Study of the effect of standardized chemotherapy order forms on prescribing errors and anti-emetic cost

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.

Health technology
The study investigated the use of standardised chemotherapy order forms (SCOFs) when prescribing antineoplastic medications. A total of 64 SCOFs for the most commonly used antineoplastic regimens were developed, using evidence-based anti-emetic guidelines and Phase II and III clinical trial data. Each SCOF contained information on the antineoplastic regimen, dose, schedule and route to be prescribed, as well as the duration of administration, cycles, required laboratory tests and recommended supported measures. The use of SCOFs was then compared with routine practice, whereby a system of individually typed or handwritten antineoplastic orders remained in use.

Type of intervention
Other: prescribing arrangements.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised patients receiving treatment for breast, endometrial, cervical, ovarian, testicular, prostate, lung and colorectal cancer, lymphomas and multiple myeloma.

Setting
The study setting was secondary care. The economic study was carried out in the USA.

Dates to which data relate
The effectiveness and resource use data were derived between 1 March and 30 June 2003 for the control period, and from 1 July to 31 October 2003 for the intervention period. The price year would appear to be 2003.

Source of effectiveness data
The effectiveness data were derived from a single study.

Link between effectiveness and cost data
The costing was undertaken retrospectively and was only performed on prescription orders for serotonin antagonists (i.e. granisetron and ondansetron).

Study sample
No study sample was determined in the planning phase of the study. In addition, power calculations were not performed retrospectively. A total of 7,177 medication orders were dispensed during the study periods, 3,592 orders during the
control period and 3,585 during the intervention period. Of these, 1,078 prescriptions for granisetron and ondansetron were dispensed during the control period and 1,121 during the intervention period.

**Study design**
The study was a retrospective cohort study with historical controls that was undertaken in a single institution. There was no follow-up in this study as the outcomes (i.e. prescription errors) occurred immediately.

**Analysis of effectiveness**
All the prescription orders included in the study were accounted for in the analysis. The primary outcome used was the number of prescribing errors. A prescribing error was defined as a miswritten or incomplete order for an antineoplastic regimen, such as wrong dosage, route, schedule, duration of infusion, missing antineoplastic agent in a multi-agent regimen, missing supportive medications such as growth factors, and missing or inappropriate anti-emetic agents. Five oncology pharmacists and three experienced oncology pharmacy technicians evaluated all prescribing orders to detect errors. The error rate was calculated by the ratio of the total number of prescription errors to the volume of prescriptions. Chi-squared tests were used to test for any significant difference in prescribing error rate between the intervention and control period, as well as with the historic prescribing error rate.

**Effectiveness results**
Fifty-three (1.4%) prescribing errors were documented during the control period, compared with 12 (0.3%) during the intervention period. (p<0.0001).

Comparing the error rate for each period to the historic prescribing error rate (0.4%; 94 errors in 21,156 orders), the difference between the control period and the historic control was significant, (p<0.0001). There was no significant difference between the test period and the historic control, (p=0.36).

**Clinical conclusions**
The use of standardised chemotherapy order forms reduced the prescribing error rate over a 4-month period in comparison with a 4-month control period. However, when the error rate observed in the intervention period was compared with the long-term historic error rate, no significant differences in error rates were observed.

**Measure of benefits used in the economic analysis**
The authors did not derive a measure of health benefit. The analysis was therefore categorised as a cost-consequences study.

**Direct costs**
The direct costs included in the analysis were those to the health care provider. Only the costs of the anti-emetic drugs (i.e. granisetron and ondansetron) were included in the analysis. The cost was calculated by multiplying the cost per unit, using the hospital's actual acquisition cost, for each dosage form by the number of units (milligrams or millilitres). Discounting was not relevant, as the costs were incurred during less than one year, and was appropriately not performed. The study reported the total and mean costs. The price year would appear to be 2003.

