

A proposed self-guide to return to exercise in COVID-19 survivors: A public perspective

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ABSTRACT To return to being physically active, COVID-19 survivors need a guide to safely return to exercise. The most common symptoms reported in COVID-19 survivors were fatigue and breathlessness. It is crucial to rule out severe complications post-acute COVID-19 such as myocarditis, pulmonary embolism, pulmonary fibrosis and deep vein thrombosis before exercise. In this study, we proposed a self-guide assessment to safely return to exercise using post-COVID-19 Physical Activity Readiness Questionnaire and discussed on COVID-19 survivor-graded exercise programme. The key points highlighted during graded exercise programme are (1) individualisation, (2) monitoring for red flag symptoms (chest pain, breathlessness at rest or minimal exertion, palpitation, chest tightness and severe calf pain), (3) step down 1 stage if feels extreme fatigue on exercise, (4) start slow and progress slow with the exercise and (5) if in doubt, to refer yourself out to health professionals. These steps will encourage COVID-19 survivors to continue being active. It will also ease the healthcare burden by reducing the number of referrals of pre-participation health evaluation for mild symptoms or asymptomatic COVID-19 survivor patients to return to exercise.

Key Words: COVID-19 survivor-graded exercise programme, COVID-19 survivors, post-COVID-19 physical activity readiness questionnaire

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Submitted: 31-Jan-2021 Revised: 01-May-2022 Accepted: 03-Jun-2022 Published: 11-Aug-2022

INTRODUCTION

COVID-19 pandemic has taken a toll on physical activity and mental health well-being. This impairs the aim of the World Health Organization to achieve global recommendations on physical activity for health with a global target to reduce the levels of physical inactivity in adults and adolescents by 15% by 2030 (Amini et al., 2021). Impact of lockdown in some countries including Malaysia has created detrimental effects on physical inactivity due to (1) remote learning and working from home emerged as a new norm, (2) closure of outdoor and indoor sports centre and park and (3) fear of contracting COVID-19 when in public places. In a national survey amongst Canadian children, there is a dramatic decline in children and youth meeting the

Canadian 24-H Movement Behaviour Guidelines from 12.7% pre-COVID era to 2.6% (Moore et al., 2020). A longitudinal study of Spanish adults before and during COVID-19 lockdown had a negative impact on the physical activity levels, sleep quality and well-being in a group of physically active Spanish adults (Martínez-de-Quel et al., 2021). In COVID-19 survivors, challenges that lead to physical inactivity are (1) post-COVID-19 symptoms and long COVID-19 symptoms and (2) detraining from prolonged period of self-quarantine or from prolonged period of hospitalisation. Robust studies have focused on managing post-COVID-19 patients (Barker-Davies et al., 2020; Dores and Cardim, 2020; Elliott et al., 2020; Phelan et al., 2020; Wilson et al., 2020). Many of the published guidelines were meant to steer

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How to cite this article: Azwan Aziz, M., Nahar, A. M. (2022). A proposed self-guide to return to exercise in COVID-19 survivors: A public perspective. *Malaysian Journal of Movement, Health & Exercise*, 11(1), 1-10.

Access this article online	
Quick Response Code:	Website: https://www.mohejournal.org
	DOI: 10.4103/mohe.mohe_16_22

physicians on how to manage post-acute COVID-19 patients, especially in severe COVID-19 cases (Barker-Davies et al., 2020; Dores and Cardim, 2020; Elliott et al., 2020; Phelan et al., 2020; Wilson et al., 2020). Some guides are focusing on athletes to return to sports or competition. Wilson et al. (2020) provide a practical guide for sports and exercise physicians on return to play in elite athletes after COVID-19 (Wilson et al., 2020). Lollgen et al. (2021) also provided clinical recommendations for clinicians, for return to play in athletes (Lollgen et al., 2021). Barker-Davies et al. (2020) provided a clinical guide for clinicians in managing post-COVID-19 rehabilitation (Barker-Davies et al., 2020). To the best of author's knowledge, there is limited guideline that can be used by public as a reference that emphasises on awareness and information on safely return to exercise in mild COVID-19 survivors. Salman et al. (2021) provided a more practical approach of return to physical activity, but this guide is still meant for clinician's references (Salman et al., 2021). The Ministry of Health Malaysia has published a national guideline for clinicians to manage post-COVID-19, but less information available for public to self-guide themselves to exercise (Ministry of Health, 2021). The only way forwards to increase physical activities amongst mild COVID-19 survivors is to provide a good information and a proper guideline to public on how to safely return to exercise post-COVID-19 infection. Thus, the objective of this guide is (1) to create awareness amongst mild COVID-19 survivors regarding how to safely return to exercise, (2) to propose a post-COVID-19 questionnaire as self-assessment tools before exercise and (3) to recommend a self-guided exercise programme to safely return to exercise amongst COVID-19 survivors.

