



TITLE: Automatic Pill Dispensers and Reminders: Clinical and Cost-Effectiveness and Guidelines for Use

DATE: 23 November 2009

RESEARCH QUESTIONS:

1. What is the clinical effectiveness of automatic pill dispensers and reminders for patients at home, in assisted living, long-term care, or in the general population?
2. What is the cost-effectiveness of automatic pill dispensers and reminders for patients at home, in assisted living, long-term care, or in the general population?
3. What are the guidelines for the use of automatic pill dispensers and reminders for patients at home, in assisted living, long-term care, or in the general population?

METHODS:

A limited literature search was conducted on key health technology assessment resources, including PubMed, the Cochrane Library (Issue 4, 2008), University of York Centre for Reviews and Dissemination (CRD) databases, ECRI, EuroScan, international health technology agencies, and a focused Internet search. The search was limited to English language articles published between 2004 and November 2009. No filters were applied to limit the retrieval by study type. Internet links were provided, where available.

Only studies assessing automatic dispenser and reminder devices for improvements in clinical outcomes, quality of life, safety outcomes (including medication error rates), need for assistive living, and cost were considered for inclusion in the summary of findings. Additional studies assessing various devices for improvement in medication adherence were included in the appendix.

The summary of findings was prepared from the abstracts of the relevant information. Please note that data contained in abstracts may not always be an accurate reflection of the data contained within the full article.

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RESULTS:

HTIS reports are organized so that the higher quality evidence is presented first. Therefore, health technology assessment reports, systematic reviews, and meta-analyses are presented first. These are followed by randomized controlled trials (RCTs), controlled clinical trials, observational studies, economic evaluations, and evidence-based guidelines.

The literature search identified one RCT and two observational studies examining automatic pill dispensers and reminders for the outcomes of interest. No health technology assessments, systematic reviews, meta-analyses, controlled clinical trials, economic evaluations, or guidelines were identified. Additional information of potential interest including product information and studies assessing various devices for improvements in medication adherence are included in the appendix.

OVERALL SUMMARY OF FINDINGS:

One RCT¹ evaluated the impact of a Disease Management Assistance System (DMAS), a device that prompts patients with verbal reminders at medication times and electronically records doses, on quality of life in 48 patients with HIV. Patients randomly assigned to the DMAS group (n=25) also received a 30 minute adherence educational session. Patients randomly assigned to the control group (n=23) received the educational session only. After six months, the control group had improved quality of life scores relative to baseline. In contrast, patients in the DMAS group had improved adherence to therapy but lower quality of life scores relative to baseline. The authors concluded that although DMAS was associated with improved adherence, its use may decrease quality of life in patients with HIV.

The use of the Informedix Med-eMonitor with a daily reminder feature was evaluated in two pilot observational studies in 20 patients taking warfarin.² The objective of the two studies was to determine whether a lottery-based system (based on opening pill compartments correctly) improves adherence to warfarin therapy and anticoagulation control. The primary outcome was the number of incorrectly taken warfarin doses. The secondary outcome was the percentage of international normalized ratio (INR) measurements not falling within the therapeutic range. Results from both pilot studies showed using the device in conjunction with the lottery-based system decreased the percentage of out-of-range INRs and the number of incorrectly taken pills. The authors concluded that a daily lottery-based financial incentive using a reminder device has the potential to significantly improve the number of missed doses and anticoagulation control in patients taking warfarin.

One observational trial investigated the relationship between using electronic pillboxes (MEMS) and blood pressure control in 239 individuals with hypertension.³ The main outcome was the association between the number of doses taken using the correct dosing interval (timing adherence) and blood pressure. Results showed that the average timing adherence measured by MEMS was high (88%). However, there was no evidence that increased timing adherence was associated with improvements in blood pressure control. The authors concluded that pharmacological non-response may be a more important factor for inadequate control of blood pressure than medication non-adherence in patients with hypertension.

