Clinical applications of the A-STEP in cystic fibrosis

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Development of the Alfred Step Test: A-STEP

• 3-Minute Step Test: ceiling and floor effects
• CPET: gold standard – run by scientists in Physiology Lab
  - limited access for annual reviews – physiotherapists
• Alternative step tests limitations in CF:
  - not suitable for use in CF across the lifespan
  - extremely low to normal lung function
  - very low fitness levels to elite athletes
  - had floor or ceiling effects
  - not able to be completed in recommended 8-12 minutes for most people
• Space / infection control considerations
• Identified need for CF specific step test - 7 years
Process: development of the A-STEP

- Selected stable outpatients:
  - across the CF spectrum of age, lung function & fitness
- Experimented with different step heights & types
- Range of cadences & stage durations
- ATS Guidelines – CPET – gold standard – blueprint
- Aim to reach a maximal effort test in 8 to 12 minutes
- Without floor or ceiling effects
- Standardized step height – limit test variables – 20 cm
- Most suitable across the ranges
Feasibility testing

- Adults – n= 40
- Paediatrics n=10
- Gene modulators – n= 80  A-STEPs
- Compassionate access – lower lung function
- Minimum of 3 levels – lowest lung function
- Elite athletes – 15.5 levels – tall++ / national basketball team
- 16 levels to the test
- No adverse events
- Handful stopped test once desaturation <80%
- Clinical assessment for all patients for suitability
Equipment needed for A-STEP

• Portable – non-slip – adjustable Bodyworx Aerobic Step
• Metronome & timer – DenciSoft Circuit Timer App
• Adjustable settings to pace & time the A-STEP
• iPhone – iPad – iPod touch or Mac computer
• Oximeter: SpO2, heart rate and blood pressure – movement artefact
• Modified BORG scale – visible during the test
• Worksheet to record the test
• Chair: resting measurements pre- post- test
• Water available for hydration
- Starting cadence: 18 steps / minute (level 1)
- Each level increased by 2 steps per minute
- Maximum of 48 steps per minutes (level 16)
A-STEP package

- Pre-test information sheet
- Clinical assessment and instructions
- Recording worksheet
- Metronome / timer instructions
- Published in Pediatric Pulmonaryology September, 2021
- Available free of charge
- Copyright – Alfred Step Test Exercise Protocol
THE ALFRED WELLNESS SCORE - AuswellScore

You are asked to report on your present state of health in order to provide you with feedback.

Check the number that reflects your current state: 1 reflects your ideal state of being possible while 10 reflects your least ideal state.

1. I rate the amount of coughing I do each day & night as: daily
   - 10
   - 9
   - 8
   - 7
   - 6
   - 5
   - 4
   - 3
   - 2
   - 1
   - 0

2. I rate the amount of apnoea I cough up each day as:
   - 10
   - 9
   - 8
   - 7
   - 6
   - 5
   - 4
   - 3
   - 2
   - 1
   - 0

3. I rate my level of energy as:
   - 10
   - 9
   - 8
   - 7
   - 6
   - 5
   - 4
   - 3
   - 2
   - 1
   - 0

4. I rate my level of exercise participation as:
   - 10
   - 9
   - 8
   - 7
   - 6
   - 5
   - 4
   - 3
   - 2
   - 1
   - 0

5. I rate my appetite as:
   - 10
   - 9
   - 8
   - 7
   - 6
   - 5
   - 4
   - 3
   - 2
   - 1
   - 0

6. I rate my weight as:
   - 10
   - 9
   - 8
   - 7
   - 6
   - 5
   - 4
   - 3
   - 2
   - 1
   - 0

7. I rate my mood as:
   - 10
   - 9
   - 8
   - 7
   - 6
   - 5
   - 4
   - 3
   - 2
   - 1
   - 0

8. I rate my level of anxiety as:
   - 10
   - 9
   - 8
   - 7
   - 6
   - 5
   - 4
   - 3
   - 2
   - 1
   - 0

9. I rate my sleep amount & quality as:
   - 10
   - 9
   - 8
   - 7
   - 6
   - 5
   - 4
   - 3
   - 2
   - 1
   - 0

10. I rate my general health as:
    - 10
    - 9
    - 8
    - 7
    - 6
    - 5
    - 4
    - 3
    - 2
    - 1
    - 0

Comments:

Date:

Total Score:

Absences:

