

# FSG 100-05 AIRCREW MEDICAL FITNESS POST RESPIRATORY ILLNESS

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## References:

- A. Flight Operations Manual 4.1.4 Part 4 – Aircrew Grounding and Ungrounding Procedures [rcmf-flight-operations-manual-21-september-2023.pdf](http://rcmf-flight-operations-manual-21-september-2023.pdf) (mil.ca)
- B. FSG 300-01 Temporary Flying Restrictions:  
[http://winnipeg.mil.ca/cms/Libraries/Flight\\_Surgeon\\_Guidelines/FSG\\_300-01.sflb.ashx](http://winnipeg.mil.ca/cms/Libraries/Flight_Surgeon_Guidelines/FSG_300-01.sflb.ashx)
- C. Flight Surgeon Guideline 100-01 Aircrew Medical Selection  
[http://winnipeg.mil.ca/cms/Libraries/Flight\\_Surgeon\\_Guidelines/FSG\\_100-01.sflb.ashx](http://winnipeg.mil.ca/cms/Libraries/Flight_Surgeon_Guidelines/FSG_100-01.sflb.ashx)
- D. AMA Directive 100-01 Medical Standards for CF Aircrew  
[http://winnipeg.mil.ca/cms/Libraries/Flight\\_Surgeon\\_Guidelines/AMA100-01.sflb.ashx](http://winnipeg.mil.ca/cms/Libraries/Flight_Surgeon_Guidelines/AMA100-01.sflb.ashx)
- E. DFHP Advisory 6636-80: COVID-19: Force Health Protection Recommendations  
<http://cmp-cpm.mil.ca/en/health/policies-direction/policies/6636-80.page>
- F. DFHP Advisory 6636-35: Influenza Prevention in the Canadian Armed Forces: Immunization and Antiviral Use for Seasonal Influenza 2022/2023 [6636-35](http://6636-35)  
[Influenza Prevention in the Canadian Armed Forces: Immunization and Antiviral Use for Seasonal Influenza 2022/2023 | Policy and Direction | Health Services | MPC \(mil.ca\)](http://Influenza_Prevention_in_the_Canadian_Armed_Forces:_Immunization_and_Antiviral_Use_for_Seasonal_Influenza_2022/2023_|_Policy_and_Direction_|_Health_Services_|_MPC_(mil.ca))
- G. DFHP Advisory 6636-68: Tuberculosis (TB) Control in the CAF  
[6636-68 Tuberculosis \(TB\) Control in the CAF | Policy and Direction | Health Services | MPC \(mil.ca\)](http://6636-68_Tuberculosis_(TB)_Control_in_the_CAF_|_Policy_and_Direction_|_Health_Services_|_MPC_(mil.ca))
- H. COVID-19 signs, symptoms and severity of disease: A clinician guide.  
[COVID-19 signs, symptoms and severity of disease: A clinician guide - Canada.ca](http://COVID-19_signs,_symptoms_and_severity_of_disease:_A_clinician_guide_-_Canada.ca)
- I. National Defence Flying Orders B-GA-100-001/AA-000 [Publications / Orders \(mil.ca\)](http://Publications/_Orders_(mil.ca))
- J. FSG 1900-01 Medications and Aircrew: HYPERLINK  
"http://winnipeg.mil.ca/cms/Libraries/Flight\_Surgeon\_Guidelines/FSG\_1900-01.sflb.ashx" [http://winnipeg.mil.ca/cms/Libraries/Flight\\_Surgeon\\_Guidelines/FSG\\_1900-01.sflb.ashx](http://winnipeg.mil.ca/cms/Libraries/Flight_Surgeon_Guidelines/FSG_1900-01.sflb.ashx)
- K. UMG 200-01 Diving fitness after respiratory illness [UMG 200-01.pdf](http://UMG_200-01.pdf)  
[aerospacemedicine.ca](http://aerospacemedicine.ca)

**Record of Amendments approved by AUMB**

<b>Date (DD/MM/YY)</b>	<b>Reason for Change</b>	<b>Fully Reviewed Y/N</b>
12/12/23	Complete revision of policy	Y
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## Table of Contents

