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Surviving COVID-19: a familiar road to recovery?
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Surviving COVID-19: a familiar road to recovery?

As health care improves and mortality rates decrease, the concept of *surviving well* has become more important. This is certainly the case in critical care, where survivorship has been coined the defining challenge of the 21st century. It is within this setting that the field now grapples with the onslaught of the COVID-19 pandemic. The initial objective globally was to manage system strain to enhance equity of provision of care. Acute services expanded care provision by increasing acute care bed numbers and stretching existing resources. For a brief period of time, the world focused only on patient survival. Consistent with the additional survivorship focus in critical care over the last 20 years, the recognition of prolonged disability in survivors of COVID-19 has stimulated a drive to understand the nature of impairments and their impacts on mental and physical health as well as return to societal roles.

Results that form the first analyses of the PHOSP-COVID UK multicentre cohort study by Evans *et al* in the *Lancet Respiratory Medicine*¹ offer a comprehensive description of survivorship of hospitalized patients with COVID-19. Of the 1077 patients assessed a median of five months post-hospitalization with COVID-19, 20% developed a new disability, 19% experienced a health-related change in occupation, and 71% described themselves as not having fully recovered. Patients described a median of nine different symptoms covering physical and mental domains, which was mirrored in both patient-reported outcome measures and in objective physical assessments.

Interestingly, Evans *et al* report an inconsistent relationship between illness severity and impairments between ward-based and intensive care-based COVID -19 patients. Further, the four phenotype clusters identified in a post-hoc clustering analysis were similarly not closely related to illness severity. The authors hypothesized mechanisms other than index severity may be responsible for persistent symptoms. Why might patients who were not admitted to the Intensive Care Unit (ICU) develop symptoms consistent with post-critical illness syndrome in this study? Perhaps one answer is that critically ill patients have long been managed outside the geographical constraints of the ICU. During data collection, in the setting of near-overwhelmed services in the

UK, the criteria for admission to ICU (a threshold that has significant international and intra-national variability) would have been even higher². In a large cohort trial such as this it is not possible to drill down to the level of detail required to substantiate this hypothesis. The fact that the recovery of non-hospitalised patients follows a faster trajectory is in some respects supportive³. The extraordinary social rules of the pandemic may impact on mental health sequelae resulting from the many severe restrictions on mobility and lifestyle which would not normally affect discharged hospitalised patients in their recovery. Women are more likely to live alone in developed countries, and therefore be less able to function without support once disabled by acute illness, perhaps an explanation for the reported sexual dimorphism. In a recent large cohort study, social isolation before an ICU hospitalisation was associated with greater disability burden in the year following critical illness suggesting the need for social isolation screening and intervention frameworks⁴. Additionally socio-economic position may impact health outcomes, particularly mental health after a critical illness⁵. These published data illustrate well the important impacts of the social determinants of health.

Further reported data of particular interest are those related to comorbidities. These are identified in each of the four clusters. A now well-established unifying thread in acute illnesses is the modifying effect of pre-morbid comorbidities and baseline functional states which have repeatedly been demonstrated to be greater discriminators of long-term physical and mental outcomes than the severity of acute illness or cardiorespiratory physiology⁶. Similarly, cognitive outcomes are highly prevalent after acute illness and in older people during hospitalisation, related to the development of in-hospital delirium. The incidence of delirium in patients was not reported by *Evans et al* but it would be interesting to investigate if this is related to poor cognitive outcomes. The impact of pre-hospitalization alcohol intake may also influence cognitive outcomes⁷.

Patients who survive a critical illness suffer from physical disability as a result of loss of skeletal muscle mass, affecting physical functional capacity. This can be due to general immobility or be associated with time in the ICU (Intensive Care Acquired Weakness) which is reported in patients with COVID-19⁸. There are no data provided on in-hospital or out-patient rehabilitation treatments that may have attenuated

subsequent functional recovery. Anxiety, depression and post-traumatic stress disorder are common and often co-exist. Such patients have multiple symptoms overlapping across domains. Return-to-work rates are low and this alone may impact health related quality of life and psychological function and many of these symptoms can persist for years⁹. Indeed, the PHOSP-COVID group offers convincing data with robust analyses that there are minimal phenotypical differences in post hospitalised COVID-19 compared with post critical illness.

The results from these high-quality data by *Evans et al* are a cause for concern. A substantial proportion of the working-age population is likely to have long-term life changing sequelae post COVID-19 infection impacting physically, mentally, socially and fiscally. The good news is that these data confirm that we have an existing prism to view this public health issue through, with mature domains to guide research and policy: that of post-critical illness syndrome, first identified in 2012. Using this approach, we can view acquired disability in domains (rather than symptoms), each of which can be screened for; using for example the Post Intensive Care Unit Presentation Screen (PICUPS) at hospital discharge¹⁰. Moving forward, it will be important to use such a structure to capture not only symptomatology but also to map these to domains that may guide holistic rehabilitation and recovery interventions. Using these systematic approaches will ensure no domains that may be affected are missed, for example nutrition, dysphonia and dysphagia, all reported in survivors of COVID-19 but not reported by *Evans et al*. In a similar manner to persistent critical illness, the long-term consequences are unrelated to the acute episode *per se*. Instead of developing new interventions, translation of interventions from other disease modalities offer hope for future patients, if resources are appropriately allocated.

There are a plethora of descriptive cohort studies examining COVID-19 sequelae. We now urgently need to undertake larger powered trials that examine the efficacy of individualised management such as pharmacological interventions¹¹, multidisciplinary in and out-patient rehabilitation or the role of targeted follow up clinics. As with the trajectory of research over the past two decades in critical care we need to identify responders to specific interventions, map impairments across time and involve the patients and family in their recovery. As *Evans et al* most appropriately conclude, hospitalised patients with COVID-19 require access to holistic follow up care.

The authors declare no competing interests.

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