EXCLUSION CRITERIA

This guide is meant for adults who are 18–65 years of age and post-COVID-19 who is in category 1 and 2a. The definition of category of COVID-19 is outlined in Table 1. This guide also excludes pregnant and post-partum ladies as extensive research is needed to be done in this population before recommendation of an exercise programme. In this population, we recommended to seek physicians before participating in exercise. This guide also excluded category 2b and above and patients who are hospitalised as they have higher risk of developing complications post-COVID-19 (Nalbandian et al., 2021). They need thorough assessments and supervision from multidisciplinary specialities to guide them to return to exercise.

PREVALENCE OF POST-ACUTE COVID SYNDROME

Based on data published by the Ministry of Health, Malaysia, majority of post-acute COVID-19 patients will have either mild symptoms or asymptomatic (Ministry of Health, 2021). The most commonly reported symptoms were fatigue (82%), exertional breathlessness (51.8%), cough (11.4%) and anxiety (4.5%). However, these symptoms are predominantly seen in hospitalised patients with category 4 and category 5 COVID-19 infection who require follow-up with rehabilitation outpatient specialised service

in Hospital Sungai Buloh, Malaysia (Ministry of Health, 2021). The exact prevalence of severe post-COVID symptoms such as chest pain, extreme breathlessness and extreme fatigue is not known amongst category 1 and 2a who are not hospitalised in Malaysian population. Common symptoms post-acute COVID-19 are highlighted in Figure 1.

Cardiovascular sequelae

The most fearsome cardiovascular sequelae of COVID-19 are myocarditis, an inflammation of the heart which could progress into heart failure and sudden death. Rajpal et al. (2021) examined screening cardiac magnetic resonance of competitive athletes who contracted COVID-19 and are asymptomatic or have mild symptoms (Rajpal et al., 2021). Out of these 24 athletes, 4 had evidence of active myocarditis and 8 had evidence of prior myocarditis (Rajpal et al., 2021). This indicates that silence myocarditis can occur during COVID-19 infection. The most common myocarditis symptoms are chest pain, breathlessness and palpitation (Daniels et al., 2021). Thus, these symptoms warrant an urgent investigation.

Respiratory sequelae

Respiratory sequelae of COVID-19 include pulmonary fibrosis which is the scarring of the lungs, pulmonary embolism which is the formation of blood clots in the lungs, persistent cough and breathlessness. A huge spectrum of respiratory symptoms from COVID-19 survivors was documented, ranging from mild symptoms such as persistent sore throat to severe breathlessness requiring oxygen support. Breathlessness was most commonly reported with a prevalence of 42%–66% (Nalbandian et al., 2021). Exertional breathlessness (51.8%) accountable for the second most common symptom was seen in 4–12-week post-COVID-19 in Malaysian clinic settings (Ministry of Health, 2021). Breathlessness could be a manifestation of ongoing lung

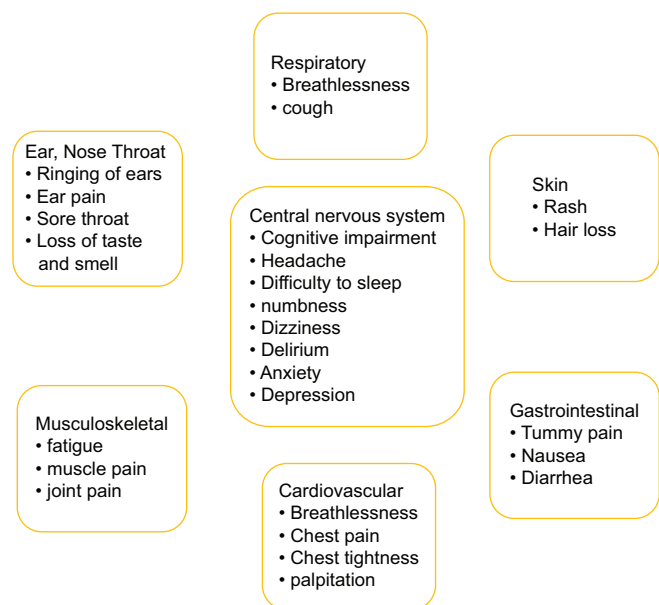


Figure 1: List of commonly reported symptoms post- acute COVID-19 (Amini et al., 2021)

