A hospital perspective on the cost-effectiveness of beta-blockade for prophylaxis of atrial fibrillation after cardiothoracic surgery
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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
Prophylactic beta-blockade for suppressing atrial fibrillation (AF) after cardiothoracic surgery (CTS) was compared with no prophylaxis. The starting postoperative metoprolol-equivalent dose was a mean of 75.3 (standard deviation, SD=56.0) mg/day.

Type of intervention
Primary prevention.

Economic study type
Cost-effectiveness analysis.

Study population
The population comprised patients who had received CTS. Further details were given in a prior study (Coleman al. 2004, see 'Other Publications of Related Interest' below for bibliographic details).

Setting
The setting was tertiary care. The economic study was performed at an urban academic hospital in Hartford (CT), USA.

Dates to which data relate
The effectiveness and resource use evidence was obtained from October 1999 to October 2003. The price year was 2005.

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

Link between effectiveness and cost data
The costing was carried out retrospectively on the same sample of patients as that used in the effectiveness analysis.

Study sample
The study involved 1,660 matched patients, 830 in each study arm. Each patient receiving beta-blockers was matched to a control patient not receiving prophylaxis, according to known predictors of POAF, with blinding to outcomes. Data were obtained from a 2,892-patient post-CTS database. No power calculations were reported.

Study design
This was a retrospective cohort study that was conducted at a single centre. The patients were followed until discharge. Blinding of the outcomes was reported for the selection of the matched controls, though not for the outcome assessment itself.

**Analysis of effectiveness**
The analysis was conducted on the basis of treatment completers only. Beta-blocker receivers were defined as those that received any dose of any beta-blocker within 24 hours after the completion of CTS. The primary health outcome was the occurrence of POAF. Variables matched to ensure comparability of the groups were age (older than 70 years), valvular surgery, history of AF, male gender, and use of preoperative digoxin and beta-blockers. Additional clinical characteristics, as well as year of surgery, were well balanced as well.

**Effectiveness results**
The use of prophylactic beta-blockade was associated with a 17.3% reduction in the incidence of POAF, from 28.4 in the control group to 23.5 in the beta-blocker group. The absolute difference was -4.9 (95% confidence interval, CI: -0.7 to -9.1; p=0.02).

The incidence of POAF did not change over the duration of the study. The incidence was 26.9% in the 1999 to 2001 cohort and 24.6% in the 2002 to 2003 cohort.

**Clinical conclusions**
In this retrospective observational study, prophylactic beta-blockade after CTS was associated with a reduction in POAF. This benefit was also observed in previous randomised trials and meta-analyses.

**Measure of benefits used in the economic analysis**
The summary measure of benefit used was the occurrence of POAF.

**Direct costs**
The quantities and the costs were not reported separately, which may limit transferability exercises to other settings. The total hospital costs were defined as all costs accumulating during the index hospitalisation, and a hospital perspective was used. Charges in each department were obtained from the claims-management database, and were converted to costs using hospital departmental cost-to-charge ratios. Given the short-term horizon of the study, discounting was appropriately not performed. Resource use was measured from 1999 to 2003, and the costs were adjusted to 2005 dollars using the Consumer Price Index for Medical Care. The estimation of the quantities and costs was based on actual data.

**Statistical analysis of costs**
The costs were treated stochastically. Comparisons were made using an unpaired t-test or the Mann-Whitney rank sum test (for non-parametric data).

**Indirect Costs**
No indirect costs were included.

**Currency**
US dollars ($).

**Sensitivity analysis**
For the incremental cost-effectiveness ratio (ICER), 95% CIs were calculated using the non-parametric bootstrap technique (25,000 replications with replacement). The resultant incremental cost-effectiveness estimates were then plotted on the cost-effectiveness plane and used to estimate CIs.

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

**Cost results**
The mean costs were $30,978 (SD=33,108) for the beta-blocker group versus $41,700 (SD=67,369) the control group, (p<0.001).

The cost-difference in favour of beta-blockers was $10,722 (95% CI: 5,611 to 15,832; p<0.001). This reduction was possibly due to a 27.6% reduction in room and board costs ($11,144, SD=15,398 versus $14,920, SD=22,132; p<0.001).

The length of stay was 2.2 days (95% CI: 0.9 to 3.5; p>0.001) shorter in the beta-blocker group, 10.2 (SD=11.4) days versus 12.4 (SD=15.7) days.

Regardless of the use of beta-blockers, POAF was associated with substantially increased LOS (mean 4.6 days; median 2 days) and total hospital costs (mean $14,724; median $3,947), (both comparisons, p<0.001).

**Synthesis of costs and benefits**
Beta-blockers were associated with both significantly better outcomes and lower costs. In the bootstrapping analysis, 99.0% of the time prophylactic blockade fell into quadrant IV, which indicated superior effectiveness and lower total costs.

**Authors' conclusions**
"From the perspective of an urban academic hospital, prophylactic beta-blockade after CTS (cardiothoracic surgery) was associated with a reduced incidence of POAF (postoperative atrial fibrillation), hospital length of stay (LOS) and total hospital costs."

**CRD COMMENTARY - Selection of comparators**
The main comparator was explicitly justified, with the authors stating that beta-blockers were the "gold standard" recommended therapy for CTS prophylaxis. You should judge if these are relevant in your setting, or if other interventions would also have been appropriate.

**Validity of estimate of measure of effectiveness**
As the authors stated, this was an observational study with inherent potential biases that can reduce internal validity and which can only be overcome through a prospective, randomised, placebo-controlled trial. However, the groups were matched by the relevant prognostic variables and, given the absence of trials, this can be considered an approximation of the technology cost-effectiveness.

**Validity of estimate of measure of benefit**
The reader is referred to comments in the 'Validity of estimate of measure of effectiveness' field (above).

**Validity of estimate of costs**
All the relevant categories for the perspective adopted seem to have been included, though there was little detail about
these categories. The authors reported only that charges from each hospital department were obtained and then converted to costs using cost-to-charge ratios. The quantities and the costs were not reported separately, which may limit transferability exercises to other settings. Due to the short-term horizon of the study, discounting was appropriately not performed. A statistical analysis of the costs was performed. The price date was adequately reported.

Other issues
The authors made adequate comparisons with other similar studies and reported limitations of their study. Such limitations included the short-term time frame of the study, which excluded downstream events and costs, and the single-institutional sample, which limits the external validity and generalisability.

Implications of the study
Beta-blockers seem to be a potentially cost-saving strategy in the short-term to prevent POAF in CTS. The reductions in LOS and total hospital costs were associated largely with suppression of POAF and not with other factors. Nevertheless, an adequately-powered prospective, randomised, placebo-controlled trial is needed to confirm these results.

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None stated.

Bibliographic details

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Other publications of related interest

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Subject indexing assigned by NLM

MeSH
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