Administration of the Short Hip Osteoarthritis Outcome Score and Pain Subscale using Text Messaging

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Introduction

- **Patient reported outcomes (PROs)** are essential to value-based healthcare
- PRO administration through **paper** and **computer-based interfaces** have unique limitations
- **Text-messaging** represents an attractive alternative for PRO Collection and has been recently validated in other select PROs in hand surgery and joint replacement¹-³

**Traditional Office-Based Administration**
- complicates clinic workflow
- slows down patient visit
- Requires buy-in and training for ancillary staff
- No-show = No PRO

**Email/Web-Based Administration**
- requires internet access
- Emails to patient may be deleted or go to spam
- sometimes partially completed and forgotten
Purpose

We validated the administration of two hip-specific outcome instruments (HOOS-PS and HOOS-PAIN) using text messaging delivered outside of a clinical encounter.

**HOOS Pain**
- 10 question instrument
- subcomponent of full HOOS
- hip pain indicator
- 0-100 point scale

**HOOS PS**
- 5 question instrument
- shortened version of full HOOS
- physical function measure
- 0-100 point scale

These subcomponents of the Hip Disability and Osteoarthritis Outcome Score (HOOS) are well validated for use in evaluating changes in nonarthritic hip pain and function\(^4\text{-}^6\).
Methods

72 patients enrolled at a university-based Young Adult Hip Clinic
- demographic information (age, clinical diagnosis) collected via chart review

Enrollment Criteria
1. 15+ years of age
2. Access to cellular phone with text messaging
3. Ability to communicate in written English
4. Current hip pain or diagnosed hip condition

Study Enrollment Workflow

- Patient screened and enrolled in clinic; cell phone # collected
- Test text message sent while still in clinic to confirm setup
- In-office PROs collected via tablet computer
- Patient receives text messages the following day for repeat PRO administration

Validation of the HOOS-PS and HOOS-Pain using Text Messaging
Patient enrolls in PRO text messaging at clinic visit

- Test message sent during clinic visit
- Preferred messaging time confirmed with patient

automated text PRO questions sent the following day

- Reminder message triggered if patient does not respond within 1 hour
- Up to 3 reminder messages sent over 24 hours

Test window closes after 24 hours

- Responses stored on internal server and evaluated retrospectively by study personnel
**Methods**

Statistical Analysis\(^6\)\(^-\)\(^8\)

**Intraclass correlation co-efficients (ICC)** evaluated reproducibility
- ICC of >0.75 defined as **excellent** reproducibility
- ICC of 0.4-0.75 defined as **good** reproducibility
- ICC of <0.4 defined as **poor** reproducibility

**Power Analysis** - *a priori* power analysis indicated **63 subjects** were required for an ICC value of 0.8 (excellent reproducibility) distinguishable from 0.6 (good reproducibility)

**Correlation** - student’s t-test, chi square, Fisher’s Exact Test
**Bland-Altman plots** used for visual representation of similarity
Methods

72 patients (age 15-55, mean 31) presenting for treatment of nonarthritic hip conditions were enrolled

<table>
<thead>
<tr>
<th>Demographic</th>
<th>N</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients included in Analysis</td>
<td>64</td>
<td>100%</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>47</td>
<td>73.4%</td>
</tr>
<tr>
<td>Male</td>
<td>17</td>
<td>26.6%</td>
</tr>
<tr>
<td>Surgical Status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recent Surgery (&lt;60 days)</td>
<td>15</td>
<td>20.8%</td>
</tr>
<tr>
<td>Previous Surgery (&gt;60 days)</td>
<td>5</td>
<td>6.9%</td>
</tr>
<tr>
<td>No Prior Surgery</td>
<td>52</td>
<td>72.2%</td>
</tr>
<tr>
<td>Diagnosis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acetabular Dysplasia</td>
<td>30</td>
<td>46.8%</td>
</tr>
<tr>
<td>Impingement</td>
<td>18</td>
<td>28.1%</td>
</tr>
<tr>
<td>Labral Tear / Labral Issue</td>
<td>37</td>
<td>51.3%</td>
</tr>
<tr>
<td>Osteoarthritis (Tonnis Grade 2+)</td>
<td>5</td>
<td>6.9%</td>
</tr>
<tr>
<td>Osteochondral Defect (OCD)</td>
<td>2</td>
<td>2.7%</td>
</tr>
<tr>
<td>Femoral Version Problem</td>
<td>3</td>
<td>4.1%</td>
</tr>
<tr>
<td>Other</td>
<td>5</td>
<td>7.0%</td>
</tr>
</tbody>
</table>

