COMMENTARY

Clinical tools for cardiorespiratory assessment and rehabilitation: A primary care perspective

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Abstract

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has infected millions of people worldwide. It mainly affects the respiratory system, seen as pneumonia or acute respiratory distress syndrome. Cardiovascular manifestations have been observed in some patients. Hence, cardiorespiratory assessment is an important component of diagnosis, management and follow-up of this disease. Primary care is the first point of contact with the healthcare system for most patients. Therefore, methods for assessment and rehabilitation should be feasible in a primary care setting. This commentary aims to provide a primary care perspective on existing clinical tools for cardiorespiratory assessment and rehabilitation.

Keywords: COVID-19, Cardiology, Pulmonology, Rehabilitation, Physical examination.

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Introduction

Since the first reports of coronavirus disease (COVID-19) came to light, it has spread to millions worldwide. The spectrum of symptoms ranges from mild to severe.[1] Community screening suggests that up to half of all infected individuals show no symptoms.[2]

A large cohort study showed the following distribution of disease severity:[1]

- Mild infection in 81%
- Severe infection in 14% of the patients requiring oxygen support
- Critical illness in 5% requiring intensive care

However, patients with initial mild symptoms may worsen over time. Risk factors for disease progression (Table-1) include age, and pre-existing pulmonary or cardiovascular disease.[1,3]

Table-1: Risk factors for severe disease.

Age >65 years
Pre-existing pulmonary disease
Chronic kidney disease
Diabetes mellitus
History of hypertension, cardiovascular disease
Obesity (body mass index ≥30)
Cancer
Immunocompromised status

The WHO recommends all patients to be isolated and managed in a health facility. In resource-challenged settings, in the absence of risk factors, patients with mild disease may be managed at home.[4,5]

Therefore, the assessment of cardiorespiratory status is essential in patients suspected or confirmed to have COVID-19.

Need for Cardiorespiratory Assessment

Cardiovascular and respiratory systems work in parallel to provide oxygen to tissues. COVID-19 affects both respiratory and cardiovascular systems. It can present as pneumonia which may progress to acute respiratory distress syndrome. Conduction defects, arrhythmias, myocarditis and acute myocardial injury have been observed in patients with severe disease.[6]

Therefore, cardiorespiratory assessment of patients with COVID-19 is essential in the following settings:

- At the time of diagnosis - case identification and triage
- During management
- Follow-up

At the time of diagnosis, patients may present at any stage of disease. Cardiorespiratory assessment is an essential component of triage. Patients at high risk and those exhibiting severe symptoms must be provided hospital care[5]. During management, frequent monitoring of symptoms and cardiorespiratory status is

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essential for the detection and management of any changes in the patient's condition.[5] This disease may result in cardiorespiratory sequelae, especially in patients with severe illness. Close follow-up of cardiorespiratory status is essential to advise appropriate rehabilitation measures.

Cardiorespiratory Assessment

Droplet and contact precautions must be taken while examining suspected patients. At the time of diagnosis, assessment is aimed at case identification and appropriate triage. Hence, it should focus on:[5]

History

- History of fever, cough, shortness of breath
- Travel/residence in a location with COVID-19 community transmission
- Contact with a confirmed/probable COVID-19 case
- Presence of risk factors (Table-1)

Signs

- General condition of the patient, including mental status
- Respiratory distress
  - Shortness of Breath
  - Fast breathing
  - Cyanosis
  - Use of accessory muscles - alae nasi, sternocleidomastoid contraction
  - In children - grunting, chest indrawing, danger signs (altered feeding, activity, mental status, convulsions)
- Cardiovascular distress
  - Weak pulse
  - Delayed capillary refill (> 3 s)
  - Low blood pressure

Investigations

- Pulse oximetry, to assess hypoxia
- Chest X-ray, to assess the extent of lung involvement
- ECG, to assess cardiovascular status
- POCUS (Point of Care Ultrasound), for cardiac, lung and vascular assessment

Patients can be classified into the following categories:

- Mild: Uncomplicated upper respiratory tract infection without shortness of breath
- Moderate: History of shortness of breath
- Severe: Any of the following features[1,5]
  - Hypoxia (oxygen saturation $\leq$93 % on room air, or partial pressure of arterial oxygen (PaO_2)/ percentage of inspired oxygen (FiO_2) <300 mmHg)
  - Tachypnoea (respiratory rate >30 breaths per minute) or respiratory distress
  - More than 50 percent involvement of the lung parenchyma on chest imaging

Management

WHO guidelines recommend all patients should be isolated and managed in a health facility. In resource-limited settings, in the absence of risk factors, patients with mild disease may be managed at home.[4,5]

Patients with mild disease should undergo twice-daily monitoring for fever and other symptoms. In case of worsening of symptoms or emergence of dyspnoea, patients should be assessed for hospitalisation. If testing facilities are limited, isolation is recommended for at least 7 days after onset and 3 days after the resolution of symptoms.[7] Patients with moderate or severe disease require frequent monitoring of cardiorespiratory status. WHO and local guidelines may be consulted for hospital-based management.[5]

When available, POCUS may play an important adjunct role in cardiorespiratory assessment. The American Society of Echocardiography has defined a POCUS protocol covering cardiac, lung, and vascular assessment in patients with suspected or confirmed COVID-19 infection.[8]

Rehabilitation and Follow-up

Rehabilitation of patients with COVID-19 is as important as assessment. Most (95%) patients with mild to moderate symptoms will recover from the disease.[1] They will form a large part of the total population, especially in badly-affected areas. Cases with mild infections may not return for follow-up visits as they are unlikely to have any respiratory or cardiac sequelae or symptoms. Attention must be focused on patients who have recovered from moderate or severe disease, specifically those who required ventilatory support.