Table 1: Clinical staging of syndrome associated with COVID-19

Category	Descriptions
Category 1	No symptoms during COVID-19 infection
Category 2	Symptomatic during COVID-19 infection, no pneumonia
Category 3	Symptomatic during COVID-19 infection, with X-ray findings of pneumonia
Category 4	Symptomatic during COVID-19 infection, with X-ray findings of pneumonia requiring oxygen only
Category 5	Symptomatic during COVID-19 infection, with X-ray findings of pneumonia requiring ventilatory support or ICU admission
Category 2a (mild)	Category 2b (moderate)
Sore throat or running nose with no fever or shortness of breath	Fever >2 days
Cough with no fever or shortness of breath	SpO ₂ <95% (at rest or after exertion)
Loss of taste but tolerating orally	Angina chest pain
	Dehydration
Loss of smell	Unable to ambulate without assistance
Diarrhoea two times or less within 24 h with normal urine output	Reduced level of consciousness reduced urine output in the last 24 h
Nausea and vomiting with normal urine output	Fever >2 days
Mild lethargy but still able to carry out daily activities	SpO ₂ <95% (at rest or after exertion)
	Angina chest pain
	Dehydration
	Unable to ambulate without assistance
Myalgia but still able to carry out daily activities	

Category 1 and 2a: Mild COVID-19 and considered in the guideline, Category 2b, 3, 4, 5: Need further assessments by medical personnel. ICU: Intensive care unit

disease. In a post-acute COVID-19 Chinese study, at least 50% of the 349 patients had one abnormal lung finding on high-resolution computer tomography (HRCT) scan (Huang et al., 2021). According to the British Thoracic guidelines for outpatient COVID-19 patients, ideal clinical setting is to follow up all patients at 12 weeks with a chest X-ray, pulmonary function test and functional test such as 6-min walk test to exclude respiratory sequelae (George et al., 2020). However, that is not feasible in many clinic settings. Patients with persistent symptoms of breathlessness and chest pain should visit their doctor for consultation and possible further investigations. The most common things to exclude were pulmonary fibrosis and pulmonary embolism (George et al., 2020).

Haematological sequelae

A study on blood-related sequelae in COVID-19 survivors is limited. The prevalence of deep vein thrombosis, which is the formation of blood clots in the blood vessels, is <5% (Nalbandian et al., 2021). Deep vein thrombosis complications are seen commonly in post-hospital discharge and more severe COVID-19 compared with outpatient COVID-19 (Nalbandian et al., 2021). Deep vein thrombosis is caused by hypercoagulability state and pathophysiology behind hypercoagulability state in COVID-19 is hyperinflammation (Nalbandian et al., 2021). Hyperinflammation is a result of excess cytokine release, endothelial injury, platelet activation, complementary activation and hypoxia, leading to formation of thrombus (Nalbandian et al., 2021).

Neuropsychiatric sequelae

Neuropsychiatric sequelae can present as debilitating symptoms that could disturb COVID-19 survivor's daily living activity. This section can be divided into 2: central nervous system and

psychiatric sequelae. Headache is the commonly reported central nervous system sequelae that do not usually respond to analgesics (Nalbandian et al., 2021). This is attributed to high cytokines level and should have a non-urgent referral to a neurologist for assessments. Cognitive impairments including brain fog, which may manifest as difficulties with concentration, memory, receptive language and/or executive function, mandate a referral to a neurologist and neurorehabilitation specialist. Other symptoms such as loss of taste and smell, chronic malaise, diffuse muscle pain and non-restorative sleep should be considered mild, as these symptoms might be resolved gradually and do not require interventions (Nalbandian et al., 2021). However, persistent symptoms mandate a referral to a specialist centre.

