



**TITLE: Medication Ordering Technologies in Long Term Care Facilities: Clinical Effectiveness and Cost-Effectiveness**

**DATE:** 12 August 2010

**RESEARCH QUESTIONS:**

1. What is the clinical effectiveness of using electronic medication ordering technologies in long term care facilities to reduce medication errors?
2. What is the cost-effectiveness of using electronic medication ordering technologies in long term care facilities to reduce medication errors?

**METHODS:**

A limited literature search was conducted on key health technology assessment resources, including PubMed, the Cochrane Library (Issue 7, 2010), University of York Centre for Reviews and Dissemination (CRD) databases, ECRI (Health Devices Gold), EuroScan, international health technology agencies, and a focused Internet search. The search was limited to English language articles published between January 1, 2005 and August 3, 2010. No filters were applied to limit the retrieval by study type. Internet links were provided, where available.

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.

**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, non-randomized studies, and economic evaluations.

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Two randomized controlled trials and one economic evaluation were identified pertaining to the use of electronic medication ordering technologies in long term care facilities to reduce medication errors. No relevant health technology assessment reports, systematic reviews, meta-analyses, or non-randomized studies were identified. Additional information that may be of interest has been included in the appendix.

**OVERALL SUMMARY OF FINDINGS:**

Overall, limited clinical and economic evidence is available regarding the use of electronic medication ordering technologies in long term care facilities. One randomized trial found that the adoption of a computerized provider order entry system did not reduce the number of adverse drug or preventable adverse drug event rates.<sup>1</sup> The second identified trial examined the use of computerized ordering in conjunction with a computerized clinical decision support system, and while the authors recommended the implementation of such systems to improve safety in long term care facilities, the low response of clinicians to warning messages and alerts suggests that the systems should be refined and that the impact of the computerized systems on medication errors needs to be assessed further.<sup>2</sup> The authors of the identified economic evaluation suggested that although computerized systems are likely beneficial for long-term care residents, the costs incurred by multiple stakeholders may necessitate the provision of financial incentives to physicians and facilities in order to encourage and accelerate the use of these systems.<sup>3</sup>

**REFERENCES SUMMARIZED:**

**Health technology assessments**

No literature identified.

**Systematic reviews and meta-analyses**

No literature identified.

**Randomized controlled trials**

1. Gurwitz JH, Field TS, Rochon P, Judge J, Harrold LR, Bell CM, et al. Effect of computerized provider order entry with clinical decision support on adverse drug events in the long-term care setting. *J Am Geriatr Soc.* 2008 Dec;56(12):2225-33. [PubMed: PM19093922](#)
2. Judge J, Field TS, DeFlorio M, LaPrino J, Auger J, Rochon P, et al. Prescribers' responses to alerts during medication ordering in the long term care setting. *J Am Med Inform Assoc [Internet].* 2006 Jul [cited 2010 Aug 12];13(4):385-90. Available from: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1513672> [PubMed: PM16622171](#)

**Non-randomized studies**

No literature identified.

**Economic evaluations**

3. Subramanian S, Hoover S, Gilman B, Field TS, Mutter R, Gurwitz JH. Computerized physician order entry with clinical decision support in long-term care facilities: costs and benefits to stakeholders. *J Am Geriatr Soc.* 2007 Sep;55(9):1451-7. [PubMed: PM17915344](#)

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**APPENDIX – FURTHER INFORMATION:**

**Systematic reviews not specific to long-term care**

4. Kaur S, Mitchell G, Vitetta L, Roberts MS. Interventions that can reduce inappropriate prescribing in the elderly: a systematic review. *Drugs Aging*. 2009;26(12):1013-28. [PubMed: PM19929029](#)
5. Wolfstadt JI, Gurwitz JH, Field TS, Lee M, Kalkar S, Wu W, et al. The effect of computerized physician order entry with clinical decision support on the rates of adverse drug events: a systematic review. *J Gen Intern Med [Internet]*. 2008 Apr [cited 2010 Aug 12];23(4):451-8. Available from: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2359507> [PubMed: PM18373144](#)
6. Eslami S, Abu-Hanna A, de Keizer NF. Evaluation of outpatient computerized physician medication order entry systems: a systematic review. *J Am Med Inform Assoc [Internet]*. 2007 Jul [cited 2010 Aug 12];14(4):400-6. Available from: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2244893> [PubMed: PM17460137](#)

**Economic information not specific to long-term care**

7. Wu RC, Laporte A, Ungar WJ. Cost-effectiveness of an electronic medication ordering and administration system in reducing adverse drug events. *J Eval Clin Pract*. 2007 Jun;13(3):440-8. [PubMed: PM17518812](#)  
CRD abstract: <http://www.crd.york.ac.uk/CRDWeb/ShowRecord.asp?ID=22007001061>
8. Kaushal R, Jha AK, Franz C, Glaser J, Shetty KD, Jaggi T, et al. Return on investment for a computerized physician order entry system. *J Am Med Inform Assoc [Internet]*. 2006 May [cited 2010 Aug 12];13(3):261-6. Available from: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1513660> [PubMed: PM16501178](#)

**Non-randomized studies not specific to long-term care**

9. Singh H, Mani S, Espadas D, Petersen N, Franklin V, Petersen LA. Prescription errors and outcomes related to inconsistent information transmitted through computerized order entry: a prospective study. *Arch Intern Med*. 2009 May 25;169(10):982-9. [PubMed: PM19468092](#)

**Review articles**

10. Computerized physician order entry [Internet]. Washington (DC): Leapfrog Group; 2009. [cited 2010 Aug 12]. Available from: [http://www.leapfroggroup.org/for\\_hospitals/leapfrog\\_hospital\\_survey\\_copy/leapfrog\\_safety\\_practices/cpoe](http://www.leapfroggroup.org/for_hospitals/leapfrog_hospital_survey_copy/leapfrog_safety_practices/cpoe)
11. Spiro RF. Electronic prescribing in long-term care: an overview of five pilot projects. *Consult Pharm*. 2008 Jan;23(1):16-26. [PubMed: PM18284315](#)

### Additional references

12. Ghahramani N, Lendel I, Haque R, Sawruk K. User satisfaction with computerized order entry system and its effect on workplace level of stress. *J Med Syst*. 2009 Jun;33(3):199-205. [PubMed: PM19408453](#)
13. Computerized provider order-entry systems [Internet]. In: Health product comparison system (HPCS). Plymouth Meeting (PA): ECRI Institute; 2009 [cited 2009 Aug 12]. Available from: [www.ecri.org/](http://www.ecri.org/) Subscription required.
14. Rochon PA, Field TS, Bates DW, Lee M, Gavendo L, Erramuspe-Mainard J, et al. Clinical application of a computerized system for physician order entry with clinical decision support to prevent adverse drug events in long-term care. *CMAJ* [Internet]. 2006 Jan [cited 2010 Aug 12];3;174(1):52-4. Available from: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1319347> [PubMed: PM16389238](#)
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17. Rochon PA, Field TS, Bates DW, Lee M, Gavendo L, Erramuspe-Mainard J, et al. Computerized physician order entry with clinical decision support in the long-term care setting: insights from the Baycrest Centre for Geriatric Care. *J Am Geriatr Soc*. 2005 Oct;53(10):1780-9. [PubMed: PM16181180](#)