An evaluation of two methods for chronic central venous access device placement
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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 use of an electromagnetic catheter locating system (EMCLS) to insert long-term central venous catheters.

Type of intervention
Treatment.

Economic study type
Cost-effectiveness analysis.

Study population
Patients over 20 years old undergoing placement of CVADs.

Setting
Secondary (hospital) and tertiary care (cancer centre). The economic study was carried out in Albuquerque, New Mexico.

Dates to which data relate
Effectiveness and resource use data were gathered between June 1996 and June 1998. The price date was not stated.

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

Link between effectiveness and cost data
Costing was undertaken on the same patient sample as that used in the effectiveness study. Resource use data were gathered alongside effectiveness data.

Study sample
No prospective power calculations were performed. Patient records were included in the study if data sets were complete. The sample included in the study was appropriate for the study question. 196 patients underwent insertion of CVAD between June 1996 and June 1998. Of these, 92 had complete datasets: 46 of these underwent insertion by EMCLS and 46 by conventional fluoroscopy. The 104 records with incomplete data were excluded.

Study design
The study was a two-centre retrospective cohort study, reviewing patient records.
Analysis of effectiveness
All patient records included in the study were accounted for in the analysis. The outcomes measured were the percentage of CVADs correctly placed, and the incidence rates of complications associated with CVAD placement and radiation exposure. At analysis, patients were shown to be comparable in terms of age and sex. The indications for placement of the CVAD were different however. 100% of patients undergoing the EMCLS method for intravenous medications had their CVAD inserted for parenteral nutrition whereas this occurred for only 26% (12/46) of the conventional fluoroscopy patients.

Effectiveness results
94% of CVADs were accurately placed in the EMCLS group (43/46) and 80% of CVADs were accurately placed in the fluoroscopy group (37/46). This difference is not statistically significant, (p=0.12).

There was no significant difference in the rates of complications between the two groups.

Radiation exposure per catheter was 30mRem in the EMCLS group and 771mRem in the fluoroscopy group was 771mRem. This difference was statistically significant, (p<0.001).

Clinical conclusions
There was no significant difference in the effectiveness or rate of complications between the two methods of catheter positioning. Patients in the EMCLS were exposed to significantly less radiation.

Measure of benefits used in the economic analysis
As the effectiveness results showed no difference between the two methods, the economic analysis was based on cost differences only, i.e. it was a cost-minimisation analysis.

Direct costs
Costs and quantities were not reported separately. The resource items included were relevant to a hospital setting. The costs included were catheter purchase, EMCLS machine purchase and hospital services use (time used in operating room, time used with fluoroscopic equipment and personnel in the operating room, post-procedure chest X-ray). Resource use and cost data were taken from patient records. As all the costs considered were incurred over a period of less than one year, discounting was not relevant. The study reported average total cost per catheter inserted. The dates of the price data were not stated. The authors stated that the "professional fees of the surgeon, anaesthesiologist and radiologist were not evaluated", but do not explain why this was so.

Statistical analysis of costs
Differences between costs were tested for using the Anderson-Darling normality test, chi-squared tests, Fischer's exact test and two-sample t-tests. The levels of significance used were not reported, but p-values were reported for all analyses. Statistical tests were performed on the total cost for catheter placement, operating room time and radiology services purchased. The authors did not state whether the study was powered to detect any given difference between the two groups.

Indirect Costs
Not applicable.

Currency
US dollars ($).
Sensitivity analysis
No sensitivity analysis was carried out.

Estimated benefits used in the economic analysis
Please refer to the effectiveness results reported earlier.

Cost results
The mean cost of catheter placement using EMCLS was $1,188.21 (SD: +/- $48.36). The mean cost of catheter placement using conventional fluoroscopy was $1,335.02 (SD: +/- $42.49). This difference was statistically significant, (p=0.025). There was no significant difference in operating room time (p=0.30), but radiology services purchased by the fluoroscopy group were significantly higher than the EMCLS group, (p<0.001).

Synthesis of costs and benefits
Not applicable.

Authors' conclusions
The use of the EMCLS is as accurate as conventional fluoroscopic-assisted placement. Furthermore, EMCLS use reduces radiation exposure, and costs less than fluoroscopy.

CRD COMMENTARY - Selection of comparators
The choice of comparator would appear to represent current practice in the authors' setting. You, the user of the database, should decide if the comparator represents current practice in your own setting.

Validity of estimate of measure of effectiveness
The analysis was based on a retrospective review of patient records. With this study design, it is not possible to control for many confounding factors. For example, the indications for CVAD placement differed between the groups, which may lead to selection bias if patients are systematically assigned to one method for one indication and another for a different indication.

The study sample was representative of the study population, and the patient groups were shown to be comparable at analysis. Appropriate statistical analyses of the results were carried out.

Validity of estimate of measure of benefit
The analysis of benefits was based on the therapeutic equivalence of the two methods of insertion. The economic analysis therefore included only costs.

Validity of estimate of costs
All categories of cost relevant to the perspective of a hospital were included, but some relevant cost items were excluded, notably the costs of consultant fees. Excluding the fees for surgeon and anaesthesiologist are unlikely to impact on the results of the study as there was no significant difference reported in operating room time used and the same costs would likely be incurred in each arm. However, excluding the radiologist's fees may impact the results since these would be expected to be lower in the EMCLS arm of the study. As the results show the EMCLS arm to be cheaper anyway, this bias will not have affected the conclusions of the study.

Costs were not reported separately from quantities. This limits the generalisability of the study to other settings. A statistical analysis of quantities was performed. The authors do not report the source of their costs and prices, and no sensitivity analysis of prices was performed. The price year is not reported.
The authors allocated the purchase cost of the EMCLS device equally over the 46 uses in the study. This is an arbitrary method, and it might have been better to divide the purchase cost by the expected number of catheter insertions it would be used for over its lifetime. Even so (assuming that the device would be used for more than 46 insertions over its lifetime), the impact would be to make the EMCLS arm look even cheaper, so not altering the conclusions of the study.

Other issues
The authors made appropriate comparisons of their findings with those from other studies. The issue of generalisability to other settings was not addressed. The generalisability is further hampered by not providing details of unit costs and quantities separately. The study included all patient records with a recorded CVAD insertion. 54% were excluded due to incomplete data. A sub-analysis of these incomplete data would have been useful to reinforce the results of this study.

The authors do not list any limitations to their study. However, reviewers' comments published alongside the study mention that the authors appear to have used retail prices for calculating the cost of catheters, x-rays and fluoroscopy time, and wholesale prices for the cost of the EMCLS device. This may have biased the study against the fluoroscopy arm. The magnitudes of these price differences are not stated, so it is not possible to judge the impact of this bias.

Implications of the study
The authors stated that the favourable results of the study led to the purchase of a second EMCLS device at their institution.

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