Stop that Slip! Brace Support and Tracker

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Introduction

Our Mission: to solve the problem of reliance on patient self-reporting and migration associated with hinged knee braces

Our Proposed Solution Includes: a retrofitted angular tracking device (ATD) with a web app interface and a brace support harness

Clinical Need

- 76.6% of anterior cruciate ligament (ACL) injuries require surgery and brace usage¹
- Only 28% of patients comply with prescribed hinged knee brace usage³ - Why?
  - Brace migration from improper fit

Need: Device(s) to address issues usage tracking and brace migration for users of hinged knee braces

Product Testing

Angular Tracking Device (ATD)
- Static Test: Accuracy and precision of ATD
- Test Plan: Use goniometer to measure knee angle and compare to captured data from tracker

Design Overview

Angular Tracking Device (ATD)
- Low-cost, lightweight Arduino-compatible components
- Knee angle recorded through rotation of a potentiometer attached to the brace hinge
- Electronics housed in a 3D printed case (Lulzbot TAZ 6)
- Graphic User Interface (GUI) available as a MATLAB web app to analyze angle data between days

Brace Support Harness (BSH)
- Uses tension to resist downwards migration of the brace
- Connects to the lateral bars of the brace where more weight is located
- Adjustable length allows for better fitting
- Secure attachment for daily use

Results:
- Brace migration over time was higher during control tests
- BSH demonstrates potential to hinder brace migration

Market Analysis

Target Market
- Purchasers: hospitals and care centers
- Users: patients using hinged knee braces

Potential for Reimbursement
- Reimbursable through Medicare and Medicaid with doctor’s prescription

Patentability and Cost

Patentability²,⁶
- Difficult to patent due to recently published patents in the pipeline

Manufacturing Costs
- $112.28 ATD + $32.99 BSH = $145.27 Total Cost

Future Work

- Further testing of brace support harness for more conclusive results
- Alternate attachments of harness to brace
- Manufacture the harness as a single unit
- Dynamic testing of the ATD

Acknowledgements

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References

¹. Anterior Cruciate Ligament (ACL) injuries require surgery and brace usage
². Difficult to patent due to recently published patents in the pipeline
³. Low-cost, lightweight Arduino-compatible components
⁴. Global orthopedics market: $3.3 billion
⁵. Projected to reach $5.3 billion by 2025
⁶. Reimbursable through Medicare and Medicaid with doctor’s prescription

Table 1: Overview of Costs

<table>
<thead>
<tr>
<th>Area of Expenditure</th>
<th>Cost (USD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Angular Tracking Device (ATD)</td>
<td></td>
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<tr>
<td>ATD Components*</td>
<td>$36.00</td>
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<tr>
<td>ATD Case*</td>
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<tr>
<td>MATLAB</td>
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<tr>
<td>Harness</td>
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<tr>
<td>SUSPENDER STRAPS</td>
<td>$10.00</td>
</tr>
<tr>
<td>QUALITY CORRECTOR</td>
<td>22.99</td>
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<tr>
<td>Total Cost for Single Device</td>
<td>$145.27</td>
</tr>
</tbody>
</table>

*Includes cost of tools/components used in manufacturing