Alfred Health Cystic Fibrosis Service, Melbourne, Australia ©

Alfred Step Test Exercise Protocol (A-STEP) worksheet

<table>
<thead>
<tr>
<th>Level</th>
<th>Test</th>
<th>Max</th>
<th>Test</th>
<th>Rest</th>
<th>Max</th>
<th>Grade</th>
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<tbody>
<tr>
<td>Level 1</td>
<td>1 min</td>
<td>15</td>
<td>73</td>
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<td>Level 2</td>
<td>3 min</td>
<td>20</td>
<td>89</td>
<td>1</td>
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<tr>
<td>Level 3</td>
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<td>21</td>
<td>88</td>
<td>3</td>
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<tr>
<td>Level 4</td>
<td>9 min</td>
<td>21</td>
<td>86</td>
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<tr>
<td>Level 5</td>
<td>12 min</td>
<td>15</td>
<td>100</td>
<td>5</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Level 6</td>
<td>15 min</td>
<td>15</td>
<td>110</td>
<td>8</td>
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<tr>
<td>Level 7</td>
<td>18 min</td>
<td>15</td>
<td>120</td>
<td>10</td>
<td>10</td>
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<tr>
<td>Level 8</td>
<td>21 min</td>
<td>20</td>
<td>100</td>
<td>10</td>
<td>10</td>
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<tr>
<td>Level 9</td>
<td>24 min</td>
<td>10</td>
<td>100</td>
<td>10</td>
<td>10</td>
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<tr>
<td>Level 10</td>
<td>27 min</td>
<td>10</td>
<td>100</td>
<td>10</td>
<td>10</td>
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<tr>
<td>Level 11</td>
<td>30 min</td>
<td>10</td>
<td>100</td>
<td>10</td>
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<tr>
<td>Level 12</td>
<td>33 min</td>
<td>10</td>
<td>100</td>
<td>10</td>
<td>10</td>
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<tr>
<td>Level 13</td>
<td>36 min</td>
<td>10</td>
<td>100</td>
<td>10</td>
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<tr>
<td>Level 14</td>
<td>39 min</td>
<td>10</td>
<td>100</td>
<td>10</td>
<td>10</td>
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<tr>
<td>Level 15</td>
<td>42 min</td>
<td>10</td>
<td>100</td>
<td>10</td>
<td>10</td>
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<tr>
<td>Level 16</td>
<td>45 min</td>
<td>10</td>
<td>100</td>
<td>10</td>
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Total push measure:

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<th>Max</th>
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<tr>
<td>Speed</td>
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<tr>
<td>Total</td>
<td>120</td>
<td>4</td>
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Particulars reported issues for stopping:

Absences:
Clinically useful aspects of the A-STEP

• Outcome measures:
  - number of levels completed
  - desaturation with exercise - trigger sleep study
  - ability to achieve 90% of maximum heart rate
  - blood pressure response – hydration

• Monitoring exercise capacity over time – annual review
• BIA (Body impedance analysis): fat free muscle mass changes
• Assess response to changes in therapy
• Real time access to results in the clinic
• Exercise prescription and education: changes in saturations and HR
• Positive feedback from patients and MDT
• Experience in determining how hard to push complex patients – maximal test - training of new staff
• Future training to come – 1 day practical face to face course
10 point Wellness Qx
10 = best health
0 = worst health
100% = perfect health

Domains - wellness:
- Respiratory
- Physical
- Nutrition
- Psychological
- General health + sleep

<table>
<thead>
<tr>
<th>AGE</th>
<th>20</th>
<th>25</th>
<th>30</th>
<th>35</th>
<th>40</th>
<th>45</th>
<th>50</th>
<th>55</th>
<th>65</th>
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<td>190</td>
<td>185</td>
<td>180</td>
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<tr>
<td>90%</td>
<td>180</td>
<td>176</td>
<td>171</td>
<td>167</td>
<td>162</td>
<td>158</td>
<td>153</td>
<td>149</td>
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<tr>
<td>80%</td>
<td>160</td>
<td>156</td>
<td>152</td>
<td>148</td>
<td>144</td>
<td>140</td>
<td>136</td>
<td>132</td>
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<tr>
<td>50%</td>
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<td>98</td>
<td>95</td>
<td>93</td>
<td>90</td>
<td>88</td>
<td>85</td>
<td>83</td>
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</table>

**EXERCISE ZONES**

- **VO₂ Max (Maximum effort)**
- **Anaerobic (Hardcore training)**
- **Aerobic (Cardio / endurance training)**
- **Weight Control (Fitness training / fat burning)**
- **Moderate Activity (Maintenance / warm up)**

**Fox and Haskell Formula**

Future directions

• Validate the A-STEP with CPET using the K5 portable equipment

For access to the A-STEP:


References


References


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• People with CF who assisted in development of A-STEP
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