**Statistical analysis of costs**
The authors compared the serotonin antagonist anti-emetic costs for the intervention and control period using a t-test. A p-value of less than 0.05 was used to determine statistically significant differences.

**Indirect Costs**
The indirect costs were not included.
Currency
US dollars ($).

Sensitivity analysis
No sensitivity analyses were performed.

Estimated benefits used in the economic analysis
See the 'Effectiveness Results' section.

Cost results
The total acquisition cost for serotonin antagonist anti-emetics was $76,454.64 (mean $70.92 per order) in the control period and $73,331.61 (mean $65.42 per order) in the intervention period.

A t-test was used to compare the mean costs. This revealed a significant difference (p<0.037, 95% confidence interval: $0.33 to $10.46)

Synthesis of costs and benefits
The costs and benefits were not combined.

Authors' conclusions
The use of standardised chemotherapy order forms reduced serotonin antagonist anti-emetic costs and prescribing errors.

CRD COMMENTARY - Selection of comparators
A justification was given for the comparator used. It represented current practice in the authors' setting. You should decide if the comparator represents current practice in your own setting.

Validity of estimate of measure of effectiveness
The study was based on a retrospective cohort study with historical controls. This has limitations in terms of answering the study question as the study was undertaken in two different time periods, with external factors potentially confounding the authors' results. It would appear that the authors' results were confounded by such external factors, as the prescribing error rate in the control period was significantly higher than that identified for a long-term historic control period. This is rather a counter-intuitive finding as the results showed no significant difference between the test and historic periods.

Validity of estimate of measure of benefit
The authors did not derive a measure of health benefit. The study was, in effect, a cost-consequences analysis, and the comments above therefore apply (see 'Validity of estimate of measure of effectiveness').

Validity of estimate of costs
The authors were only interested in determining if the costs of anti-emetic drugs were lower during the period when SCOFs were in place than in the control period. Consequently, they only included the costs of these drugs. However, to make their analysis more generalisable and informative, the authors could have included the costs of preparing and maintaining the SCOFs, and the costs associated with the outcomes from the errors in prescription (e.g. adverse outcomes in patients due to wrong medication). The costs and the quantities were reported separately, which will
increase the transferability of the authors' results. The unit costs were derived from the authors’ setting. Appropriate statistical analyses of the costs were performed to test for statistically significant differences. Since all the costs were incurred during less than one year, discounting was unnecessary. The price year was not explicitly reported, which will hamper any future inflation exercises.

**Other issues**

The authors made appropriate comparisons of their findings with those from other studies that also found the use of SCOFs led to improved compliance with prescribing guidelines, and reduced incomplete orders and prescribing errors. The issue of generalisability to other settings was not addressed. The authors do not appear to have presented their results selectively. Their study would appear to have important limitations, making it difficult to draw any meaningful conclusions. The authors reported several further limitations to their study. First, the time commitment and maintaining a conscious effort by the pharmacy staff to record interventions may have been a disincentive that could have led to the under-reporting of errors. Second, only 36 of 64 SCOFs were approved before the start of the test period. Third, oncologists did not use SCOFs extensively which, according to the authors, might be due to their failure to market them aggressively. Fourth, oncologists made changes to the SCOFs. Finally, there were numerous oncologist staff changes during the intervention period.

**Implications of the study**

The authors recommended that future studies should use a study period with less personnel turnover and also incorporate aggressive staff education, with a transition period to the new system prior to actual measurement of the effect change. If ethically feasible, a randomised prospective study should be undertaken.

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None stated.

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**Other publications of related interest**


**Indexing Status**

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**MeSH**

Antiemetics /economics; Antineoplastic Agents /administration & dosage /adverse effects; Cost-Benefit Analysis; Drug Costs; Drug Prescriptions /standards; Drug Utilization; Forms and Records Control; Granisetron /therapeutic use; Medical Errors /prevention & control; Ondansetron /therapeutic use; Pharmacy Service, Hospital; Prospective Studies