Rehabilitation has multiple facets. One must focus on both physical and mental health. The public health response has resulted in economic difficulties. Long periods of isolation and social stigma take their toll. An ideal rehabilitation programme should take these issues into account and try to address them as much as possible.

Physical health rehabilitation includes both pulmonary and cardiac components. Pulmonary rehabilitation needs are assessed during follow-up visits in primary health centres equipped for this. This assessment is similar to an assessment done for various other respiratory ailments causing dyspnoea. Dyspnoea can be assessed by one of the following:[9]

- Modified Medical Research Council Scale
- American Thoracic Society Shortness of Breath Scale
- Borg Dyspnoea Scale
- Visual Analogue Scale

However, the scale used should be consistent and be the one that most assessors are comfortable using. Borg Dyspnoea scale $\geq$3 has been proposed as a threshold to start 15-45 minutes daily exercise in Chinese recommendations for respiratory rehabilitation in adults with COVID-19.[10] Other means of cardiorespiratory and psychosocial assessment is highlighted in Table-2.

Socioeconomic Rehabilitation

Considering governments across the globe have had to resort to drastic measures to contain the pandemic, this disease has also led to economic slowdown and repercussions. Every effort should be made to assess this impairment and effect on the society. Various socio-cultural and non-governmental organisations (NGOs) can be involved at the primary health centre to address this need by arranging interviews with affected individuals. However, it should be ensured that this should not be a burden on already preoccupied and busy healthcare facilities. This can be addressed by referring needy persons to nearby social care organisations.

Social stigma attached to the disease can also be assessed by these organisations side-by-side by personal interviews. Educational material in the form of print and

Table-2: Various methods of cardiorespiratory and psychosocial assessment.

Dyspnoea	■ Modified Medical Research Council Scale ■ American Thoracic Society Shortness of Breath Scale ■ Borg Dyspnoea Scale ■ Visual Analogue Scale
Respiratory Function Evaluation[11]	■ Spirometry with FEV1/FVC ratio, FVC and FEV1. This will not only provide information about their baseline function but will also guide follow up to assess the effect of intervention. ■ Diffusing Capacity of Carbon Monoxide (DLCO) by single breath technique. This is low in studies done in patients with H1N1 ARDS 6 months after disease.[12] ■ Arterial blood gas to assess oxygenation, CO2 retention, and requirement of long term oxygen therapy (LTOT)
Respiratory Muscle Function	■ Maximum Inspiratory Pressure (MIP) ■ Maximal Expiratory Pressure (MEP)
Muscle Strength Tests	■ Manual Muscle Test (MMT) ■ Isokinetic Muscle Testing (IMT) ■ Joint ROM test to rule out contractures ■ Balance functional evaluation: Berg balance scale (BBS)
Aerobic Exercise Testing	■ 6 Minute walk test ■ Cardiopulmonary exercise testing (CPET)
Cardiac Evaluation	■ ECG to evaluate post-cardiac injury arrhythmias (Seen in 16.7 % of hospitalised patients in Canada.)[13] ■ Echocardiography in physician's office to follow up acute cardiac injury ■ Treadmill testing after ruling out significant hypoxia and arrhythmias ■ Cardiopulmonary exercise testing if available
Psychosocial Assessment	■ General Interview: Physical appearance, Verbal and Nonverbal communication ■ Coping mechanisms: Solution finding, rational thinking ■ Social Engagement and disability assessment due to chronic sequelae ■ Evaluation of activities of daily living ■ Interview of family members to provide valuable insight ■ Quality of Life assessment — WHO-QOL questionnaire ■ Cognitive assessment to assess the ability to engage with respiratory rehabilitation.

FEV_1 Forced expiratory volume in first second; FVC Forced vital capacity; ARDS Acute respiratory distress syndrome; ROM Range of motion.

advertisements can be used to educate people and develop empathy for those affected.

Safety in the COVID Era

The safety of patients and healthcare workers is the first priority. Droplet and contact precautions are essential while examining suspect patients.[5] Any examination should be performed only if its result is likely to affect management. Appropriate personal protective equipment (PPE) depends upon the risk profile of the patient and the procedure being performed. For this purpose, WHO and local guidelines should be followed.

Safety precautions such as the use of isolation suits may affect cardiorespiratory assessment. A person wearing an isolation suit has limited ability to perform a physical examination or use a stethoscope. Doctors have devised ingenious ways to get around these limitations, e.g. placing the stethoscope in between 2 layers of a double-gloved hand. Alternatives like automated blood pressure measuring devices may be used. If available, POCUS acts as a useful tool for cardiac, pulmonary, and vascular assessment.

Aerosol-generating procedures place healthcare workers at high risk for transmission. Spirometry involves a forced expiratory manoeuvre and results in the generation of aerosols. Care must be taken before carrying out spirometry and other aerosol-generating procedures. They should be performed only when essential, after taking relevant safety precautions. Alternative tests should be devised to assess pulmonary function without generating aerosols.

Conclusion

The COVID-19 pandemic has focused the spotlight on cardiorespiratory health. Cardiorespiratory assessment as well as rehabilitation is an integral part of health management in these times. Primary care physicians will have to shoulder the burden of both cardiorespiratory screening and rehabilitation. Awareness and knowledge of the details will help enhance the quality of counselling and care provided to our patients.

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