



Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.

an opposite seeming improvement of kidney function with an eGFR of 90 mL/min per 1.73 m<sup>2</sup> or more in 142 (29.7%) of 478 patients at follow-up with an eGFR of less than 90 mL/min per 1.73 m<sup>2</sup> and no evidence of acute kidney injury during the acute disease. We encourage the investigators to show eGFR trajectories between acute phase and follow-up independent from cutoffs to substantiate the robustness of their findings.

We declare no competing interests.

Philipp Enghard,  
Jan-Hendrik Hardenberg,  
Helena Stockmann, Christian Hinze,  
Kai-Uwe Eckardt, \*Kai M Schmidt-Ott  
kai.schmidt-ott@charite.de

Department of Nephrology and Medical Intensive Care, Charité–Universitätsmedizin Berlin, corporate member of Freie Universität Berlin, Humboldt-Universität zu Berlin, 12203 Berlin, Germany

- Huang C, Huang L, Wang Y, et al. 6-month consequences of COVID-19 in patients discharged from hospital: a cohort study. *Lancet* 2021; **397**: 220–32.
- Levey AS, Stevens LA, Schmid CH, et al. A new equation to estimate glomerular filtration rate. *Ann Intern Med* 2009; **150**: 604–12.
- Hilderink JM, van der Linden N, Kimenai DM, et al. Biological variation of creatinine, cystatin C, and eGFR over 24 hours. *Clin Chem* 2018; **64**: 851–60.

Chaolin Huang and colleagues<sup>1</sup> have highlighted the putative renal consequences of COVID-19 at 6 months from discharge. A decreased estimated glomerular filtration rate (eGFR) was defined as less than 90 mL/min per 1.73 m<sup>2</sup> and was observed in 35% of participants during follow-up. The term decreased eGFR is ambiguous. According to the mean age of the cohort, chronic kidney disease should be defined as an eGFR of less than 60 mL/min per 1.73 m<sup>2</sup>.<sup>2</sup> The usual prevalence of eGFR less than 90 mL/min per 1.73 m<sup>2</sup> in the Chinese general population of similar ages to those in Huang and colleagues' cohort ranges between 35% and 50%.<sup>3,4</sup> In other words, the prevalence of eGFR of less than 90 mL/min per 1.73 m<sup>2</sup> in COVID-19 survivors might not differ from the

general population. Furthermore, the majority of patients with eGFR less than 90 mL/min per 1.73 m<sup>2</sup> during follow-up did not show acute kidney injury during the acute phase, which suggests that the eGFR of these patients was already less than 90 mL/min per 1.73 m<sup>2</sup> before COVID-19. Therefore, the prevalence of patients with eGFR less than 60 mL/min per 1.73 m<sup>2</sup> at 6 months from discharge is required to factually assess the long-term effect of COVID-19 on renal function. The pathological relevance of an eGFR between 60 and 90 mL/min per 1.73 m<sup>2</sup> is questionable in the absence of proteinuria.<sup>2</sup> Proteinuria has been frequently described in patients with COVID-19. Our follow-up observations suggest a spontaneous remission within a few weeks after discharge.<sup>5</sup> The available data of Huang and colleagues do not support their alarming conclusions about the poor renal prognosis at 6 months after COVID-19.

We declare no competing interests.

\*Pierre Delanaye, Justine Huart,  
Antoine Bouquegneau,  
François Jourret  
pierre.delanaye@yahoo.fr

Department of Dialysis–Nephrology–Transplantation, University of Liège, CHU Sart Tilman, Liège 4000, Belgium (PD, JH, AB, FJ); Department of Nephrology–Dialysis–Apheresis, Hôpital Universitaire Carêmeau, Nîmes, France (PD); Groupe Interdisciplinaire de Génomique Appliquée, Cardiovascular Sciences, University of Liège, Liège, Belgium (JH, FJ)

