Propofol-based versus dexmedetomidine-based sedation in cardiac surgery patients
Curtis JA, Hollinger MK, Jain HB

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
This study aimed to evaluate the clinical outcomes and costs of sedation regimens, containing propofol or dexmedetomidine, after cardiac surgery. The authors concluded that dexmedetomidine-based sedation was clinically beneficial, with similar mortality and total hospital charges. The study methods and results were well reported, apart from the cost details. The results were susceptible to bias, and the authors' conclusions did not adequately account for this. It is unclear if these conclusions were appropriate.

Type of economic evaluation
Cost-effectiveness analysis

Study objective
This study aimed to evaluate the clinical outcomes and costs of sedation regimens, containing propofol or dexmedetomidine, after cardiac surgery.

Interventions
Primary postoperative sedation based on propofol was compared with sedation based on dexmedetomidine. The drug dosage was defined by the hospital’s protocols. Dexmedetomidine dosage was 1.5 micrograms per kilogram per hour, for a maximum of five days.

Location/setting
USA/secondary care.

Methods
Analytical approach:
The cost-effectiveness analysis was based on data from a study conducted between December 2008 and October 2010. The time horizon was the length of stay in hospital. The study perspective was not explicitly stated.

Effectiveness data:
The effectiveness data were the achievement of early extubation (defined as up to six hours after surgery), length of stay, and in-hospital mortality. The data were from a hospital's medical records database. Due to a recall of propofol vials, due to potential particulate contamination, the hospital switched from propofol to dexmedetomidine in November 2009; this created a before-and-after cohort. There were 978 patients who met the inclusion criteria of 18 years or older; admitted for cardiac surgery; received either study drug; and surgery of up to eight hours. From each drug group, 291 patients were randomly selected for analysis.

Monetary benefit and utility valuations:
Not relevant.

Measure of benefit:
There was no summary measure of benefit. The measures of benefit were the clinical outcomes: early extubation, length of stay, and in-hospital mortality.

Cost data:
The cost data were selected retrospectively from the observational hospital database. Total hospital charges and pharmacy charges, for each patient, were included. The costs were reported in US $.
Analysis of uncertainty:
For nominal data, statistical tests were conducted using Pearson's $X^2$ procedure, and for continuous data, they were conducted using the Student's t-test. Subgroup analyses were conducted for different surgery types.

Results
Early extubation was achieved for 68.7% of patients in the dexmedetomidine group, and in 58.1% of patients in the propofol group ($p=0.008$). Average hospital stay was 181.9 hours (SD 125.7) with dexmedetomidine and 221.3 hours (SD 226.8) with propofol ($p=0.001$).

In-hospital mortality was 2.4% of patients in the dexmedetomidine group, and 1% of patients in the propofol group ($p=0.202$).

The average total hospital charges for dexmedetomidine were $3,994.73 less than for propofol. The average pharmacy charges for dexmedetomidine were $807.69 greater than for propofol.

The clinical results were similar in the subgroup analyses, which did not assess the costs.

Authors' conclusions
The authors concluded that compared with propofol-based sedation, dexmedetomidine-based sedation achieved earlier extubation and shorter hospital stay after cardiac surgery, with no difference in mortality and similar total hospital charges.

CRD commentary
Interventions:
The comparators were relevant to the study setting. Their dose and duration of therapy were not measured, so the variation in these is unknown. The authors reported that opioid agonists were often given with propofol, and were associated with respiratory depression; no further information on the regimens was presented.

Effectiveness/benefits:
The effectiveness data were from a retrospective cohort study; this design is susceptible to bias due to confounding factors. The study's random selection method did not appear to control for baseline differences in patient characteristics between the two groups. Propensity score matching between the two groups would have allowed for greater study power and more similar groups. There appear to have been some differences between the groups; propofol patients were in a more severe state at time of surgery ($p=0.001$), and they were more likely to be obese ($p=0.079$). The clinical outcomes appear to have either captured the relevant health outcomes or were proxies. The authors indicated that both drugs were associated with adverse events, but other than mortality, these were not analysed.

Costs:
The costs were from the same retrospective cohort study, and susceptible to bias from the same confounding factors. Few details of the cost analysis were reported; it was only stated that hospital and pharmacy charges were included. The study perspective appears to have been that of a third-party payer, as hospital charges were reported.

Analysis and results:
The analysis and results were adequately reported. The authors compared their results with those of other studies. One of which was a randomised controlled trial, which is generally considered to be a more rigorous design than retrospective cohorts. This study found no statistically significant difference in the time to extubation between the two drugs (see Other Publications of Related Interest). The authors acknowledged some limitations to their study: its single-centre retrospective design, the lack of measurement of duration of opioid use, and differences in patient characteristics between groups. They acknowledged that none of the subgroup analyses were powered to detect statistical significance.

Concluding remarks:
The study methods and results were well reported, apart from the cost details. The results were susceptible to bias, and the authors' conclusions did not adequately account for this. It is unclear if these conclusions were appropriate.
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Other publications of related interest

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