Recommendations for Preparedness of Medical Rehabilitation Services in Thailand during COVID-19 Outbreak

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The current pandemic of Coronavirus Disease 2019 (COVID-19), which occurs worldwide including in Thailand and other ASEAN countries, greatly affects medical rehabilitation services of physiatrists and the other rehabilitation team members. To establish resilience in this critical situation, our group of Thai physiatrists came together to rapidly prepare recommendations for medical rehabilitation services uring COVID-19 outbreak based on evidence-based documents from the previously affected countries such as China,[1-3] Singapore,[4] Italy[5] and the consensus of the opinions of experts from Thailand, which are described as followed.

1. The objectives of recommendations are

1.1 To ensure that each patient receivesthe proper rehabilitation management according to his/her medical conditions.

1.2 To protect rehabilitation professionals from the infection of SARS-CoV2 (Severe Acute Respiratory Syndrome Coronavirus 2).

1.3 To effectively use human and equipment resources in this limited situation.

2. Medical ethics

Medical ethics including beneficence (benefits of the patient from those rehabilitation programs), non-maleficence (avoiding the risk of SARS-CoV2 infection in both patients and providers) and justice (effects of providing those rehabilitation programs on society such as wide-spreading the infection from patient's transportation or overusing personal protective equipment (PPE) in non-urgent rehabilitation program) are taken into consideration in making decisions in medical rehabilitation management.

3. General recommendations for medical rehabilitation for non-COVID-19 patients

It always needs to be considered that face-to-face rehabilitation programs bring a significant risk of SARS-CoV2 infection for both providers and receivers. Also, patients who come to attend medical rehabilitation programs are probably categorized in a high-risk group for developing severe COVID-19 since they usually have multiple comorbidities such as stroke, spinal cord injury, hypertension or diabetes. Therefore, a face-to-face rehabilitation program should be carefully prescribed according to

- The benefit of the program, and
- The risk of infection of the program (Figure 1).

Besides, all programs should be provided in compliance with universal precautions and social distancing policies.

3.1 Both benefits and risk of infection of face-to-face rehabilitation programs should be comparatively considered. If the risk outweighs the benefits, a home-based rehabilitation program using media or written instructions with proper follow-up evaluation should be preferred. In addition, alternative methods of service provision including tele-rehabilitation services may be considered especially for those who need home isolation.

3.2 If the benefit of a face-to-face rehabilitation program outweighs the risk, before performing that rehabilitation program, history and clinical features of COVID-19 should be evaluated. If the patient has symptoms, signs or are at risk of COVID-19, referral to an acute respiratory infection clinic (ARI clinic) should be done according to the National or institutional guidelines.

3.3 After that, the rehabilitating procedures should be planned. They should be categorized according to their risk of COVID-19 transmission. Physical distance of 1-2 meters should be maintained from the patients when performing the