Psychiatric sequelae are also commonly seen in post-acute COVID syndrome. One in two COVID-19 survivors in Italy, suffered from psychiatric sequelae including depression, anxiety, and difficulty to sleep during early COVID-19 pandemic (Mazza et al., 2020). In Malaysia, anxiety accounts for the most common psychiatric symptoms seen in 4–12 weeks post COVID-19 (Ministry of Health, 2021). Thus, any patients suffering from psychiatric sequelae and affecting the activity of daily living should have a referral to psychiatric or psychological supports from a trained professional.

Endocrine sequelae

In patients with diabetes, diabetic ketoacidosis has been reported in post-COVID-19. Diabetic ketoacidosis is a medical emergency where there is an excess blood glucose that leads to severe dehydration and organ failure. However, the exact prevalence is still unknown (Nalbandian et al., 2021). This could be attributed to deficit in insulin production, mediated by factors such as

inflammation or infection stress response, along with peripheral insulin resistance (Gentile et al., 2020). Thus, in diabetic patients, counselling regarding prevention of dehydration and early detection of diabetic ketoacidosis is important in post-COVID infection.

Gastrointestinal sequelae

Significant gastrointestinal sequelae have not been reported (Nalbandian et al., 2021). The most commonly reported symptoms are loss of taste, nausea, vomiting and diarrhoea, which resolved over time (Nalbandian et al., 2021). This is attributed to alteration of gut microbiota (Zuo et al., 2020). Thus, a gastrointestinal symptom is considered mild symptoms.

Dermatological sequelae

Predominant symptoms reported are hair loss and skin rashes, after (64%) or concurrent to (15%) other acute COVID-19 symptoms in an international study of 716 patients with COVID-19 (Freeman et al., 2020). This is attributed to viral infection or a resultant stress response (Nalbandian et al., 2021). All reported dermatological symptoms are mild and do not require urgent attention from healthcare professionals.

For non-hospitalised and mild COVID-19 patients, it is crucial to screen for myocarditis, pulmonary fibrosis, pulmonary embolism and deep vein thrombosis before start of exercise as well as during the exercise programme. This symptom includes chest pain, breathlessness at rest or mild exertion, palpitation and severe calf pain that mandate an urgent referral to hospital. Other neuropsychiatric sequelae including fatigue and mild respiratory symptoms such as prolonged cough can be investigated as non-urgent referral. The current research states that other mild symptoms do not have any significant complications in post-acute COVID syndrome, although many of the studies are still ongoing (Nalbandian et al., 2021). Thus, mild symptoms should not stop patients to return to exercise unless they feel uncomfortable with it. In this review, we divided the symptoms based on urgency of referrals; red flag requires urgent referral to hospital, yellow flags require a non-urgent assessment by specialist and green flags are symptoms that do not require a specialist attention. This symptom is summarised in Figure 2.

POST-COVID-19 SELF-ASSESSMENTS

Returning to exercise in COVID-19 survivors is challenging as there is fear of COVID-19 complications such as myocarditis, pulmonary fibrosis, pulmonary embolism and deep vein thrombosis. Most of the guidelines require a patient to be asymptomatic before exercise. This is impractical as many COVID-19 survivors have persistent symptoms up to 60 days and more (Nalbandian et al., 2021). Thus, it is more practical to create self-assessment tools and identify which symptoms require a specialist attention. The pathway for assessing physical activity readiness (PAR) is still based on the latest American College of Sports Medicine (ACSM) guidelines (American College of Sports Medicine, 2018). ACSM encourages the use of self-assessments using PAR questionnaire (PAR-Q) and modified



Figure 2: Indication of referral to a specialist

PAR-Q+ to identify cardiorespiratory and metabolic disease before exercise (American College of Sports Medicine, 2018). We proposed a post-COVID-19 PAR COVID-Questionnaire (PAR-COVID-Q) as per Figure 3 to guide COVID-19 survivors for self-assessments before exercise. A risk stratification approach can help maximise safety and mitigate the risk. The main objective of this questionnaire is to ensure safe return to exercise after COVID-19. Specific objectives are:

- (1) To rule out any symptoms of myocarditis, pulmonary embolism, pulmonary fibrosis and deep vein thrombosis
- (2) To identify high-risk factors for developing myocarditis, pulmonary embolism, pulmonary fibrosis and deep vein thrombosis
- (3) To identify any debilitating complications from COVID-19 affecting activity of daily living.

