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.

hospitalisation. Neurotoxic drugs that are used to treat COVID-19 include daptomycin, linezolid, lopinavir, ritonavir, hydroxychloroquine, cisatracurium, clindamycin, tocilizumab, and glucocorticoids.[2] Neuropathy or myopathy in patients with COVID-19 requiring treatment in intensive care units can also result from bedding (ie, compression neuropathy), compartment syndrome, artificial nutrition, infection, electrolyte disorder, or sepsis (ie, critically ill neuropathy or myopathy).[2] Anti-COVID-19 drugs can also be myotoxic, for example, chloroquine is associated with myopathy and myasthenia.[3]

Taquet and colleagues distinguished Guillain-Barre syndrome and nerve root disorders on the basis of ICD codes in the database. However, the ICD system is incomplete: Guillain-Barre syndrome is a classic nerve root disorder and some doctors might encode Guillain-Barre syndrome under nerve root disorders, whereas other doctors might use the ICD code for Guillain-Barre syndrome. Therefore, these two groups should be assessed together.

The authors excluded patients with a diagnosis of COVID-19 or a positive test for SARS-CoV-2 from the control cohorts. However, it is not known whether all patients in the control groups were actively tested for SARS-CoV-2 infection: patients from the control groups need to be SARS-CoV-2 negative to serve as controls, which can be ensured only by systematic PCR tests in each patient.

Major outcomes that were not considered in the evaluation included cerebral vasculitis, venous sinus thrombosis, seizures or epilepsy, cranial nerve affection, myelitis, acute disseminated encephalomyelitis, and headache.[4] Particularly, venous sinus thrombosis should have been included in the evaluation as COVID-19 is associated with an increased risk of thrombosis.[5] The authors also did not consider hyperlipidaemia or atherosclerosis as pre-existing comorbidities: these might worsen during COVID-19 and might contribute to the increased incidence of neuropsychiatric disease.

I declare no competing interests.

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1 Taquet M, Geddes JR, Husain M, Luciano S, Harrison PJ. 6-month neurological and psychiatric outcomes in 236 379 survivors of COVID-19: a retrospective cohort study using electronic health records. *Lancet Psychiatry* 2021; **8:** 416–27.
2 Finsterer J, Scorza FA. Neuropathy of peripheral nerves in COVID-19 is due to pre-existing risk factors, anti-viral drugs, or bedding on the ICU. *Arq Neuropsiqiatr* (in press).
3 Carvalho AAS. Side effects of chloroquine and hydroxychloroquine on skeletal muscle: a narrative review. *Curr Pharmacol Rep* 2020; published online Oct 31. https://doi.org/10.1007/s40495-020-00243-4.
4 Finsterer J, Scorza FA. Clinical and pathophysiologic spectrum of neuro-COVID. *Mol Neurobiol* 2021; published online April 8. https://doi.org/10.1007/s12035-021-02383-0.
5 Fontelo P, Bastola MM, Zheng Z, Baik SH. A review of thromboembolic events in hospitalized COVID-19 patients. *Res Sq* 2021; published online April 5. https://doi.org/10.21203/rs.3.rs-393440/v1 (preprint).

We read with interest the Article by Maxime Taquet and colleagues[1] in *The Lancet Psychiatry* that evaluated a large population (n=236 379) for neurological and psychiatric complications of COVID-19 via analysis of diagnostic codes associated with electronic health notes.[1] The highest hazard ratios (HRs) reported were for myoneural junction or muscle disease (ICD-10 codes G70–73), with HR 5·28 (95% CI 3·71–7·53) after COVID-19 versus after influenza and 4·52 (3·65–5·59) after COVID-19 versus after other respiratory tract infection. These striking findings received little discussion in the manuscript. The incidences of specific disorders within this category were not reported and presumably were not available.

Some of our author group are involved in a project providing weekly syntheses of the neurological and psychiatric sequelae of COVID-19.[2] We have not yet found any large-scale publication reporting empirical analysis of specific neuromuscular disease in COVID-19. Hence, we were interested to read these new findings. We speculate that critical illness neuromyopathy might partially account for the findings. Critical illness polyneuropathy and critical illness myopathy commonly co-occur, presenting with limb and respiratory muscle weakness, and delayed weaning from mechanical ventilation. Critical illness polyneuropathy and critical illness myopathy are complications of critical illnesses, particularly sepsis, and including severe COVID-19.[3,4] These complications are likely to adversely affect both short-term and long-term patient outcomes, and are of particular concern given the very high numbers of critically ill patients with COVID-19.[5]

Within the ICD-10 system, critical illness myopathy is likely to be coded as other specified myopathy (G72.8), although there could be other possibilities within the myoneural junction or muscle disease coding (G70–73). Other diagnoses, such as myasthenia gravis, muscular dystrophy, and congenital myopathy, are generally less common. The higher risk of myoneural junction or muscle disease for patients with COVID-19 who are hospitalised versus those who are not (HR 7·76 [95% CI 5·15–11·69]) and those who are admitted to the intensive therapy unit versus those who are not (11·53 [6·38–20·83]) are compatible with critical illness polyneuropathy and critical illness myopathy potentially being an important component of this ICD-10 category.

At face value, this specific finding reported by Taquet and colleagues could indicate an important neuromuscular complication in COVID-19. We recommend that COVID-19-related neuromuscular complications are investigated in more detail. Neuromuscular disorders after COVID-19 might have substantial implications for patient recovery and

utilisation of physical rehabilitation health-care resources. In our view, critical illness myopathy might be the most likely explanation for this previously unrecognised, important finding.