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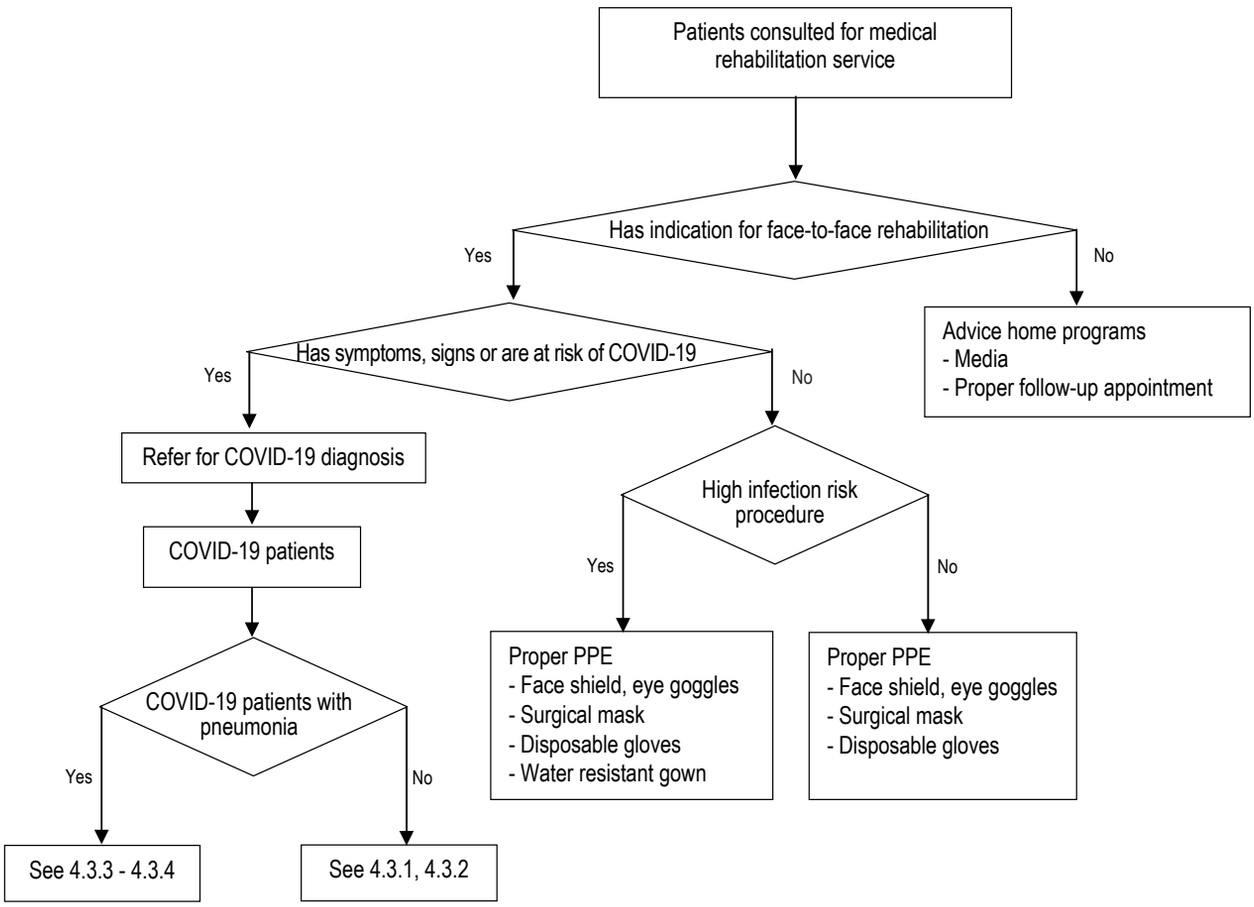

Figure 1. General recommendations flowchart for medical rehabilitation of non-COVID-19 patients

following high infection risk procedures:

- Procedures that require more than 5 minutes of close contact within 1 meter distance to the patient, including speech training and electrodiagnosis.

- Procedures which directly induce cough or sneezing, including swallowing evaluation and training, and chest physical therapy.[4]

3.4 In some possible activities, patients should be instructed to perform the procedures themselves such as swallowing, breathing, articulation exercises. Also, universal precautions and PPE should be properly applied.

3.5 When performing high-risk procedures, a surgical mask, disposable gloves, a face shield or medical eye goggles, and water-resistant gown should be worn. Whenever possible, healthcare providers should be at the back or side of the patient. Patients should always wear surgical masks and therapists should always stay upwind.[2,3]

3.6 An electrodiagnostic study, chemoneurolysis or musculoskeletal ultrasonography should not be performed unless its benefit outweighs the risk, since these procedures require close proximity and continuous contact with the patients. The provider should use PPE, at least a surgical mask, disposable gloves, and a face shield or medical eye goggles, whereas the patient should wear a surgical mask during the examination.[6]

3.7 When performing low-risk procedures such as ambulation or balance training when approaching the patient from the side or behind, a surgical mask, disposable gloves, and a face shield or medical eye goggles should be worn.[7]

3.8 Disinfect therapists' hands and contacted parts, as well as touched surface of the equipment for at least 20 seconds with proper washing techniques before and after each therapy session with a patient.

