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Nail Polish Color Can Affect Pulse Oximeter Saturation

To the Editor:—Pulse oximetry provides reliable and noninvasive monitoring of arterial oxygenation.¹ The Ohmeda Biox® 3700 pulse oximeter adult finger probe contains two Light Emitting Diodes (LEDs), emitting light at 660 nm and 940 nm wavelengths, and a photodetector diode that measures the light that passed through the tissue. The relative absorbances of oxygenated and deoxygenated hemoglobin affect the amount of the different wavelengths of light detected by the photodetector.² Any substance in the blood or tissue that absorbs light of the same wavelength as that produced by the LEDs may alter the amount of light sensed by the photodetector and thus change oximeter-determined oxygen saturation (SpO₂).

Factors interfering with accurate determination of SpO₂ include infrared heat lamps,³ high-intensity ambient light,⁴ patient movement, electrocautery, cardiopulmonary bypass, hypothermia, administration of vasopressors, hypoperfusion, dyshemoglobinemias,⁵ and iv-administered dyes (methylene blue, indigo carmine, indocyanine green).^{6,7} It has been reported that nail polish (NP) does not interfere with pulse oximetry.⁸ The authors, however, do not mention what colors of NP were used. I examined the effect of 31 colors of NP on SpO₂ (table 1).

A healthy female OR nurse was the volunteer. An adult finger probe (Ohmeda Biox® 3700 pulse oximeter) was applied to the nail bed of the right index finger. While she was breathing room air, a baseline measurement of SpO₂ without NP was obtained. Then, two coats of NP were applied to the same finger (one color at a time), were allowed to dry, and SpO₂ was again measured. This procedure was repeated for each color. The only color of NP that had any effect on the SpO₂ was "Blue Flame" nail enamel by Avon (Avon Prod. Inc., NY, NY, 10019). It decreased SpO₂ from 97% to 87%. This NP was then analyzed with the Perkin-Elmer 552 spectrophotometer. The NP absorbed light maximally at 688 nm—very near 660 nm wavelength of light emitted by one of the oximeter LEDs. Thus, the NP absorbed most of the 660 nm light emission and the

TABLE 1. Colors of Nail Polish Evaluated (in Alphabetical Order)

Black	Coral	Red
Blue Flake	Fuschia Fire	Rose
Blue Flame	Garnet	Rosewine
Blue (Iceberg)	Gemsmoke	Ruby Red
Brandy	Gold Sequins	Silver Lilac
Clear	Green	Silver Screen
Clear with Toluene	Mulberry	Silver Sequins
Clear with UV Absorber	Orchid	Silver Struck
Clear with Blue Dye #1	Plum	Tangerine
Copper Sequins #1	Purple	Violet
Copper Sequins #2		

oximeter, therefore, interpreted this absorption as the presence of reduced hemoglobin and a reduction in SpO₂.

In conclusion, some nail polish, especially blue, may interfere with SpO₂ measurement and should be removed preoperatively.

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