I have no underlying medical problem

The initial questionnaires begin by identifying medical status of patient. Patients who have underlying medical problems such as diabetes, chronic heart disease and renal disease are recommended to have a medical clearance before exercise. A patient who is

QUESTIONNAIRES

QUESTIONS	YES	NO
1. I have never been hospitalized due to COVID-19	<input type="checkbox"/>	<input type="checkbox"/>
2. I do not have any of the red flags symptoms;		
a. Fever	<input type="checkbox"/>	<input type="checkbox"/>
b. breathlessness at rest or in minimal activity	<input type="checkbox"/>	<input type="checkbox"/>
c. palpitation	<input type="checkbox"/>	<input type="checkbox"/>
d. chest pain	<input type="checkbox"/>	<input type="checkbox"/>
e. chest tightness	<input type="checkbox"/>	<input type="checkbox"/>
f. severe calf pain	<input type="checkbox"/>	<input type="checkbox"/>
g. light headache/ blackout	<input type="checkbox"/>	<input type="checkbox"/>
3. I do not have any problem that prevents me from exercising	<input type="checkbox"/>	<input type="checkbox"/>
4. I can walk:		
For male > 500 m without being breathless	<input type="checkbox"/>	<input type="checkbox"/>
For female > 580 m without being breathless	<input type="checkbox"/>	<input type="checkbox"/>
5. I have no underlying medical problem	<input type="checkbox"/>	<input type="checkbox"/>

Figure 3: PAR-COVID-Q, a self-assessments tools for COVID-19 survivors category 1 and 2a

unsure of his/her medical condition can use PAR-Q or PAR-Q + for screening assessments before exercise.

I have never been hospitalised due to COVID-19

COVID-19 patients who are hospitalised have increased risk of developing complications from COVID-19 such as myocarditis, pulmonary embolism, VTE and pulmonary fibrosis which could lead to sudden death and increase morbidity to patients. Thus, these patients should have a multidisciplinary follow-up and assessments and be cleared for exercise in specialist settings before participating in moderate-to-high-intensity exercise.

I do not have any of the red flag symptoms, breathlessness at rest or in minimal activity, fever, palpitation, chest pain, chest tightness or severe calf pain

Question 3 highlighted the red flag symptoms to rule out symptoms of myocarditis, pulmonary embolism, pulmonary fibrosis and

deep vein thrombosis (Nalbandian et al., 2021). Any red flag symptoms mandate an urgent referral to a specialist and are highly recommended against exercise until further assessments are done and cleared by a specialist to perform exercise.

I do not have any limitations that hinder me from exercising

Question 4 helps identify any limitations that could hinder the patients from exercise such as severe joint pain, restricted range of motion, muscle pain and deformity that might need further assessments. In this population, they need a supervised and individualised supervised exercise programme that allows them to exercise with minimal pain and achieve maximum benefits from exercise.

I can walk more than 500 m without being breathless

Question 5 is used to identify any patients that have limitation in activity of daily living (ADL). Patients that had severe impairments in ADL after contracting COVID-19 should be seen by a specialist

for further evaluation and management (Ministry of Health, 2021). These patients need a gentle, graded, supervised exercise programme in hospital settings or by trained professionals.

POST-COVID-19-GRADED EXERCISE PROGRAMME

There is multitudinous proposed exercise rehabilitation programme to help the COVID-19 survivors safely return to sports or exercise (Elliott et al., 2020; Ministry of Health, 2021; Phelan et al., 2020; Salman et al., 2021). The goal is to (1) ensure patients return to exercise safely without having catastrophic cardiopulmonary events and (2) applying graded return to exercise. Most of the

programmes available were meant for clinicians to guide their patients in clinic settings with list of investigations needed to be performed before exercise. This is impractical for mild COVID-19 survivors (Elliott et al., 2020; Ministry of Health, 2021; Phelan et al., 2020; Salman et al., 2021). Unlike most of the guide, which focused more on endurance exercise, we added resistance programme as part of our exercise programme. This programme helps improve strength of major muscle group, which subsequently improves the activity of daily living as per Figure 4.

