COVID-19 Webinar Series

Lessons About COVID-19 Survivorship: From Long COVID to Post-Intensive Care Syndrome

January 21, 2021
3 PM – 4 PM CT

MODERATOR: Neha Dangayach, MD
PANELISTS: E. Wesley Ely, MD, MPH | Dylan Wessman, MD, CAPT, MC, USN | David Putrino, PhD

Supported in part through an unrestricted educational grant from Mallinckrodt Pharmaceuticals.
Athletes and COVID-19: “Return to Play” Recommendations

Dylan E. Wessman, MD
CAPT, MC (UMO), USN
FACC, FACP, FAHA
Disclaimer

- The views expressed in this presentation are those of the author and do not necessarily reflect the official policy or position of the Department of the Navy, the Department of Defense, or the U.S. Government.
Faculty Disclosure

- Dr. Dylan E. Wessman has no relevant financial relationships with any commercial supporters.
Cardiovascular Complications of COVID-19

Cardiac Evaluation in COVID-19

“Return to Play” (RTP) Algorithms

• Based on age, COVID-19 severity, and symptoms.

• Cardiac testing for athletes with moderate or severe COVID-19:
  ▪ Troponin, electrocardiogram, and/or echocardiogram
  ▪ Cardiac MRI reserved for suspected myocardial injury

• Three proposed RTP algorithms:
  ▪ Athletes in competitive high school sports
  ▪ Adult athletes in competitive sports
  ▪ Recreational masters athletes
Cardiac Troponin (cTn)

- Detect subclinical myocardial injury
- High-sensitivity cTn (hs-cTn) recommended
- No established reference range for athletes
- Can be released after prolonged or strenuous exercise
- Do not measure within 24-48 hours of exercise

Electrocardiogram (ECG)

- Common diagnostic tool
- Low sensitivity and specificity
- High prevalence of anomalies in athletes
- Abnormalities related to myocarditis:
  - Complex ectopy or ventricular arrhythmias
  - ST-segment and T-wave changes
  - Left bundle branch block
  - Atrioventricular block

ECG Interpretation in Athletes

Normal ECG Findings
- Increased QRS voltage for LVH or RVH
- Incomplete RBBB
- Early repolarization/ST segment elevation
- ST elevation followed by T wave inversion V1-V4 in black athletes
- T wave inversion V1-V3 age <16 years old
- Sinus bradycardia or arrhythmia
- Ectopic atrial or junctional rhythm
- 1^ AV block
- Mobitz Type I 2^ AV block

Borderline ECG Findings
- Left axis deviation
- Left atrial enlargement
- Right axis deviation
- Right atrial enlargement
- Complete RBBB

Abnormal ECG Findings
- T wave inversion
- ST segment depression
- Pathologic Q waves
- Complete LBBB
- QRS ≥ 140 ms duration
- Epsilon wave
- Ventricular pre-excitation
- Prolonged QT interval
- Brugada Type I pattern
- Profound sinus bradycardia < 30 bpm
- PR interval ≥ 400 ms
- Mobitz Type II 2^ AV block
- 3^ AV block
- 2 PVCs
- Atrial tachyarrhythmias
- Ventricular arrhythmias

No further evaluation required in asymptomatic athletes with no family history of inherited cardiac disease or SCD.

Further evaluation required to investigate for pathologic cardiovascular disorders associated with SCD in athletes.

AV = atrioventricular; LBBB = left bundle branch block; LVH = left ventricular hypertrophy; RBBB = right bundle branch block; RVH = right ventricular hypertrophy; PVC = premature ventricular contraction; SCD = sudden cardiac death.

Exercise-Induced Cardiac Remodeling (EICR)

Myocarditis Recommendations

• Athletes should not participate in competitive sports while active inflammation is present, regardless of age, gender, and left ventricular function (Class III).

• Before returning to competitive sports, athletes should undergo resting echocardiogram, 24-hour Holter monitoring, and exercise ECG no less than 3 to 6 months after the initial illness (Class I).

Myocarditis Recommendations

• It is reasonable for athletes resume training and competition when the following criteria are met (Class IIa):
  ▪ Cardiac biomarkers have normalized.
  ▪ Ventricular systolic function has normalized.
  ▪ Clinically-relevant ectopy and arrhythmias are absent on Holter monitor and graded exercise ECG.

• It is unresolved whether resolution of myocarditis-related LGE should be required to permit return to competitive sports.

### Graduated Return to Play Protocol

**Under Medical Supervision**

<table>
<thead>
<tr>
<th>Stage</th>
<th>Minimum Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>10 Days Minimum</td>
</tr>
<tr>
<td>2</td>
<td>2 Days Minimum</td>
</tr>
<tr>
<td>3A</td>
<td>1 Day Minimum</td>
</tr>
<tr>
<td>3B</td>
<td>2 Days Minimum</td>
</tr>
<tr>
<td>4</td>
<td>Earliest Day 17</td>
</tr>
<tr>
<td>5</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>

#### Activity Description

- **Stage 1:** Minimum Rest Period
- **Stage 2:** Light Activity
- **Stage 3A:** Frequency of Training Increases
- **Stage 3B:** Duration of Training Increases
- **Stage 4:** Intensity of Training Increases
- **Stage 5:** Resume Normal Progressions
- **Stage 6:** Resume Normal Progressions