BACKGROUND .....	4
GENERAL .....	4
FORCE HEALTH PROTECTION RECOMMENDATION .....	5
TESTING .....	5
GENERAL CONSIDERATIONS FOR RETURN TO AIRCREW DUTIES .....	6
RESPIRATORY ILLNESS SEVERITY .....	7
GUIDANCE TO AIRCREW ON MGMT OF SELF-LIMITED RESPIRATORY ILLNESS.....	8
GUIDANCE TO CLINICIANS ON MGMT OF AIRCREW POST RESPIRATORY ILLNESS .....	9
ANNEX A PROTOCOL FOR THE ONE MINUTE SIT TO STAND TEST (1MSTS) .....	11
ANNEX B BORG SCALE.....	12
ANNEX C PROTOCOL FOR THE SIX MINUTE WALK TEST (6MWT) .....	13

## BACKGROUND

### Purpose:

1. The purpose of this Flight Surgeon Guideline (FSG) is to provide direction to all Canadian Forces Health Services Group (CF HSvcs Gp) personnel regarding the assessment of fitness for CAF aircrew to return to aircrew duties following acute respiratory infections or illness.

### Application:

2. This FSG applies to all CFHS personnel, Department of National Defence (DND) Public Servants, contractors and sub-contractors who provide Health Services to CAF aircrew.
3. This FSG replaces all previous versions of FSG 100-05 Aircrew Medical Fitness post COVID-19.

## GENERAL

4. Respiratory illness has long been a concern in the aviation environment due to impact on the pulmonary system, as well as the upper airway, ears, and sinuses. Respiratory tract diseases increase aeromedical risk by increasing susceptibility to acute incapacitation as well as performance compromise through potential hypoxia, acceleration atelectasis and decrease in G-tolerance. The eustachian tube, middle ear, and sinuses are all sensitive to Boyles law. If air passage and pressure equalization are restricted due to infection, otic-barotrauma, sinus block, and decreased hearing acuity may pose an impact to flight safety and performance.
5. In general, aircrew have often chosen to manage mild, self-limited upper respiratory tract infections without consulting an aviation medicine provider, in line with Refs A and B. However, the COVID-19 pandemic triggered new guidelines for in-depth review post COVID-19 infection to ensure fitness to return to the aviation environment. Concerns centered around potential cardiac, neurological and pulmonary sequelae of this new viral illness, as well as acute symptoms such as dyspnea and silent hypoxia, which would be further exacerbated in the hypobaric environment. We now have three years of data examining SARS CoV-2 infection in aircrew. There are several cases of RCAF aircrew who have developed sequela secondary to COVID and have had prolonged grounding periods. However, these cases were identified by the aircrew themselves and ongoing significant clinical symptoms. As Canadians develop at least partial immunity from vaccination and infection, this policy aims to move away from COVID-19 specific direction and instead be more inclusive to describe the general management of infective respiratory illness in aircrew. However, specific COVID-19 and other identifiable infective respiratory illness guidance will continue to be updated as required. Further revisions with amendments will be posted on the 1 CAD Surg intranet website and aerospacemedicine.ca application.

6. Return to aircrew duties, both ground-based and in-flight, must be determined with focus on two main considerations:
  - a. Aeromedical risk assessment post-illness to confirm that the member has sufficiently recovered to return to their operational environment (in-flight or ground based) considering:
    - i. Risk to flight safety;
    - ii. Risk to mission completion;
    - iii. Risk for performance compromise and mission effectiveness;
    - iv. Risk to the individual.
  - b. Preventive health measures recommended to prevent transmission of contagious illness as discussed in the next section.

## **FORCE HEALTH PROTECTION RECOMMENDATIONS**

7. Recommendations for workplace exclusion, isolation, quarantine, testing and preventive health measures (PHMs) are promulgated by Directorate of Force Health Protection (DFHP). Examples of guidance for specific infective respiratory illnesses is outlined in Refs E, F, G.
8. Minimum guidance for exclusion from the workplace for common infective respiratory illnesses for which specific guidance is not provided includes:
  - a. Members should remain out of the physical workplace for 24 hours after the symptoms of fever, congestion, rhinorrhea, fatigue have resolved without use of medication. Minor (resolving) cough is acceptable.
  - b. This exclusion should be extended to 48 hours if diarrhoea or vomiting were experienced.
9. Future DFHP recommendations on new respiratory pathogens of concern will supersede the PHM guidance above but return to aircrew duties will be directed by this FSG.

