Assessing the patient is vital to identify the type of medicines management problem and whether it is likely to be resolved by using a dosing aid.

A dose administration aid may be considered when a person is struggling to manage a complex medicine regimen that cannot be simplified and primarily consists of regularly scheduled, solid oral dose forms that are suitable for packing. They may also be considered for a person who sometimes forgets whether or not they have taken their medicines (leading to risk of double dosing) and requires a visual cue, or a patient whose medicine-taking is being monitored by a carer. Ideally the medicine regimen should be stable and unlikely to change frequently.

Dosing aids are most effective in people who are motivated and willing to take their medicines and possess adequate vision, cognition and dexterity to use the device. Although they may be helpful in people with mild cognitive impairment, there has to be an adequate level of cognition. For example, the patient needs to be able to understand how to use the device, orientated to the day and time, and be able to remember when medicines need to be taken or respond to a reminder.

Dose administration aids are not effective for addressing deliberate non-adherence, poor motivation and errors due to more severe cognitive impairment.

Box 1 Potential benefits of dose administration aids^{5,10,15,21}

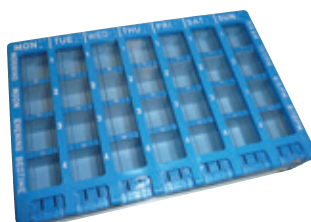
Benefits of dose administration aids packed by community pharmacies, in appropriately selected patients as part of a co-ordinated multidisciplinary approach to medicines management, may include:

- fewer medicines stored in the home
- fewer doses missed or taken incorrectly
- reduced patient and/or carer stress
- better disease control
- increased communication and collaboration between community pharmacy and the GP
- improved access to the patient's (oral) medicines profile, potentially facilitating medicines review and identification of drug interactions

What do patients think of dose administration aids?

Studies assessing patients' opinions report that some users like the fact that the device simplifies their medicine-taking and reduces stress associated with managing multiple medicines.^{2,5,18,23} Other users prefer to manage their medicines from original packs or experience difficulties using the devices.^{2,5,6,8,15,18} Some users feel that the decision to issue a dose administration aid reflects a paternalistic or ageist attitude by health professionals.² A small study assessing user acceptability of several automated dispensing and

Table 1 Types of dose administration aids



Picture courtesy of the author

Compartmentalised plastic boxes (e.g. Dosette)

Reusable devices that are usually filled by the user, sometimes filled by health professionals. Many varieties, with one, two or four compartments for each day of the week. Some devices have the days and times labelled in Braille for people with vision impairment. Some contain a built-in alarm that can be set to remind the user when it is time to take their medicines. Usually not tamper-evident.

Blister or bubble packs

(e.g. MedicoPak, Webster-Pak)

Plastic or disposable cardboard device with four compartments for each day of the week. Provided by pharmacies. Usually filled manually, although some pharmacies use an automated packing method. Some brands may be easier to use than others. Blister packs for people with low vision or who cannot read English are available from some suppliers.



Picture by Australian Prescriber

Sachet systems

(e.g. APHS medication sachets, MPS Packettes)

Tablets and capsules for a particular date and dose time packed in an individual sachet, labelled with the date and time, the medicine details and the patient's name. Sachets are rolled up in chronological date and time order and usually provided in a container. Sachets are prepared using automated packing technology. Community pharmacies usually outsource sachet packing to a large-scale packing facility, although some pharmacies have installed technology to enable onsite packing.



Picture by Australian Prescriber

Automated medication dispensing devices

(e.g. Medido, TabTimer)

Devices that dispense the medicines for a particular dose-time after the user has responded to a built-in reminder alarm that activates when medicines are due to be taken. The device may need to be manually filled or it may dispense pre-filled medication sachets. Some devices have a monitoring function which can send a text message or email to a designated person if the user does not respond to the reminder within a set time.



Picture with permission from TabTimer

reminder devices found that most patients would be unlikely to want to use one.²⁴ Cost and the need for technical support are also barriers to their use.^{20,24}

Inappropriate use

Dosing aids are sometimes used by patients who could potentially manage their medicines from original packs with appropriately targeted information, counselling and simple adherence strategies or aids, and would prefer to do so.^{1,2,5,6,8,18} In these circumstances, using a dose administration aid may lead to unnecessary patient disempowerment and de-skilling.^{2,5,6,8}

Often other strategies to improve medicine-taking are not tried before implementing a dosing aid.^{1,8,25} Patient suitability is not always assessed,^{5,6,8,26} and initiation and subsequent choice of device sometimes focuses on the needs of health professionals and carers rather than the patient.^{8,18,25}

