

Title: EXTRAPOLATED VALUES OF Hb AND HbCO FOR SHUNT CALCULATION

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Introduction. It has been demonstrated that calculations of blood oxygen content can be significantly affected by errors in measurement of: (1) hemoglobin (Hb),¹ (2) carboxyhemoglobin (HbCO),¹ and (3) oxyhemoglobin (HbO₂).² Since these values are not measured in many hospitals, this study is designed to evaluate the reliability of utilizing assumed values for Hb and HbCO in conjunction with HbO₂ values derived from a nomogram on the intrapulmonary shunt (Qsp) as calculated:

$$\dot{Q}_{sp} = \frac{CcO_2 - CaO_2}{CcO_2 - CvO_2} \cdot \dot{Q}$$

Methods. Qsp measurements are routinely performed on all patients with pulmonary artery catheters in our intensive care units. pH, PCO₂ and PO₂ are measured in a quality controlled blood gas laboratory and Hb, HbCO, and HbO₂ are simultaneously measured with an IL 282 co-oximeter. Retrospective analysis of Qsp data from 100 intensive care patients revealed a mean Hb of 11.9 (S.D. \pm 2.3) gm% and a mean HbCO of 1.7 (S.D. \pm 0.7) %. A prospective study is being conducted comparing measured Qsp values with those obtained utilizing an assumed Hb value of 12 gm% and a derived HbO₂ via the Severinghaus nomogram from which an HbCO value of 1.7% is subtracted. Statistical analysis utilizes the student's T-test for paired data.

Results. To date, 30 patients have been studied of which 23 were males and 7 were females. Their mean age was 54.5 (S.D. \pm 16) years and 14 were surgical patients. The mean duration of stay in the intensive care unit was 8.7 (S.D. \pm 7.3) days and the mean therapeutic intervention score was 45 (S.D. \pm 15). The mean measured Qsp was 19.3 (S.D. \pm 10.5) % while the mean assumed Qsp was 21.7 (S.D. \pm 10.1) %. The difference between these values is not statistically significant ($P > 0.01$).

Discussion. Qsp calculations should ideally be made utilizing measured values for all variables. However, this preliminary data indicates that utilization of an assumed Hb value of 12 gm% and HbCO of 1.7% in conjunction with a derived HbO₂ may provide a clinically acceptable alternative when complete measurements are not available. The study is continuing so as to include a larger heterogenous population of critically ill patients.

References.

1. Cohn JD, and Engler PE: Shunt effect of carboxyhemoglobin. Crit Care Med 7:54-58, 1979.
2. Quan SF, Kronberg GM, Lister G, Schlobohm RM, Feeley T, and Don HF: The effect of varying inspired oxygen concentrations on calculated intrapulmonary shunt (Abstr). American Society of Anesthesiologists Annual Meeting, 1978, pp 453-454.