Results of a Prospective Study Evaluating a Noninvasive Method of Hemoglobin Adjustment for Determining the Diffusing Capacity of the Lung.

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RATIONALE: Measurement of the diffusing capacity of the lung for carbon monoxide (DlCO) is significantly influenced by the pulmonary capillary blood volume. Consequently, measurements require adjustment for blood hemoglobin concentration (DlCOadj) to allow meaningful clinical interpretation. Noninvasive point-of-care devices that measure hemoglobin transcutaneously provide immediate values for hemoglobin that may be useful in pulmonary function laboratories for determining DlCOadj.

OBJECTIVES: To test the hypothesis that DlCOadj determinations obtained with a commercially available device for noninvasive, point-of-care measurement of blood hemoglobin concentrations are not significantly different from determinations obtained using hemoglobin concentrations measured conventionally in venous blood samples.

METHODS: In a prospective open trial, hemoglobin measurements were obtained with the Pronto-7 spot check pulse CO-oximeter (Massimo, Irvine, CA) and by venipuncture for 205 patients referred for DlCO testing at Cincinnati Children's Hospital. Hemoglobin and DlCOadj measurements were compared between the two methods, using Student paired t tests and Bland-Altman plots. To assess variability, the differences in DlCOadj between the two methods were also compared by a modification of the current standard for acceptable within-session variability for DlCO. Clinical interpretation for individual DlCO tests based on DlCOadj values obtained from the two methods were compared statistically using Kendall's coefficient of concordance to determine whether the Pronto-7 altered the classification of the severity of DlCO defects.

MEASUREMENTS AND MAIN RESULTS: Measurements of hemoglobin concentration by the Pronto-7 analyzer were significantly lower than those obtained from venipuncture

blood samples (13.1 ± 1.8 vs. 13.4 ± 2.0; P = 0.01). However, there were no differences for DlCOadj between both methods (23.6 ± 7.7 vs. 23.7 ± 7.5 ml/min/mm Hg; P = 0.42). There was strong correlation between the Pronto-7 and venipuncture DlCOadj values (r = 0.99, P < 0.0001). Variability between the two methods was low for DlCOadj, with a bias of -0.07. More than 96% of tests met acceptable within-session variability. There was no significant difference in the clinical interpretation of the DlCO test based on DlCOadj values recovered from both methods (Kendall's coefficient, 0.96).

CONCLUSIONS: Noninvasive measurement of hemoglobin for determination of DlCOadj was accurate and provided acceptable within-session variability. The results obtained noninvasively did not alter clinical interpretation of test results compared with venipuncture. These findings support noninvasive point-of-care devices as an alternative to venipuncture for determining hemoglobin to measure DlCOadj in most patients.