Results of a recent NPS MedicineWise hypothetical case study for health professionals suggested that there are misunderstandings about when it is appropriate to use a dose administration aid. In response to the case, 77% of GPs and 76% of pharmacists recommended a dose administration aid for a 65-year-old woman with heart failure despite the fact that her non-adherence appeared to be a result of uncertainty about why she needed to take the medicines rather than her inability to manage them.²⁷ Providing information and education to the patient was suggested by only 44% of GPs and 62% of pharmacists. Practical aids or strategies – for example reminder charts, alarms, placing medicines in a prominent place, simplifying dose times or linking them to meals – were recommended by just 21% of GPs and 27% of pharmacists.²⁷

Table 2 The limitations of dose administration aids

Limitations	Implications
They do not address all medicines management problems (intentional non-adherence, poor motivation, forgetfulness) ^{1,2}	Other adherence strategies may be more effective for some patients
Many medicines cannot be packed in a dosing aid (see Box 2) ^{3,4}	Most users will need to maintain two medicines management systems – packed oral medicines and non-packed oral medicines or non-oral medicines
When filled by a third party, they may reduce the user's medicines knowledge and autonomy ^{2,5-7}	Users often do not know what they are taking or why they are taking it. Removal from the original packaging means the user cannot check that the correct drug has been dispensed. Inability to identify individual tablets prevents reasoned decisions to not take a medicine (e.g. a laxative when bowels are loose). A medicines list with tablet images may be helpful.
When home delivered, the opportunity for pharmacist review and counselling may be reduced ^{2,5}	Regular review and counselling should be provided such as home visit, phone call, Home Medicines Review or MedsCheck
People with impaired dexterity, eyesight or cognition often have difficulty using them ^{4,5,8}	Ability to manage the dosing aid should be assessed before implementation. For people who have difficulty extracting medicines from blister packs, assistive devices are available (e.g. Pil-Bob, Pak-Popper)
Doses may be missed if tablets are spilled during removal from the dosing aid (patient may have no 'spare' medicines at home) ⁵	Compartmentalised boxes may be more likely than other devices to result in medication spillage
Risk of double dosing if the patient also maintains a supply of non-packed medicines ⁹	Ensure the user knows which medicines are packed. A medicines list with generic and trade names, and images may help.
Medication changes and care transitions such as hospital discharge are more complex with a dosing aid ^{5,6,10,11}	Delays or errors in implementation of changes to medication regimens sometimes occur. Outsourcing of packing by community pharmacies may increase delays.
Unintended discrepancies in the contents occur in more than 10% of patients (failure to communicate medication changes, dispensing or packing errors) ^{8,12,13}	Regular medication reconciliation is required
They increase the cost of medication management (set-up costs, weekly charges, wastage when there are medicine changes) ^{4,5,10}	Cost may be a barrier to their use, or could increase the risk of non-adherence*
Implementation of a dosing aid may increase dose-related adverse effects if it leads to a sudden increase in adherence	Increased monitoring for adverse reactions is required after implementation

* Indigenous patients may be eligible for subsidised dose administration aids through the Quality Use of Medicines Maximised in Aboriginal and Torres Strait Islander Peoples (QUMAX) Program

The suitability of medicines

Despite the widespread use of dosing devices, there are few data regarding the stability (and therefore efficacy and safety) of medicines during packing and storage.^{3,28} Some medicines may not be suitable for use in a dosing aid (see Box 2)^{3,4,28,29} or may have reduced shelf-life when re-packed (for example thyroxine is only stable for 14 days in a sealed, light protected dosing aid stored below 25°C). In warm and humid climates, stability of medicines in dosing aids may be further reduced.

Avoiding problems with dose administration aids

The risk of problems with dose administration aids may be minimised in a number of ways.^{3,4,28} These are best achieved through active collaboration between the general practitioner, pharmacist and patient or carer:

- assess the patient's suitability (see Box 3)
- consider whether the potential benefits outweigh the potential problems (Table 2)
- determine the most suitable type of device in consultation with the patient, and provide education and counselling about its use
- provide education and counselling about the medicines packed in the device, including a printed medicine list*, preferably with images of the medicines
- document the patient's current medicine regimen, type of device, which medicines are to be packed, packing interval and harm-benefit assessment. This document should be shared between the packing pharmacy, prescriber(s), the patient (and their carer if applicable), and updated whenever there are changes to the medicines or packing arrangements³
- put in place a system to ensure good reciprocal communication between prescriber(s), the packing pharmacy and the patient or carer to ensure medicine changes are implemented accurately and in a timely fashion
- consider delaying non-urgent medication changes until the next packing cycle to minimise wastage and costs
- avoid prescribing medicines that are not suitable for packing in a dosing aid
- ensure the device is packed as close as possible to the date that it will be used, and protect from direct light and heat during storage and use to minimise risks of drug degradation

- provide regular patient follow-up and monitoring to ensure that the patient is successfully managing the device and that it has addressed their medication management problem. Make sure that better adherence has not led to increased adverse effects, and that ongoing information and education needs are met
- conduct regular medication reconciliation to ensure that the medicines packed in the device match the prescriber's intended regimen.

