INTERVENTIONS FOR REHABILITATION OF POST COVID-19 CONDITION

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Highlight

- Introduction
- COVID-19 Rehabilitation Medicine response
- Rehabilitation framework model
  - Criteria, Assessment, Intervention, Mode of Delivery & Outcome Measures
- Outcomes data
- Interventions for common post-COVID condition
Introduction

03-10-2021 (Source: covidnow.moh.gov.my)

- Infected cases: 2,281,724
- Death: 26,801
- Recovered: 2,115,019

If lowest prevalence of 10% Long COVID applied, at least 211,502 individuals are at risk!
Hospital Sungai Buloh (HSgB) 2006
- Malaysia COE for Infectious Disease
- First designated hospital for COVID-19
- Admission commenced 25-01-2020
- Total COVID-19 admission until Sept, 21 was 36,467

National Leprosy Centre Sungai Buloh 1930
- Tentative listing UNESCO
- Set up first Post COVID-19 Rehab Clinic Nov 2020
Hospitals with rehabilitation medicine services for Post COVID-19 conditions

Total 32 Ministry of Health, 3 Ministry of Education & 4 Private hospitals and 1 Ministry of Human Resource Rehab Centre
Present list of healthcare facilities with rehabilitation medicine services for Post COVID-19 conditions

- Federal territory - Hospital Rehabilitasi Cheras, Hospital Kuala Lumpur, University Malaya Medical Centre, Hospital Chancellor Tunku Mukhriz, Hospital Daehan Rehab (Putrajaya), Prince Court Medical Centre, Gleneagles Hospital Kuala Lumpur, Ara Damansara Medical Centre
- Selangor - Hospital Sungai Buloh, Hospital Serdang, Hospital Tengku Ampuan Rahimah, Hospital Shah Alam, Hospital Teknologi MARA, Hospital ReGen Rehab, Hospital Sunway
- Negeri Sembilan - Hospital Tuanku Jaafar Seremban, Hospital Rembau, Hospital Bandar Seri Jempol, Hospital Tuanku Ampuan Najihah
- Pahang - Hospital Tengku Ampuan Afzan, Hospital Sultan Haji Ahmad Shah
- Kelantan - Hospital Raja Perempuan Zainab II
- Pulau Pinang - Hospital Pulau Pinang, Hospital Seberang Jaya, Hospital Balik Pulau.
- Kedah - Hospital Sultanah Bahiyah, Hospital Jitra, Hospital Kuala Nerang, Hospital Sultan Abdul Halim
- Sabah - Hospital Sandakan, Hospital Queen Elizabeth
- Sarawak - Hospital Umum Sarawak, Hospital Miri, Hospital Sibu
- Johor - Hospital Sultan Ismail, Hospital Sultanah Aminah
- Terengganu - Hospital Kemaman, Hospital Sultanah Nur Zahirah
- Perak - Hospital Raja Permaisuri Bainun
- Melaka - Hospital Melaka, Pusat Rehabilitasi PERKESO Tun Abdul Razak
## Spectrum of COVID-19 Rehabilitation Medicine Response

<table>
<thead>
<tr>
<th>Acute Rehabilitation Services</th>
<th>Intensive Care Unit / Acute Medical Wards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single discipline physiotherapy</td>
<td></td>
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</tbody>
</table>

| COVID-19 Rehabilitation Inpatient | Off-tagged Medical Wards |
| Specialized Services (CRISS)      |                           |
| Interdisciplinary rehabilitation  |                           |

| COVID-19 Rehabilitation Outpatient | Rehabilitation Specialist Clinic |
| Specialized Services (CROSS)      |                              |
| Interdisciplinary rehabilitation  |                              |
# COVID-19 Rehabilitation Inpatient Specialized Services (CRISS)

## Entrance Pathway
- Category 4 & 5 COVID-19 automated referral
- Other categories of COVID-19 with identified rehabilitation needs
- Referral by the infectious disease/medical team

