Prophylaxis for stress-related gastrointestinal hemorrhage: a 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.

Health technology
Using prophylaxis for stress-related gastrointestinal hemorrhage with either sucralfate or cimetidine versus placebo.

Type of intervention
Treatment; Secondary prevention.

Economic study type
Cost-effectiveness analysis.

Study population
Patients admitted to ICUs.

Setting
Hospital. The economic study was carried out in Detroit, USA.

Dates to which data relate
For the effectiveness analysis, the model assumptions were based on results from studies between 1984-1994. Costs used were estimated accordingly, based on data (charges) from the institution. Prices (partly unitary costs) were implicitly reported to be those from 1993.

Source of effectiveness data
The evidence for the final outcomes was derived from a review of previously completed studies.

Modelling
A decision-tree model was used to estimate the benefits and costs associated with the alternative health technologies.

Outcomes assessed in the review
The major clinical outcomes were stress-related hemorrhage (SRH), risk reduction due to prophylaxis, and nosocomial pneumonia (using cimetidine, sucralfate versus placebo).

Study designs and other criteria for inclusion in the review
The review included controlled (placebo) clinical trials of stress-related hemorrhage prophylaxis published since 1984. A previously published meta-analysis was used to obtain the assumed reduction in risk of bleeding with prophylaxis.
Sources searched to identify primary studies
Medline was searched to identify the primary studies.

Criteria used to ensure the validity of primary studies
Not stated.

Methods used to judge relevance and validity, and for extracting data
Not stated.

Number of primary studies included
Eleven studies were directly referred to in the estimation of the main clinical outcomes.

Methods of combining primary studies
The only combination method described was the use of the median outcome for frequency of stress-related hemorrhage.

Investigation of differences between primary studies
Not stated.

Results of the review
The baseline assumptions for the model arising from the review were a 6% (range: 0.1 - 33%) frequency (risk) of stress-related hemorrhage among ICU patients not receiving prophylaxis and a 50% (range: 10 - 90%) risk reduction due to prophylaxis (assuming equal efficacy for the prophylactic medications, i.e. cimetidine or sucralfate). The estimated risk of nosocomial pneumonia was 0% (range: 0 - 10%).

Measure of benefits used in the economic analysis
The main benefit measure chosen was the number of episodes of stress-related hemorrhage prevented. A decision tree was used to deal with the uncertainty in the occurrence of the major clinical outcomes.

Direct costs
Quantities were not analysed separately from the costs. Cost items were partially reported separately. The cost calculations consisted of the costs of prophylaxis and the costs of evaluation and treatment of stress-related haemorrhage (the costs of services and materials). The cost perspective adopted was that of the health care provider. The estimation of costs was based on standard prices (unitary costs) from the study institution. The source of charges was the hospital billing system. The global inpatient cost-to-charge ratio (0.6) was used to convert the charges to costs. 1993 prices were used. The costs of adverse effects associated with prophylactic medications were not included since they were regarded as uncommon and reversible on the discontinuation of the medications. The cost of the evaluation and treatment of nosocomial pneumonia was included in the sensitivity analysis. The costs associated with the evaluation and treatment of nosocomial pneumonia did not include the cost of mechanical ventilation, respiratory therapies, daily chest radiographs, or arterial blood gas samples.

Indirect Costs
Not considered.

Currency
US dollars ($).
Sensitivity analysis
The parameters chosen for the sensitivity analysis were the estimate of risk reduction of SRH for prophylaxis, occurrence of SRH and nosocomial pneumonia. The areas of uncertainty investigated were variability in data and generalisability of results (for sucralfate alone). The method used was two-way simple sensitivity analysis.

Estimated benefits used in the economic analysis
Prophylaxis with sucralfate prevents three episodes for every 100 patients treated (the baseline assumptions for the model arising from the review were a 6% (range: 0.1 - 33%) frequency (risk) of stress related hemorrhage among ICU patients not receiving prophylaxis and a 50% (range: 10 - 90%) risk reduction due to prophylaxis (assuming equal efficacy for cimetidine and sucralfate). Side-effects of treatment were not considered in the analysis.

Cost results
The incremental cost of prophylaxis with sucralfate (relative to placebo), less any savings accruing from prevention of hemorrhage was $3,432.

Synthesis of costs and benefits
The synthesis was carried out by means of a ratio of cost per SRH averted. As part of the sensitivity analysis it was assumed that the two intervention treatments were different in terms of effectiveness. The more expensive (cimetidine) was assumed to be 50% more effective than the less expensive (sucralfate), and as a consequence, an incremental analysis was performed. Sucralfate prophylaxis had a cost per bleeding episode averted of $1,144 versus $7,538 for cimetidine. If cimetidine prophylaxis were assumed to bring about a reduction in risk of SRH of 75%, compared to the 50% reduction in SRH risk from sucralfate, the incremental ratio of cost per bleeding episode averted was $12,210. Moving from low-risk to high-risk of SRH sub-populations, the cost-effectiveness ratio decreased. The sensitivity analysis showed that sensitive parameters (for sucralfate prophylaxis) were: risk of developing SHR and risk of pneumonia with prophylaxis (combined), RRP and risk of SHR (combined). For the former, the higher the risk of SHR, the higher the marginal effect of the risk of pneumonia (in percentage units) on costs per bleed averted. For the latter combination of parameters, in ICU populations with less than 12% risk of SHR, prophylaxis gave positive cost effectiveness ratios at any assumed rate of RRP (no saving of resources or no-dominant strategy result).

Authors' conclusions
The results suggested that the cost per bleeding episode averted in low-risk populations may make prophylaxis for SRH an unjustifiable expense. Further research is needed to identify patient populations that are at high risk of developing SRH, and to determine whether prophylaxis increases the risk of nosocomial pneumonia.

CRD COMMENTARY - Selection of comparators
The reason for the choice of the comparator is clear.

Validity of estimate of measure of benefit
There was no mention of any methods used to ensure the quality of the primary studies included in the review, therefore the internal validity of the estimates of benefit measures cannot be assessed.

Validity of estimate of costs
Resource utilisation was not reported separately from the costs. Adequate details of the methods of cost estimation were given. As acknowledged by the authors, there are possible cases of overestimation and underestimation in the cost analysis.
Other issues
Overall, in view of the fact that primary studies were not of exclusively randomised design and given the lack of statistical analysis of the costs, the results need to be treated with some caution.

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