A Home Medicines Review can help to identify factors contributing to medication errors or non-adherence, and assess the patient's suitability for a dose administration aid or other strategies to improve

Box 2 Not all medicines can be used in a dose administration aid^{3,4,28,29}

Medicines may not be suitable if they:

- deteriorate when removed from the manufacturer's packaging e.g. effervescent, dispersible, buccal and sublingual preparations
- degrade when exposed to light e.g. frusemide, nifedipine
- absorb moisture from the air when removed from packaging e.g. sodium valproate, (es)omeprazole
- have special administration instructions e.g. alendronate
- have special handling requirements e.g. cytotoxic medicines, finasteride
- are taken 'when required' or in variable doses e.g. warfarin
- are not available in a solid oral dose form

Box 3 Assessing a patient's suitability for a dose administration aid

If the answer to any of these questions is 'no', then a dose administration aid may not be suitable:

- Has a specific medicines management problem been identified that may be resolved with a dosing aid? (e.g. unintentional non-adherence or errors due to a complex regimen, double dosing due to short-term memory loss)
- Is the person motivated to take their medicines?
- Has a medicines review and regimen simplification occurred?
- Have other strategies been considered and discussed with the person? (e.g. linking dose times to meals or other regular activities, medication list or chart with dose times, medication calendar or diary, multi-alarm reminder device)
- Are a majority of the person's medicines suitable for packing in a dosing aid?
- Has the person been shown the dosing aid and agreed to use it?
- Has the person demonstrated that they can use the dosing aid (able to identify correct compartment and remove medications) or do they have a carer who is able to assist?
- Will the person be able to manage dual medication management systems, if applicable? (for packed and non-packed medicines)
- Can the person afford the fees associated with packing?

* www.nps.org.au/conditions-and-topics/topics/how-to-be-medicinewise/managing-your-medicines/medicines-list

ARTICLE

Dose administration aids

SELF-TEST
QUESTIONS

True or false?

1. Dose administration aids improve adherence in patients who are poorly motivated to take their medicines.
2. Patients need to have an adequate level of cognition for a dose administration aid to be useful.

Answers on page 71

medicines management. A pharmacy MedsCheck[†] or Home Medicines Review can also provide education and medication reconciliation for users.

Conclusion

Dose administration aids are not a panacea for all medicines management problems. They only benefit appropriately selected patients when a specific medicines management problem has been identified and less complex adherence strategies have been tried. In such patients a dosing aid, as part of a coordinated multidisciplinary approach to

medicines management, may support the person to remain independent with medicine-taking and reduce the risk of medication administration errors. Healthcare providers need to be aware of the benefits and limitations of dosing aids, and carefully assess patients to determine whether potential benefits outweigh risks and costs. ◀

Conflict of interest: none declared

[†] <http://5cpa.com.au/programs/medication-management-initiatives/medscheck-diabetes-medscheck/>