### Evaluation
- Interdisciplinary team – Rehabilitation Clinician, Physiotherapist, Occupational Therapist and nurses
- Goals setting – Short and intermediate term

### Functional assessment
- Physical – Bed mobility, lying to sitting, sitting balance, transfers, standing, ambulating
- Activities of Daily Living (ADL) – Modified Barthel Index (MBI); Post COVID-19 Functional Scale (PCFS)

### Specialized test as tolerated performed in phases with vital signs monitoring
- 1 Minute Sit To Stand (1MSTS); Timed Up & Go (TUG); 2 Minutes Walking Test (2MWT); 6 Minutes Walking Test (6MWT)

### Rehabilitation prescription
- Conservative, intermittent, graded and personalized program
- Education and skills empowerment:
  - Breathing techniques such as pursed lips, diaphragmatic, incentive spirometer
  - Muscle strengthening such as biceps curl, arm reach, alternate punch, knee extensions
  - Aerobic activities such as cross body movement, knee lifts, marching on the spot, walking
  - Intensity threshold setting using Borg Scale Rating of Perceived Exertion and heart rate response
  - Gradual return to Activities of Daily Living

## Rehabilitation Process

## Pre-hospital Discharge
- Early supported discharge
- Personalized prescription of home based pulmonary rehabilitation program
- Caregiver training as indicated
- Equipment and assistive devices prescription such as walking frame, specialized wheelchair and orthoses
- Facilitate long term oxygen therapy procurement as required
- Organize referral to other rehabilitation center if required
- Transfer of care to community

## Exit Pathway
- Achieved immediate and short term rehabilitation goals
- Procurement of immediately required assistive and adaptive devices
- Medical discharge
- Automated activation of COVID-19 Rehabilitation Outpatient Specialized Services (CROSS) pathway

Multidisciplinary discussion and referral for complex cases, review of clinical process with emerging evidence are done as indicated.
# Long COVID: Rehabilitation Framework Model

## COVID-19 Rehabilitation Outpatient Specialized Services (CROSS)

### Entrance pathway
- Post COVID-19 Rehabilitation Inpatient Specialized Services (CRISS) cases
- All category 4 & 5 automated referral
- Other categories with Long COVID symptoms
- Patients with existing rehabilitation needs whom contracted COVID-19

### Teleconsultation
- Monitor progress at home such as home oxygen therapy, wounds
- Symptoms screenings using standardized questionnaire
- Real time database entry
- Medical advise and awareness for red flags symptoms
- Decide urgency for in-person review

### Comprehensive in-person review
- **Interval:** 1 - 3 months; 3 - 6 months & 6 - 12 months as per attending clinician judgement
- **Method:** In-person evaluation by Interdisciplinary rehab team members, then team discussion as required
- **Multi-system impairment evaluation:**
  - Cognitive – Brief MSE, MMSE; Psychosocial – DASS-21, IES; Respiratory – Auscultation; Home oximeter glary, Incentive spirometer, PEFR; GVS – 1MSTS; 6MMT; MSK – FSS, MRC, TUG, Hand dynamometry; Others are based on comprehensive clinical evaluation.
  - **Functional assessment:** MBI; PCFS
  - **Quality of Life:** WHODAS 2.0; Community ADL - RTW, RTD
  - **Other specialty referral:** Accessible as clinically required for further investigation & management including but not limited to pulmonologist, cardiologist, internal medicine, infectious disease, neurologist, psychiatrist, gynecologist.
  - **Other interdisciplinary team activation:** SLT, MSW, Dietician, Counselor and others as required
  - **Rehabilitation prescription:** Targeted, personalized, gradual increment; home based with monitoring log and access for medical advise; institutional based program on case to case basis, intensity based on Modified Borg Scale and THR
  - **Devices:** IMT, OPEP, ambulatory O2 support, TES stockings, abdominal binders