## **TESTING**

10. A variety of testing mechanisms exists for commonly diagnosed infective respiratory illnesses, including COVID, Influenza, Respiratory Syncytial Virus, and Tuberculosis.
11. In aircrew, testing is only recommended if clinically indicated to determine clinical management. In line with DFHP guidance, testing for COVID is no longer routinely recommended for aircrew.
12. If aircrew are tested for COVID using antigen-based testing, a positive should be taken at face value. If negative, but high clinical suspicion, the test should be repeated in 24 – 48 hrs. If both are negative, follow baseline prevention measures discussed in para 8.

13. If aircrew test positive for any infective respiratory illness, infection precautions to prevent transmission should be in accordance with DFHP guidance or local clinic or public health policy (Ref E, F, G)

## **GENERAL CONSIDERATIONS FOR RETURN TO AIRCREW DUTIES POST INFECTIVE RESPIRATORY ILLNESS**

14. Returning aircrew to duty following respiratory illness requires consideration of the risk associated with several key factors:

- a. Risk of the hypobaric environment:
  - i. Symptoms due to hypoxia will be exacerbated at altitude;
  - ii. Positive pressure breathing requirements of certain platforms induces additional physical demands including work of breathing;
  - iii. Gas expansion and contraction with changes in altitude (i.e., barotrauma)
- b. Risks to flight safety:
  - i. Impact of medications: potential to mask symptoms which may cause issues if the medication effect is not sustained; most cold and sinus medications are not approved for aircrew duties due to cognitive or cardiovascular side effects;
  - ii. Minor symptom effects may be cumulative and become distracting and affect ability to concentrate and maintain vigilance for safety sensitive tasks.
- c. Risk of reduced operational effectiveness
  - i. Enclosed spaces in aircraft and controlling areas, in addition to onboard oxygen systems may increase transmission of infective agents from still infectious personnel to other aircrew or operationally required personnel.
  - ii. Reduction in physical exertion and respiratory capacity which may impact ability to perform physically demanding tasks, such as anti-G straining maneuver or Search and Rescue operations.

**RESPIRATORY ILLNESS SEVERITY**

15. The definitions of respiratory illness severity for this context are outlined in Table 1 and are largely unchanged from case definitions established by AUMB for COVID in 2021 through incorporation of Ref H and international data available at the time.
16. Management of and disposition for return to aircrew duties depends on the category of severity of respiratory illness as well as whether in-flight or ground duties are to be performed.

**TABLE 1 – Determination of respiratory illness severity**

Severity	Asymptomatic	Mild	Moderate	Severe
Symptoms; Resp	None	None, or only on significant exertion	With minimal exertion or ADLs	At rest
Cardiac	None	None	Transient chest pain, palpitations, pre-syncope	Persistent or prominent chest pain, palpations, pre-syncope or syncopes
Other	None	Fever, rhinorrhea, sore throat, muscle ache, N/V, ENT issues, anosmia, rash	Mental Status changes	
Objective	None	Normal O2 saturation	Any requirement for O2, O2 saturation <95% at rest	
Lab	+PCR/ rapid antigen	+PCR/ Rapid Ag test <b>or</b> high-risk exposure followed by illness development within incubation period.		
Imaging	None	+/- CXR if required, no acute findings	CXR or CT may have been abnormal but no ground glass, cavitation etc. or had pneumonia	CXR or CT with severe findings
Treatment required	None	Self-isolation at home if required. +/- clinic visit. No O2 required, No prescription medication use	ER consult, outpatient treatment or short hospital observation for O2, no intubation	Hospitalization for inpatient care

## GUIDANCE TO AIRCREW ENGAGED IN TRAINING OR OPERATIONAL DUTIES ON MANAGEMENT OF SELF-LIMITING RESPIRATORY ILLNESS

17. The following paragraphs provide guidance to aircrew on when it is appropriate to consider self-ungrounding post respiratory illness and factors to consider before returning to duty.

