D3.3 Gait Speed Measurement

PI: Brian Jones, MSEE, Theodore Johnson, MD

Team: Ann Vandenberg, Ph.D
Breakout Group Objectives

• Discuss tech transfer options and outcomes measures
  • App distribution
  • Wall-mount Device
• Identify possible partners for transfer options
• Identify supplemental funding opportunities
Gait Speed Background

- Short distance (4m) gait speed predicts outcomes in older adults
- Clinical decisions by function rather than age
  - Too aggressive care in patients with limited survival (slow gait)
  - Failing to recommend care for robust, vigorous patients (fast gait)
Gait Speed Background

Women

Mrs. G: 21 years
Mrs. W: 11 years

Gait speed, m/s

Median Summa, y

Age, y

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Background: Gait speed adoption

Gait speed measurement is **NOT routinely incorporated into primary care**

- Despite potential to inform the appropriateness of health-related options such as surgery.

Lack of widespread adoption in the clinical setting likely stems from the complexity of integrating assessment into the **workflow**.
Project Purpose

PREVIOUS WORK:

- Develop a reliable, simple, and cost-effective mobile app / device to measure gait speed in clinic settings and home.
- Validate against gold standard
- Evaluate in different health settings: clinic, rehab, home health, home.

CURRENT (Year 2) WORK:

- Translate knowledge and tools into practice / product. (partial)
Developed app

App to measure short-distance gait speed on 4-meter course as a rapid method for collecting gait speed in everyday clinical and rehab settings and to compare against population norms.
Developed prototype device

**Device** to automatically measure short-distance gait speed on 4-meter course as a rapid method for collecting gait speed in everyday clinical and rehab settings.

Wall mount device installed temporarily

Demonstration of embedded install
Video demonstration of Device
Clinic Testing
Translation Efforts (Device)

• Provisional patent filed (Feb, 2018)
• Coulter Translational Program (Dec, 2017 - March, 2018)
  • Mini-Pitch
  • “technology is sufficiently mature such that main risk associated with the commercialization is market adoption. In this case, it is the OC’s recommendation to begin producing and installing devices in the clinical setting as soon as possible”
• TREAT (http://treatcenter.org) (future)
  • Pre-approved for submission for funding
  • Advised to learn more about the markets
• Patent application filed (Feb, 2019)
• VA Medical Center interest for research study
Next Steps

• Device
  • Add data recorder shield and display of multiple trials per session (requested and for tracking use)
  • Design for faster development
  • Evaluation in clinics
  • Pursue corporate partners

• App
  • AppStore release
Partner / Tech Transfer Questions

- What are the tech transfer opportunities?
  - For app?
  - For device? Licensing?
- Who would be good partners to consider to match with transfer opportunities?
  - For app?
  - For device?
- Building on recommendations of tech transfer and partners, what funding opportunities should be considered?
Thank you

Brian D. Jones
Brian.jones@imtc.gatech.edu
Past Project Methods: Survey Needs Assessment

Developed and conducted needs assessment survey of **25** subject matter experts related to their use of gait speed in clinical/research settings, home.

| Some Key Survey Results                                                                 |  
|-----------------------------------------------------------------------------------------|---
| Gait speed is predictive of functional performance                                      | 76%  
| Gait speed is reliable proxy for frailty                                                | 68%  
| Gait speed is a good way to assess progress.                                            | 68%  
| Preferred stopwatch for gait speed measurement (existing solutions)                     | 90%  
| Conducting a gait speed test as determined necessary                                   | 60%  
| Conducting gait speed tests at every visit                                               | 20%  
| Gait speed is #1 measure for lower body functional abilities followed by TUG            |  
| Gait speed is measured on a variety of courses.                                         |  

## Focus Group Results: Potential Barriers

<table>
<thead>
<tr>
<th>Technical interference by objects needed by patients</th>
<th>Hand rails</th>
<th>Assistive devices</th>
<th>Equipment (e.g., oxygen tanks)</th>
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<tbody>
<tr>
<td>Patient safety during ambulation</td>
<td><strong>Fall risk</strong></td>
<td>Potential for patient rushing for better performance</td>
<td>Need for staff to have hands free to assist as needed</td>
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<tr>
<td>Psychological effects of assessment</td>
<td>Fear of results</td>
<td>Self-conscious gait performance</td>
<td>Defensive reaction to test and results</td>
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<tr>
<td><strong>Work flow burden</strong></td>
<td>Location of 4 meter course with minimal clinic <strong>disruption</strong></td>
<td><strong>Extra work</strong> of timing gait speed</td>
<td>Extra work documenting gait speed in EMR</td>
</tr>
</tbody>
</table>

Staff agreed that gait speed measurement had value and expressed willingness to measure it.
Focus Groups: Clinic Staff

N = 10 clinical staff
  – 5 at primary care clinic
  – 5 at geriatric outpatient clinic

Who: registered nurses, licensed practical nurses, and medical assistants who conduct routine patient intake assessments

Goal: to assess preferences and potential implementation barriers

Topic:
• Current procedures used and knowledge of gait speed
• Test impact of gait speed measurement on workflow
• Test reaction to app and device
Validation

Conducted validation of the device and app (stopwatch) against $80k pressure-mapping mat at Emory Brain Health

Accuracy: Differences between systems

Device vs Mat  0.0299 +/- 0.047 m/s
App vs Mat     0.0588 +/- 0.047 m/s
App vs Device  0.0289 +/- 0.050 m/s

10 participants
82 walks
Testing by SME Focus Groups

Conducted informal test with device installed in Wesley Woods Health Center to allow researchers time to experiment.

- 7 researchers who conduct gait speed measures.

Likes:
- Hands free measurement (safety and convenience)
- More precise than stopwatch
- Placement of blue button allows accel/decal area, so patients won’t guess at stop line.
- Measuring shoulder seems more accurate than foot
- Blue button makes system look like game – fun

Dislikes / improvements:
- Instructions too complex
- Walking behind would not help patient w/ Parkinson’s festinating
- Some errors encountered (certain flowing dress wouldn’t trigger, erroneous long time in one trial)
- Issue of other people in the space – suggested indicator Test in Progress
- Button press could be reduced to single press to reset.
- Results recall
Validation Results

- Mat calculates speed based on stride length and speed from foot falls
- App has inherent human error based on determination of foot crossing.
- Device uses shoulder height speed
- App and Device correlated fairly well
- App and Device deviated similarly from mat at faster speeds.
Validation Results

All trials Gait Speed of participants 10 ppts x 8 trials

- Mat Speed
- App Speed
- Device Speed
Validation Results

10 Participant’s Trials (8) versus Device Gait Speed