Comparison of accuracy and cost of disposable, nonmechanical pumps used for epidural infusions
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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
The models of disposable, non-mechanical pumps (the Baxter (2C1075), Homepump (H10020), and SurgiPEACE (SP500-24) designed to infuse analgesics in patients with chronic intractable pain were tested.

Type of intervention
Equipment efficacy.

Economic study type
Cost-effectiveness analysis.

Study population
Three brands of disposable, non-mechanical pumps used to infuse analgesics to patients with chronic intractable pain were studied.

Setting
No information is given regarding the setting of the study. The economic study was carried out in USA.

Dates to which data relate
Not stated.

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

Link between effectiveness and cost data
Since the costing was limited to the list price of the tools investigated, it did not relate to the sample used in the effectiveness study.

Study sample
Four different units of each model of pump were tested. Power calculations were not used to determine the sample size. The sample size does not seem to be large enough to allow the statistical tests to detect clinically significant differences in outcomes related to the study question.

Study design
The study was a non-randomised trial with concurrent controls. The pumps were run for 60 hours. There was no loss to
Analysis of effectiveness
The study outcomes were reported in terms of the following measures: the flow rate efficacy, the ease of handling, ease of filling, and patency. The flow rate efficacy data were reported as the percentage of alleged flow rate (% of 2 mL/h) versus infusion time (hours), 90-110% being defined as acceptable. The three models of pump were comparable because all of them had the same level of alleged flow rate (2mL/h).

Effectiveness results
For the first 3-6 hours all pumps showed a flow rate of infusion above 110%. After an initial period, the flow rate declined steadily. In terms of percentage of infusion time spent in the acceptable flow-rate range the least effective brand was the Baxter unit (10.4%) followed by the SurgiPEACE unit (34%) and then by the Homepump (41%). In terms of the ease of handling the Homepump unit and SurgiPEACE unit were easy to handle and the Baxter unit was cumbersome to handle. In terms of the filling criterion the SurgiPEACE unit was easy to fill while the Baxter and Homepump units were difficult to fill. Two units of the SurgiPEACE had blockage and patency problems.

Clinical conclusions
All three units deviated considerably from the claimed flow rate of 2-mL/h, both at the beginning and at the end of the infusion. Presumably, the decreasing flow rates are responsible for the diminishing pain relief often experienced by patients over the course of infusion.

Modelling
The authors designed a mock model to test the flow rate efficacy of each model of pump.

Measure of benefits used in the economic analysis
In the economic analysis, 'additional hours of "acceptable" flow rate' was used as a measure of benefits. A standard setup was used to measure the flow rate efficacy in an environment consistent with patient ambulation.

Direct costs
Only the retail price of each device was included in the costing. These costs were reported as direct costs to the patient. The date to which price data referred was not stated.

Currency
US dollars ($).

Sensitivity analysis
No sensitivity analysis was reported.

Estimated benefits used in the economic analysis
For the first 3-6 hours all pumps showed a flow rate of infusion above 110%. After initial period the flow rate declined steadily. In terms of percentage of infusion time spent in the acceptable flow-rate range the least effective brand was the Baxter unit (10.4%) followed by the SurgiPEACE unit (34%) and the Homepump (41%). The duration of the follow up was 60 hours. The side effects of using pumps (in the case of overdose infusion) were not considered in the analysis.
Cost results
The cost of each unit of Baxter, Homepump and SurgiPEACE were $45, $40, and $98 respectively. The costs of adverse effects were not considered in the costing.

Synthesis of costs and benefits
The use of Homepump was a dominant strategy.

Authors' conclusions
The Homepump unit appeared to be the most cost-effective and the easiest to handle and maintained an acceptable infusion rate for the greatest percentage of the infusion period. The considerable cost benefit of using a nonmechanical pump as opposed to a costly but more reliable computerised pump (not included in the study) appears to warrant further product improvement and development.

CRD COMMENTARY - Selection of comparators
It is not clear why the comparators used were chosen, nor do the authors provide a justification for the choice.

Validity of estimate of measure of benefit
The adequacy of the sample size was not justified in terms of hypothesised clinically significant differences between devices. The analysis did not account for associated adverse effects.

Validity of estimate of costs
The costs associated with adverse effects of high flow rate of infusion were not estimated and included. The limited scope of the analysis was a direct cause of the lack of any statistical analysis of the results. The price year was not reported in the paper.

Other issues
The conclusions of the authors were not justified given the uncertainties in the data (lack of sensitivity analysis was evident, at least for list prices of the devices). The authors did not discuss thoroughly the implications of observed differences in performance between devices in terms of ease of filling and patency.

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