



HAL
open science

Assessment of the SpO₂/FiO₂ ratio as a tool for hypoxemia screening in the emergency department

Pierre Catoire, Eric Tellier, Caroline de La Rivière, Marie-Christine Beauvieux, Guillaume Valdenaire, Michel Galinski, Philippe Revel, Xavier Combes, Cédric Gil-Jardiné

► To cite this version:

Pierre Catoire, Eric Tellier, Caroline de La Rivière, Marie-Christine Beauvieux, Guillaume Valdenaire, et al.. Assessment of the SpO₂/FiO₂ ratio as a tool for hypoxemia screening in the emergency department. American Journal of Emergency Medicine, 2021, 44, pp.116-120. 10.1016/j.ajem.2021.01.092 . hal-03366071

HAL Id: hal-03366071

<https://cnrs.hal.science/hal-03366071>

Submitted on 13 Feb 2023

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



Distributed under a Creative Commons Attribution - NonCommercial 4.0 International License

Assessment of the SpO₂/FiO₂ ratio as a tool for hypoxemia screening in the emergency department

Pierre CATOIRE MD¹, Eric TELLIER MD, PhD^{1,2}, Caroline DE LA RIVIERE MD¹, Marie-Christine BEAUVIEUX MD, PhD^{3,4}, Guillaume VALDENNAIRE MD⁵, Michel GALINSKI MD, PhD^{1,2}, Philippe REVEL MD^{1,2}, Xavier COMBES MD, PhD^{1,2}, Cédric GIL-JARDINE MD, PhD^{1,2}.

1. University Hospital of Bordeaux, Emergency Medicine Department, 1 place Amélie Raba Léon, 33000 Bordeaux, France

2. INSERM, ISPED, Bordeaux Population Health research center INSERM U1219-”Injury Epidemiology Transport Occupation” team, Université de Bordeaux, 146 Rue Léo Saignat, 33000 Bordeaux, France

3. University Hospital of Bordeaux, Biochemistry Department, Université de Bordeaux, 146 Rue Léo Saignat, 33000 Bordeaux, France

4. Center for Magnetic Resonance of Biological Systems, UMR5536, Université de Bordeaux, 146 Rue Léo Saignat, 33000 Bordeaux, France

5. Clinique Mutualiste, Emergency Medicine Department, 46 Avenue du Dr Albert Schweitzer, 33600 Pessac, France

Corresponding author :

Pierre Catoire

Secrétariat des Urgences Adultes

Hôpital Pellegrin, Place Amélie Raba Léon, 33000 Bordeaux

pierre.catoire@chu-bordeaux.fr. ORC-ID : 0000-0002-1849-9781

The authors have no conflict of interest to declare.

Word count for article (abstract excluded) : 1937

Short title : SpO₂/FiO₂ ratio for hypoxemia screening in the ED

Keywords : respiratory Insufficiency, oximetry, COVID-19, triage, ROC curve.

Authors contribution statement :

CP, GJC and TE conceived the study and designed the trial. GJC, TE, GM and CX provided statistical advice on study design. CP and GJC supervised the data collection, analyzed the data, drafted the manuscript, and all authors contributed substantially to its revision. CP and GJC take responsibility for the paper as a whole.

1 **Abstract:**

2 Objective: We assessed the performance of the ratio of peripheral arterial oxygen saturation to
3 the inspired fraction of oxygen (SpO_2/FiO_2) to predict the ratio of partial pressure arterial
4 oxygen to the fraction of inspired oxygen (PaO_2/FiO_2) among patients admitted to our
5 emergency department (ED) during the SARS-CoV-2 outbreak.

6 Methods: We retrospectively studied patients admitted to an academic-level ED in France who
7 were undergoing a joint measurement of SpO_2 and arterial blood gas. We compared SpO_2 with
8 SaO_2 and evaluated performance of the SpO_2/FiO_2 ratio for the prediction of 300 and 400
9 mmHg PaO_2/FiO_2 cut-off values in COVID-19 positive and negative subgroups using receiver-
10 operating characteristic (ROC) curves.

11 Results: During the study period from February to April 2020, a total of 430 arterial samples
12 were analyzed and collected from 395 patients. The area under the ROC curves of the
13 SpO_2/FiO_2 ratio was 0.918 (CI 95% 0.885–0.950) and 0.901 (CI 95% 0.872–0.930) for
14 PaO_2/FiO_2 thresholds of 300 and 400 mmHg, respectively. The positive predictive value (PPV)
15 of an SpO_2/FiO_2 threshold of 350 for PaO_2/FiO_2 inferior to 300 mmHg was 0.88 (CI95% 0.84–
16 0.91), whereas the negative predictive value (NPV) of the SpO_2/FiO_2 threshold of 470 for
17 PaO_2/FiO_2 inferior to 400 mmHg was 0.89 (CI95% 0.75–0.96). No significant differences were
18 found between the subgroups.

19 Conclusions: The SpO_2/FiO_2 ratio may be a reliable tool for hypoxemia screening among
20 patients admitted to the ED, particularly during the SARS-CoV-2 outbreak.