Step 1: Rest from training or exercise

The initial step of this programme is rest from training. This is important because (1) patients need to undergo quarantine at

component	Step 1	Step 2	Step 3	Step 4
component	Rest from training	Light intensity training	Moderate intensity training	High intensity training/ sports specific
objective	Recovery from the disease	Retraining from detraining. Increasing heart rate	Increasing loads of training to improve strength and endurance	Introducing sports specific skills
Endurance training	No endurance training Perform activity daily living	Light intensity endurance training	Moderate intensity endurance training	High intensity endurance training/ sports specific training
Intensity for endurance	Borg < 9 HRmax < 57%	Borg < 12 HRmax < 63%	Borg 12 -13 HRmax 64 – 76 %	Borg >14 HRmax > 76%
Resistance training	No resistance training Perform activity daily living	Body weight exercise	Light - Moderate intensity weight/ resistance training	Moderate - high intensity weight/ resistance training plyometrics
Intensity for resistance training	RPE < 2	RPE 2 - 3	RPE 4-6	RPE > 6
monitoring	Monitor for RED FLAG symptoms Step down if feels extreme fatigue on that stage If in doubt, refer yourself out Start slow and progress slow			

Figure 4: Graded exercise program for mild COVID-19 disease. HRmax Methods Desire heart rate = target intensity (%) X (220 – current age). Borg Score: 7 – 8 (very very light activity), 9 -11 (very light to light), 12 – 13 (somewhat hard), 14 and above (hard to maximum). Rating Perceived Exertion for resistance training intensity: 1 (very light activity), 2-3 (light activity), 4-6 (moderate activity), > 6 (difficult activity). Red flags: breathlessness at rest or in minimal activity, palpitation, chest pain, chest tightness, or severe calf pain

home and (2) to allow recovery of the body from stress of fighting the infection. The range of resting period varies from 7 days of illness to 2 weeks from the onset of symptoms or positive in many literature (Elliott et al., 2020; Phelan et al., 2020; Salman et al., 2021). However, for category 1 and 2a, we recommend an average period of 7 days from the date of positive or from the date of onset of symptoms, whichever is last. In our observation, it is safe for the category 1 and 2a to return to exercise as long as the patients have only mild symptoms and absence of red flag symptoms. Although patients are rested from training or exercise, being physically active in the house is highly encouraged during the resting period.

Step 2: Light-intensity training

Step 2 of the graded exercise programme is focusing on returning the patients to training or exercise. Initial steps of retraining from deconditioning are to start slow and progress slowly. We recommend starting at light-intensity exercise or training, with the initial time of exercise <15 min and it should be individualised. The two most important things to monitor are red flag symptoms and extreme fatigue. Red flag symptoms mandate an urgent referral to hospital. Alternatively, extreme fatigue needs to be addressed by gentle exercise and progress slow. Example of light-intensity exercise such as walking in the park, slow cycling and recumbent cycling without resistance can be performed. Once the patient feels better, he/she can progress to step 3.

Step 3: Moderate exercise

Step 3 is a moderate-graded exercise programme where patients can increase their intensity of exercise to moderate intensity and gradually increase his/her time of exercise. If the patients feel extreme fatigue during or after exercise, it is important to downgrade his/her training, perform more gentle exercise and progress slowly. Endurance exercise such as brisk walking, slow jogging, road cycling and swimming can be performed in this step. We recommend introducing resistance/weight exercises in this step at light to moderate intensity. Gentil et al. (2021) recommended compound exercises combined with low-volume (low weight and low repetitions) programmes in COVID-19 survivors as it is safe and feasible using body weight or elastic bands (Gentil et al., 2021). This includes functional body weight squat, push up, lunges, shoulder press and body weight deadlift that has an important practical aspect of daily living. Start using body weight and progressively add loads if patients feel recovered from previous exercise. They also recommended against prolonged exhaustive or high-intensity exercise at early phase of recovery and avoid exercise for 2–3 weeks if presence of extreme muscle pain or extreme fatigue (Gentil et al., 2021).

Step 4: High-intensity exercise/sports specific

Step 4 is an advanced-graded exercise programme where we focus on higher intensity training and sports-specific skills, to prepare patients into sports or competition. In this step, patients can introduce themselves to sports-specific trainings such as playing footballs, basketball, performed plyometric exercise, high-intensity endurance training and exhaustive weight training.

