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
Bedside placement of peripherally inserted central catheters (PICCs), initially by trained intravenous nurses, and using interventional radiology (IR) service in the failed cases.

Type of intervention
Treatment.

Economic study type
Cost-effectiveness analysis.

Study population
Patients requiring PICC placement.

Setting
Hospital. The economic study was carried out in the USA.

Dates to which data relate
The effectiveness data related to PICC placement at the bedside were gathered between December 1996 and March 1997. Some of the effectiveness data related to PICC placement in IR suite were extracted from a paper published in 1996. The resource use data and related date(s) were not reported. The price year was 1996.

Source of effectiveness data
Effectiveness data were derived from a single study and a review of the literature.

Link between effectiveness and cost data
The costing was not performed on the same patient sample as that used in the effectiveness analysis.

Study sample
Power calculations were not used to determine the sample size. A total of 161 patients were referred for PICC placement, of whom 150 cases were primarily attempted by IV team and 11 cases were attempted by IR service. The male and female patients in the IV group had an average age (standard deviation) of 54 (19) and 61 (20) years, respectively. The corresponding figures for the IR group were not given.

Study design
The study was a prospective case-series study, carried out in a single centre. The duration of the follow-up was not
reported. No loss to follow-up was reported.

**Analysis of effectiveness**
The clinical outcomes were primary SVC/RA (superior vena cava and right atrium), secondary SVC/RA, usable access, and failure. The performance of bedside PICC placement were summarised in the following probabilities: vein accessed and unable to access vein, tip at SVC-RA junction on initial placement if vein accessed, and usable access on initial placement if vein accessed, tip at SVC-RA junction after repositioning at bedside, and usable access after repositioning at bedside. For the IR placement the probability of initial success with fluoroscopy only and venography required were used in the decision analytic model. The effectiveness of the PICC placement was measured on a scale ranging from 0 (catheter position would not make adequate access for the required infusion possible) to 100 (the ideal case in which the tip of the PICC would be placed at the SVC-RA junction).

**Effectiveness results**
The number of cases of primary SVC/RA, secondary SVC/RA, usable access, and failure for the IV replacement approach was 97, 4, 29, and 20, respectively. The corresponding figures for the IR replacement approach was 13, 1, 1, and 2, respectively.

The IV probabilities were as follows:

- vein accessed, 0.85;
- unable to access vein, 0.15;
- tip at SVC-RA junction on initial placement if vein accessed, 0.75;
- usable access on initial placement if vein accessed, 0.25;
- tip at SVC-RA junction after repositioning at bedside, 0.20;
- usable access after repositioning at bedside, 0.80.

For the IR placement the probability of initial success with fluoroscopy only and venography required were 0.80 and 0.20, respectively. The effectiveness of usable access was assigned a range of values: 0, 25, 50, 75, and 100.

- Tip at SVC-RA junction in the case of success after venography, 0.95; usable access, .03;
- failure in the case of primary attempt in IR suite, 0.03;
- tip at SVC-RA junction obtained by IR service, 0.75;
- usable access obtained by IR service in the case of using IR suite after IV team failure, 0.05.

**Clinical conclusions**
"The results of this study also indicate that attempts at repositioning the PICC (if the initial chest radiograph demonstrated that the tip was not at the SVC-RA junction) are usually not successful. Of the 14 attempts to reposition the tip of the PICC into the SVC-RA junction, only four (29%) were successful. Furthermore, if the tip was not adequately repositioned after the first manipulation, further attempts at manipulation were never successful”.

**Modelling**
A decision analytic model was employed to calculate the costs and effects associated with the strategies considered in the model.
Outcomes assessed in the review
The review assessed the probabilities related to IR placement: tip at SVC-RA junction when success after venography, usable access, and failure in the case of primary attempt in IR suite; tip at SVC-RA junction obtained by IR service, and usable access obtained by IR service in the case of using IR suite after IV team failure.

Study designs and other criteria for inclusion in the review
Not reported.

Sources searched to identify primary studies
Not reported.

Criteria used to ensure the validity of primary studies
Not reported.

Methods used to judge relevance and validity, and for extracting data
Not reported.

Number of primary studies included
The total number of studies was not reported (only one reference was explicitly specified).

Methods of combining primary studies
Not reported.

Investigation of differences between primary studies
Not reported.

Measure of benefits used in the economic analysis
The measure of benefits was the effectiveness of the PICC placement.

Direct costs
Discounting of costs was not required due to the 3-month study period. Quantities were not reported separately from the costs. The cost items were reported separately. The cost analysis covered the costs of PICC catheter, nurse's time, and procedure time in an IR suite or fluoroscopy room (equipment, professional service, and disposable items). The perspective adopted in the cost analysis was that of the hospital. Hospital actual cost data and Medicare B fee schedule were the sources of cost data. The date of the price data was 1996.

Indirect Costs
Not considered.

Currency
US dollars ($).

Sensitivity analysis
One-way and two-way sensitivity analyses, and threshold analysis were performed on the rate of venous access, levels of usable access, and the cost of the IR suite.

**Estimated benefits used in the economic analysis**
IR suite approach had an effectiveness score of 99 for all levels of usable access. The corresponding figure for the IV approach was 79, 84, 88, 93, and 97, corresponding to the levels of usable access of 0, 25, 50, 75, and 100.

**Cost results**
The IR suite approach had a cost of $150-200 per hour of room time in an IR suite in the study hospital, but in the model a range of costs from 0-1000 was considered. The total cost of IV approach was not reported. The cost of PICC, venogram, chest radiograph, and IV nurse were reported to be $107, $127.60, $28.89, and $23.11.

**Synthesis of costs and benefits**
The cost-effectiveness ratio was calculated for different levels of the rate of venous access, levels of usable access, and the cost of the IR suite. The range of cost-effectiveness ratio for the IR approach was from 1.3434 (cost of IR suite of $0) to 11.4444 (cost of IR suite of $1,000). The range for the IV approach was from 1.6835 to 14.3418, corresponding to level of usable access of 0 and cost of IR suite of $0 and $1,000.

**Authors' conclusions**
The authors concluded that if the cost of fluoroscopy or the IR suite was more than $100, the IV approach was more cost-effective for most PICC uses. If the cost was less than $75, the IR approach was more cost-effective for all PICC uses. If the cost fell between $75 and $100, "the most cost-effective strategy depends on the intended use of the PICC and the need to have the tip placed at the junction of the superior vena cava and right atrium".

**CRD COMMENTARY - Selection of comparators**
No alternative health technology was regarded as the comparator.

**Validity of estimate of measure of benefit**
The internal validity of the estimates of benefit may be weakened by the lack of randomisation, and the apparent lack of a systematic literature review and quality assessment of the primary studies included in the review.

**Validity of estimate of costs**
Resource utilisation was not systematically reported separately from the costs. Adequate details of the methods of cost estimation were not given. The study lacked a prospective cost analysis.

**Other issues**
In view of the lack of randomisation, lack of a systematic literature review, and absence of quality assessment of the primary studies included in the review, the results should be treated with some caution.

**Source of funding**
None stated.

**Bibliographic details**

**PubMedID**
9457195