21 **1. Introduction**

22 *1. 1. Background*

23 Acute respiratory distress is a common reason for emergency department (ED) admission.
24 Since the end of 2019, healthcare workers have been facing the coronavirus disease (COVID-
25 19) pandemic due to SARS-CoV-2, with a major risk of overcrowding in the ED. Severe
26 COVID-19 infections are associated with hypoxemia, the severity of which can quickly
27 become life-threatening.

28 The development of tools for the initial assessment of the degree of hypoxemia among patients
29 with respiratory symptoms is essential. Such a tool should reduce both under-triage, allowing
30 critical patients to quickly receive the appropriate level of care, and over-triage, maintaining
31 critical care capacity despite an influx of patients. An appropriate triage tool should also be
32 applicable for all causes of respiratory distress, whether related to COVID-19 or not. Limited
33 reliable data are available for the triage of hypoxemic patients in the ED, yet it could be
34 particularly useful during the COVID-19 pandemic.

35 *1. 2. Importance*

36 Early diagnosis of critical hypoxemia is important for both COVID-19 infection and Acute
37 Respiratory Distress Syndrome (ARDS) based on the ratio of partial pressure arterial oxygen
38 to the fraction of inspired oxygen ($\text{PaO}_2/\text{FiO}_2$) (1,2). This indicator has been validated in many
39 pathological situations (3,4) but requires an arterial blood sample and therefore is often not
40 immediately accessible upon the patient's admission. Arterial puncture is also a source of pain
41 and complications (5-8).

42 Validation of a noninvasive tool could allow us to improve triage time and patient orientation
43 upon admission. In particular, the ratio of peripheral arterial oxygen saturation to the inspired
44 fraction of oxygen ($\text{SpO}_2/\text{FiO}_2$) has been proposed by several authors (9-12). However,
45 diagnostic performance of this index has not yet been evaluated.

46 *1. 3. Goals of this investigation*

47 This study evaluated the performance of the $\text{SpO}_2/\text{FiO}_2$ ratio for predicting mild ($\text{PaO}_2/\text{FiO}_2$
48 superior to 400 mmHg) or moderate ($\text{PaO}_2/\text{FiO}_2$ inferior to 300 mmHg) hypoxemia, and
49 evaluated the performance of this index among patients admitted during the COVID-19
50 outbreak, with subgroup analyses distinguishing SARS-CoV-2 positive and negative patients.

51 2. Methods

52 2. 1. Study design and setting

53 We performed a retrospective observational cohort study to assess the predictive value of
54 SpO₂/FiO₂ for the PaO₂/FiO₂ ratio among adult patients admitted to our ED from February to
55 April 2020. The study center is an academic-level hospital in France and was the regional
56 referral center for COVID-19 patient management during the pandemic.

57 We followed the Standards for Reporting of Diagnostic Accuracy criteria for diagnostic
58 performance studies (13). Our study is in accordance with the current regulations in France
59 relative to protection of personal health and privacy data.

60 2. 2. Data collection

61 We extracted the following from our computer data system (*DxCare*® software, France): data
62 on demographics, medical history, vital signs at admission and time of arterial blood sampling,
63 presence of oxygen therapy, oxygen flow rate (QO₂) at arterial puncture, SARS-CoV-2
64 virological status, final diagnosis, and blood gas results for each arterial sample during ED
65 admission including PaO₂, arterial hemoglobin saturation (SaO₂), and arterial carbon dioxide
66 partial pressure (PaCO₂). Data collection was planned subsequent to admission of the study
67 population for the study period. **All patients admitted during the study period and from whom**
68 **an arterial blood sampling was performed were reviewed.** The diagnosis of COVID-19
69 infection was retained in our analyses in cases of a positive PCR and/or typical lesions in chest
70 CT scans (when performed).

71 FiO₂ was estimated from the interface used for oxygen delivery (nasal cannulas, single mask,
72 high-concentration mask, non-invasive ventilation) and oxygen flow rate. For nasal-cannula or
73 single-mask oxygen therapy, FiO₂ was estimated from the data presented by Wettstein *et al*
74 (14) using the formula $FiO_2 = 4.QO_2 + 21\%$. For the high-concentration mask, FiO₂ was

75 estimated at 80%. For non-invasive ventilation, the FiO₂ value selected was the one set on the
76 ventilator.

77 Pulsed oxygen saturation was measured using pulse oximeters (Space Labs Healthcare Qube™,
78 USA). The quality of the measurement was controlled by a nurse with simultaneous
79 visualization of the plethysmography curve. Arterial blood gas analyses were performed
80 immediately after sampling with a Werfen Instrumentation Laboratory GEM Premier 5000™
81 (Spain).

82 2. 3. *Choice of PaO₂/FiO₂ thresholds*

83 The PaO₂/FiO₂ thresholds chosen to plot ROC curves were 300 and 400 mmHg, respectively.
84 The 300 mmHg threshold corresponds to the definition of both severe COVID-19 (15), and
85 ARDS (16). The 400 mmHg threshold corresponds to changes in hematosi relative to observed
86 normal (17) and is used for early detection of hypoxemia, such as in the SOFA score (18).