#### Exercise Allowed

- **Stage 1:** Walking, Activities of Daily Living
- **Stage 2:** Walking, Light Jogging, Stationary Cycle, No Resistance Training
- **Stage 3A:** Simple Movement Activities E.g., Running Drills
- **Stage 3B:** Progression to More Complex Training Activities
- **Stage 4:** Normal Training Activities
- **Stage 5:** Resume Normal Progressions
- **Stage 6:** Resume Normal Progressions

#### % Heart Rate Max

- **Stage 1:** < 70%
- **Stage 2:** < 80%
- **Stage 3A:** < 80%
- **Stage 3B:** < 80%
- **Stage 4:** < 80%
- **Stage 5:** Resume Normal Progressions
- **Stage 6:** Resume Normal Progressions

#### Duration

- **Stage 1:** 10 Days
- **Stage 2:** < 15 Mins
- **Stage 3A:** < 30 Mins
- **Stage 3B:** < 45 Mins
- **Stage 4:** < 60 Mins
- **Stage 5:** Resume Normal Progressions
- **Stage 6:** Resume Normal Progressions

#### Objective

- **Stage 1:** Allow Recovery Time Protect Cardio Respiratory System
- **Stage 2:** Increase Heart Rate
- **Stage 3A:** Increase Load Gradually, Manage Any Post Viral Fatigue Symptoms
- **Stage 3B:** Exercise Coordination and Skills/Tactics
- **Stage 4:** Restore Confidence and Assess Functional Skills
- **Stage 5:** Resume Normal Progressions
- **Stage 6:** Resume Normal Progressions

#### Monitoring

- **Stage 1:** Subjective Symptoms, Resting HR, I-PPRS
- **Stage 2:** Subjective Symptoms, Resting HR, I-PPRS, RPE
- **Stage 3A:** Subjective Symptoms, Resting HR, I-PPRS, RPE
- **Stage 3B:** Subjective Symptoms, Resting HR, I-PPRS, RPE
- **Stage 4:** Subjective Symptoms, Resting HR, I-PPRS, RPE
- **Stage 5:** Subjective Symptoms, Resting HR, I-PPRS, RPE
- **Stage 6:** Subjective Symptoms, Resting HR, I-PPRS, RPE

---

**Acronyms:**
I-PPRS (Injury - Psychological Readiness to Return to Sport); RPE (Rated Perceived Exertion Scale)

**Note:** This guidance is specific to sports with an aerobic component.

---

Minimum of 7 days at each phase
Drop back a phase if finding it difficult
Only move up when progression criteria are met

**Phase 1**
Goal: preparation for return to exercise
Exercise: rest, breathing exercises, flexibility/stretching, balance, gentle walking
Suggested Rating of Perceived Exertion (RPE): 6-8

**Phase 2**
Goal: low intensity activity such as walking and light yoga, and light household/garden tasks
Exercise: graduated increases by 10-15 mins/day
Suggested RPE: 6-11
Progression: 7 days and when can walk 30 minutes at RPE 11

**Phase 3**
Goal: moderate intensity aerobic and strength challenge
Exercise: an example would be 2 intervals of 5 minute aerobic exercise separated by 1 block of recovery. Add one interval per day as tolerated
Suggested RPE: 12-14
Progression: 7 days and when can achieve 30 minute session, and feel recovered after an hour

**Phase 4**
Goal: moderate intensity aerobic and strength challenge with co-ordination and functioning skills
Exercise: 2:1 days training: recovery
Suggested RPE: 12-14
Progression: 7 days and when fatigue levels are normal

**Phase 5**
Goal: baseline exercise
Exercise: return to regular exercise pattern
Suggested RPE: >15 as tolerated

Only exercise if: you feel recovered from the previous day, no new, or return of, symptoms
Spend at least a few minutes warming up and cooling down at the beginning and end of a session respectively

- Any abnormal shortness of breath for a given activity level, or return of symptoms including temperature, lethargy or chest pain
  - Seek medical advice
- Monitor your mood. If you feel more anxious, down or low, speak to someone, and seek medical advice if you are concerned

**Borg Rating of Perceived Exertion (RPE)**

<table>
<thead>
<tr>
<th>Rating</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>No exertion</td>
</tr>
<tr>
<td>2</td>
<td>Extremely light</td>
</tr>
<tr>
<td>3</td>
<td>Very light</td>
</tr>
<tr>
<td>4</td>
<td>Light</td>
</tr>
<tr>
<td>5</td>
<td>Somewhat hard</td>
</tr>
<tr>
<td>6</td>
<td>No exertion</td>
</tr>
<tr>
<td>7</td>
<td>Extremely light</td>
</tr>
<tr>
<td>8</td>
<td>Very light</td>
</tr>
<tr>
<td>9</td>
<td>Light</td>
</tr>
<tr>
<td>10</td>
<td>Somewhat hard</td>
</tr>
<tr>
<td>11</td>
<td>Moderate</td>
</tr>
<tr>
<td>12</td>
<td>Hard (heavy)</td>
</tr>
<tr>
<td>13</td>
<td>Very hard</td>
</tr>
<tr>
<td>14</td>
<td>Extremely hard</td>
</tr>
<tr>
<td>15</td>
<td>Maximal exertion</td>
</tr>
</tbody>
</table>

Questions?

- Email: dylan.e.wessman.mil@mail.mil
References


References


  - POST-COVID-19 CARDIOPULMONARY RETURN TO EXERCISE RECOMMENDATIONS