Introduction

In order to evaluate the benefits of routine oxygen saturation measurements using an oximeter, we initiated a prospective study for 1 month in a chest department to find out whether the use of an oximeter could reduce the number of arterial blood gas samples needed.

Materials and Methods

The Pitie-Salpetriere chest department has a ten-bed respiratory intensive care unit, a 73-bed pulmonary care unit and an out-patient facility.

The results of all the arterial blood gas samples (624) were recorded with respect to sex, age, ethnic background and objective (diagnosis or therapy) during March 1985. Physicians and medical students were asked to measure oxygen saturation by the oximeter simultaneously as they drew arterial blood samples. The cost of arterial blood gas sampling varied from patient to patient but amounts to about $20 per sample.

Results

1. During 1 month 624 arterial blood gas samples were taken, one-third for diagnosis (204) and two-thirds (420) for therapeutic management. The total cost of three analyses to the department was approximately $12,480.
2. We recorded the first 200 oxygen saturation measurements determined by the oximeter and \( S_{a}O_{2}(\text{calc}) \) derived from simultaneously drawn arterial blood samples. Of the 200 patients, 172 were white, 22 black and 6 Asian. Their mean age was 57.4 ± 10.4 years. Mean \( P_{a}O_{2} \) was 80 ± 33 mmHg (range 35–243), mean \( P_{a}CO_{2} \) 42.4 ± 9.5 mmHg (range 23–66) and mean pH 7.35 ± 0.05. Mean haematocrit was 0.36 ± 0.04. The relationship plotted in Fig. 7.1 is:

\[
(S_{po_{2}} \text{ (oximeter)}) = S_{a}O_{2}(\text{calc}) \times 0.835 + 0.155; \ r = 0.759
\]

(1)

while the difference

\[
(S_{po_{2}} - S_{a}O_{2}(\text{calc})) = 0.020 \pm 0.033
\]

(2)

3. Real-time oximeter measurements were made simultaneously with arterial blood gas sampling in 344 cases; oximeter measurements were not performed in 280 cases for miscellaneous reasons, such as weekends or lack of communication between physicians. On 19 occasions oximeter measurements only were performed because the physician decided that the result of the real-time oximeter measurement was sufficient and further tests were unnecessary. In 18 patients real-time oximetry was unsuccessful (in 17 black patients and in a 184-kg woman). In 307 cases the oxygen saturation was measured simultaneously by the two techniques.

4. The amount of savings depends upon the indication for arterial blood gas analysis. The savings were rather small when analysis was performed because of the need to know \( P_{a}CO_{2} \) and pH values for diagnostic reasons, and higher when it was done to control oxygen therapy, to readjust settings or to re-evaluate the