- a. **Asymptomatic:** Aircrew who have no subjective symptoms but test positive for an identifiable infective respiratory illness should be managed in accordance with DFHP guidance in Ref E, F, G, and local clinic and Defence Team policy. Once permitted back in the workplace, aircrew may resume their duties.
- b. **Mild symptoms:**
  - i. Initial disposition:
    1. If mild symptoms of infective respiratory illness (as defined in Table 1) are experienced, aircrew must self-ground and follow DFHP guidance from para 8 for exclusion from the workplace.
    2. National Defence Flying Orders B-GA-100-001/AA-000 (Ref I) preclude aircrew from self-medicating, and consultation with a Flight Surgeon is recommended if medications are required.
    3. Aircrew and clinicians are encouraged to consult Ref J for use of medication in aircrew.
  - ii. Return to aircrew duties:
    1. Self-ungrounding as outline in Ref A is appropriate for trained aircrew with:
      - a. Duration of symptoms less than 48 hrs which have completely resolved; or
      - b. A residual sore throat or other minor but improving symptom not impacting duties.
    2. Medical assessment by an aviation medicine clinician is required for ungrounding for all student aircrew, all personnel with symptoms lasting longer than 48 hrs, and for all personnel requiring medication.
    3. If any cough or respiratory symptoms were experienced, prior to return to duties, aircrew are reminded to:
      - a. Confirm recovery to baseline respiratory fitness by participating in a 30-minute-high intensity PT session (70-85% max heart rate). Self-reported performance should be close to or at baseline. If not recovered, assessment by an aviation medicine clinician should be sought.
      - b. For pilots, consideration should be given to a dual flight, or gradual return to flight profile for their first flight post illness.
      - c. For aircrew operating in platforms capable of >3Gz, a self-assessment of their AGSM should be completed prior to resuming duties.



## GUIDANCE TO CLINICIANS ON MANAGEMENT OF RESPIRATORY ILLNESS IN AIRCREW ENGAGED IN TRAINING OR OPERATIONAL DUTIES

18. The following paragraphs provide guidance to aviation medicine clinicians for the evaluation, management and disposition of aircrew recovered from infective respiratory illness.
- a. **Asymptomatic:** Aircrew who have no subjective symptoms but test positive for an identifiable infective respiratory illness should be managed in accordance with DFHP in Ref E, F, G, and local clinic and Defence Team policy. Once permitted back in the workplace, aircrew duties may resume.
  - b. **Mild:**
    - i. If mild symptoms of infective respiratory illness (as defined in Table 1) are experienced, aircrew must self-ground and follow DFHP guidance from para 8 for exclusion from the workplace. Guidance on self-ungrounding is provided in para 17.
    - ii. If symptoms are not completely resolved, last longer than 48hrs, aircrew member is a student, or the CoC has concerns, evaluation by an aviation medicine provider is required. Physical exam should be as directed for the specific illness, and attention should be paid to respiratory, cardiovascular and ENT systems to ensure aeromedical fitness. If pulmonary symptoms persist, consider exercise oxygen saturation testing using the 1-minute sit to stand (1MSTS) or 6-minute walk test (6MWT) as outlined in Annexes A and C.
    - ii. Consideration should be given to type of duty performed by the aircrew. Persistent eustachian tube dysfunction may be permitted in a ground based controlling job but would be unfit for in-flight duties.
    - iii. Additional testing is required prior to return to aircrew duties for those with abnormal exam or investigation results, or persistent symptoms beyond 14 days. Flight Surgeons should seek advice from the office of 1 CAD Surgeon/ ASCS as required. The investigations required may be adjusted based on aircrew MOSID and/or case specific information.
    - iv. SAR Techs must also meet the requirements for return to dive duties as outline in Ref K.
    - v. The following advice should be given to aircrew upon return to aircrew duties:
      1. Aircrew should confirm baseline respiratory fitness has been recovered by participating in a 30-minute-high intensity PT session (70-85% max heart rate). Self-reported performance should be close to or at baseline. If not recovered, assessment by an aviation medicine clinician should be sought.
      2. For pilots, consideration should be given to a dual flight, or gradual return to flight profile for their first flight post illness.

3. For aircrew operating in platforms capable of >3Gz, a self-assessment of their AGSM should be completed prior to resuming duties, as well as a thorough G warm on their first flight back.

c. **Moderate and Severe:**

- i. Unfit aircrew duties, both in-flight and ground based, until reviewed by an aviation medicine provider.
- ii. Medical work up will include at a minimum:
  1. History, physical exam
  2. CXR
  3. ECG
  4. Exercise oxygen saturation testing (1MSTS or 6MWT) as outline in Annex A and C.
- iii. Severe cases will require additional testing in consultation with ASCS, who may consult CFEME for Aviation Internal Medicine advice.
- iv. All moderate and severe cases of respiratory illness require ASCS review before returning to aircrew duties.