4. Medical rehabilitation recommendations for COVID-19 patients[4,5]

4.1 The objectives of medical rehabilitation are

- To relieve symptoms (decrease dyspnea/difficulty breathing, improve respiration efficiency and secretion clearance).
- To prevent deconditioning.
- To decrease stress, anxiety and increase the quality of life.

4.2 Regarding the severity of COVID-19, patients are clinically classified into[6]

1) Asymptomatic infection
2) Mild symptoms without major risk factors
3) Mild symptoms with major risk factors
4) Patients with pneumonia

- Mild pneumonia
- Severe pneumonia (including those who have extrapulmonary organ dysfunction, a high-flow nasal cannula (HFNC), non-invasive ventilation (NIV) or invasive ventilation (IV))

4.3 Medical rehabilitation programs for COVID-19 patients

1) Asymptomatic patients and patients with mild symptoms without major risk factor, who have good mobility but need isolation.[1,2]

- Type of services
  - o Non-face-to-face service by presenting with
    - Short video clips
    - Written instructions
    - Tele-rehabilitation
- Contents
  - o Information about the disease and its management to decrease stress and anxiety
  - o Self-administrated pulmonary rehabilitation program (see No. 5)
  - o Light to moderate aerobic exercise (Borg dyspnea score ≤ 3 out of 10) such as walking 15 minutes, 2 times/day, if
    - No dyspnea or absence of dyspnea for more than 3 days
    - Not in the first 7 days of diagnosis
    - Body temperature less than 38ºC
    - Blood oxygen saturation (SpO_2) more than 95%
    - Blood pressure between 90/60 and 140/90 mmHg
  - o Swallowing evaluation and training, speech training or electrodiagnosis should be postponed unless the patients have an exceptional indication, depending on the consideration of attending physiatrists and rehabilitation teams.

2) Medical rehabilitation services for COVID-19 patients with mild symptoms with major risk factors (such as age more than 60 years, have COPD or other lung diseases, chronic kidney disease, coronary artery disease, congenital heart disease, stroke, hypertension, diabetes, obesity (BMI ≥ 35 kg/m^2), liver cirrhosis, immunocompromised host)[6] are similar to those withmild symptoms without major risk factor but the underlying disease should be considered according to the recommendations of the American College of Sports Medicine (ACSM).[7]

3) Medical rehabilitation services for COVID-19 patients with mild pneumonia who are admitted in a cohort ward or ICU.[1-3]

- Type of services
  - o Non-face-to-face service by presenting with
    - Short video clips
    - Written instructions
    - Tele-rehabilitation
  - o Bedside physical therapy should be provided especially in case of patients who cannot exercise by themselves such as those with an underlying disease of chronic lung diseases or neuromuscular disorders[8] with an allowance of the consulting physiatrists and attending physicians. Chest physical therapy should be conducted by experienced physical therapists[8] with the appliance of proper PPE (N95 mask, disposable gloves, face shield or eye goggles, water-resistant gown and boots or closed work shoes are). The therapists always stay upwind.
- Contents
  - o Information about the disease and its management to decrease stress and anxiety
  - o Self-administrated pulmonary rehabilitation program (see No.5)
  - o Light to moderate aerobic exercise (Borg dyspnea score ≤ 3 out of 10) with Zheng's recumbent exercise[3] including 1) stepping (in the air) exercise, 2) bridging pose exercise and 3) stretcher sit-ups. These exercises should be prescribed for not exceeding 15 repetitions/exercise, 2 times/day if:
    - No dyspnea or absence of dyspnea for more than 3 days
    - Not in the first 7 days of diagnosis
    - Body temperature less than 38°C
    - Continuous improvement in 2 consecutive chest x-rays or CT
    - Blood oxygen saturation (SpO_2) more than 95%
    - Blood pressure between 90/60 and 160/100 mmHg
  - o Exercise should be stopped when the patient has:
    - More than a moderate degree of dyspnea (Borg dyspnea score > 3 out of 10).
    - Abnormal symptoms during exercise such as chest pain, dizziness, headache, blurred vision, palpitation, sweating, pallor, cyanosis or other abnormalities detected by the assessor.
  - o Swallowing evaluation and training, speech training or electrodiagnosis should be postponed unless the patients have an exceptional indication, depending on the consideration of attending physiatrists and rehabilitation teams.

