



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.

Risk factors for in-hospital mortality in patients with cancer and COVID-19

We read with great interest the excellent research by Kunyu Yang and colleagues¹ in *The Lancet Oncology*. The results indicated that receiving chemotherapy within 4 weeks before symptom onset was associated with increased odds of death (odds ratio [OR] 3.51, 95% CI 1.16–10.59; $p=0.026$) in patients with cancer and COVID-19, adjusted for sex, cancer type, and time since cancer diagnosis. Although we applaud the authors' efforts, we have some questions for the authors and would appreciate some additional information about the research.

First, older age (≥ 60 years) has been proved as a significant independent predictor of mortality in both patients with cancer and patients with COVID-19.^{2,3} However, the authors excluded this risk factor because of no significant difference in age between the survival group and non-survival group, explaining that their study was comprised of an older population (median age 63 years). We cannot completely accept this elucidation because we found that patients aged younger than 60 years accounted for 86 (42%) of the 205 patients in this study, and they did not belong to the older age group. We think that the explanation might be that patients with haematological malignancies were younger (median age 55 years vs 63 years) but accounted for a higher proportion of mortality (41% vs 20%) compared with the overall patient cohort. As a result, haematological malignancies might increase the odds of death in young people with COVID-19. Therefore, age could be an important factor affecting the risk of mortality in this study, and the results should be presented after adjusting for age.

Second, in the group of patients receiving chemotherapy within

4 weeks before symptom onset, 9 (29%) of 31 patients received other anticancer treatments, including targeted therapy or chest radiotherapy concurrently, which also might affect the odds of death. We suggest that the data might be further analysed to evaluate the association of chemotherapy with death after excluding these patients who had received additional treatments.

Third, advanced cancer stage has been identified as a risk factor of death for patients with cancer,⁴ and increased odds of death (OR 3.38; 95% CI 1.33–8.59; $p=0.011$) in patients with solid tumours and COVID-19 in univariable logistic regression analysis of this study. It would be interesting to know whether or not receiving chemotherapy within 4 weeks before symptom onset is related to death in patients with solid tumours and COVID-19 after adjusting for cancer stage.

We declare no competing interests.

Guosen Zhang, Yang An, Lu Zhang, Longxiang Xie, *Xiangqian Guo
xqguo@henu.edu.cn

Department of Predictive Medicine, School of Basic Medical Sciences, Institute of Biomedical Informatics, Bioinformatics Center, Henan Provincial Engineering Center for Tumor Molecular Medicine, Henan University, Kaifeng 475004, China

- 1 Yang K, Sheng Y, Huang C, et al. Clinical characteristics, outcomes, and risk factors for mortality in patients with cancer and COVID-19 in Hubei, China: a multicentre, retrospective, cohort study. *Lancet Oncol* 2020; **21**: 904–13.
- 2 Siegel RL, Miller KD, Jemal A. Cancer statistics, 2019. *CA Cancer J Clin* 2019; **69**: 7–34.
- 3 CDC COVID-19 Response Team. Severe outcomes among patients with coronavirus disease 2019 (COVID-19)—United States, Feb 12–March 16, 2020. *MMWR Morb Mortal Wkly Rep* 2020; **69**: 343–46.
- 4 Kattan MW, Hess KR, Amin MB, et al. American Joint Committee on Cancer acceptance criteria for inclusion of risk models for individualized prognosis in the practice of precision medicine. *CA Cancer J Clin* 2016; **66**: 370–74.