- Huang C, Huang L, Wang Y, et al. 6-month consequences of COVID-19 in patients discharged from hospital: a cohort study. *Lancet* 2021; **397**: 220–32.
- Delanaye P, Jager KJ, Bökenkamp A, et al. CKD: a call for an age-adapted definition. *J Am Soc Nephrol* 2019; **30**: 1785–805.
- Zhang L, Wang F, Wang L, et al. Prevalence of chronic kidney disease in China: a cross-sectional survey. *Lancet* 2012; **379**: 815–22.
- Wang S, Chen R, Liu Q, Shu Z, Zhan S, Li L. Prevalence, awareness and treatment of chronic kidney disease among middle-aged and elderly: The China Health and Retirement Longitudinal Study. *Nephrology (Carlton)* 2015; **20**: 474–84.
- Huart J, Bouquegneau A, Lutterli L, et al. Proteinuria in COVID-19: prevalence, characterization and prognostic role. *J Nephrol* 2021; **34**: 355–64.

## Authors' reply

In our study,<sup>1</sup> we observed a considerable number of patients presenting with low estimated glomerular filtration rate (eGFR) over time without acute kidney injury and an eGFR of 90 mL/min per 1.73 m<sup>2</sup> or more during hospitalisation. Another study has shown that the use of creatinine to diagnose acute kidney injury might underestimate the patients with acute kidney injury at acute phase.<sup>2</sup> We found that reduced eGFR at follow-up is possibly associated with kidney injury at acute phase, which was not recognised on the basis of serum creatinine values.

Philipp Enghard and colleagues reported that other factors (eg, hydration) could lead to fluctuations of serum creatinine values and further affect the calculated eGFR values. Patients categorised into the group with an eGFR of 90 mL/min per 1.73 m<sup>2</sup> or more at acute phase all had eGFR values that were 90 mL/min per 1.73 m<sup>2</sup> or more during hospitalisation. According to our data, 1366 (80.1%) of 1703 had at least two eGFR values and 956 (56.0%) of 1703 patients had at least three eGFR values, which, to some extent, excluded the possibility of misclassification resulting from fluctuations. For the eGFR value at 6 months after symptom onset, fluctuations might have existed, as the value was obtained once. However, attention should be paid to the group of people that had a lower eGFR value after discharge than at acute phase and are at risk of long-term kidney damage, and who need help from health-care providers and further follow-up to differentiate kidney damage from fluctuation or physiological decrease.

Pierre Delanaye and colleagues reported that among patients without acute kidney injury during acute phase, an eGFR less than 90 mL/min per 1.73 m<sup>2</sup> during follow-up might be attributable to lowered eGFR before COVID-19. For patients



SOPA Images/Getty Images

without acute kidney injury and with an eGFR less than 90 mL/min per 1.73 m<sup>2</sup> at acute phase, the possibility of an eGFR less than 90 mL/min per 1.73 m<sup>2</sup> before COVID-19 cannot be excluded. However, for those patients without acute kidney injury and an eGFR of 90 mL/min per 1.73 m<sup>2</sup> or more at acute phase, an eGFR less than 90 mL/min per 1.73 m<sup>2</sup> should be paid attention to because the possibility of an eGFR less than 90 mL/min per 1.73 m<sup>2</sup> before COVID-19 is quite low. We agree that the criteria of an eGFR less than 90 mL/min per 1.73 m<sup>2</sup> cannot define chronic kidney disease, especially for those with an eGFR between 60 and 90 mL/min per 1.73 m<sup>2</sup> in the absence of proteinuria; although, we do not want to ignore patients with preclinical manifestation of kidney damage as proteinuria was not measured then. We hope these important questions can be further answered in future studies.

Kidney involvement in patients with COVID-19 is critically important and more attention should be paid to renal consequences after COVID-19 because acute kidney injury could result in short and long consequences in adults and children.<sup>3</sup> Patients without acute kidney injury at acute phase are also at a potential risk of kidney function deterioration over time, which needs to be validated in future follow-up studies and further investigated for the potential pathogenesis.

All authors declare funding from the Natural Science Foundation of China (82041011/H0104), the Chinese Academy of Medical Sciences Innovation Fund for Medical Sciences (CIFMS 2018-I2M-1-003 and 2020-I2M-CoV19-005), the National Key Research and Development Program of China (2018YFC1200102), and the Major Projects of National Science and Technology on New Drug Creation and Development of Pulmonary Tuberculosis (2020ZX09201001). This work was also supported by the China Evergrande Group, Jack Ma Foundation, Sino Biopharmaceutical, Ping An Insurance (Group), and the New Sunshine Charity Foundation.

