Use of a pulse oximeter in an adult emergency department: impact on the number of arterial blood gas analyses ordered

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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
Pulse oximetry (SpO2), a non invasive method of measuring arterial oxygenation and arterial blood gas analysis (ABG).

Type of intervention
Diagnosis.

Economic study type
Cost-effectiveness analysis.

Study population
All patients who presented at the ED during the study period.

Setting
Hospital. The economic study was performed in France.

Dates to which data relate
Effectiveness data were obtained during a 2 month period in 1993 and the same period in 1992. Resource dates to which data related were not stated. Price dates were not stated.

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

Link between effectiveness and cost data
It was not stated whether the costing was undertaken on the same patient sample as that used in the effectiveness study nor whether it was undertaken prospectively or retrospectively.

Study sample
All the patients who presented at the ED during the study period were eligible to take part in the prospective study. Residents ordered SpO2 alone, ABG, or SpO2 plus ABG measurements on their own initiative and without being given any guidelines. There is no evidence that the initial study sample was appropriate for the clinical study question. A power calculation was not used to determine the sample size. The overall number of subjects who participated in the study was 336. The intervention group included a total of 152 patients (70 men and 82 women) aged 59 (+/- 23) years. The comparison group was composed of 184 consecutive patients (aged 57 (+/- 23),(103 men and 81 women) who had the ABG measurement during the same period in 1992.
Study design
The study was a non-randomized single centre trial with historical controls.

Analysis of effectiveness
It was not reported whether the analysis of the clinical study was based on intention to treat or on treatment completers only. The primary health outcome used in the analysis was the incidence of complications and detriment to the patient due to the introduction of the new technology. The two groups were comparable in terms of age and sex.

Effectiveness results
The authors found a significant reduction in the number of useless ABG determinations in 1993 compared to 1992 when pulse oximetry was not available (13 of 119 versus 43 of 184; p<0.01). 12% of the ABG measurements performed in 1993 (14 of 119) were considered unjustified as compared with 29% (54 of 184) of the ABG determinations performed in 1992 (p<0.001). The reduction in useless ABG determinations accounted for 23% (3 out of 13) in 1993 and 67% (29 out of 43) in 1992 (p<0.01).

Clinical conclusions
The availability of SpO2 reduced the number of unnecessary ABG measurement ordered without any detriment to the patient. The reduction of unjustified ABG measurements was mainly due to the decrease of useless ABG determinations performed for miscellaneous nonrespiratory disorders.

Measure of benefits used in the economic analysis
Since the effectiveness analysis showed no difference in effectiveness or clinical benefit between the intervention and comparator, the economic analysis was based on the difference in costs only.

Direct costs
Costs were not discounted. Quantities and costs were not reported separately. The cost of ABG analysis was measured. The cost boundary adopted was the hospital. The estimation of costs was based on actual data from the hospital. The dates of the price data were not reported.

Statistical analysis of costs
Not carried out.

Indirect Costs
Not reported.

Currency
US dollars ($).

Sensitivity analysis
No sensitivity analysis was carried out.

Estimated benefits used in the economic analysis
Not applicable.
**Cost results**
The authors found a cost of $17 for a single ABG analysis. ABG measurement savings were represented by the number of ABG determinations that would have been performed if there were no pulse oximetry. A saving of $323 every two months was estimated, giving a total saving of $1,938 per year, assuming a constant rate of cost of ABG measurement throughout the year.

**Synthesis of costs and benefits**
Not applicable.

**Authors' conclusions**
The availability of a pulse oximeter in an adult ED did not affect the ordering of useful ABG measurements, but did result in a significant reduction in the number of unjustified ABG determinations. SpO2 should provide substantial savings in patient care costs in the ED.

**CRD COMMENTARY - Selection of comparators**
The reason for the choice of the comparator is clear. You should consider whether this applies to your own setting.

**Validity of estimate of measure of benefit**
Some problems may derive from the duration of the study. The two months results may not be an accurate representation of effectiveness. A more reliable assessment of the relative benefits would come from a randomized trial.

**Validity of estimate of costs**
Resource quantities were not reported separately from prices. Also, adequate details of methods of quantity/cost estimation were not given. Some important cost items were omitted such as an estimate of the unit/annual SpO2 technology costs. It cannot be judged with certainty whether other cost items were omitted because of the lack of information about the cost estimation methods adopted. The study lacked randomisation and sensitivity analysis, so the results should be treated with some caution.

**Other issues**
Given the uncertainties in the data, the author's conclusions appear justified. The issue of generalisability to other settings was not addressed, but an adequate comparison with other studies was made.

**Implications of the study**
The authors addressed some interesting issues about appropriateness in clinical practice. They also suggested that their results should be confirmed by a well designed randomized controlled trial though the cost of a trial might not be justified as the findings of this study suggested that only limited cost savings can be achieved by the introduction of a pulse oximeter.

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