87 2. 4. *Inclusion and exclusion criteria*

88 This study included patients over 18 years of age who were admitted to our ED and underwent
89 vital sign recording and arterial blood gas sampling less than 1 h apart. Exclusion criteria were
90 the absence of recording of one of the parameters studied, a suspicion of blood gas analyses
91 using venous samples (defined as SaO₂ inferior to 75% with SpO₂ superior to 95%), and the
92 presence of hyperoxygenation (defined as the presence of oxygen therapy despite SaO₂
93 superior to 99%). We did not exclude samples collected for extra-respiratory indications.

94 2. 5. *Statistical analyses*

95 Calculation of the SpO₂/FiO₂ values and determination of the mean areas under the receiver-
96 operating characteristic (ROC) curves of SpO₂/FiO₂ for PaO₂/FiO₂ threshold values of 300 and
97 400 mmHg, as well as their confidence intervals, were performed using R software version
98 3.6.3 (pROC package) (19). Agreement between SpO₂/FiO₂ and PaO₂/FiO₂ ratios was assessed
99 using Spearman's rank correlation coefficient. Subgroup analysis of COVID-19 positive and

100 negative patients was conducted using Delong's test of equivalence on ROC curves of both
101 subgroups for PaO₂/FiO₂ threshold values of 300 and 400 mmHg. SpO₂/FiO₂ thresholds were
102 determined using the weighted closest topleft method (pROC package).

103 **3. Results**

104 *3. 1. Characteristics of the study subjects*

105 During the study period, 564 patients underwent one or more blood gas analyses for a total of
106 765 blood samples. After application of the exclusion criteria, 430 blood samples from 395
107 patients were included in statistical analyses. Figure 1 shows the flow chart of the study. The
108 characteristics of the patients and blood samples are presented in Table 1.

109 *3. 2. Main results*

110 Spearman's rank correlation between SpO₂/FiO₂ and PaO₂/FiO₂ ratios was 0.799 (CI 95%
111 0.747-0.842). The ROC curves of the SpO₂/FiO₂ ratio among overall (N=430), COVID-19
112 positive (N = 94) and negative (N = 336) subgroups for PaO₂/FiO₂ threshold values of 300 and
113 400 mmHg are shown in Figure 2. Delong's test for comparison of ROC curves showed no
114 significant difference between the subgroups for PaO₂/FiO₂ threshold values of 300 mmHg
115 (D = 1.46, p = 0.15) and 400 mmHg (D = 0.68, p = 0.50).

116 The AUCs of ROC curves of overall patients were 0.918 (CI 95% 0.885–0.950) for a
117 PaO₂/FiO₂ threshold of 300 mmHg and 0.901 (CI 95% 0.872–0.930) for a PaO₂/FiO₂
118 threshold of 400 mmHg. **Analysis of SpO₂/FiO₂ performance shows** a specificity of
119 SpO₂/FiO₂ superior to 470 of 0.98 (CI95% 0.96–0.99) with a positive predictive value (PPV)
120 of 0.89 (CI95% 0.75–0.96) for PaO₂/FiO₂ superior to 400 mmHg. Specificity of SpO₂/FiO₂
121 inferior to 350 was 0.95 (CI95% 0.91–0.97) with PPV of 0.88 (CI95% 0.84–0.91) for
122 PaO₂/FiO₂ inferior to 300 mmHg.

123 4. Discussion

124 4. 1. Synthesis of relevant results

125 The SpO₂/FiO₂ ratio in our cohort showed a good association with the PaO₂/FiO₂ ratio. In this
126 series, the use of thresholds of 370 and 450 showed satisfactory diagnostic performances for
127 the positive diagnosis of PaO₂/FiO₂ < 300 mmHg and exclusion of a PaO₂/FiO₂ < 400 mmHg.
128 Performance was not significantly different between COVID-19 positive and negative patients.
129 **Our results suggest that SpO₂/FiO₂ can be used for the estimation of the degree of hypoxemia**
130 **on admission to the emergency room, allowing the patient's severity to be assessed prior to**
131 **confirmation of viral status. Without other signs of respiratory distress (including increased**
132 **work of breathing and/or altered mental status), SpO₂/FiO₂ superior to 450 could be used as a**
133 **decision threshold for outpatient management, whereas SpO₂/FiO₂ inferior to 370 could require**
134 **referral to intensive care units. An SpO₂/FiO₂ between 370 and 450 would require further**
135 **clinical evaluation and possibly arterial blood gas.**

136 4. 2. Relationship to previous results

137 Our results support data published by Lu *et al.* (20), who found that a significant association
138 between SpO₂/FiO₂ decreases and increases mortality risk. Similarly, results recently published
139 by Hamlovich *et al.* (21) showed the prognostic value of SpO₂ and FiO₂ in the initial assessment
140 of the severity of COVID-19 patients. In this context, our results support the possibility of
141 using SpO₂/FiO₂ by admission nurses as a tool for triage and early referral of patients admitted
142 for respiratory symptoms.

143 4. 3. Limitations

144 This study had several limitations. First, its retrospective design is subject to several biases. In
145 particular, the SARS-CoV-2 virological status is based on the presence of a positive PCR
146 and/or CT scan with typical lesions. The number of false positives is likely to be small; thus,
147 we can assume the existence of many false negatives, particularly in patients who have not had

148 a CT scan or if the CT scan was performed too early, which may be negative during the first
149 few days of symptom progression (22).

