A cost-effectiveness analysis of propofol versus midazolam for procedural sedation in the emergency department

Hohl C M, Nosyk B, Sadatsafavi M, Anis A H

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 examined the cost-effectiveness of using propofol (PRO) in comparison with midazolam (MID) for procedural sedation in adults in the emergency department. The authors concluded that the use of PRO was an effective and cost-saving alternative to MID from the perspective of the health service provider. On the whole, the study was well carried out and presented. The authors’ conclusions appear to be valid.

Type of economic evaluation
Cost-effectiveness analysis

Study objective
This study examined the cost-effectiveness of using propofol (PRO) in comparison with midazolam (MID) for procedural sedation (PS) in adults, presenting at the emergency department (ED), with a requirement for routine PS, and with minimal co-morbidities.

Interventions
The two strategies were MID and PRO. The patients were pre-treated with a short-acting narcotic before PS.

Location/setting
Canada/emergency department.

Methods
Analytical approach:
This economic evaluation was based on a decision analytic model with a short time horizon corresponding to the recovery time and time for management of potential adverse events. The authors stated that the perspective of the health care provider was adopted.

Effectiveness data:
The clinical data were derived from a systematic review of the literature. The patient characteristics and most of the clinical data were derived from randomised controlled trials (RCTs). Standard meta-analytic techniques were used to estimate the differences between the two drugs. When required, a random effects model was used to pool the data and statistical tests were used to investigate the issue of heterogeneity among the data sources. A few assumptions were needed. The key clinical outcomes were the rate of successful sedations (with or without adverse events) and the recovery time (the time between the start of sedative infusion to full recovery).

Monetary benefit and utility valuations:
Not relevant.

Measure of benefit:
The summary benefit measure was the rate of successful sedations, which was defined as the ability to sedate a patient to a Ramsey Sedation Scale score greater than or equal to three, and successfully perform the medical procedure.

Cost data:
The health service costs were ED visits, drugs, personnel (physicians and nurses), management of adverse events, and
treatment of PS failure. The costs were derived from multiple sources, including the St Paul's Hospital Cost Model (which referred to a tertiary care teaching hospital), the British Columbia Nurses Union, the Health Employer's Association of British Columbia, and the Vancouver General Hospital Practice Plan and Drug Formulary. The calculation of drug costs took into account wastage. The cost of consumable equipment was considered to be identical in the two treatments and was not considered. The resource use data were derived from published sources, which were mainly the RCTs used for the clinical data. All costs were in Canadian dollars (CAD) and the price year was 2006.

Analysis of uncertainty:
The issue of uncertainty was addressed by means of a probabilistic sensitivity analysis based on a Monte Carlo simulation. The details of this probabilistic approach were reported. A one-way sensitivity analysis was also undertaken on the key model inputs.

Results
The recovery time was statistically shorter for PRO compared with MID, even when excluding the outliers (difference: 21.3 minutes, 95% confidence interval, CI: 15.5 to 27.1). The use of PRO led to costs per sedation of CAD -17.33 (95% CI: -24.13 to -10.44) over MID, a cost saving.

The rate of successfully sedated patients improved by 0.029 (95% CI: -0.028 to 0.103) with PRO over MID. The incremental cost per successfully sedated patient was a negative figure (CAD -597.03, 95% credibility interval: -6,434.03 to 6,113.57), which suggests that PRO was dominant or was both less expensive and more effective than MID.

The probabilistic sensitivity analysis showed that PRO was dominant in 82% of simulations. The results of the deterministic sensitivity analysis supported these base-case findings.

Authors' conclusions
The authors concluded that the use of PRO for PS was an effective and cost-saving alternative to MID in the ED setting.

CRD commentary
Interventions:
The authors justified their selection of the comparators, which were two of the most commonly used drugs for adults admitted to the ED. They stated that other drugs were not considered due to the limited availability of comparative data.

Effectiveness/benefits:
The approach used to derive the clinical data appears to have been appropriate and was well reported. The use of a literature review is a valid methodology. Furthermore, the inclusion of RCTs as the key source of evidence strengthens the validity of the comparison, due to their robust design. The authors used appropriate methods to combine the data from multiple sources, and addressed the issue of baseline differences between these studies. The benefit measure was derived directly from the literature review. Overall, the clinical analysis was carried out in a credible way.

Costs:
The economic analysis was consistent with the perspective. The categories of costs were appropriately reported and a justification was provided for the exclusion of some items. The authors reported most of the details of their cost calculations. The sources of data were given for each item, with the unit costs. The price year and the details of the probabilistic analyses were reported.

Analysis and results:
The synthesis of the costs and benefits was appropriately performed and the issue of uncertainty was satisfactorily addressed. The methods and results of both the base case and the sensitivity analyses were clearly presented. The authors made several assumptions, which were explicitly reported and justified. Some limitations of the analysis were pointed out, such as the limited evidence available and the different definitions of recovery times in the source studies.

Concluding remarks:
On the whole, the study was well carried out and presented. The authors’ conclusions appear to be valid.

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