4) Medical rehabilitation services for COVID-19 patients with severe pneumonia who are admitted to an intensive care unit (ICU)[1-3]

- Type of services: same as 4.3.3
- Contents
  - o Information about the disease and its management to decrease stress and anxiety
  - o Pulmonary rehabilitation (see No.5) if:
    - Respiratory system
      - □ Oxygen concentration (FiO_2) less than or equal to 0.6

□ Blood oxygen saturation (SpO_2) more than 95%

□ Respiratory rate less than or equal to 40/minute[2]

□ Use positive end-expiratory pressure (PEEP) less than or equal to 10 mmH_2O

□ Breathing with ventilator simultaneously

- Cardiovascular system

□ Systolic blood pressure (SBP) between 90-180 mmHg

□ Mean arterial pressure (MAP) between 65-110 mmHg

□ Pulse rate between 60-120/minute

□ No new arrhythmia or myocardial ischemia

□ No shock or blood lactic acid less than 4 millimole/liter

□ No venous thromboembolism or pulmonary embolism

□ No aortic stenosis

- Neurological system

□ Nearly normal consciousness (the Richmond Agitation Sedation Scale: RASS -2 to 2)

□ Intracranial pressure < 20 cmH_2O

- Other systems

□ No fracture

□ No severe or uncontrolled renal or liver dysfunction

□ No active bleeding

□ Body temperature less than 38.5 °C

o Aerobic exercise, swallowing evaluation and training, speech training and electrodiagnosis should be postponed until recovery from a critical period.

o Pulmonary rehabilitation should be stopped when

- Respiratory system

□ Blood oxygen saturation (SpO_2) less than 90% or decreased from baseline more than 4%

□ Respiratory rate more than 40/minute

- Cardiovascular system

□ Systolic blood pressure (SBP) < 90 or > 180 mmHg

□ Mean arterial pressure (MAP) < 65 or > 110 mmHg

□ Pulse rate < 60 or > 120/minute

□ New arrhythmia or myocardial ischemia

- Neurological system

□ Abnormal consciousness (Richmond Agitation Sedation Scale: RASS <- 2 or > 2)

- Other systems

□ Have abnormal symptoms during therapy such as chest pain, dizziness, headache, blurred vision, palpitation, sweating, pale, cyanosis other abnormalities detected by the assessor.

5. Pulmonary rehabilitation for COVID-19 patients[1,2,9]

The objectives of pulmonary rehabilitation are to decrease dyspnea, improve respiration efficiency, and prevent complications from prolonged bed rest including secretion obstruction, atelectasis, muscle weakness and deconditioning.

In patients with dyspnea or secretion obstruction but normal consciousness and no invasive mechanical ventilator needed, vital signs should be evaluated. If patients have hemodynamic instability including SBP < 90 or > 180 mmHg, MAP < 65 or > 110 mmHg, pulse rate < 60 or > 120/minute, respiratory rate more than 40/minute, only positioning to improve respiration and secretion drainage should be performed. In patients with stable vital signs, deep-slow breathing and active cycle of breathing technique should be added. In patients with an invasive mechanical ventilator, positioning and closed suction are recommended. (Figure 2)

The summary of pulmonary rehabilitation services in COVID-19 patients are as in Table 1.

