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- lactate in hospitalized and ambulatory Covid-19 patients. *Am J Trop Med Hyg* 2021; **104**: 1041–4
7. Gattinoni L, Vasques F, Camporota L, et al. Understanding lactatemia in human sepsis. Potential impact for early management. *Am J Respir Crit Care Med* 2019; **200**: 582–9
  8. Levy B, Gibot S, Franck P, Cravoisy A, Bollaert P-E. Relation between muscle Na<sup>+</sup>K<sup>+</sup> ATPase activity and raised lactate concentrations in septic shock: a prospective study. *Lancet* 2005; **365**: 871–5
  9. Casserly B, Phillips GS, Schorr C, et al. Lactate measurements in sepsis-induced tissue hypoperfusion: results from the Surviving Sepsis Campaign database. *Crit Care Med* 2015; **43**: 567–73
  10. Arina P, Baso B, Moro V, et al. Discriminating between CPAP success and failure in COVID-19 patients with severe respiratory failure. *Intensive Care Med* 2021; **47**: 237–9

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## COVID-19: a boost for intensive care authorship?

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Editor—Almost 180 million cases of COVID-19 have been diagnosed, with almost 4 000 000 deaths.<sup>1</sup> As this pandemic had unprecedented worldwide healthcare and socio-economic effects, the scientific world is under exceptional pressure regarding the need for knowledge on this new disease, including its pathophysiology and possible treatments. Such pressure prioritised scientific publications on COVID-19 over other medical conditions, with exponential increases in editorial workload.<sup>2</sup> Trials on COVID-19 underwent rapid ethical evaluation<sup>3</sup>; the peer-review process was shortened and was possibly less stringent.<sup>4</sup> Studies were published as preprints in order to spread immediate knowledge and experience.<sup>4</sup> Moreover, the emergence of viral variants and the roll-out of vaccines is keeping pressure high to publish on COVID-19.

From a scientific perspective, the pandemic probably boosted research collaboration both as interdisciplinary teamwork (i.e. radiology, pathology, pulmonology) and as multicentre data sharing. In order to evaluate the appropriateness of the authorship patterns during the COVID-19 pandemic, two simplified systematic searches on PUBMED were conducted on January 25, 2021 to retrieve articles on COVID-19 and acute respiratory distress syndrome (ARDS), the latter including non-COVID-19 cases only. The search in both groups consisted of the combination of terms from three sets. The first two were identical: (1) 'retrospective', AND (2) 'intensive care' OR 'critical care' OR 'critically ill'. The third set was 'COVID' OR 'coronavirus' for the COVID-19 group, and 'ARDS' OR 'acute respiratory distress' for the ARDS group. We

applied filters to articles published with an abstract and containing human data. Each article was assessed by three authors. We excluded reviews, meta-analyses, non-human studies, letters, and editorials. For each of the included studies we recorded the number of: patients included, authors (excluding collaborators), and centres involved.

Our primary outcome was the difference between the patient number/author number ratio (P/A ratio) calculated as follows:

$$P / A \text{ ratio} = \frac{n \text{ of patients studied}}{n \text{ of authors listed}}$$

After testing data distribution (Kolmogorov–Smirnov test), variables of interest were reported as mean (standard deviation), or median (inter-quartile range). Statistical analysis was performed with the Student t-test or Mann–Whitney test according to data distribution; P values <0.05 were considered statistically significant. Two sensitivity analyses were conducted. The first included studies of <1000 patients to remove the influence of large registries that may have a very high number of patients and consequently P/A ratio. The second included single-centre studies.

Our simplified search found 701 articles for the COVID-19 group and 778 for the ARDS groups. After screening, we included 535 and 464 articles, respectively (Table 1). When excluding outliers, the number of studies in the COVID-19 and ARDS groups decreased to 485 (–9.3%) and 442 (–4.7%), respectively. The first sensitivity analysis changed only the results on

**Table 1** Summary of results. Patient/author number (PA) ratios for COVID-19 and ARDS papers during the COVID-19 pandemic. Data are reported as median and inter-quartile range or as mean and standard deviation according to their data distribution. Statistical analysis was performed with Student t-test or Mann–Whitney test according to data distribution. \*Sensitivity analysis conducted for studies with <1000 patients. Sensitivity analysis conducted after excluding outliers, defined as studies including more than 1000 patients. †Sensitivity analysis conducted including only for single-centre studies only. ARDS, acute respiratory distress syndrome.

	COVID-19	ARDS	P value	COVID-19*	ARDS*	P value*	COVID-19†	ARDS†	P value†
Patients per article	115 (266)	73 (170)	<0.001	106 (200)	70 (139)	<0.001	102 (183)	61 (136)	<0.001
Authors per article	10 (8)	7 (4)	<0.001	10 (7)	7 (4)	<0.001	9 (6)	7 (3)	<0.001
P/A ratio	11.1 (26.4)	11.2 (22.6)	0.74	9.4 (17.8)	10.9 (19.9)	0.39	25 (44)	35 (109)	0.09
Centres per study	1 (1)	1 (0)	0.004	2.2 (4.4)	2.2 (4.2)	0.84	1	1	–

Numbers are expressed as mean (standard deviation) or median (interquartile range), as appropriate.

the number of centres per study, which became normally distributed and not significant. The second sensitivity analysis on single-centre studies found similar results, although the median P/A ratios in both groups were two to three times higher than in the primary analysis, and there was a trend towards lower P/A ratio in COVID-19 retrospective research.