Overall, studies evaluating automatic pill dispensers and reminders for clinical, safety, and economic outcomes are limited. No literature was identified examining the cost, safety, and need for assistive services when these devices are used in patients residing in supportive-living facilities. Results from the identified studies were inconsistent in terms of improvements in clinical outcomes with the use of automatic pill dispensers and reminders.

REFERENCES SUMMARIZED:

Health technology assessments

No literature identified.

Systematic reviews and meta-analyses

No literature identified.

Randomized controlled trials

1. Wu AW, Snyder CF, Huang IC, Skolasky R, McGruder HF, Celano SA, et al. A randomized trial of the impact of a programmable medication reminder device on quality of life in patients with AIDS. *AIDS Patient Care STDS*. 2006 Nov;20(11):773-81. [PubMed: PM17134351](#)

Controlled clinical trials

No literature identified.

Observational studies

2. Volpp KG, Loewenstein G, Troxel AB, Doshi J, Price M, Laskin M, et al. A test of financial incentives to improve warfarin adherence. *BMC Health Serv Res*. 2008;8:272. [PubMed: PM19102784](#)
3. Zeller A, Schroeder K, Peters TJ. Electronic pillboxes (MEMS) to assess the relationship between medication adherence and blood pressure control in primary care. *Scand J Prim Health Care*. 2007 Dec;25(4):202-7. [PubMed: PM17924286](#)

Economic evaluations

No literature identified.

Guidelines and recommendations

No literature identified.

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APPENDIX – FURTHER INFORMATION:

Systematic reviews and meta-analyses

4. Heneghan CJ, Glasziou P, Perera R. Reminder packaging for improving adherence to self-administered long-term medications. *Cochrane Database Syst Rev* [Internet]. 2006 [cited 2009 Nov 20];(1): CD005025. Available from: <http://www.mrw.interscience.wiley.com/cochrane/clsystrev/articles/CD005025/frame.html>
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Randomized controlled trials

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Observational studies

7. Hayes TL, Cobbinah K, Dishongh T, Kaye JA, Kimel J, Labhard M, et al. A study of medication-taking and unobtrusive, intelligent reminding. *Telemed J E Health*. 2009 Oct;15(8):770-6. [PubMed: PM19780692](#)
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[PubMed: PM17946369](#)
11. de BM, Hospers HJ, van den Borne HW, Kok G, Prins JM. Theory- and evidence-based intervention to improve adherence to antiretroviral therapy among HIV-infected patients in the Netherlands: a pilot study. *AIDS Patient Care STDS*. 2005 Jun;19(6):384-94. [PubMed: PM15989434](#)
12. Robbins B, Rausch KJ, Garcia RI, Prestwood KM. Multicultural medication adherence: a comparative study. *J Gerontol Nurs*. 2004 Jul;30(7):25-32. [PubMed: PM15287324](#)

Review articles

13. *Remote medication management for outpatients*. Plymouth Meeting (PA); ECRI Institute; 2008 (Emerging Technology report). Available for purchase from: <https://www.ecri.org>
14. Lindenmeyer A, Hearnshaw H, Vermeire E, Van RP, Wens J, Biot Y. Interventions to improve adherence to medication in people with type 2 diabetes mellitus: a review of the literature on the role of pharmacists. *J Clin Pharm Ther*. 2006 Oct;31(5):409-19. [PubMed: PM16958818](#)
15. McGraw C. Multi-compartment medication devices and patient compliance. *Br J Community Nurs*. 2004 Jul;9(7):285-90. [PubMed: PM15284670](#)

Additional references

16. Lomas C. Medication dispensing tool for vulnerable adults. *Nursing times.net* [Internet]. 2009 [cited 2009 Nov 15]. Available from: <http://www.nursingtimes.net/whats-new-in-nursing/primary-care/medication-dispensing-tool-for-vulnerable-adults/5005686.article>
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