REFERENCES

1. Raynor DK, Nicolson M, Nunney J, Petty D, Vail A, Davies L. The development and evaluation of an extended compliance support programme by community pharmacists for elderly patients at home. *Int J Pharm Pract* 2000;8:157-64.
2. Nunney J, Raynor DK, Knapp P, Closs SJ. How do the attitudes and beliefs of older people and healthcare professionals impact on the use of multi-compartment compliance aids?: a qualitative study using grounded theory. *Drugs Aging* 2011;28:403-14.
3. Pharmaceutical Society of Australia. Dose Administration Aids Service: guidelines and standards for pharmacists. PSA; 2007. www.psa.org.au/download/community-pharmacy-agreements/dose-administration-aids/dose-administration-service-guidelines.pdf [cited 2014 Mar 4]
4. Australian Pharmaceutical Advisory Council. Guiding principles for medication management in the community. Canberra: Commonwealth of Australia; 2006. www.health.gov.au/internet/main/publishing.nsf/Content/apac-publications-guiding [cited 2014 Mar 4]
5. Roberts M, Stokes J, Ientile C, Lewis G, Doran C, Hendry M, et al. Effectiveness and cost effectiveness of dose administration aids (DAAs): Final report. Quality Medication Care Pty Ltd & Therapeutics Research Unit, School of Medicine, University of Queensland; 2004.
6. Brown SH, Hafeez U, Abdelhafiz AH. Use of multicompartiment compliance aids for elderly patients: patient viewpoints and hospital length of stay. *Postgrad Med* 2010;122:186-91.
7. Kwint HF, Stolk G, Faber A, Gussekloo J, Bouvy MI. Medication adherence and knowledge of older patients with and without multidose drug dispensing. *Age Ageing* 2013;42:620-6.
8. Nunney JM, Raynor DK. How are multi-compartment compliance aids used in primary care? *Pharm J* 2001;267:784-9.
9. Levings B, Szep S, Helps SC. Towards the safer use of dosettes. *J Qual Clin Pract* 1999;19:69-72.
10. Roberts M, Stokes J, Ientile C, Lewis G, Doran C, Haywood A, et al. Effectiveness and cost effectiveness of dose administration aids (DAAs): Phase 3 Final report. Quality Medication Care Pty Ltd & Therapeutics Research Unit, School of Medicine, University of Queensland; 2006.
11. Elliott RA, Tran T, Taylor SE, Harvey PA, Belfrage MK, Jennings RJ, et al. Gaps in continuity of medication management during the transition from hospital to residential care: an observational study (MedGap Study). *Australas J Ageing* 2012;31:247-54.
12. Carruthers A, Naughton K, Mallarkey G. Accuracy of packaging of dose administration aids in regional aged care facilities in the Hunter area of New South Wales. *Med J Aust* 2008;188:280-2.
13. Gilmartin JF, Hussainy SY, Marriott JL. Medicines in Australian nursing homes: a cross-sectional observational study of the accuracy and suitability of re-packing medicines into pharmacy-supplied dose administration aids. *Res Social Adm Pharm* 2013;9:876-83.
14. Connor J, Rafter N, Rodgers A. Do fixed-dose combination pills or unit-of-use packaging improve adherence? A systematic review. *Bull World Health Organ* 2004;82:935-9.
15. Mahtani KR, Heneghan CJ, Glasziou PP, Perera R. Reminder packaging for improving adherence to self-administered long-term medications. *Cochrane Database Syst Rev* 2011;CD005025.
16. Winland-Brown JE, Valiante J. Effectiveness of different medication management approaches on elders' medication adherence. *Outcomes Manag Nurs Pract* 2000;4:172-6.
17. Nunes V, Neilson J, O'Flynn N, Calvert N, Kuntze S, Smithson H, et al. National Collaborating Centre for Primary Care and Royal College of General Practitioners. Medicines adherence: involving patients in decisions about prescribed medicines and supporting adherence. Report No CG76. London: Royal College of General Practitioners; 2009. www.nice.org.uk/nicemedia/pdf/CG76FullGuideline.pdf [cited 2014 Mar 4]
18. Larsen AB, Haugbolle LS. The impact of an automated dose-dispensing scheme on user compliance, medication understanding, and medication stockpiles. *Res Social Adm Pharm* 2007;3:265-84.
19. Zillich AJ, Jaynes HAW, Snyder ME, Harrison J, Hudmon KS, de Moor C, et al. Evaluation of specialized medication packaging combined with medication therapy management: adherence, outcomes, and costs among Medicaid patients. *Med Care* 2012;50:485-93.
20. Buckwalter KC, Wakefield BJ, Hanna B, Lehmann J. New technology for medication adherence: electronically managed medication dispensing system. *J Gerontol Nurs* 2004;30:5-8.
21. School of Pharmacy and Medical Sciences, University of South Australia and Australian Association of Consultant Pharmacy. Dose administration aids: Final report. 1997. <http://qummap.net.au/files/reports/12112699466799.pdf> [cited 2014 Mar 4]
22. George J, Elliott RA, Stewart DC. A systematic review of interventions to improve medication taking in elderly patients prescribed multiple medications. *Drugs Aging* 2008;25:307-24.
23. Lecouturier J, Cunningham B, Campbell D, Copeland R. Medication compliance aids: a qualitative study of users' views. *Br J Gen Pract* 2011;61:93-100.
24. Wakefield BJ, Orris LJ, Holman JE, Russell CL. User perceptions of in-home medication dispensing devices. *J Gerontol Nurs* 2008;34:15-25.
25. Raynor DK, Nunney JM. Medicine compliance aids are partial solution, not panacea. *BMJ* 2002;324:1338.
26. Green CF, McCloskey EF. UK survey of the provision of multicompartiment compliance aids and medicines reminder charts on discharge from hospital. *Int J Pharm Pract* 2005;13:85-9.
27. NPS MedicineWise. Heart failure: Case study 71 report. 2012. www.nps.org.au/health-professionals/professional-development/case-studies/pdfs/case-71-report-heart-failure [cited 2014 Mar 4]
28. Glass BD, Haywood A, Llewellyn V, Mangan M. Compliance aids and medicine stability: new evidence of quality assurance. *Curr Drug Saf* 2009;4:74-8.
29. Church C, Smith J. How stable are medicines moved from original packs into compliance aids? *Pharm J* 2006;276:75-81.



This article has a continuing professional development activity for pharmacists available at www.australianprescriber.com/continuingprofessionaldevelopment

For more information see page 45