Evidence on medium to long term physical health impacts of COVID-19

By NIHR Applied Research Collaboration North Thames and UCLPartners

Background

NIHR Applied Research Collaboration (ARC) North Thames was asked to summarise the evidence on the longer-term physical health effects of COVID-19 after recovery from acute illness, and what NHS service support recovered patients will need.

A rapid review of online documents, resources and publications was conducted on 24 March 2020 and updated on 31 March 2020.

Summary

- There is very limited data on outcomes of patients following the recovery from the acute phase of COVID-19, reflecting how we are still only a few weeks into the pandemic.
- Recovery rates fall with increasing disease severity, with an estimated 50% survival following mechanical ventilation. Complications among patients on intensive care units (ICU) include cardiovascular events and acute renal injury and a proportion of those who survive ICU are likely to have ongoing medical needs in the short term.
- A case series of ICU survivors of SARS CoV infection in 2002-3 identified that return to normal respiratory function took up to one year.
- Considerations for post-acute care include planning for a likely surge in demand for inpatient rehabilitation, outpatient rehabilitation, outpatient nursing care (including palliative care), supported discharge and home care services (including palliative care).
- There is evidence from Italy of pressure on rehabilitation services due to recovering COVID-19 patients, and some available guidance documents for planning purposes.
- Specific considerations for rehabilitation services include
    - how to support home exercise during self-isolation eg through tele-rehabilitation
    - how to implement appropriate infection control given likely vulnerability among rehabilitation patients
    - how to ensure adequate PPE supplies for speech and swallowing therapists and chest physiotherapists
    - how to appropriately decontaminate equipment

Review Findings

Rates of recovery among patients with COVID-19

All cases

WHO's analysis of 55,924 laboratory confirmed cases in China reported about 80% of reported cases had mild to moderate disease (including non-pneumonia and pneumonia cases), 13.8% had severe disease and 6.1% were critical (respiratory failure, septic shock, and/or multiple organ dysfunction/failure). By 20th February, approximately eight weeks from identification of the first case, 24% of reported cases had recovered. Recovery rates are highest in those with mild disease but fall with increasing disease severity(1). A review by Imperial College of case reports from Hong Kong, Japan, Singapore and South Korea, found the time from onset to hospitalisation was 5.76 days, and the average time from onset to recovery or discharge was 20.51 days (2).

Cases requiring ICU admission or ventilation

The Scientific Advisory Group for Emergencies estimates 50% mortality in those hospitalised who require invasive ventilation (3). Data on the clinical course of those who are critically ill is limited, with many in reported studies remaining on ICU at point of last follow-up.
Findings from two small case series are below:

Case series 1: Wuhan, China(4)
52 critically ill adult patients with SARS-CoV-2 pneumonia who were admitted to the intensive care unit (ICU) were followed up 28-days post ICU admission:

- 20 (38%) had survived at 28 days;
    - 8 (15%) were discharged from ICU
    - 3 (5.7%) were on invasive ventilation at 28 days, including 1 on ECMO
    - 1 patient was on non-invasive ventilation, 2 were using high-flow nasal cannula, and 6 were using common nasal cannula.

Case series 2: Washington, USA(5)
21 critically ill (ICU) patients were followed up for a mean of 7.5 days (minimum 5-days, maximum 25-day):

- Mechanical ventilation was initiated in 15 patients, all had ARDS
- Cardiomyopathy developed in 7 patients (33%)
- Final follow up (mean 7.5 days) revealed
    - 33% survival:
    - 24% remained critically ill
    - 2 (9.5%) were discharged

Complications of COVID-19

Documented complications of the acute illness include shock, ARDS, acute cardiac injury (22% of those in ICU), arrhythmia (44% of those in ICU), and acute kidney injury (8% in ICU) (6). Fifty-two (30%) of 187 patients treated at a designated COVID-19 hospital in Wuhan developed myocardial injury, of whom two fifths survived (7). One case series documented 33% (7 of 21) ICU patients developed cardiomyopathy (5).

Considerations for post-acute care

A commentary by Ser et al scopes considerations for care after recovery from the acute illness (8). They note that USA Medicare data suggests more than 30% of patients hospitalized with sepsis, a condition with inpatient mortality similar to that associated with COVID-19, require facility-based care and another 20% require home health care (9). This implies a surge in demand should be anticipated for services such as inpatient rehabilitation, outpatient rehabilitation, outpatient nursing care (including palliative care), supported discharge and home care services (including palliative care).