Lixue Huang, Xiaoying Gu,  
Yeming Wang, Chaolin Huang, \*Bin Cao  
caobin\_ben@163.com

Department of Pulmonary and Critical Care Medicine, Capital Medical University, Beijing, China (LH); Department of Pulmonary and Critical Care Medicine, National Center for Respiratory Medicine, Center of Respiratory Medicine, National Clinical Research Center for Respiratory Diseases (LH, XG) and Institute of Clinical Medical Sciences (XG, YW, BC), China-Japan Friendship Hospital, Beijing 100029, China; Jin Yin-tan Hospital, Wuhan, Hubei Province, China (CH); Wuhan Research Center for Communicable Disease Diagnosis and Treatment, Chinese Academy of Medical Sciences, Wuhan, Hubei Province, China (CH); Institute of Respiratory Medicine, Chinese Academy of Medical Science, Beijing, China (BC); Tsinghua University-Peking University Joint Center for Life Sciences, Beijing, China (BC)

- 1 Huang C, Huang L, Wang Y, et al. 6-month consequences of COVID-19 in patients discharged from hospital: a cohort study. *Lancet* 2021; **397**: 220–32.
- 2 Bhatraju PK, Wurfel MM, Himmelfarb J. Trajectory of kidney function: the canary in sepsis. *Am J Respir Crit Care Med* 2020; **202**: 1211–12.
- 3 Heung M, Chawla LS. Acute kidney injury: gateway to chronic kidney disease. *Nephron Clin Pract* 2014; **127**: 30–34.

## Department of Error

*Chauvin L. Peruvian COVID-19 vaccine scandal spreads. Lancet* 2021; **397**: 783—This World Report incorrectly stated that clinical trials had been halted at Cayetano Heredia University. The National Institute of Health suspended the unit at Cayetano Heredia University doing the Sinopharm trial, pending an investigation. It did not suspend other trials. This correction has been made to the online version as of May 13, 2021.

*Greenhalgh T, Jimenez JL, Prather KA, Tufekci Z, Fisman D, Schooley R. Ten scientific reasons in support of airborne transmission of SARS-CoV-2. Lancet* 2021; **397**: 1603–05—In this Comment, the conflict of interest statement for David Fisman has been corrected according to what was declared on his ICMJE form to read: “DF is funded by the Canadian Institutes for Health Research (2019 COVID-19 rapid researching funding OV4-170360), received consulting fees as a legal expert for Elementary Teachers Federation of Ontario in August and September, 2020, related to COVID-19 transmission in schools, including the importance of ventilation and masks for kids as source control, and currently serves as a legal expert for the Ontario Nurses Association on their challenge to Ontario Directive 5, which restricts access to N95 masks for health-care workers except during performance of aerosol generating medical procedures.” This correction has been made to the online version as of May 13, 2021.

*Marson A, Burnside G, Appleton R, et al. The SANAD II study of the effectiveness and cost-effectiveness of valproate versus levetiracetam for newly diagnosed generalised and unclassifiable epilepsy: an open-label, non-inferiority, multicentre, phase 4, randomised controlled trial. Lancet* 2021; **397**: 1375–86—In this Article, N Vora should not have been included in the SANAD II collaborators list. This correction has been made to the online version as of May 13, 2021.

*Marson A, Burnside G, Appleton R, et al. The SANAD II study of the effectiveness and cost-effectiveness of levetiracetam, zonisamide, or lamotrigine for newly diagnosed focal epilepsy: an open-label, non-inferiority, multicentre, phase 4, randomised controlled trial. Lancet* 2021; **397**: 1363–74—In this Article, N Vora should not have been included in the SANAD II collaborators list. This correction has been made to the online version as of May 13, 2021.

*Dalbeth N, Gosling AL, Gaffo A, Abhishek A. Gout. Lancet* 2021; **397**: 1843–55—In this Seminar, the legend of figure 3 has been corrected to clarify that the left panel is perpendicular to the lambda axis, and the right panel is parallel to the lambda axis, both at 40× magnification. This correction has been made to the online version as of May 13, 2021, and the printed version is correct.