Step Activity Monitoring to Assess Functional Outcomes in EOS “Graduates”

Charles E. Johnston, MD, Wilshaw Stevens Jr, BS, Kelly A Jeans, MS
• Growing rod treatment designed to delay spinal fusion so the thorax can continue to grow, potentially increasing lung volume

• Poor PFT values have been reported in EOS grads who have undergone growing rod treatment
  ~ 50% pred FVC % and FEV$_1$ %  (SRS 2015 eposter #220)

• Clinical impression: kids with EOS are limited, not as active as their peers
OBJECTIVE

• To obtain activity data during a typical week + weekend in patients > 1yr from last GR/definitive fusion surgery (holidays excluded)

• To assess participation and daily function
  ▪ Weekday Monday-Friday
    • scheduled activity
  ▪ Weekend day Saturday-Sunday
    • self-selected activity
METHODS

• 11 patients with EOS were invited to wear a Step Activity Monitor (SAM) (StepWatch™, Modus, WA)
  ▪ Prospective IRB approved study

• Wear time included morning-bedtime excluding bathing/swimming

• Data were logged every 10sec
METHODS

- Custom Matlab (Mathworks, MA) code used for analysis

- Step Activity Data
  - Week M-F and Weekend Sat/Sun
  - Steps/day
  - Activity Time accumulated time steps are taken in the day
  - Intensity and Duration
    - >10% of Daily Activity Time in continuous (>5min) non stop activity
  - Student t-Test \( p<0.05 \)

- Correlation between SAM and PFT
  - Spearman’s Coefficient \( p<0.05 \)
RESULTS Demographics

EOS diagnoses:
- 4 congenital
- 3 idiopathic
- 2 syndromic
- 2 neuromuscular

Preop, 5 years old

Most-recent 16.2 yo
8 lengthenings, 0 complications
62.1 months since last surgery
# RESULTS Demographics

<table>
<thead>
<tr>
<th></th>
<th>EOS n=11</th>
<th>Control n=20</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age at test</td>
<td>12.6</td>
<td>13.1</td>
<td>0.592</td>
</tr>
<tr>
<td>Height</td>
<td>150</td>
<td>157</td>
<td>0.215</td>
</tr>
<tr>
<td>Weight</td>
<td>38.8</td>
<td>52.2</td>
<td>0.090</td>
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</tbody>
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<table>
<thead>
<tr>
<th></th>
<th>EOS Surgical</th>
<th>EOS PFT</th>
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</thead>
<tbody>
<tr>
<td>Last Sx months</td>
<td>42.2 23.9-66.2</td>
<td>1.2 (0.48-2.04)</td>
</tr>
<tr>
<td>Definitive Fusion</td>
<td>6/11</td>
<td>48.4 (23-80)</td>
</tr>
<tr>
<td>Observation</td>
<td>4/11</td>
<td>1.2 (0.40-2.59)</td>
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<td></td>
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<td>50.5 (15-77)</td>
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</table>
**RESULTS** Total Steps

<table>
<thead>
<tr>
<th></th>
<th>Total Steps</th>
<th>EOS</th>
<th>Control</th>
<th>EOS</th>
<th>Control</th>
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</thead>
<tbody>
<tr>
<td><strong>Weekday</strong></td>
<td></td>
<td>p=0.49</td>
<td></td>
<td>p=0.75</td>
<td></td>
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<tr>
<td></td>
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<tr>
<td><strong>Weekend</strong></td>
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- Total Steps were the same for EOS and Controls
  - Weekday and Weekend \( P = \text{ns} \)
• **Total Active Time was the same for EOS and Controls**
  - Weekday and Weekend  \( P = ns \)
RESULTS Intensity/Duration

- Fewer EOS patients chose to spend their time at a continuously high intensity level on the Weekend.
CONCLUSION

• PFT’s – underwhelming result ~50% pred value
  ▪ No correlations were found to SAM data

• Step Activity data shows that patients with EOS take the same number of steps and spend the same amount of time in Activity during the week as their peers

• Despite pulmonary “limitations”, daily activity measures suggest no significant limitation in activity or active time
Thank You