The details of pulmonary rehabilitation are as followed.

5.1 Positioning

Position the patients at 30-60° upright for improved respiration and secretion drainage by adjustable bed.[1] However, it depends on patients' status and attending physicians' recommendations. For example, the application of prone positioning will be considered for severe acute respiratory distress syndrome (ARDS) since it could alter the mechanics and physiology of gas exchange to result consistently in improved oxygenation.[9-11] However, the prone position needs to be close monitored as it might induce side-effects, such as pressure sores and endotracheal dislocation.[9,10,12]

5.2 Deep-slow breathing

Deep-slow breathing improves chest expansion. The patients should raise their arms during slow inhalation and let it down during exhalation. The slow movement of upper extremities and slow breathing is done simultaneously 12-15 times/minute, 10 repetitions/session with 30-60 seconds rest interval. This could be done as frequently as the patient preferred.

5.3 Active cycle of breathing technique[1,2,13]

This technique aims to drain secretion and improve respiration efficiency. It includes 3 steps, which are:

1) Breathing control: The patient sits, inhales and exhales as usual.

2) Thoracic expansion breathing: The patient places their hands on the chest wall to sense chest wall movement during inhalation and exhalation. Relax all muscles during breathing.

3) Huffing: Position the patients in sitting or secretion drainage position, then tell the patients to do forced inhalation, hold for 1-3 seconds, open mouth and pharynx and forcefully exhale 1-3 times without inhalation. Abdominal muscles will