150 The population sample collected over this period cannot be considered representative of a
151 standard sample of patients consulted in an ED. Significantly more patients were admitted for
152 respiratory symptoms during the period. In addition, relatively fewer patients were admitted
153 for other indications as they may have avoided consultations to reduce their exposure to viral
154 contamination.

155 Blood gas measurements performed for acute respiratory distress were included, as well as for
156 non-respiratory reasons, considering that validation of SpO_2/FiO_2 in non-hypoxemic patients
157 was necessary to exclude significant hypoxemia at triage. Hyperoxygenated patients were
158 excluded from the analyses, in whom the SpO_2/FiO_2 ratio is artificially lowered by a nonlinear
159 evolution of SpO_2 (limited between 99% and 100%) compared to FiO_2 . This choice limits the
160 use of these results for triage, where pre-hospital treatment may have imposed significant
161 oxygen therapy during transport to the hospital center, leading to hyperoxygenation at
162 admission to the ED. The use of SpO_2/FiO_2 then requires a prior decrease in FiO_2 to obtain an
163 SpO_2 of less than 99%.

164 Finally, this study evaluated the performance of SpO_2/FiO_2 based on its association with a
165 biological criterion. An evaluation based on a clinical criterion would be more relevant and
166 would allow for a better assessment of the interest of this index in practice. In particular,
167 previous studies (23, 24) have shown that the relationship between PaO_2 and FiO_2 is not linear.
168 Thus, the PaO_2/FiO_2 ratio depends on the FiO_2 , and its evolution in cases of FiO_2 variation
169 depends on the fraction of shunt and the ventilation/perfusion mismatch. As such, a perfect
170 correlation between SaO_2/FiO_2 and PaO_2/FiO_2 would mean that SaO_2/FiO_2 has the same
171 drawbacks.

172 **5. Conclusion**

173 In summary, our results suggest that $\text{SpO}_2/\text{FiO}_2$ could be a useful index for triage upon
174 admission of patients consulting for acute respiratory symptoms, particularly with suspicion of
175 COVID-19, and would identify patients who could be managed on an outpatient basis and
176 patients requiring admission to the intensive care unit. The use of this index nevertheless
177 requires oxygen titration to ensure the absence of hyperoxygenation, **and does not take into**
178 **account the other dimensions of the respiratory assessment (including work of breathing and**
179 **mental status).**

180 Future studies are required for a prospective evaluation of the diagnostic performance of
181 $\text{SpO}_2/\text{FiO}_2$ among COVID-19 patients, as well as in the acute respiratory tract. In particular,
182 the use of a clinical criterion such as mortality, length of hospitalization, the need for admission
183 to intensive or conventional care could allow us to more accurately assess the contribution of
184 $\text{SpO}_2/\text{FiO}_2$ in emergency medicine triage, providing options in addition to $\text{PaO}_2/\text{FiO}_2$.

185 **References**

- 186 1. Berlin DA, Gulick RM, Martinez FJ. Severe Covid-19. *N Engl J Med*. 2020.
- 187 2. ARDS Definition Task Force, Ranieri VM, Rubenfeld GD, Thompson BT, Ferguson ND,
188 Caldwell E, et al. Acute respiratory distress syndrome: the Berlin Definition. *JAMA*.
189 2012;307(23):2526-33.
- 190 3. Offner PJ, Moore EE. Lung injury severity scoring in the era of lung protective mechanical
191 ventilation: the PaO₂/FIO₂ ratio. *J Trauma*. 2003;55(2):285-9.
- 192 4. Esteve F, Lopez-Delgado JC, Javierre C, Skaltsa K, Carrio ML, Rodríguez-Castro D, et al.
193 Evaluation of the PaO₂/FiO₂ ratio after cardiac surgery as a predictor of outcome during
194 hospital stay. *BMC Anesthesiol*. 2014;14:83.
- 195 5. Crawford A. An audit of the patient's experience of arterial blood gas testing. *Br J Nurs*.
196 2004;13(9):529-32.
- 197 6. Mortensen JD. Clinical sequelae from arterial needle puncture, cannulation, and incision.
198 *Circulation*. 1967;35(6):1118-23.
- 199 7. Giner J, Casan P, Belda J, González M, Miralda RM, Sanchis J. Pain during arterial
200 puncture. *Chest*. 1996;110(6):1443-5.
- 201 8. Halpern AA, Mochizuki R, Long CE 3rd. Compartment syndrome of the forearm
202 following radial-artery puncture in a patient treated with anticoagulants. *JBJS*.
203 1978;60(8):1136-1137.
- 204 9. Sanz F, Dean N, Dickerson J, Jones B, Knox D, Fernández-Fabrellas E, et al. Accuracy of
205 PaO₂ /FiO₂ calculated from SpO₂ for severity assessment in ED patients with pneumonia.
206 *Respirol Carlton Vic*. 2015;20(5):813-8.
- 207 10. Pandharipande PP, Shintani AK, Hagerman HE, St Jacques PJ, Rice TW, Sanders NW, et
208 al. Derivation and validation of SpO₂/FiO₂ ratio to impute for PaO₂/FiO₂ ratio in the

209 respiratory component of the Sequential Organ Failure Assessment (SOFA) Score. *Crit Care*
210 *Med.* 2009;37(4):1317-21.

