A review of the use of propofol for procedural sedation in the emergency department
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CRD summary
This review assessed the effects of propofol for procedural sedation in the emergency department. The authors concluded that the evidence suggests that propofol is safe and effective, but the studies generally used deeper sedation than that recommended in the UK for non-anaesthetists. Poor reporting of the review methods and differences between the studies make it difficult to confirm the robustness of the conclusions.

Authors’ objectives
To assess the effects of propofol for procedural sedation in the emergency department.

Searching
MEDLINE (1966 to week 4, 2005), EMBASE (1980 to week 10, 2005) and the Cochrane Library (including the Cochrane CENTRAL Register) were searched using the reported search terms. The keywords implied that only studies reported in the English language were sought.

Study selection
Study designs of evaluations included in the review
Inclusion criteria were not specified in terms of the study design. However, reviews, case reports or comments were excluded. Two studies were excluded because of small patient numbers, no randomisation and no explanation of choice of drug. Randomised controlled trials (RCTs) and observational studies were included.

Specific interventions included in the review
Inclusion criteria were not specified in terms of the interventions, but it was clear that studies of propofol were to be included. The included studies used infusions or boluses of propofol (generally 1 mg/kg followed by further doses until the required level of sedation was achieved), either alone or in combination with fentanyl. Controlled trials compared propofol with methohexital, etomidate or midazolam (midazolam given either alone or in combination with ketamine or flumazenil). Cointerventions included fentanyl, morphine, unspecified opiates and oxygen; routine oxygen was not given in all studies. Studies aimed at various levels of sedation where reported, including: sufficient sedation for ptosis and slurred speech, tolerance of pain with no purposeful verbalisation or movement, Ramsay Scale score of 4 to 5, Ramsay score of 6, and bispectral analysis score of 70 to 85.

Participants included in the review
Inclusion criteria were not specified in terms of the participants, but it was clear that the review focused on studies of patients undergoing procedures in the emergency department. The included studies were in children and adults undergoing a variety of painful procedures including fracture reduction; in one study, adult patients were undergoing cardioversion. In some of the included studies the patients were fasted.

Outcomes assessed in the review
Inclusion criteria were not specified in terms of the outcomes. The included studies assessed a variety of outcomes such as depth of sedation, time to sedation, recovery and discharge, satisfaction (physician, nurse, patient and parent), patient recall and adverse events.

How were decisions on the relevance of primary studies made?
The authors did not state how the papers were selected for the review, or how many reviewers performed the selection.

Assessment of study quality
For individual studies, comments were made on the use of a control group, use of standardised protocols, subjectivity of
outcome measures, sample size, exclusions, rates of follow-up, drop-outs, method of randomisation and blinding. However, it was unclear if validity was assessed systematically. The authors did not state how the validity assessment was performed.

**Data extraction**
The authors did not state how the data were extracted for the review, or how many reviewers performed the data extraction. Where possible, the percentages of patients with outcomes of interest were extracted.

**Methods of synthesis**
How were the studies combined?
The studies were combined in a narrative. Each study was described in the text, with additional descriptive information tabulated.

How were differences between studies investigated?
Some differences between the studies were described in the text and the tables.

**Results of the review**
Eight studies (n=850) were included: 4 RCTs (n=345), 3 prospective observational studies (n=453) and 1 retrospective observational study (n=52).

**RCTs.**
Methodological weaknesses included small sample sizes, poor follow-up rates, subjective assessment of the outcomes, lack of blinding and patients excluded from analysis.

One blinded paediatric RCT reported no statistically significant differences between propofol plus lignocaine and midazolam with respect to the depth of sedation or complication rate. Patients receiving propofol had higher rates of immediate recall but there were no significant differences between treatments at 24 hours (follow-up rates 72% and 54%). One partially blinded paediatric RCT reported a significant difference between fentanyl plus propofol and ketamine plus midazolam on the Observational Scale of Behavioral Distress but both sets of scores were low. Delayed dysphoric reactions and nausea occurred in 10% of the control group. Nurses, surgeons, parents and patients’ preference rates were similar for both regimens. Patient recall was similar for both treatments. One RCT in adults reported no significant differences between propofol and methohexital with respect to level of sedation, adverse effects, respiratory depression and patient satisfaction. One RCT in adults reported a significantly shorter recovery time for propofol compared with etomidate and midazolam, but not for propofol compared with midazolam plus flumazenil. Adverse effects were similar between treatment groups, apart from marked myoclonus in four patients receiving etomidate.

**Observational studies.**
Methodological weaknesses included lack of a control group, small sample sizes, lack of an assessment of depth of sedation, drop-outs from follow-up, subjective assessment of the outcomes and deviations from the protocol.

The results table in the review specified that 3 studies reported deep sedation; the fourth reported conscious sedation.

The rates of hypoxia ranged from 5 to 30% (the latter rate was in patients not given oxygen). Apnoea was reported in 0 to 10%. Hypotension was reported in 0% to ‘most’. Arrhythmia was reported in 0% (3 studies) to 6%. Pain on injection was reported in 0 to 20% of patients (based on 3 studies). Patient satisfaction was rated as ‘all willing to have drug again’ (1 study), while 100% reported an excellent level of satisfaction (1 study). The mean recovery time ranged from 6.1 to 27.1 minutes.

**Authors’ conclusions**
Evidence suggests that propofol is safe and effective in the emergency department. However, many of the studies
appeared to use deeper levels of sedation or possibly general anaesthesia than that recommended in the UK for use by non-anaesthetists.

CRD commentary
The review question was clear in terms of the intervention and participants, although the inclusion criteria were not explicitly defined. Inclusion criteria for study design and outcomes were not defined, and this resulted in the inclusion of observational studies and controlled trials that assessed a wide variety of outcomes. The methodological rigour of the study selection process was unclear as two potentially relevant studies were excluded from the review based on criteria not previously specified. Three relevant databases were searched and some limited attempts were made to locate unpublished studies. By limiting the included studies to those in English, the authors might have missed some relevant studies. The methods used to select studies, assess validity and extract the data were not described, so it is not known whether any efforts were made to reduce reviewer errors and bias. Some quality aspects were assessed but it was not clear if validity was assessed systematically.

A narrative synthesis was appropriate given the diversity of the studies, but attention was not drawn to higher quality evidence and, overall, little attempt was made to structure the existing evidence. Comparisons across controlled studies were difficult because of the range of comparators and the use of propofol in combination with other agents in some studies. Overall, as the methods used to conduct the review were not reported, it is difficult to comment on the strength of the evidence underpinning the authors' conclusions.

Implications of the review for practice and research
Practice: The authors stated that patients receiving propofol should be given supplementary oxygen and should be closely monitored with respect to oxygen saturation, respiration, pulse and blood-pressure.

Research: The authors stated that further studies are required to assess the safety of propofol when used to achieve the levels of sedation currently recommended in the UK.

Bibliographic details

PubMedID
16439733

DOI
10.1136/emj.2005.023713

Indexing Status
Subject indexing assigned by NLM

MeSH
Emergency Service, Hospital; Emergency Treatment /methods; Evidence-Based Medicine; Humans; Hypnotics and Sedatives /therapeutic use; Pain /prevention & control; Propofol /therapeutic use; Treatment Outcome

AccessionNumber
12006003259

Date bibliographic record published
30/04/2007

Date abstract record published
30/04/2007
Record Status
This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.