The key points highlighted in our programme are (1) individualised, (2) start slow and progress slow, (3) always watch for red flag symptoms, (4) if patients experience extreme fatigue, step down the rehabilitation and (5) if you in doubt, refer yourself out to a specialist.

To monitor your intensity of your exercise, we recommend using Borg score of scale 6–20, talk test or maximum heart rate (HRmax) methods for endurance exercise and rating of perceived exertion for resistance exercise (American College of Sports Medicine, 2018; Webster and Aznar-Laín, 2008). HRmax methods are suitable for patients who had heart rate monitoring. The maximum heart rate can be calculated using formula; $220 - \text{age}$. The intensity of the exercise can be monitored using heart rate monitoring using HRmax methods as stated in Table 2. It is important to monitor the red flag symptoms and only proceed with exercise if patients had recovered from previous exercise in all stages of exercise. If patients develop new symptoms, it is encouraged to visit medical professionals for further assessments. The exercise programme is summarised in Figure 4.

PRACTICE SAFE EXERCISE

It is important for patients who recovered from COVID-19, to prevent themselves from re-infection of COVID-19, especially with current Omicron variant that rapidly spreading amongst communities. CDC highly encourages all to participate in COVID-19 vaccination before participation in any outdoor or indoor activities (<https://www.cdc.gov/coronavirus/2019-ncov/daily-life-coping/outdoor-activities.html>). It is encouraged to participate more in outdoor activities than indoor, non-contact sports than contact sports, where we can practice 6 feet apart and limit our distance with others (<https://www.cdc.gov/coronavirus/2019-ncov/daily-life-coping/outdoor-activities.html>).

Regarding face mask in sports activities, the American Academy of Pediatrics has an interesting discussion on their recommendation of return to exercise. Face mask is well tolerated in many exercise and sports activities except in certain

Table 2: Intensity of exercise based on Borg score, HRmax Methods, and talk test

Intensity	Borg Scale	HRmax methods (%)	Talk test
Very light	<9	<57	Speech is unaffected from rest
Light	9-11	57-63	Comfortable speech is possible
Somewhat hard (moderate)	12-13	64-76	Speech possible with some difficulties
Hard (vigorous)	14-17	77-95	Speech limited in short phrases
Near maximal	>17	>95	Speech is very difficult

HRmax methods: $\text{Desire heart rate} = \text{Target intensity (\%)} \times (220 - \text{current age})$, Borg score: 7-8 (very very light activity), 9-11 (very light to light), 12-13 (somewhat hard), 14 and above (hard to maximum), Rating perceived exertion for resistance training intensity: 1 (very light activity), 2-3 (light activity), 4-6 (moderate activity), >6 (difficult activity). HRmax: Maximum heart rate