### Exit Pathway
- Complete symptoms resolution
- Absence of new on-going symptoms or issues
- Full re-integration into society & pre-morbid life roles

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**Abbreviation:**
- FSS - Fatigue Severity Scale; THR - Target Heart Rate Response; MSK - Musculoskeletal; IMT - Inspiratory Muscle Trainer; OPEP - Oscillating Positive Expiratory Pressure; TMSTS - 1 Minute Sit To Stand; TUG - Timed Up & Go; 6MMT - 2 Minutes Walking Test; RPE - Rate of Perceived Exertion; Modified Barthel Index; PCFS - Post C-19 Functional Scale; PEFR - Peaked Expiratory Flow Rate; PCF - Peak Cough Flow; RTW - Return to Work; RTD - Return to Drive; WHODAS - World Health Organization Disability Assessment Scale; DASS - Depression, Anxiety, Stress Scale; C-19 IES - COVID 19 Impact of Event Scale; PT - Physiotherapy; OT - Occupational Therapy, SLT - Speech Language Therapy
Long COVID: Ongoing symptomatic COVID-19
(Persistent symptoms > 4 - 12 weeks)
COVID-19 Rehabilitation Outpatient Specialized Services (CROSS) database preliminary analyses
Nov 2020 – Sept 2021 (N=2,612)

Note: Persistent symptoms timeline are from onset of initial acute symptoms. Most patients reported cluster of symptoms.
Long COVID: Post COVID-19 Syndrome (Persistent symptoms >12 weeks) COVID-19 Rehabilitation Outpatient Specialized Services (CROSS) preliminary database analyses Nov 2020 – Sept 2021 (N=2,043)

Note: Timeline categorization are from onset of initial acute symptoms. Most patients reported cluster of symptoms.
Long COVID: Post COVID-19 Syndrome (Persistent symptoms >12 weeks)
COVID-19 Rehabilitation Outpatient Specialized Services (CROSS) preliminary database analyses
Nov 2020 – Sept 2021 (N=2,043)

<table>
<thead>
<tr>
<th>Basic characteristics</th>
<th>Frequency (%)</th>
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<tbody>
<tr>
<td>Gender</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>1,214 (59.4%)</td>
</tr>
<tr>
<td>Female</td>
<td>829 (40.6%)</td>
</tr>
<tr>
<td>Race</td>
<td></td>
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<tr>
<td>Malay</td>
<td>1,347 (65.9%)</td>
</tr>
<tr>
<td>Chinese</td>
<td>516 (25.2%)</td>
</tr>
<tr>
<td>Indian</td>
<td>132 (6.4%)</td>
</tr>
<tr>
<td>Others</td>
<td>48 (2.5%)</td>
</tr>
<tr>
<td>Age (Years)</td>
<td></td>
</tr>
<tr>
<td>13 – 29</td>
<td>78 (3.8%)</td>
</tr>
<tr>
<td>30 – 59</td>
<td>1,224 (59.9%)</td>
</tr>
<tr>
<td>60 – 89</td>
<td>740 (36.3%)</td>
</tr>
<tr>
<td>Disease severity</td>
<td></td>
</tr>
<tr>
<td>Cat ≤ 3</td>
<td>14 (0.8%)</td>
</tr>
<tr>
<td>Cat 4</td>
<td>1,697 (83%)</td>
</tr>
<tr>
<td>Cat 5</td>
<td>332 (16.2%)</td>
</tr>
<tr>
<td>Co-morbidities</td>
<td></td>
</tr>
<tr>
<td>Presence</td>
<td>1,388 (67.9%)</td>
</tr>
<tr>
<td>Home O₂</td>
<td></td>
</tr>
<tr>
<td>Required</td>
<td>30 (1.5%)</td>
</tr>
</tbody>
</table>