**ANNEX A: PROTOCOL FOR THE ONE MINUTE SIT TO STAND TEST (1MSTS)****References:**

1. Borg, G. Borg's Perceived Exertion and Pain Scales. Champaign, IL: Human Kinetics, 1998.  
[https://www.sralab.org/sites/default/files/2018-04/Rating\\_of\\_perceived\\_exertion\\_-\\_Borg\\_scale.pdf](https://www.sralab.org/sites/default/files/2018-04/Rating_of_perceived_exertion_-_Borg_scale.pdf)
2. Kalin, A. et al. Direct and indirect evidence of efficacy and safety of rapid exercise for exertional desaturation in COVID-19: a rapid systematic review. Systematic Reviews; 2021 (10)77.  
<https://doi.org/10.1186/s13643-021-01620-w>
3. Niyogi, S.G et al One-minute sit-to-stand as a potential triage marker in COVID-19 patients: A pilot observational study. Trends in Anaesthesia and Critical Care; 2021 (39)  
<https://doi.org/10.1016/j.tacc.2021.04.007>

**Equipment required:**

1. Chair which has a hard flat seat, and no arm rests;
2. Stopwatch/ timer; and
3. Pulse oximeter.

**1MSTS test instructions:**

1. Before beginning, measure the patients resting O2 saturation, heart rate, and level of breathlessness/ fatigue using Borg scale of fatigue level (6-20, per Annex B) and record in table.
2. Do not proceed with the test if resting O2 saturation is less than or equal to 96%.
3. Instruct the patient to sit in a chair with feet flat on the floor, hands on hips or hanging loosely.
4. Instruct the patient to stand up from the chair until their legs are straight without use of arms or hands, then return to a sitting position. This cycle counts as one sit-to-stand.
5. Continue sitting up and down on the chair as many times as possible for a duration of one minute. Resting is permitted during the one minute if required but patients should be instructed to put in as much exertional effort as they are able to during the 1 minute.
6. Stop the test at any time if the patient feels unwell, has chest pain, dizziness or severe breathlessness. Patient is unfit to return to aircrew duties.
7. At the end of one minute, record O2 saturation, heart rate and Borg scale of fatigue level (6-20, per Ref 4)

	Resting	At test completion
O2 saturation		
Heart rate		
BORG scale rating		
Total number sit-to-stands		

**Criteria for return to aircrew duties:** O2 desaturation of less than or equal to 4% from baseline at test completion is consider a pass. Patients should target a minimum of 20 sit-to-stands in 1 min to ensure adequate effort. There is no defined cutoff for Borg value and HR, but these criteria may be used to assess level of effort.

**ANNEX B: BORG SCALE**

The BORG scale is a simple way to allow individuals to subjectively rate their perceived effort of level or fatigue during exercise or exercise testing. The scale ranges from 6 (no effort) to 20 (maximum effort).

6	
7	Very, very light
8	
9	Very light
10	
11	Fairly light
12	
13	Somewhat hard
14	
15	Hard
16	
17	Very hard
18	
19	Very, very hard
20	

*Borg G. Borg's Perceived Exertion and Pain Scales. Champaign, IL: Human Kinetics, 1998.*

**ANNEX C: PROTOCOL FOR THE SIX-MINUTE WALK TEST (6MWT)****References:**

1. Am J Resp Critical Care Med 2002 166(1). <https://doi.org/10.1164/ajrccm.166.1.at1102>
2. Singh et al. An official systematic review of the ERS/ATS: measurement properties offield walking tests in chronic respiratory disease. Eur Resp J 2014, 44(6) 1447-1478
3. Manttari A, Suni J, Sievanen H, Husu P et al. Six-minute walk test: a tool for predicting maximum aerobic power (VO<sub>2</sub> max) in healthy adults. Clinical Physiology and Functional Imaging. 2018;38 (6) 1038-45
4. Borg, G. Borg's Perceived Exertion and Pan Scales. Champaign, IL: Human Kinetics, 1998. [https://www.sralab.org/sites/default/files/2018-04/Rating\\_of\\_perceived\\_exertion\\_-\\_Borg\\_scale.pdf](https://www.sralab.org/sites/default/files/2018-04/Rating_of_perceived_exertion_-_Borg_scale.pdf)
5. Enright PL, Sherrill DL. Reference equations for the six-minute walk in healthy adults. Am J Respir Crit Care Med 1998;158: 1384-87
6. Nes BM, Janszky I et al. Age-predicted maximum heart rate in healthy subjects: The HUNT fitness study. Scan J Med Sci Sports 2013; 23(6), 697-704

**Background:** A major issue in those recovering from COVID-19 infection is whether ongoing mild fatigue and SOB/OE represent lingering symptoms during recovery, or alternatively, ongoing functional impairment related to underlying lung dysfunction.