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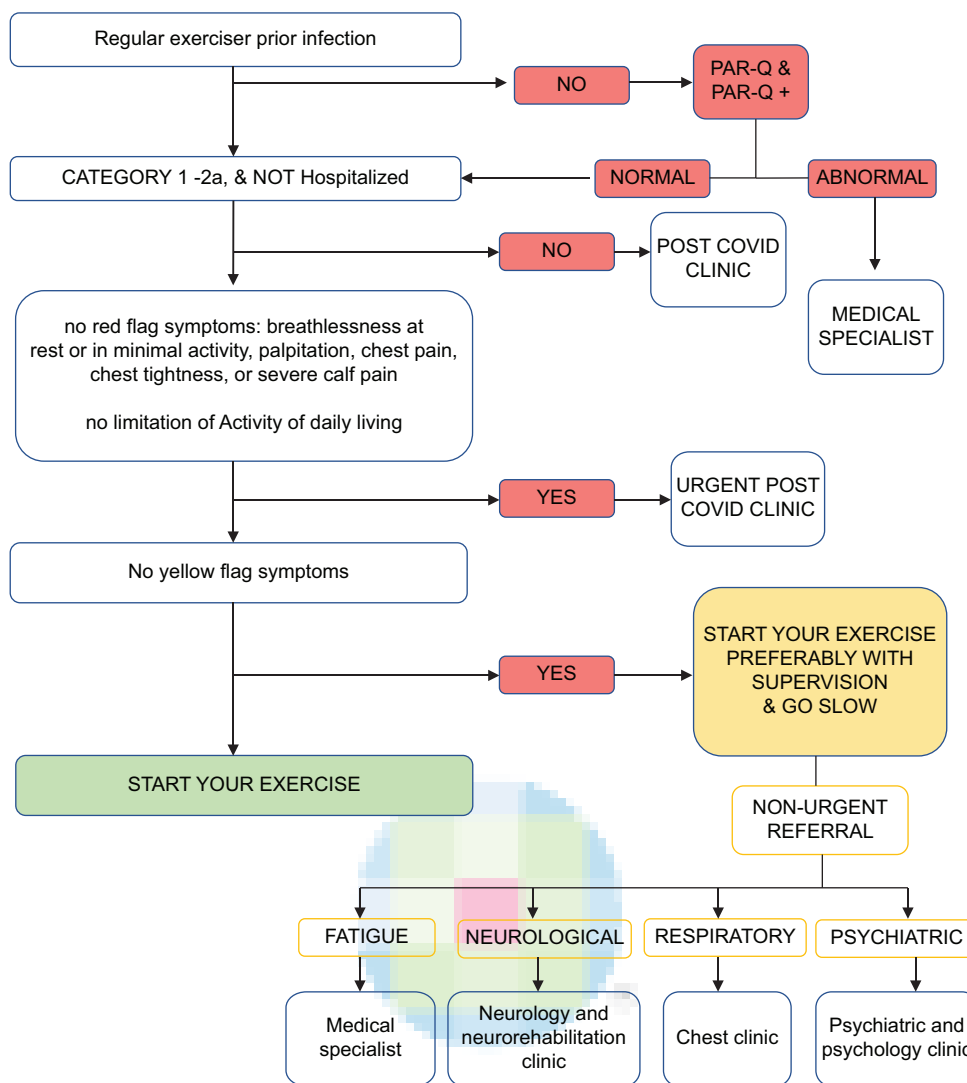


Figure 5: Self-guide to return to exercise and when to visit a specialist

WHAT IS NEW?

- This guideline highlights a more practical approach on how to return to exercise following COVID-19. Most on the guidelines requires patient to be asymptomatic. This will hinder post COVID patient to return to be physically active that only have mild symptoms and does not require attention from medical personnel.
- This guideline proposed a new post COVID 19 Physical Activity Readiness Questionnaire as a screening tools for mild COVID-19 patient to return to exercise
- This guideline also highlights
 - o Monitoring of red flags symptoms
 - o Go slow and progress slow
 - o If develop extreme fatigue, step down 1 step
 - o If in doubt, refer yourself out
- Red flag symptoms should have an urgent referral to hospital
- Yellow flag symptoms should have a non-urgent referral to relevant specialties

Figure 6: What is new in our article

2021). Face mask is discouraged in swimming, gymnastic, cheer leading, and wrestling contact as it increases risk of injuries (Pediatrics, 2021). It is important to wear masks in crowded places such as locker room and possibly in indoor places to reduce risk of transmission of virus. More importantly, always be updated with the local guideline on exercise and social activities.

WHEN TO VISIT A SPECIALIST?

Here is a guide when to refer mild post-COVID-19 patients to specialists as shown in Figures 2 and 5. Any red flag symptoms will mandate an urgent referral to hospital for ruling out the diseases mentioned earlier. If the patients had yellow flag symptoms, the patients can still be physically active. However, it is advisable that these patients exercise under supervision or with companion. Asymptomatic or patients with green flag symptoms can perform their exercise as usual. However, it is encouraged to start at light intensity and progress according to symptoms.

situations. A face mask is not necessary in non-contact sports, and outdoor sports with good physical distancing (Pediatrics,

CONCLUSION

We provide practical recommendations on how to self-evaluate to safely return to exercise in mild COVID-19 infection patients. The potential cardiorespiratory complications such as myocarditis, pulmonary fibrosis, pulmonary embolism and deep vein thrombosis should always be assessed using red flag symptoms. We proposed a post-COVID-19 PAR-COVID-Q as an assessment tool before exercise. We outline a practical guide for graded exercise programme for COVID-19 survivors. We appreciate a pragmatic approach must be taken and suggest that if in doubt, refer yourself out and get further assessments from medical experts. Summary of this paper can be referred to Figure 6 as well.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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