EFFECT OF SKIN PIGMENTATION ON PULSE OXIMETER ACCURACY AND FUNCTION IN THE EMERGENCY DEPARTMENT

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Objective: Several factors may decrease the accuracy of pulse oximetry (PO), including certain colors of nail polish. The effect of skin pigmentation on PO is controversial with contradictory results in the literature. Previous studies have significant limitations, but suggest that PO may not be as accurate and may not work as reliably in patients with darkly pigmented skin compared with their less pigmented counterparts. This study was done to measure the effect of skin pigmentation on PO signal accuracy and function.

Methods: Two hundred seventy-three consecutive adult ED patients in a suburban ED requiring arterial blood gas (ABG) determination were enrolled in this observational study. Skin pigmentation was determined by comparison with standardized swatches and was later stratified into lighter and darker groups using a previously determined threshold. Simultaneous with ABG sampling, pulse oximeter function was recorded. Function was stratified into good and three levels of suboptimal function (variable, poor, and failure). PO was compared with criterion values measured by a four-wavelength spectrophotometer (co-oximeter). Bias (mean difference between PO and co-oximeter measured values of hemoglobin saturation) was calculated. Groups were compared using chi-square and t-tests.

Results: 255 of 273 subjects had complete data for evaluation. PO signal failure was rare (0.8% overall). The darker group had more suboptimal pulse oximeter function (35.5% vs 12.6%, $p < 0.001$). Bias was not significantly different between groups ($p = 0.43$).

Conclusions: Consistent PO values may be more difficult to obtain in patients with darkly pigmented skin. Once a value is obtained, however, PO is equally accurate between individuals with different levels of skin pigmentation.