A pharmacist-led information technology intervention for medication errors (PINCER): a multicentre, cluster randomised, controlled trial and cost-effectiveness analysis

Record Status
This is a critical abstract of an economic evaluation that meets the criteria for inclusion on NHS EED. Each abstract contains a brief summary of the methods, the results and conclusions followed by a detailed critical assessment on the reliability of the study and the conclusions drawn.

CRD summary
The objective was to assess the effectiveness, cost-effectiveness and acceptability of a pharmacist-led information technology-based intervention to reduce the number of hazardous prescribing errors. The authors concluded that the intervention was effective in preventing a range of medication errors. The methods were good, but a very narrow economic evaluation was performed assessing the incremental cost per error avoided. As the authors pointed out, further research is required to assess the true cost-effectiveness of the intervention.

Type of economic evaluation
Cost-effectiveness analysis

Study objective
The objective was to assess the effectiveness, cost-effectiveness and acceptability of a pharmacist-led information technology-based intervention to reduce the number of hazardous prescribing errors.

Interventions
Two procedures to reduce the number of patients exposed to hazardous prescribing or inadequate blood-test monitoring were examined: simple feedback or feedback with a complex pharmacist-led IT-based intervention.

With simple feedback, general practices received computerised feedback for patients identified as being at risk from potentially hazardous prescribing or inadequate blood-test monitoring of their medication. Educational materials explaining the importance of each type of error were included.

The pharmacist-led information technology intervention (PINCER), comprised simple feedback, and in addition, educational outreach and dedicated support from a pharmacist over a 12 week period. Pharmacists used various techniques to correct medication errors that had been identified and prevent them in the future. This included a review of patients' records, discussions with doctors on actions to be taken, invitations to patients to be reviewed or have blood tests, and improvements to local safety systems.

Location/setting
UK/primary care.

Methods
Analytical approach:
A decision-tree model was used to assess the costs and outcomes for each intervention. The time horizon was six months for the main analysis. The authors reported that the perspective was that of the English NHS.

Effectiveness data:
The clinical and effectiveness data were from a pragmatic, cluster-randomised trial. A total of 240 English general practices were invited to participate and 72 agreed to participate and were randomised equally to each group. At baseline the 36 simple feedback practices had 32,938 patients at risk of error and the 36 PINCER practices had 30,399 patients at risk. Follow-up was for six months after the intervention, with no practice lost to follow-up. An analysis was also performed after one year post-intervention. There were three primary outcomes: patients with a history of peptic ulcer who were prescribed a non-selective non-steroidal anti-inflammatory drug without a proton-pump inhibitor;
patients with asthma who were prescribed a beta-blocker; and patients aged 75 years or older who were prescribed an angiotensin converting enzyme inhibitor or a loop diuretic for the long-term without a computer-recorded check of their renal function and electrolytes in the previous 15 months. Data were also collected on a number of secondary outcomes relating to contraindicated prescribing, inadequate monitoring and dosing problems. The trial methods were reported in the published protocol (Avery, et al. 2009, see 'Other Publications of Related Interest' below for bibliographic details).

Monetary benefit and utility valuations:
None.

Measure of benefit:
The measure of benefit was the number of errors detected at six months after the intervention.

Cost data:
The direct costs included those of the generation of error reports; pharmacist training sessions; facilitated meetings; monthly operational meetings; practice feedback meetings; and other time spent following-up errors. The time that the pharmacists spent in these activities was recorded in the trial. All costs were reported in UK £.

Analysis of uncertainty:
The costs and outcomes were adjusted for specific characteristics, using regression analysis; the effects of baseline list-size, the number of general practitioners, the practice's Quality and Outcomes Framework score; regional settings; and demographics were assessed. Uncertainty was assessed using 10,000 bootstrap replications and a cost-effectiveness acceptability curve was constructed.

Results
At six months, the average cost per practice was £92.84 with simple feedback and £1,049.67 with the PINCER intervention. The mean incremental cost of the PINCER intervention was £871.88 (95% CI 765.96 to 977.79). At six months, the PINCER intervention generated an average 12.90 fewer medical errors than simple feedback (95% CI 12.39 to 13.42).

Compared with simple feedback, the PINCER intervention had a mean additional cost of £65.60 (95% CI 58.2 to 73.0) per error avoided at six months.

The sensitivity analysis showed that the PINCER intervention had a 95% likelihood of being cost-effective at a willingness-to-pay threshold of £75 per error avoided at six months.

Authors' conclusions
The authors concluded that the PINCER was an effective way to prevent a range of medication errors in general practice.

CRD commentary
Interventions:
The interventions were reported clearly and in detail.

Effectiveness/benefits:
The clinical and effectiveness data were from a pragmatic, cluster-randomised trial. The inclusion criteria, sample size, randomisation method, primary and secondary outcome measures, and follow-up procedures were reported. Given that well-conducted randomised controlled trials are considered to be the gold standard when comparing health care interventions, it is likely that the outcome information was internally valid. The outcome of errors avoided was not a direct health outcome; the health benefits were not measured.

Costs:
The perspective was explicitly reported to be that of the NHS. A very narrow costing was performed, including only those costs directly associated with performing the intervention. Important costs, such as for the treatment of complications due to the medication errors were not included. All the resource use data were from the clinical trial, but
the sources used to value each resource were not reported. The price year was not reported, which will hamper future inflationary exercises.

Analysis and results:
A decision tree was created to synthesise the cost and outcome information from the clinical trial. The details of the model structure were reported, with a diagram. The uncertainty in the results was tested using appropriate statistical and sensitivity analyses. The authors reported that one of their main limitations was their use of “errors avoided” as the primary outcome, which assumed that reducing errors was a policy objective. They did not include any health outcomes (quality of life or survival) or costs (treating complications from these errors) associated with these errors. In their discussion, they called for further research on the costs and benefits of avoiding different types of medication error.

Concluding remarks:
The methods were good, but a very narrow economic evaluation was performed assessing the incremental cost per error avoided. As the authors pointed out, further research is required to assess the true cost-effectiveness of the intervention.

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