Methods

72 patients enrolled

patients complete in-office PRO testing

3 patients provide incorrect phone number

69 patients receive text-message PRO questionnaires

5 patients with incomplete in-office and/or text message questionnaires

64 included in final ICC analysis

64 patients were included in the final statistical analysis
Results

We observed a high completion rate (93%) and good to excellent reproducibility (ICC 0.80, 0.72) for the HOOS PROs administered via text messaging.

<table>
<thead>
<tr>
<th></th>
<th>Mobile Phone Administration</th>
<th>Standard Administration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Completion Rate</td>
<td>93.0%</td>
<td>94.4%</td>
</tr>
<tr>
<td>Average Time to</td>
<td>1:34:19</td>
<td>0:01:43</td>
</tr>
<tr>
<td>Completion (hh:mm:ss)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Range (hh:mm:ss)</td>
<td>00:02:59 - 24:06:59</td>
<td>00:00:35 - 0:03:41</td>
</tr>
<tr>
<td>PRO Instrument</td>
<td>Intraclass Correlation</td>
<td>95% CI</td>
</tr>
<tr>
<td></td>
<td>Coefficient (ICC)</td>
<td></td>
</tr>
<tr>
<td>HOOS PAIN</td>
<td>0.80</td>
<td>0.69-0.87</td>
</tr>
<tr>
<td>HOOS PS</td>
<td>0.72</td>
<td>0.58-0.81</td>
</tr>
</tbody>
</table>
## Results

<table>
<thead>
<tr>
<th>PRO Instrument</th>
<th>Raw Score</th>
<th>Nomogram Score</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>In-Office Average (range)</td>
<td>HOOS-PS</td>
</tr>
<tr>
<td>HOOS-PS</td>
<td>8.8 (out of 20) 0-16</td>
<td>65.63 (100-32.1)</td>
</tr>
<tr>
<td></td>
<td>Text Message Average (range)</td>
<td>56.97 (100-0.0)</td>
</tr>
<tr>
<td></td>
<td>Average Difference</td>
<td>1.8</td>
</tr>
<tr>
<td></td>
<td>P value (t-test)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td></td>
<td>In-Office Average (range)</td>
<td>17.5 (out of 40) 0-31</td>
</tr>
<tr>
<td>HOOS-PAIN</td>
<td>Text Message Average (range)</td>
<td>48.59 (100.0-0.0)</td>
</tr>
<tr>
<td></td>
<td>Average Difference</td>
<td>3.0</td>
</tr>
<tr>
<td></td>
<td>P value (t-test)</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

HOOS-PS and HOOS-PAIN scores were not significantly different between in-office electronic and at-home text messaging.

*Raw Score – 0 represents no difficulty, increasing score represents increasing difficulty/pain*

*Nomogram Score - 100 represents no difficulty, and 0 represents extreme difficulty/pain*
Results
Differences between in-office and text message PRO administration

Bland-Altman plots demonstrate differences between in-office administration and at-home mobile phone delivery versus mean values for each participant’s HOOS PS and HOOS Pain score. Red lines represent upper and lower 95% agreement limits.
Conclusion

Text Message Administration of the HOOS-Pain and HOOS–PS demonstrated:

1. Good to excellent reproducibility (ICC 0.8, 0.72)
2. Equally high completion rate (93.0%) compared to in-office testing (94.4%)

Text message PRO administration remains unique in allowing access to patient outside of office setting, without requiring internet access or data connections in smartphones.

It may be a valid alternative to traditional testing.


For more information about this study, contact:

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