211 11. Katsuya H, Sakanashi Y. Simple and noninvasive indicator of pulmonary gas exchange
212 impairment using pulse oximetry. *J Clin Monit.* 1989;5(2):82-6.

213 12. Brown SM, Grissom CK, Moss M, Rice TW, Schoenfeld D, Hou PC, et al. Nonlinear
214 Imputation of Pao₂/Fio₂ From Spo₂/Fio₂ Among Patients With Acute Respiratory Distress
215 Syndrome. *Chest.* 2016;150(2):307-13.

216 13. Bossuyt PM, Reitsma JB, Bruns DE, Gatsonis CA, Glasziou PP, Irwig L, et al. STARD
217 2015: an updated list of essential items for reporting diagnostic accuracy studies. *BMJ.*
218 2015;351.

219 14. Wettstein RB, Shelledy DC, Peters JI. Delivered Oxygen Concentrations Using Low-
220 Flow and High-Flow Nasal Cannulas. *Respir Care.* 2005;50(5):604-9.

221 15. China National Health Commission. Chinese Clinical Guidance for COVID-19
222 Pneumonia Diagnosis and Treatment (7th edition). 2020.

223 16. ARDS Definition Task Force, Ranieri VM, Rubenfeld GD, Thompson BT, Ferguson ND,
224 Caldwell E, Fan E, Camporota L, Slutsky AS. Acute respiratory distress syndrome: the Berlin
225 Definition. *JAMA.* 2012 Jun 20;307(23):2526-33.

226 17. Trulock EP. Arterial Blood Gases. In: Walker HK, Hall WD, Hurst JW, editors. Clinical
227 Methods: The History, Physical, and Laboratory Examinations. 3rd ed. Boston: Butterworths;
228 1990.

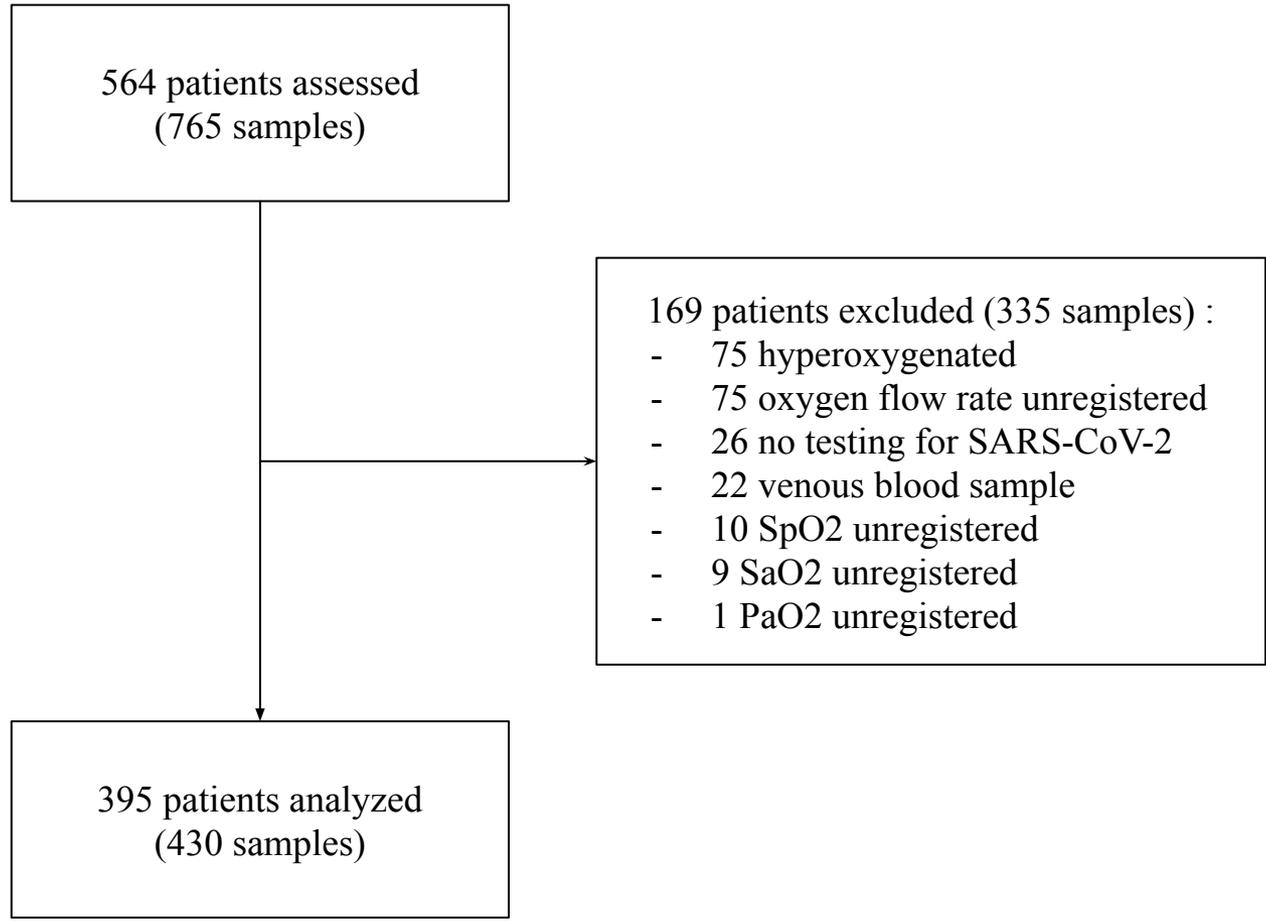
229 18. Vincent J-L, Moreno R, Takala J, Willatts S, De Mendonça A, Bruining H, et al. The
230 SOFA (Sepsis-related Organ Failure Assessment) score to describe organ dysfunction/failure.
231 *Intensive Care Med.* 1996;22(7):707-10.