JR reports honoraria from Alberta Psychiatric Association and has attended an advisory meeting with Promentis Pharmaceuticals, outside of the submitted work. DN is principal investigator on an NIH-funded randomised trial evaluating nutrition and exercise in acute respiratory failure and, related to this trial, is currently in receipt of donated amino acid product from Baxter Healthcare Corporation and an equipment loan from Reck Medical Devices, outside of the submitted work. All other authors declare no competing interests.

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1 Taquet M, Geddes JR, Husain M, Luciano S, Harrison PJ. 6-month neurological and psychiatric outcomes in 236 379 survivors of COVID-19 : a retrospective cohort study using electronic health records. *Lancet Psychiatry* 2021; **8:** 416–27.
2 Butler M, Watson C, Rooney A, et al. The neurology and neuropsychiatry of COVID-19. JNNP Blog. 2020. https://blogs.bmj.com/jnnp/2020/05/01/the-neurology-and-neuropsychiatry-of-covid-19/ (accessed April 11, 2021).
3 Latronico N, Bolton CF. Critical illness polyneuropathy and myopathy: a major cause of muscle weakness and paralysis. *Lancet Neurol* 2011; **10**: 931–41.
4 Nasuelli NA, Pettinaroli R, Godi L, et al. Critical illness neuro-myopathy (CINM) and focal amyotrophy in intensive care unit (ICU) patients with SARS-CoV-2: a case series. *Neurol Sci* 2021; **42:** 1119–21.
5 Vanhorebeek I, Latronico N, Van den Berghe G. ICU-acquired weakness. I*ntensive Care Med* 2020; **46:** 637–53.

Authors' reply

We thank Elizabeth Charlton and colleagues, Josef Finsterer, and Ella Burchill and colleagues for their comments on our Article in *The Lancet Psychiatry*.[1]

	Incidence within 6 months after COVID-19	Incidence within 6 months after influenza	Hazard ratio	p value
Alzheimer's disease (G30)	0·071% (0·050–0·10)	0·036% (0·025–0·054)	2·19 (1·29–3·70)	0·0029
Vascular dementia (F01)	0·063% (0·042–0·094)	0·041% (0·029–0·060)	1·59 (0·94–2·70)	0·082
Dementia in other diseases classified elsewhere (F02)	0·11% (0·081–0·15)	0·055% (0·040–0·076)	2·11 (1·37–3·23)	0·0005
Unspecified dementia (F03)	0·25% (0·20–0·31)	0·12% (0·094–0·15)	2·04 (1·52–2·75)	<0·0001

Data in parentheses are 95% CIs. Dementia subtypes are presented with their ICD-10 codes. The sum of incidences exceeds the total incidence of dementia because the same patient might be diagnosed with one subtype (eg, unspecified dementia) and then another (eg, Alzheimer's disease) within the follow-up period. No data can be shown for frontotemporal dementia and Lewy body dementia because they occurred in fewer than ten patients in each cohort (which is the minimum number to be returned by TriNetX to safeguard patients' anonymity).

Table: **Incidence and hazard ratio for dementia subtypes between matched cohorts of patients diagnosed with COVID-19 versus influenza**

Charlton and colleagues raise several interesting points. Regarding post-traumatic stress disorder (PTSD), we did not explore this specific diagnosis, although we did in an earlier Article.[2] We have now done so, extending the window for the index event to April 20, 2021. The risk of a first diagnosis of PTSD within 6 months of a COVID-19 diagnosis was 0·58% (95% CI 0·50–0·67). This risk was significantly higher than in the matched cohort of patients diagnosed with influenza (0·26% [0·23–0·31]; hazard ratio [HR] 2·12 [95% CI 1·74–2·59]; p<0·0001). Patients with COVID-19 requiring admission to an intensive care unit (ICU) were at a higher risk of PTSD than a matched cohort of patients with COVID-19 not requiring admission to an ICU (1·02% [95% CI 0·78–1·33] *vs* 0·20% [0·12–0·35]; HR 4·55 [95% CI 2·59–7·98]; p<0·0001).

Using the same matched cohorts of patients with COVID-19 and with influenza diagnosed between Jan 20, 2020, and April 20, 2021, we also investigated the incidence and HRs for subtypes of dementia (table). The majority of diagnoses were of unspecified dementia but the relative increase was broadly similar across categories. We did not exclude people with a history of mild cognitive impairment or delirium, and therefore some patients diagnosed with dementia might have been in this high-risk or prodromal group, as we noted in the Discussion of our Article.[1]

We have no data as to which of the COVID-19 cases had been asymptomatic, but we assume that this group is substantially under-represented in our dataset because there is a bias towards symptomatic people presenting for testing (especially early in the pandemic), and because we used the U07.1 ICD-10 code to define cases, which refers to a confirmed diagnosis. Asymptomatic COVID-19 might well be associated with lower rates of subsequent psychiatric or neurological disorder, and our results should be interpreted with this important possibility in mind. We agree that asking about COVID-19 should become a routine item in medical history questionnaires. The idea of reverse redeployment will be attractive to mental health professionals but we suspect rather less so to our general medical colleagues.

Josef Finsterer commented on the overlap between the influenza and respiratory infections cohorts. We agree that we could have made them mutually exclusive; however, we chose not to do this to enable the respiratory infection cohort to be sufficiently large to enable all the COVID-19 cases to be included after propensity score matching. Our study was observational, and we did not attempt to list or explore all the potential mechanisms that might be involved. For instance, we did not investigate the list of putatively neurotoxic compounds that some