Considerations for planning include the existing capacity in these settings and the need to increase this temporarily, testing requirements prior to discharge to community residential settings, infection control such as cohorting within these settings, and staffing, training and supply of adequate personal protective equipment.

Planning guidance for rehabilitation services

Three papers provide guidance for rehabilitation services specifically.

This paper by the Italian Physical and Rehabilitation Medicine society (SIMFER)(10) states that Italy has seen an increasing pressure on rehabilitation services due to:

- The increasing pressure from acute care services to transfer patients to inpatient rehabilitation units for rehabilitation or other care.
- Increasing difficulties in providing community care due to restrictions in movement imposed by authorities to halt spread of the virus.

It sets out recommendations for planning for the increases including:

- **For inpatient rehabilitation facilities** - increase admission capacity of rehabilitation facilities to receive patients recovering from COVID-19 and facilitating subsequent safe discharge to the community.
- **For outpatient and home-based rehabilitation services** – to review caseload, to prioritise interventions, and to alternative modalities for the delivery of care (e.g. remote consultation and telerehabilitation) for those with chronic disabling conditions, where it is not detrimental to their functioning.

This report for American Acute Inpatient Rehabilitation Facilities (11) also provides guidelines for strategic planning. It makes the following observation re: rehabilitation care for post-COVID-19 patients:

> *Physicians are reporting that patients are requiring prolonged prone positioning during mechanical ventilation.*
> *From a rehabilitation perspective, we can expect to see posterior reversible encephalopathy syndrome and critical illness myopathy/neuropathy following acute respiratory distress syndrome (ARDS) and extracorporeal membrane oxygenation (ECMO). Patients will exhibit typical sequelae of neuromuscular illness along with plantar flexion contractures and wounds. These patients may have severe respiratory impairment and may not be able to tolerate intensive therapies.*

A third report outlines the following specific challenges to rehabilitation patients and services(12):

- Deconditioning during self-isolation, requiring measures to continue home exercise e.g. tele-rehabilitation which has evidence of effectiveness in post-stroke care.
- Increased vulnerability of many rehab patients to the illness, and the need for effective infection control.
- Ensuring adequate PPE supplies, including PPE required for speech, swallowing therapists and chest physiotherapists.
- Environmental decontamination of equipment.

Long term health outcomes and health utilisation: Evidence from SARS

The SARS coronavirus (SARS-CoV) caused outbreaks in 33 countries between 2002 and 2003. It had a higher case-fatality rate (10.8%) but was less infectious than the SARS-CoV-2 virus causing COVID-19 (case fatality currently estimated at 2–3 %) (13).

One study followed 117 SARS survivors in Canada followed up at three, six and 12 months after hospital discharge. **Of note:** This was a relatively young cohort with a mixed spectrum of disease (median age 42 years, 9% had a pre-existing condition, 16% were admitted to ICU, 9% required mechanical ventilation).

For the 19 patients admitted to ICU - Patients had evidence of restrictive disease at three and six months after hospital discharge but had normal pulmonary function by one year. One long-stay ICU patient had moderate restrictive lung disease that persisted beyond the one year follow up.

For all 117 patients - A reduced walking distance was present in 31% of patients at three months and in 18% at one year**.**

37% of survivors were still reporting an important reduction in their physical health (at least 1 SD below normal on the physical component summary score of the SF-36) at one year after acute care hospitalization. Many patients continued to report shortness of breath and fatigue as notable contributors to exercise limitation at one year, despite normal pulmonary function testing and normal exercise capacity.

At one year, 17% of patients had not returned to work, and a further 9% had not returned to their pre-SARS level of work.

Health care utilization in the Canadian health system during the first year after hospital discharge was found that three patients needed inpatient rehabilitation, four patients readmitted within days of discharge, and two admitted months later for non-SARS related issues. Four had surgery over the course of the follow-up year.

Mental health and social support services were used by 43% of patients and accounted for the greatest number of healthcare encounters, while 74% saw their primary care physician a median of five times. There were six hospital readmissions.

To help the international response

The World Health Organisation are asking for standardised clinical data on all hospitalized patients to improve understanding of natural history of the disease. To contribute please contact EDCARN@who.int.(14)

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