**Purpose:** The six-minute walk test is performed to obtain an objective basic functional assessment of an individual's aerobic capacity. This allows the HCP to distinguish between mild residual symptoms or ongoing functional cardiopulmonary impairment.

**Test Protocol:** The test is performed by having the individual walk as far as possible in six minutes on a measured, demarcated course in an indoor hallway. The preferred length of the course is 30 meters, but may be modified if necessary, but should not be less than 20 meters. The course should be marked every 3m, and the turnaround points marked with a cone e.g. traffic cone. The starting line should be clearly demarcated.

**Equipment Required**

- a. Clipboard with data collection sheets
- b. Blood pressure kit
- c. Lap counter
- d. Timer

**Protocol**

1. The patient should sit in a chair near the starting position for 10 minutes before starting the test. During this period, baseline information should be recorded
  - a. Blood pressure.
  - b. Pulse.
  - c. SpO<sub>2</sub>.
  - d. Borg scale of fatigue level (6-20, per Ref 4).

2. Provide instructions to the patient. “The object of this test is to walk as far as possible for 6 minutes around this demarcated course. You should walk as quickly as possible, but you should not run or jog. You are allowed to slow down or even stop if necessary and lean against the wall”. Demonstrate one revolution around the course pivoting briskly around the marker.
3. After obtaining baseline data, have the patient start. During the test
  - a. After each two minute interval:
    - i. Record the SpO<sub>2</sub>/HR and fatigue level (Borg scale).
    - ii. Tell the patient how many minutes are left and “Keep up the good work or “You are doing well.”
  - b. Stop at six minutes and record:
    - i. SpO<sub>2</sub>/HR and fatigue level (Borg scale).
    - ii. Total distance walked (m).

### **Six-Minute Walk Test Criteria for Aircrew to Return to Aircrew Duties**

4. Based on normative data (Refs 2), the following criteria are recommended for aircrew undergoing the 6MWT as part of a return to duty assessment. These criteria are derived from Ref 2, with the lower limit of normal being defined as mean - 1 SD.
5. Aircrew who do not meet these criteria (i.e., have an abnormal 6MWT) may have ongoing cardio-pulmonary dysfunction (reflective of moderate or severe infection). All abnormal 6MWT must be forwarded to CFEME for IM Consult to determine if/which additional investigations are indicated. Further assessment may be required in discussion with CFEME and ASCS. Of note, Distance, Borg, and HR values should aim to be exceeded as an indicator of sufficient effort. Exceeded values in these three criteria do not constitute a fail. Similarly, the VO<sub>2</sub> max and O<sub>2</sub> sat criteria should exceed the lower limit in order to qualify as a passed test.

**TABLE 1: 6MWT CRITERIA REQUIRED FOR RETURN TO FLIGHT POST COVID-19**

	Males	Females
Distance (meters)	576	562
Borg Fatigue Level	12	13
Heart Rate	75% PMHR* [(0.64x age)-211] x 0.75	75% PMHR* [(0.64x age)-211] x 0.75
Calculated aerobic capacity(ml/kg/min)	27	26
O <sub>2</sub> saturation	>94% at rest >90 % with exercise	>94% at rest >90 % with exercise

\*PMHR = predicted maximum heart rate [(0.64x age)-211] x 0.75

**Maximum aerobic capacity equation:**Males

$\text{VO}_2 \text{ max} = 110.546 + 0.063 \text{ (6MWD meters)} - 0.250 \text{ (age)} - 0.486 \text{ (BMI)} - 0.420 \text{ (ht cms)} - 0.109 \text{ (HR)}$

Females

$\text{VO}_2 \text{ max} = 22.506 - 0.271 \text{ (wt kgs)} + 0.051 \text{ (6MWD meters)} - 0.065 \text{ (age)}$