Note: Research entitled “Long COVID Characterization and Prediction from COVID-19 Rehabilitation Outpatient Specialized Services (CROSS) database in a designated COVID-19 hospital in Malaysia” is presently in progress.
Management of Post-COVID 19 Condition

- Recognize symptoms
- Comprehensive clinical evaluation
- Rule out red-flags and other diagnoses
- Investigation as required
- Optimize medical co-morbidities
- Consultation / referral to other indicated medical specialties
- Supportive & symptomatic treatment
## Intervention for rehabilitation of Post COVID-19 condition – An integrated approach

<table>
<thead>
<tr>
<th>Post- COVID condition</th>
<th>Non-pharmacological</th>
<th>Pharmacological</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fatigue</td>
<td>▪ Energy conservation technique&lt;br&gt;▪ Sleep hygiene&lt;br&gt;▪ Graded return to physical activity &amp; ADL&lt;br&gt;▪ Personalized graded aerobic exercise with pacing&lt;br&gt;▪ Breathing and relaxation technique&lt;br&gt;▪ Cognitive behavioral therapy&lt;br&gt;▪ Healthy life style&lt;br&gt;▪ Adaptive and assistive devices</td>
<td>▪ Stimulants&lt;br&gt;  Methyl phenidate&lt;br&gt;  D-amphetamine&lt;br&gt; ▪ Analgesics&lt;br&gt;  Bupropion&lt;br&gt; ▪ Anti depressants&lt;br&gt;  SSRIs&lt;br&gt;  TCAs</td>
</tr>
<tr>
<td>Exertional dyspnea</td>
<td>▪ Personalized pulmonary rehab program&lt;br&gt;  Improve ventilation capacity: Breathing techniques, positioning, adjuncts- incentive spirometer, inspiratory muscle trainer&lt;br&gt;  Aerobic exercise- Conservative, intermittent, pacing gradual increment, intensity &lt;60% max heart rate&lt;br&gt;  Muscle strengthening – Resistance and weights as tolerated</td>
<td>▪ Supplemental O₂ therapy&lt;br&gt; ▪ Inhaler meds if bronchial hyperresponsiveness&lt;br&gt; ▪ Anti-fibrotic if progressive FLD</td>
</tr>
<tr>
<td>Cough</td>
<td>▪ Dry: Hydration, gargle, lozenges, menthol crystal steam inhalation&lt;br&gt;  Productive: Postural drainage, percussion, active cycle breathing technique, huffing methods</td>
<td>▪ Dry: Suppressant, if sensory neural cough neuropathic medication&lt;br&gt;  Productive: Mucolytics, expectorants</td>
</tr>
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<th><strong>Pharmacological</strong></th>
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</table>
| **Anxiety**              | - Educate with facts on recovery process  
- Cognitive Behavioral Therapy  
- Sleep hygiene  
- Relaxation and breathing techniques  
- Psychoeducation & psychotherapy  
- Facilitate access to mental health support | **Anxiolytics**  
Benzodiazepines  
Anti depressants  
SSRIs  
SNRIs  
TCAs |
| **Brain Fog**            | - Sleep hygiene  
- Breathing and relaxation technique  
- Cognitive re-orientation  
- Compensatory strategies – memory aids, checklist, alarm  
- Brain exercise – puzzle, word and number game, gradual complexity  
- Personalized graded exercise program | **Stimulants**  
Methyl-phenidate if attention deficit |
| **Chronic pain**         | Desensitization techniques  
Physical modalities – TENS, cryotherapy, ultrasound etcs  
Cognitive behavioral therapy  
Relaxation and breathing techniques  
Personalized graded exercise program | **Neuropathic**  
Gabapentin, Pregabalin  
**Nociceptive**  
NSAIDS topical / oral  
Opioids |

**Note:** Integration of non-pharmaceutical and pharmaceutical approach are adopted from alike symptoms management in other pathological condition. Effectiveness of its application in post-COVID-19 condition requires scientific validation.

Acknowledgement

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