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
The present study compared a combination of remifentanil (REM) and propofol (PRO) with conventional balanced anaesthesia (CBA) in elective outpatient surgery. Patients received a mixture starting at 50 microg/mL REM and 10 mg/mL PRO, resulting in a final syringe admixture of a 20-mL solution containing 25 microg/mL REM and 5 mg/mL PRO. Inductions were accomplished using slow intravenous administration of 1.0 and 1.5 mg/kg PRO from the mixture; the maintenance infusion was 25 to 75 microg/kg per minute PRO from the mixture. In the CBA strategy, patients were induced with PRO (1 to 2 mg/kg) and fentanyl (2 to 5 microg/kg) via intravenous boluses.

Type of intervention
Treatment.

Economic study type
Cost-effectiveness analysis.

Study population
Patients with an American Society of Anesthesiologists' (ASA) physical status classification of I to IV were included in the study. The inclusion criteria were age 12 years or older, systemic disease well controlled for patients with ASA physical status III or IV, and undergoing elective surgery. The exclusion criteria included unstable medical conditions, long-term use of benzodiazepines, clonidine or opioids, opioids use within 12 hours of surgery, and history of substance abuse. Further exclusion criteria were psychiatric illness, pregnancy or lactation, hypersensitivity to opioid or PRO lipid emulsion, and participation in an investigational drug trial within 8 weeks before surgery.

Setting
The setting was tertiary care. The economic study was carried out in Pennsylvania, USA.

Dates to which data relate
The dates of the effectiveness evidence and resource use data were not reported. The price year was not reported.

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
Sample size and power calculations were not reported. Forty-nine outpatient charts were retrospectively reviewed. Twenty-three patients (11 males) were included in the RPC group and 26 patients (12 males) in the CBA group. The mean age was 29.7 years (range: 13 to 58) in the RPC group and 36.0 years (range: 14 to 75) in the CBA group. There were no significant differences between the groups in their age, gender, or ASA physical status, but the charts reviewed had dissimilar diagnoses and procedures.

**Study design**
This was a single-centred, retrospective cohort study. Although the period of follow-up was unclear, it appears to have been until discharge. No blinding of the outcomes assessment was reported.

**Analysis of effectiveness**
The primary outcomes in the analysis included operating room (OR), post-anaesthesia care unit (PACU) and intraoperative characteristics. Intraoperative and PACU complications were also considered. OR characteristics included total surgery time and OR plus PACU time. PACU characteristics included total PACU time and PACU stay. Intraoperative characteristics included OR total discharge score, activity score, respiratory score, consciousness score and pulse-oximetry score. Intraoperative and PACU complications included hypotension, bradycardia, prolonged awakening, nausea, emesis and hallucinations. Time to discharge from the end point of surgery was compared between groups. Also, any side effects of anaesthesia were noted. Pearson chi-squared and Student's t-test were used for the statistical analyses. Differences were considered statistically significant at a p-value of 0.05 or less.

**Effectiveness results**
The RPC group had shorter times for total surgery (mean 26.78 minutes versus 34.23 minutes), OR plus PACU time (mean 75.04 minutes versus 93.85 minutes) and total PACU time (mean 48.26 minutes versus 59.62 minutes) compared with the CBA group. These differences were not statistically significant

The RPC group had significantly higher OR total discharge scores (65% of patients with score 10) than the CBA group (23% of patients with score 10), (p=0.02).

Patients in the RPC group also had a higher level of consciousness (43% full awake) than patients in CBA group (27% full awake).

Although these differences were not statistically significant, (p=0.16), they were clinically significant.

Patients in the CBA group (15%) had significantly fewer overall intraoperative complications than patients in the RPC group (44%), (p=0.03). Otherwise, intraoperative characteristics and complications were similar between groups.

The RPC group had fewer PACU complications (10%) than the CBA group (23%). Bradycardia was the only complication that occurred in the RPC group (9%). Complications in the CBA group included bradycardia (12%), hypotension (4%), nausea (4%) and emesis (8%).

PACU complications were similar between groups and there were no statistically significant differences.

**Clinical conclusions**
The RPC strategy allowed synergism and ease of use, and reduced PRO and REM requirements. “Because the context-sensitive half-life is approximately 3 minutes, the analgesia dissipated quickly; therefore, to enable rapid patient discharge, local anaesthesia or a nonsteroidal anti-inflammatory drug must be used for postoperative pain control.”