- 232 19. Robin X, Turck N, Hainard A, Tiberti N, Lisacek F, Sanchez J, Müller M. pROC: an
233 open-source package for R and S+ to analyze and compare ROC curves. *BMC*
234 *Bioinformatics*. 2011;12(77).
- 235 20. Lu X, Jiang L, Chen T, Wang Y, Zhang B, Hong Y, et al. Continuously available ratio of
236 SpO₂/FiO₂ serves as a noninvasive prognostic marker for intensive care patients with
237 COVID-19. *Respir Res*. 2020;21(1):194.
- 238 21. Haimovich A, Ravindra NG, Stoytchev S, Young HP, PerryWilson F, Dijk D van, et al.
239 Development and validation of the quick COVID-19 severity index (qCSI): a prognostic tool
240 for early clinical decompensation. *Ann Emerg Med* 2020.
- 241 22. Wang Y-C, Luo H, Liu S, Huang S, Zhou Z, Yu Q, et al. Dynamic evolution of COVID-
242 19 on chest computed tomography: experience from Jiangsu Province of China. *Eur Radiol*.
243 2020.
- 244 23. Aboab J, Louis B, Jonson B, Brochard L. Relation between PaO₂/FIO₂ ratio and FIO₂: a
245 mathematical description. *Intensive Care Med*. 2006;32(10):1494-7.
- 246 24. Karbing DS, Kjærgaard S, Smith BW, Espersen K, Allerød C, Andreassen S, et al.
247 Variation in the PaO₂/FiO₂ ratio with FiO₂: mathematical and experimental description, and
248 clinical relevance. *Crit Care*. 2007;11(6):R118.

564 patients assessed
(765 samples)

- 169 patients excluded (335 samples) :
- 75 hyperoxygenated
 - 75 oxygen flow rate unregistered
 - 26 no testing for SARS-CoV-2
 - 22 venous blood sample
 - 10 SpO2 unregistered
 - 9 SaO2 unregistered
 - 1 PaO2 unregistered

395 patients analyzed
(430 samples)



