

LETTER

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COVID-19: efficacy of prehospital pulse oximetry for early detection of silent hypoxemia



Valentina Quaresima and Marco Ferrari* 

We read with interest the research letter published in *Critical Care* by Jouffroy et al. who suggest the utility of prehospital pulse oximetry as a red flag for early detection of silent hypoxemia in COVID-19 patients [1]. Fingertip pulse oximeters are one of the most widely used medical standard monitoring tools to assess oxygenation and respiratory function in patients. In fact, a pulse oximeter non-invasively measures arterial blood oxygen saturation (SpO₂, %), and it represents an accessible tool that can be easily used by patients, physicians, and prehospital healthcare providers. However, it is important to ensure that the used pulse oximeter has a high accuracy, especially when SpO₂ is lower than 90%. The accuracy criteria for the pulse oximeter equipment are provided in the International Standard ISO 80601-2-61 [2], and the U.S. Food and Drug Administration (FDA) only permits pulse oximeters that meet these criteria [3]. According to the ISO 80601-2-61, the SpO₂ accuracy of a pulse oximeter should be assessed through a controlled desaturation study by comparing the SpO₂ measurements with the gold standard measurements of blood arterial oxygen saturation (SaO₂) obtained by a CO-oximeter. The prices for home pulse oximeters range from \$20 to \$80, and not all pulse oximeters are built with the same performances and the required FDA's accuracy. Few of them have the FDA's approval.

A recent study on the accuracy of six low-cost pulse oximeters, not cleared by the FDA, has demonstrated highly inaccurate readings, even if some of them surprisingly performed likewise the expensive clinical pulse oximeters during voluntary hypoxia [4].

Some COVID-19 patients suddenly develop the condition called "silent hypoxia," during which they still look and feel comfortable, but their SpO₂ is perilously low. This happens to patients either in the hospital or at home. Low SpO₂ may indicate severe COVID-19-related pneumonia, requiring a ventilator. A useful practical guidance for the correct use of pulse oximetry for monitoring patients with COVID-19 at home have been very recently published [5]. SpO₂ self-monitoring by patients with non-severe COVID-19, discharged from the emergency department or an outpatient testing center, is an essential way to identify patients needing to return to the hospital for a further evaluation.

However, considering the largely unregulated low-cost pulse oximetry market, physicians should pay attention to incorporating SpO₂ data, obtained from pulse oximeters not cleared [3] by the FDA, the European Medicine Agency or other regulatory agencies, for making medical decisions.

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Authors' response

Reply to Quaresima et al.: "COVID-19: efficacy of prehospital pulse oximetry for early detection of silent hypoxemia"

Romain Jouffroy, Daniel Jost, Bertrand Prunet

Dear Editor,

We thank Quaresima et al. [6] for their interest and relevant comments about the early detection of silent hypoxemia in COVID-19 patients based on prehospital pulse oximetry [1]. We agree that fingertip pulse oximeters may only provide approximate measurements of arterial blood oxygen saturation and that many intrinsic and extrinsic factors influence pulse oximetry values [6, 7] beyond the preanalytical conditions required for certification [8]. One particularity of COVID-19-related acute respiratory failure was that, despite low blood oxygen concentration, the respiratory rate frequently remained close to normal, unlike in other acute respiratory failure etiologies [9]. Our observational study was not designed to assess pulse oximetry for medical decision making but was intended to detect "silent hypoxemia" in suspected COVID-19 patients. Furthermore, the Paris Fire Brigade basic life support teams used a device complying with the European Union's Medical Device Regulation of 2017. Quaresima et al. remind us that rescuers must continuously be aware of the technical limitations of the equipment they use in their daily practice.

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Authors' contributions

Both authors conceived the idea for the letter and drafted the manuscript. The authors read and approved the final manuscript.

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Competing interests

The authors declare that they have no competing interests.

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