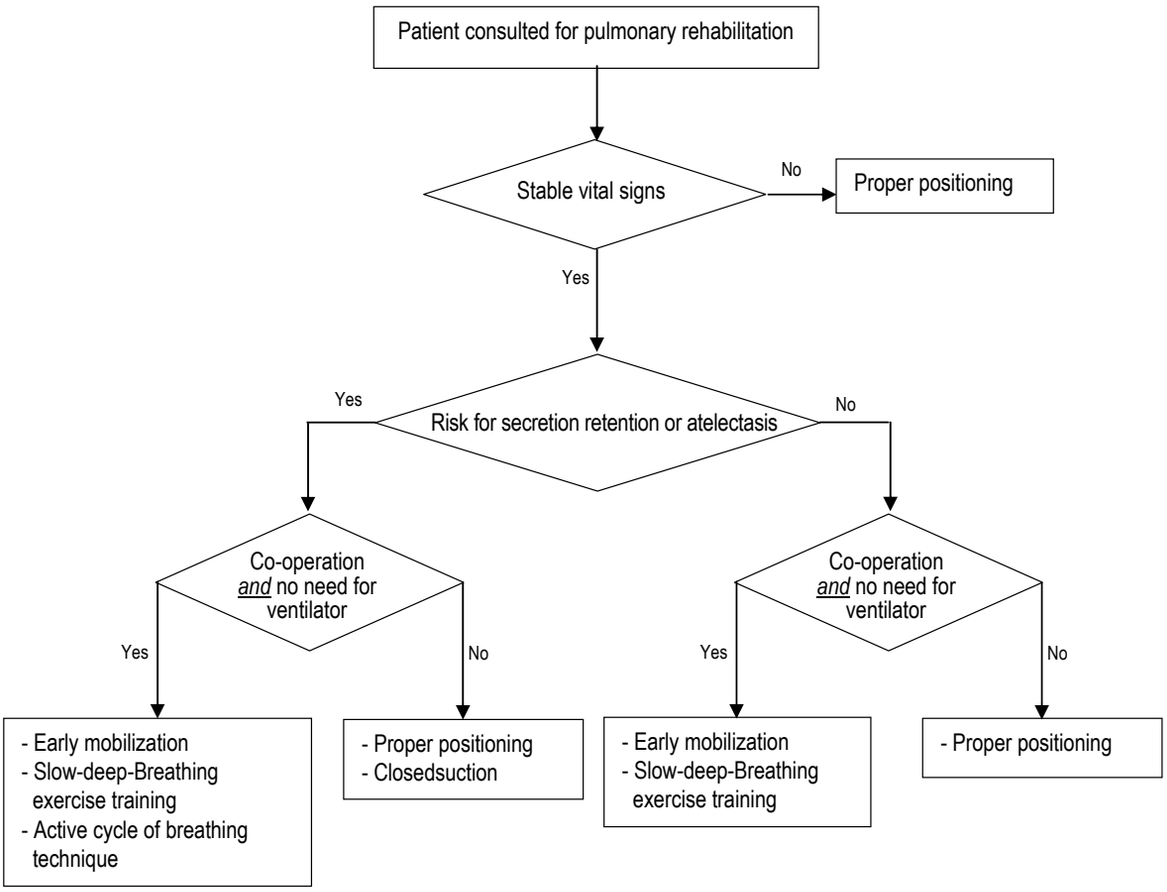

Figure 2. Flowchart for pulmonary rehabilitation in patients with COVID-19

Table 1. Pulmonary rehabilitation services for COVID-19 patients[8]

Patient classifications	Rehabilitation goals	Type of pulmonary rehabilitation
Asymptomatic or mild symptoms (with or without major risk factors)	Improved respiration	Self exercise programs by - Short video clips - Written instructions
Mild pneumonia without secretion obstruction	Improved respiration	
Mild pneumonia with secretion obstruction or with underlying diseases such as neuromuscular or respiratory disorders	Improved respiration Adequate secretion drainage	Self exercise programs by - Short video clip - Written instruction If unable to clear secretion, consider bedside chest physical therapy.
Severe pneumonia	Improved respiration Adequate secretion drainage	If unable to clear secretion, consider bedside chest physical therapy.

be contracted to clear secretions.

To start the active cycle of breathing technique, normal breathing should be advised for 5-10 times. Then, thoracic expansion breathing for 3-4 times and normal breathing before forced exhalation or do huffing 1-2 times. Huffing helps secretions move upward for easier coughing. If secretions remain, repeat this cycle.

5.4 Early mobilization

Early mobilizations improve respiration, secretion drainage and prevent deconditioning. If the patients have stable vital signs, progressive bed mobility and ambulation should be performed. However, the longer patients remain in the intensive care unit, the more likely they are to suffer long-term physical, cognitive and emotional effects of being sedated. To cope with the post-acute care of COVID-19 patients, rehabilitation might take as long as months, and very often, to help patients back to normal life.

6. Administrative recommendations for rehabilitation team management[4,5]

6.1 Rehabilitation teams should work strictly to their institute's guidelines about COVID-19.

6.2 Online meetings or conferences (teleconference) should be encouraged. If a face-to-face meeting could not be

avoided, sitting distance should be more than 1-2 meters.

6.3 If possible, working online or from home should be encouraged. Appropriate work assignments and assessments should be considered.

6.4 To take care of COVID-19 patients, rehabilitation teams should be split into at least 2 teams with restricted movement across teams. Alternate teams for taking care of COVID-19 patients to reduce the risk of widespread infection and prevent a situation of an inadequate workforce.

6.5 Rehabilitation teams who have risk factors for severe COVID-19 such as age more than 60 years, have COPD or other lung diseases, chronic kidney disease, coronary artery disease, congenital heart disease, stroke, hypertension, diabetes, obesity (BMI ≥ 35 kg/m^2), liver cirrhosis, immunocompromised host[6] should not be assigned to take care of COVID-19 patients.

6.6 Regular two-way communications within rehabilitation teams should be done in compliance with reliability, transparency and a trustworthy attitude.

There are some limitations. Given the recent pandemic of COVID-19, clinical recommendations may be altered if more studies about the natural course of this disease are present. These recommendations are inferred based on best evidences for current management of these patients. In addition, these recommendations should be adapted in each hospital/center according to the differences inpatients, contexts, laws and future researches.

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