The scientific community should be commended for its extraordinary efforts during the current pandemic. However, it has also been criticised that COVID-19 articles included an excess of authors, especially in studies of lower methodological quality, for example retrospective studies. Moreover, it is possible that the increased speed of review process did not allow careful evaluation of honorary, guest, or gift authorships.<sup>5</sup>

We sought to evaluate the appropriateness of the P/A ratio with simplified analyses on patterns of authorship in retrospective studies in the intensive care field, comparing COVID-19 articles with articles on non-COVID ARDS. We confirmed that the urgent need of knowledge regarding COVID-19 boosted collaboration between centres, as shown by a greater number of multicentre studies in the COVID-19 group. We also found a greater number of patients and larger authorship numbers in COVID-19 studies as compared with ARDS studies. Such parallel increases yielded similar P/A ratios in COVID-19 and ARDS studies, supporting the idea that the increase in authorship numbers in COVID-19 articles is justified by the corresponding increase in patient numbers studied.

The increase in the number of authors in scientific publications is under scrutiny.<sup>6,7</sup> Among other investigations, Rong and colleagues<sup>8</sup> recently analysed the five top anaesthesiology journals and showed an average increase of 1.3 authors per manuscript (from 5.8 in the period 2008–10, to 7.1 in 2016–8). The growth of authors per manuscript is a complex and multifactorial phenomenon, and it is not necessarily bad practice. For instance, greater complexity of research questions requires multidisciplinary collaboration; conversely, the higher academic pressure and the need to boost metrics to increase chances of success in promotion and grants are areas of potential concern. One is the use of ‘honorary’, ‘guest’, or ‘gift’ authorships, where authorship is gifted without meeting standard criteria.<sup>5</sup> Another issue is the proliferation of self-citation, which has been further expanded to coordinated clusters of scientists massively citing each other (‘citation farms’). Currently, only a minority of anaesthesiology and critical care medicine journals have policies to discourage inappropriate self-citations.<sup>9,10</sup>

Our study has several limitations. First, we performed simplified searches limited to retrospective studies in the

intensive care field. Second, our analysis does not correct for study complexity. Indeed, the number of variables per patient and the need for multidisciplinary evaluation may significantly increase author workload, thus justifying an increase in authorship numbers. We partially limited this issue by choosing ARDS studies, a topic similar to COVID-19, as a control group.

Our simplified analyses limited to retrospective studies published in the field of intensive care showed similar ratios between numbers of patients and authors in recent COVID-19 literature as compared with non-COVID ARDS articles. Our analysis does not support an artificial increase in the number of authors and a proliferation in ‘gift authorships’ during the current pandemic.

## Declarations of interest

The authors declare that they have no conflicts of interest.

## References

- Center for Systems Science and Engineering at Johns Hopkins University. COVID-19 map. Available from: <https://coronavirus.jhu.edu/map.html>. [Accessed 23 June 2021]
- Citerio G, Bakker J, Brochard L, et al. Critical care journals during the COVID-19 pandemic: challenges and responsibilities. *Intensive Care Med* 2020; **46**: 1521–3
- Gianola S, Jesus TS, Barger S, Castellini G. Characteristics of academic publications, preprints, and registered clinical trials on the COVID-19 pandemic. *PLoS One* 2020; **15**, e0240123
- Vlasschaert C, Topf JM, Hiremath S. Proliferation of papers and preprints during the coronavirus disease 2019 pandemic: progress or problems with peer review? *Adv Chronic Kidney Dis* 2020; **27**: 418–26
- Rajasekaran S, Shan RL, Finnoff JT. Honorary authorship: frequency and associated factors in physical medicine and rehabilitation research articles. *Arch Phys Med Rehabil* 2014; **95**: 418–28
- Dotson B, McManus KP, Zhao JJ, Whittaker P. Authorship and characteristics of articles in pharmacy journals: changes over a 20-year interval. *Ann Pharmacother* 2011; **45**: 357–63
- Levsky ME, Rosin A, Coon TP, Enslow WL, Miller MA. A descriptive analysis of authorship within medical journals, 1995–2005. *South Med J* 2007; **100**: 371–5

8. Rong LQ, Rahouma M, Lopes AJ, Charlson ME, Gaudino M. Authorship patterns in contemporary anaesthesia literature: a cross-sectional study. *Br J Anaesth* 2021; **126**: e152–4
9. Sanfilippo F, Tigano S, Morgana A, Murabito P, Astuto M. Self-citation policies and journal self-citation rate among Critical Care Medicine journals. *J Intensive Care* 2021; **9**: 15
10. Sanfilippo F, Tigano S, Morgana A, Murabito P, Astuto M. Self-citation policies in anaesthesiology journals. *Br J Anaesth* 2021; **126**: e21–5

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