Exploring the Feasibility of Gait Monitoring and Falls in the Homes of Persons with Multiple Sclerosis

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Introduction

• Due to the progressive nature of the disease, persons with MS (PwMS) experience worsening symptoms and gait variability, which places this population at a high risk for falls.

• Studies have shown that gait characteristics may be analyzed to assess fall risk in addition to being a diagnostic marker of progression. (Benedetti et al. 2012; Galli et al, 2015)

• The use of a monitoring system in the homes of PwMS may allow for targeted gait and symptom management, fall prevention strategies, and early treatment for symptom and disease progression.

Objectives

• The objective of this study was to describe the feasibility and validity of depth sensors to monitor gait and falls in the homes of PwMS over a period of 30 days.

Methods

• Clinical gait measures: Timed-Up and Go, Timed 25-foot walk test (T25FWT), and the Six minute walk test (6MWT).

• To validate fall risk with the sensor system, each participant completed a 30-day fatigue/pain/fall log.

• In home-gait systems using the depth sensors were installed in the main living area of each home (Fig. 2) (SensorForesite Patientcare™ System) (Rantz et al, 2014)

• The depth image was processed to compute gait parameters of stride time, stride length, and velocity.

• The average in-home gait speed (AIGS) of a subject for a given day was computed as a weighted average of gait speed from all segmented walks in their home during the prior seven days.

Results

21 PwMS were contacted about participating in the study.

• Six failed screening due to not meeting fall eligibility, and one subject did not qualify due to having a relapse.

• Seven PwMS did not want to participate due to privacy concerns.

• A final total of seven PwMS participated (Table 1)

• Four PwMS reported positively during interview on the acceptibility of the sensors as method to detect gait and falls.

• Four subjects had 30 days of continuous recordings.

Sample Characteristics

Table 1. Demographic and Clinical Sample Characteristics

<table>
<thead>
<tr>
<th>Sex, n (% n)</th>
<th>Male</th>
<th>Female</th>
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<tbody>
<tr>
<td></td>
<td>3 (42.9)</td>
<td>4 (57.1)</td>
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<tr>
<th>Race, n (% n)</th>
<th>White</th>
<th>African American</th>
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<td></td>
<td>5 (71.4)</td>
<td>2 (28.6)</td>
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| Age (years), mean (SD) | 50.7 (9.2) |

| Years since diagnosis, mean (SD) | 12.2 (8.2) |

| Self-report EDSS, median (IQR) | 5 (4.5, 6.0) |

| MS Walking Scale-12, median (IQR) | 62.5 (60.4, 68.8) |

| Timed 25 foot walk (seconds) | 7.6 (7.1, 8.5) |

| 6 Minute Walk (feet) | 1587 (450,1188) |

| Timed Up and Go (seconds) | 15.5 (13.8, 20.4) |

Conclusion

• Our study has the strength of the positive interview feedback from the participants as to the usefulness of these sensors for future studies.

• Limitations included small sample size, sensor placement limitations in capturing falls, and privacy concerns.

• This technology has the potential to provide an accurate and measure of in home gait parameters in PwMS, leading to improved detection of disease progression.

References

