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## Provision of holistic care after severe COVID-19 pneumonia: anticipating clinical need and managing resources



The COVID-19 pandemic continues to pose extraordinary challenges to clinicians, patients, and health-care services worldwide. Anticipating substantial burdens of multisystem and psychological morbidity, many organisations have instituted post-COVID-19 clinical services. Exponential increases in case numbers at the peak of the pandemic necessitated rapid implementation of follow-up pathways that evolved in response to clinical need and, in the absence of robust COVID-19-specific data, through extrapolation of post-critical illness evidence and observations made during previous coronavirus outbreaks. As the daily incidence of COVID-19 continues to rise, there is an urgent need to establish adequately resourced, multidisciplinary post-COVID-19 care pathways, informed by evaluation of recent shared experience.

The spectrum of fibrotic lung disease observed in COVID-19 ranges from fibrosis associated with organising pneumonia to severe acute lung injury with evolution to widespread fibrotic change. Early observations indicate that impaired diffusion capacity is the most common lung function abnormality in discharged COVID-19 survivors, followed by restrictive ventilatory defects. These observations parallel those of previous SARS and Middle East respiratory syndrome (MERS) coronavirus outbreaks. In an early follow-up study of patients with SARS, 15 (62%) of 24 patients had CT evidence of pulmonary fibrosis 4–6 weeks after discharge. However, the natural history of COVID-19 pneumonia is yet to be fully established, and labelling lung changes as indicative of irreversible fibrosis is premature. Indeed, the commonest pattern of evolution observed in early COVID-19 case series was initial progression to a peak level followed by radiographic improvement, and long-term data from SARS survivors show resolution of restrictive lung function defects and improvement or stability of ground-glass changes. The impact of pulmonary sequelae could be outweighed by chronic extrapulmonary COVID-19 manifestations. SARS and moderate-to-severe acute respiratory distress syndrome (ARDS) requiring critical care admission are associated with adverse physiological and psychological outcomes, with functional limitation likely related to muscle wasting and weakness and impaired health-related quality of life observed at 6 and 12 months. Preliminary data from COVID-19 survivors indicate a high prevalence of post-traumatic stress disorder (28%), anxiety (42%), and depression (31%) 1 month after hospitalisation.

Given the well described extrapulmonary manifestations of acute COVID-19 (including venous thromboembolism, renal failure, liver dysfunction, myocarditis, and delirium), prompt follow-up is necessary to identify potential complications, such as pulmonary hypertension, chronic kidney disease,

heart failure, and neurocognitive impairment. However, several hurdles must be overcome to deliver this. First, the spectrum of clinical sequelae has not yet been defined. Designing a clinical service is therefore challenging, since appropriate patient-centric outcome measures and follow-up timeframes remain unknown. However, sequelae of severe COVID-19 pneumonia might parallel those of critical illness, and we can draw upon experiences of post-intensive care programmes to select appropriate tools that facilitate early recognition and management of post-COVID-19 sequelae and mitigate their long-term implications. Second, the backlog created by temporary cessation of outpatient services challenges already stretched resources. Thus, while acknowledging the value of core outcome sets that are well established in acute respiratory failure research, outcome measures implemented in a busy clinical service during the COVID-19 pandemic must be selected pragmatically to yield maximum clinical utility while avoiding imposition of excessive burdens on both patients and clinicians. The need for staff training, equipment, and clinic space, and the ability to adhere to infection control precautions, need to be considered. Third, potential aerosolisation of respiratory droplets limits several diagnostic and therapeutic resources. Lung function testing is gradually restarting, but strict infection control precautions limit availability and careful judgment is required as to whether testing is needed to guide patient management. Meanwhile, face-to-face rehabilitation programmes remain largely suspended. Finally, the multisystem involvement and novelty of the disease requires integration of cross-specialty and allied health-care activity within a service that is adaptable to patient need as our understanding of COVID-19 sequelae evolves. As an inherently multidisciplinary speciality, respiratory departments are well placed to facilitate this and indeed have been integral in delivering both acute and follow-up care during the pandemic. However, the ideal supervising

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For more on **fibrotic lung disease in COVID-19** see **Articles** *Lancet Infect Dis* 2020; **20**: 425–34

For more on **pulmonary function in COVID-19 survivors** see *Eur Respir J* 2020; **55**: 2001217

For the **follow-up study of patients with SARS** see *Radiology* 2003; **228**: 810–15

For **long-term data for SARS survivors** see *Bone Res* 2020; **8**: 8

For more on **outcomes in SARS survivors** see *Thorax* 2005; **60**: 401–09

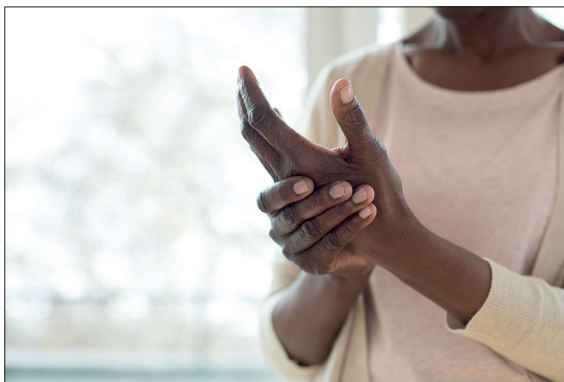
For more on **outcomes in ARDS survivors** see *N Engl J Med* 2003; **348**: 683–93

For more on **mental health in COVID-19 survivors** see *Brain Behav Immun* 2020; **89**: 594–600

For more on **post-intensive care programmes** see *Intensive Care Med* 2019; **45**: 939–47