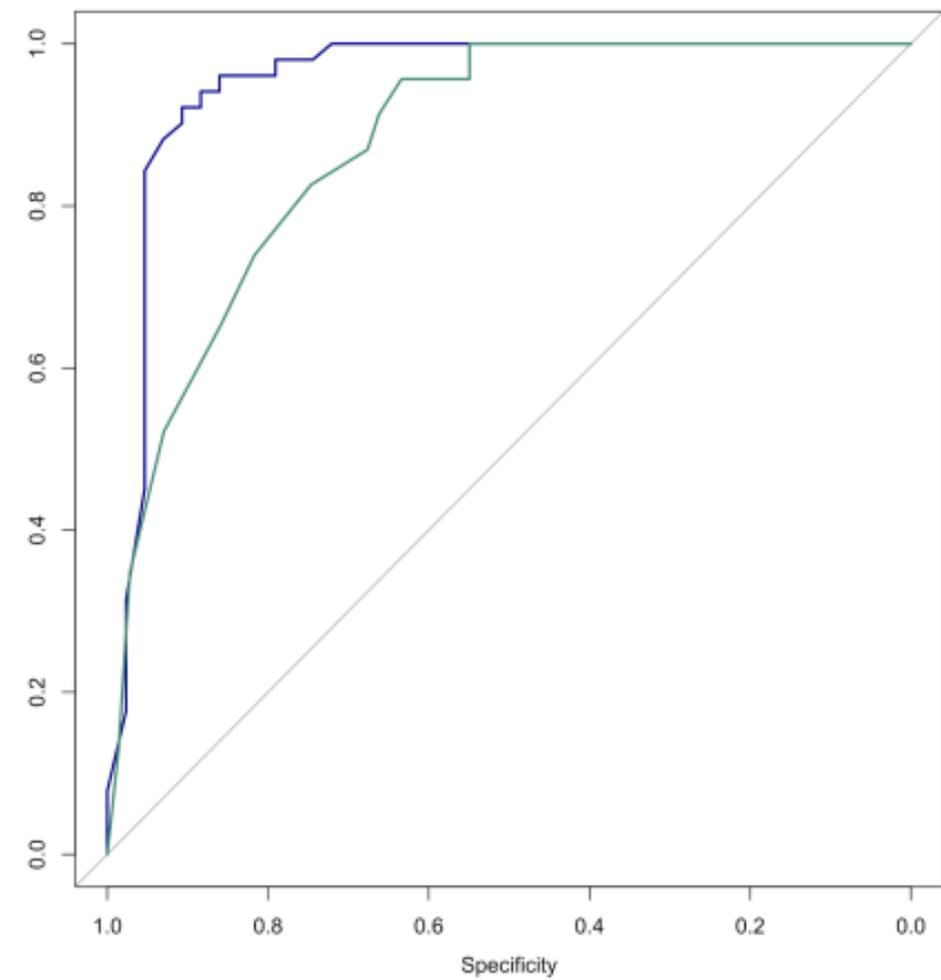
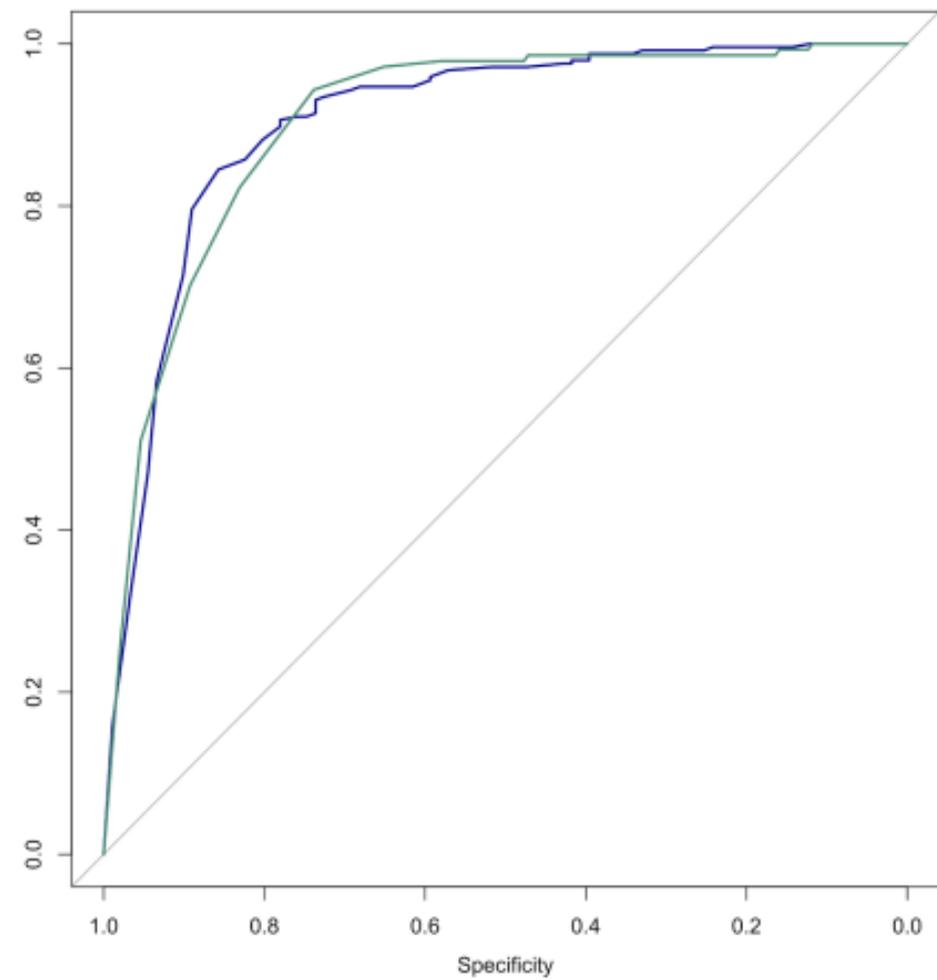
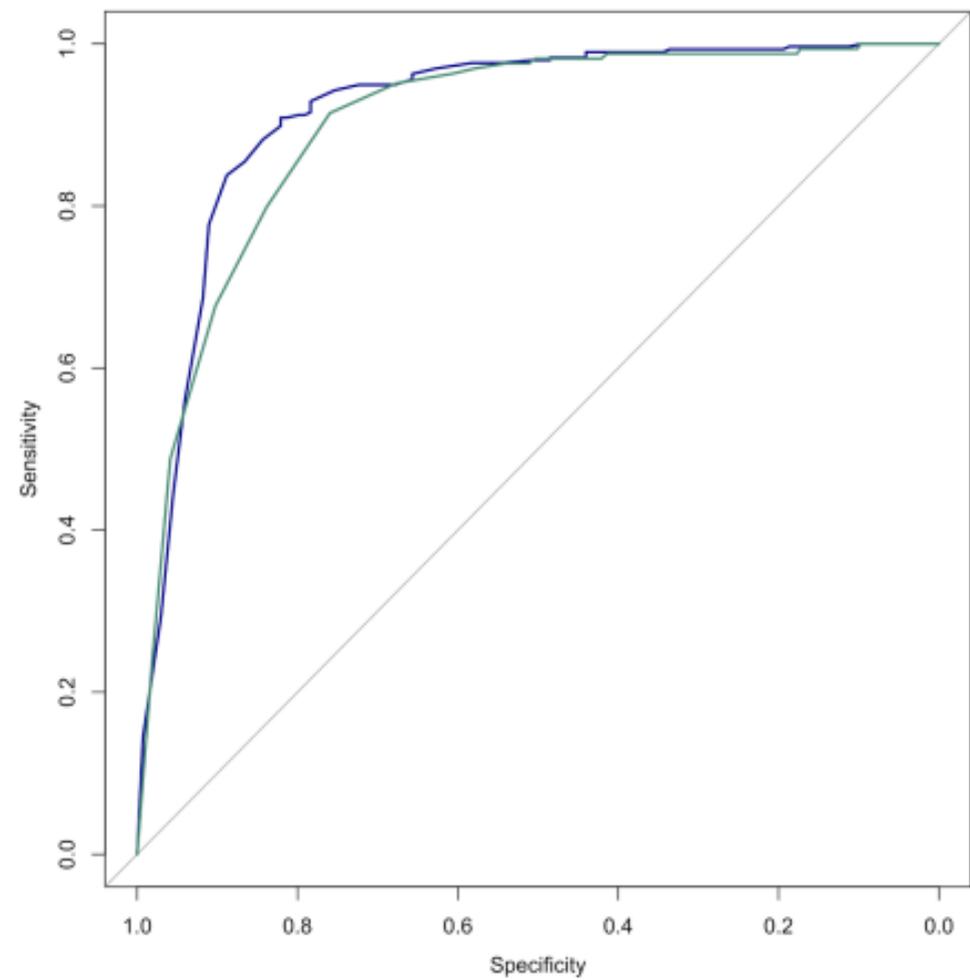


