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Portable, Consumer-Grade Pulse Oximeters Are Accurate for Home and Medical Use: Implications for Their Use in Patients with COVID-19

To the Editor:

We read with interest the article by Luks and Swenson (1). The authors highlight the fundamentals of pulse oximetry and some of the limitations associated with the use of it at home. In many ways, the coronavirus disease (COVID-19) pandemic has changed how medicine is practiced. Some institutions, including our own, have been overwhelmed with patients with COVID-19 and have instituted novel practices like using a combination of telehealth visits and home pulse oximetry to monitor patients with COVID-19 who might otherwise have been admitted (2).

For oxygen saturation monitoring to be successful at home, the device used must be accurate. We previously published a paper describing the inaccuracy of three smartphone apps, which Luks and Swenson review in their article (3). We agree in advising caution against the use of these devices.

These authors also cite several articles evaluating the use of consumer-grade standalone pulse oximeters in the clinical setting. They assert that an evaluation of six commercially available pulse oximeters using 22 healthy volunteers is the best study available on the topic (1, 4). We wanted to take a moment to highlight some additional information from a paper we recently published. Our study was an order of magnitude larger than the article by Lipnick and colleagues (4) and evaluated emergency department patients, not volunteers, many of whom were hypoxic (5). We studied 200 patients presenting with hypoxia, chest pain, or dyspnea. Three different consumer-grade pulse oximeters were compared with a medical-grade pulse oximeter. We performed Bland-Altman plots as described by Luks and Swenson as necessary to compare the performance of the devices. All three studied devices had sensitivities of at least 96% when evaluating for hypoxia when using a cutoff value of 92% oxygen saturation. They all had exceptionally good correlation with the control device. Our findings suggest that these devices can reliably measure hypoxia and should be safe for home use. This should provide additional reassurance to providers who wish to monitor patients at home with pulse oximetry.

We commend the authors for a well-written and timely review and hope that our additional information will be of interest to your readers. We agree that there are knowledge gaps regarding the use of out-of-hospital pulse oximetry, particularly use among patients with COVID-19, and that further study among this patient population would be useful. Nonetheless, we hope that our findings may still be useful to those making decisions regarding the use of home pulse oximetry.

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Reply: Portable, Consumer-Grade Pulse Oximeters Are Accurate for Home and Medical Use: Implications for Their Use in Patients with COVID-19

From the Authors:

We welcome the letter from Drs. Schrading and Page "Portable, Consumer-Grade Pulse Oximeters Are Accurate for Home and Medical Use: Implications for their Use in Patients with COVID-19" and the opportunity to reply. As we indicated in our review on this topic (1), data regarding the accuracy of finger oximeters are lacking. The authors are to be commended for their large patient-centered study of one medical and two nonmedical use (NMU) oximeters (2), which adds much needed information on this important question, particularly given the demands of caring for large volumes of patients in the midst of the coronavirus disease (COVID-19) pandemic.

While their study includes a much larger number of subjects than the highest quality study on this question (3) and suggests that these devices may be accurate for use as part of home monitoring programs, caution is still warranted for several reasons. First, their study only examines two NMU oximeters, a number that pales in comparison to the large number of such devices that are available on the market. Whether their findings apply to the plethora of other devices available to consumers is not clear, particularly in light of the problems with NMU devices demonstrated in the study by Lipnick and colleagues (3).

Second, Shrading and colleagues compared the results of the finger oximeters to those obtained from a nonportable pulse oximeter in the emergency department rather than the true gold standard of cooximetry performed on arterial blood samples. While the emergency department oximeter is a Food and Drug Administration–approved device, as a pulse oximeter, it is still prone to measurement errors. In light of recently published data highlighting the inaccuracy of pulse oximetry in Black patients (4), the fact that 50.5% of the patients in the study by Shrading and colleagues were Black raises some issues as to whether their gold standard provided the degree of accuracy necessary for this study.

Finally, although a strength of their study was the fact that they examined patients rather than healthy volunteers, the overwhelming majority of the measurements in their study were on patients whose oxygen saturation was >90%. The accuracy of all oximeters decreases as the oxygen saturation decreases, particularly when the saturation is <90%. The Bland–Altman plots for the NMU devices in this study show significantly worsening levels of agreement when the saturation fell below 90%, including some cases in which the finger oximeter overestimated the saturation obtained on the emergency department devices by >10%. Had they examined performance over the range of saturation values examined by Lipnick and colleagues (3), more significant problems may have become apparent.

The pressing demands of the pandemic often require us to institute new practice patterns before adequate data may be available to support those practices. The study by Schrading and colleagues (2) is an important contribution to the literature on these widely available devices, but we must be careful to not draw overly strong conclusions about the accuracy of all NMU oximeters from their results.

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