**Measure of benefits used in the economic analysis**
No summary measure of benefit was used in the economic evaluation. The costs and effects were left disaggregated and the study was, in effect, a cost-consequences analysis.
Direct costs
The cost categories used in the analysis included OR charges, OR plus PACU charges, and PACU charges. Drug charges for RPC patients included the cost of REM and PRO only, whereas CBA patients were charged for the cost of PRO, fentanyl and the inhalation agent. Discounting was appropriately not carried out since the costs were incurred during less than 2 years. The quantities and the costs were not analysed separately. Their estimation was based on actual data, but resource use dates were not reported. The cost information was taken from the resource centre from the same institution. The price year was not reported.

Statistical analysis of costs
The costs were treated stochastically. Student's t-test was used for the statistical analysis. Differences were considered statistically significant at a p-value of 0.05 or less.

Indirect Costs
No indirect costs were reported.

Currency
US dollars ($).

Sensitivity analysis
No sensitivity analysis was reported.

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

Cost results
The OR charges and OR plus PACU charges for the RPC group were significantly less than those for the CBA group.

The OR mean charges were $280.83 (standard deviation, SD=80.86) for the RPC group and $337.42 (SD=112.08) for the CBA group.

The RPC group had a mean OR plus PACU charges of $442.67 (SD=130.05), while the CBA group had a mean of $544.62 (SD=174.85).

Although the difference was not statistically significant, the mean PACU charges were $171.80 (SD=90.24) for the RPC group and $207.20 (SD=93.93) for the CBA group.

Synthesis of costs and benefits
Not relevant as the study was, in effect, a cost-consequences analysis.

Authors' conclusions
The combination and simultaneous administration of propofol (PRO) and remifentanil (REM) is more cost-effective than conventional balanced anaesthesia (CBA) and enables some patients to bypass the post-anaesthesia care unit (PACU), resulting in quicker discharge. In addition, the PRO-REM mixture (RPC strategy) contained in one syringe was easy to use and suited a busy ambulatory surgery centre or office practice.

CRD COMMENTARY - Selection of comparators
A justification was given for the comparator used. It reflected standard practice in the authors’ setting. You should judge whether these drugs and procedures are relevant in your setting, or whether other comparators from other drugs and strategies could have been relevant as well.

Validity of estimate of measure of effectiveness
The analysis was based on a non-randomised, retrospective study design, which was convenient given the data available to answer the study question. However, this type of study design is subject to selection bias, which can affect the reliability of the effectiveness results. The methodological design of the study was briefly reported. As the authors reported, there might be concerns about the low sample size of the present study. For example, since power calculations were not performed, the study might have been underpowered to detect any statistically significant differences in health outcomes. No statistical analyses were undertaken to account for potential biases and confounding factors, though baseline characteristics were generally similar except for diagnoses and procedures. The authors did not report evidence that the study sample was representative of the study population. These issues tend to limit the internal validity of the analysis.

Validity of estimate of measure of benefit
The authors did not derive a measure of health benefit. The reader is referred to the comments in the ‘Validity of estimate of measure of effectiveness’ field (above).

Validity of estimate of costs
The perspective of the study was not reported. There was too little detail on the cost estimation and only charges were considered. Although it was not stated, some relevant costs could have been omitted from the analysis. The use of charges to proxy costs has the limitation of not reflecting true opportunity costs, thus restricting the external validity of the results. The cost categories were not reported in detail and their omission might have affected the authors’ conclusions. The costs and the quantities were not reported separately, which would not enable the analysis to be easily extrapolated to other settings. All these factors could affect the robustness of the cost results. A statistical analysis of the costs was reported. Discounting was not necessary since the study had a very short-term time horizon. The price year was not reported, which will make any future reflation exercises difficult.

Other issues
The authors did not compare their findings with those from other similar studies. The issue of generalisability to other settings was not addressed. The conclusions reflected the scope of the analysis. The authors stated some additional limitations of the study, such as the different types and durations of the surgeries included. They also recognised the importance of having a homogeneous surgery sample.

Implications of the study
The authors’ recommendation for practice was to mix the drugs just before use. After giving the initial bolus induction and securing the airways, one infusion pump could be used for the case. The authors' experience with the mixture suggested that it might be feasible for many patients to bypass the recovery room and be discharged directly home from the OR. This technique would be an asset to busy office and ambulatory surgery practices performing general anaesthesia. To overcome the limitations of this retrospective study, the authors recommended designing a prospective, randomised, double-blind study.

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