For more on **core outcome measures after acute respiratory failure** see *Am J Respir Crit Care Med* 2017; **196**: 1122–30

For more on the **transmission of SARS-CoV-2** see **Editorial** page 1159



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For the **British Thoracic Society guidelines** see <https://www.brit-thoracic.org.uk/document-library/quality-improvement/covid-19/resp-follow-up-guidance-post-covid-pneumonia/>

For our **study of outcomes in survivors of severe COVID-19 pneumonia** see *ERJ Open Res* 2020; published online Oct 22. <https://doi.org/10.1183/23120541.00655-2020>

For more on the **4-m gait speed test** see *Eur Respir J* 2013; **42**: 333–40

For more on the **6-min walk test** see *Respir Med* 2007; **101**: 286–93

See [Online](#) for appendix

department for post-COVID-19 care should be that which is best resourced to assimilate and deliver patient-centred multidisciplinary care.

Similar to other centres, our post-COVID-19 clinic was developed at the height of the pandemic with no additional funding, therefore patient selection and rationalisation of clinical assessments were paramount. Building on British Thoracic Society guidelines, we invite patients hospitalised with severe COVID-19 pneumonia (locally defined as requiring a fraction of inspired oxygen  $\geq 40\%$  or critical care admission) to attend face-to-face appointments 4–6 weeks after discharge. A summary of our clinical evaluation is depicted in the appendix. All patients have a chest x-ray and specific enquiry is made about the presence and severity of persistent breathlessness, cough, sleep disturbance, fatigue, or pain. Patient-reported outcomes are evaluated using validated questionnaires (modified Medical Research Council Breathlessness scale, Patient Health Questionnaire-9, Generalised Anxiety Disorder-7 assessment, Trauma Screening Questionnaire, Nijmegen Questionnaire, and 6-item Cognitive Impairment Test). To objectively assess mobility impairment, we use the 4-m gait speed and 1-min sit-to-stand tests. These tests require minimal staff training and clinic space, and are quick, reliable, validated techniques that correlate closely with conventional measures of exercise capacity (incremental shuttle and 6-min walk tests), allowing comparisons with existing data. Importantly, they facilitate identification of (often asymptomatic) oxygen desaturation warranting further evaluation. Our service currently invites survivors of severe COVID-19 pneumonia to attend follow-up evaluation, and we acknowledge the as-yet-undefined burden of non-severe COVID-19. There is increasing awareness of those with so-called long COVID, in whom symptoms persist for weeks or months after the acute phase of illness, which is likely to continue to affect both primary and secondary health-care providers.

In developing this service, we have strengthened pre-existing relationships with numerous specialities. Specialist respiratory physiologists conduct functional tests before physician review, CT scans requested for patients with persistent radiographic opacification, symptoms, or desaturation (including high-resolution CT and pulmonary angiography, with or without ventilation–perfusion single-photon emission CT) are discussed at radiology multidisciplinary meetings. Pathways are also in place to refer patients with extrapulmonary disease to appropriate clinical specialities, and those who required intensive care unit admission are reviewed by the critical care team on the same day. Regular service evaluation is done to monitor the utility of the selected outcome measures, enabling evolution of the service in response to patient need.

Despite the devastating impact of COVID-19 on an individual and societal level, we have been given an opportunity to strengthen clinical and academic multidisciplinary relationships, and develop a de-novo clinical service that is practical, simple to deliver, and facilitates holistic assessment of physical and psychological sequelae of severe COVID-19 pneumonia. With sustained rises in confirmed cases worldwide, increasing interest and engagement from funding bodies and health-care management, and emergence of long-term data, we continue to adapt and rationalise our service to deliver evidence-based post-COVID-19 care.

We declare no competing interests.

**Rebecca F D'Cruz†, Felicity Perrin†, Surinder S Birring, Amit S Patel, Irem Patel, Caroline J Jolley, \*Michael D Waller**  
[m.waller@nhs.net](mailto:m.waller@nhs.net)

†Contributed equally.

Centre for Human and Applied Physiological Sciences, King's College London, London WC2R 2LS, UK (RFD'C, SSB, IP, CJJ, MDW); and Department of Respiratory Medicine, King's College Hospital NHS Foundation Trust, London, UK (FP, SSB, ASP, IP, CJJ, MDW)



## Patient perspectives

### Confronting a rare ovarian cancer during lockdown

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England is due to return into a second national lockdown on Nov 5, 2020

To see the **film *The Forgotten*** C go to <https://www.youtube.com/watch?v=b2LISBiEn18>

Perhaps the strangest thing about Jessi Gutch's condition is that she is currently feeling no symptoms, is pain free, and is showing no outward signs of a person facing incurable cancer. Yet this is the situation that this 28-year-old film producer from London, UK, finds herself. She has a very rare ovarian cancer called Sertoli-Leydig cell tumour, which has metastasised. Sertoli-Leydig represents roughly just 0.5% of all ovarian cancers, and of these, 90% are found at stage 1 and resolved, while just 10% metastasise. This particular form of ovarian cancer predominantly affects young women.

Like many women diagnosed with any form of ovarian cancer, Jessi's original symptoms were initially mistaken

for something else. On Christmas eve, 2018, she awoke with terrible pain in her abdomen. "Like no pain I'd ever felt before", she explains. Her worried parents, who she was visiting for Christmas, took her to the nearest hospital accident and emergency department, where doctors believed she had acute appendicitis. "I was told my appendix could be removed during the morning of Christmas day, and I might be home in time for Christmas dinner", she recalls.

When she was woken for the appendix procedure on the morning of Christmas day, she was shocked to see several gynaecologists at her bedside, along with the rest of the