Figure legends

Figure 1. Flowchart of the study

Figure 2. ROC curves of the SpO₂/FiO₂ ratio for PaO₂/FiO₂ threshold values of 300 mmHg (blue) and 400 mmHg (green), for overall (left), COVID-19 negative (center) and positive (right) patients.

Supplemental tables legends

Table 1. Characteristics of study subjects

Table 1.

Patients characteristics	N = 395
Age, median (IQR)	60 (44-78)
Gender, male, N (%)	193 (48.9%)
Comorbidities :	
- cardiac, N (%)	91 (23.0%)
- heart failure, N (%)	71 (18.0%)
- atrial fibrillation, N (%)	40 (10.1%)
- coronary artery disease, N (%)	30 (7.6%)
- other cardiac disease, N (%)	33 (8.4%)
- pulmonary, N (%)	118 (29.9%)
- asthma, N (%)	48 (12.2%)
- Chronic obstructive pulmonary disease(COPD) , N (%)	51 (12.9%)
- lung carcinosis, N (%)	10 (2.53%)
- restrictive lung disease, N (%)	16 (4.05%)
- other, N (%)	10 (2.53%)
Acute kidney failure, N (%)	33 (8.4%)
Chronic kidney disease, N (%)	29 (7.34%)
COVID-19 status	
- positive, N (%)	90 (22.8%)

- negative, N (%)	305 (77.2%)
Diagnosis at discharge	
- pulmonary disease, N (%)	291 (73.7%)
- SARS-CoV-2, N (%)	90 (22.8%)
- COPD exacerbation, N (%)	21 (5.32%)
- Acute asthma, N (%)	18 (4.56%)
- Pneumonia, N (%)	49 (12.4%)
- Cardiogenic pulmonary oedema, N (%)	21 (5.32%)
- respiratory acute viral syndrome (undetermined), N (%)	72 (18.3%)
- others, N (%)	20 (5.06%)
- Extra-respiratory disease, N (%)	104 (26.3%)
Vital signs :	
Heart rate, median (IQR)	88 (77-101)
Systolic blood pressure, median (IQR)	129 (115-144)
Diastolic blood pressure, median (IQR)	77 (68-87)
SpO2, median (IQR)	97 (95-99)
Ventilatory rate, median (IQR)	22 (18-28)
Temperature (°C), median (IQR)	37 (36.6-37.5)
Blood gas analysis	N = 430
Sample from COVID-19 patient, N (%)	94 (21.9%)

FiO2 (%), median (IQR)	21 (21-29)
PaO2 (mmHg), median (IQR)	83.3 (71.3-97.5)
SaO2 (%), median (IQR)	97.9 (96.4-98.9)
PaCO2 (mmHg), median (IQR)	36.0 (32.3-40.5)
pH, median (IQR)	7.44 (7.41-7.47)
PaO2/FiO2 (mmHg), median (IQR)	364.3 (269.5-450)
- PaO2/FiO2 > 400, N (%)	164 (38.1%)
- PaO2/FiO2 300-400, N (%)	132 (30.7%)
- PaO2/FiO2 < 300, N (%)	134 (31.2%)
SaO2/FiO2, median (IQR)	461.2 (339.0-470.5)
SpO2/FiO2, median (IQR)	452.4 (337.9-466.7)