Who are we?
M-HEAL

- Parent Organization
- Global Health / Design
MEND

- Founded in 2017
- Developing mobility & fall intervention solutions for older adults
Problem Environment
Among older adults (65+)

- >33% fall every year.
- <25% are using mobility / assistive devices.
- Device usage is more prevalent for top 25% socioeconomic bracket.
Among device users:

- 75% do not have their device when they fall.
- 50% have received proper use training.
- 4000+ per year hospitalized due to falls with device.
Current Work / Progress
Design Cycle

Interview Older Adults -> Analyze Data

Generate User Personas

Create Fall / Device Statistics

Design Device

Re-Edit Questions
• Turner Geriatric Clinic
• 3 Question Focuses:
  1. Where, when, and why do people fall?
  2. How can devices be made to better deal with falls?
  3. How can we promote more and proper usage?
Fall Location

Fall Cause

* Based on n=28 interviews from the Turner Geriatric Clinic; ongoing study
Fall Location

<table>
<thead>
<tr>
<th>Location</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stairs</td>
<td></td>
</tr>
<tr>
<td>Outdoors</td>
<td></td>
</tr>
<tr>
<td>Athletic Location</td>
<td></td>
</tr>
<tr>
<td>Home</td>
<td><strong>High</strong></td>
</tr>
<tr>
<td>Indoors</td>
<td></td>
</tr>
<tr>
<td>No Fall</td>
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</tbody>
</table>

Suggests people most often fall **at home** - where they are least likely to use/have their device.

* Based on n=28 interviews from the Turner Geriatric Clinic; ongoing study
The reasons for falls are extremely multivariable, but are most often associated with a physical interruption.

* Based on n=28 interviews from the Turner Geriatric Clinic; ongoing study
Interviews

• Turner Geriatric Clinic
• 3 Question Focuses:
  1. Where, when, and why do people fall?
  2. How can devices be made to better deal with falls?
  3. How can we promote more and proper usage?
Designs

- Defined User Needs:
  1. Promote usage
  2. Improve safety
  3. Improve mobility
  4. Improve situational awareness
  5. Optimize truncal position
Timeline

Research → Electrical + Mechanical → Build

Next semester
Solution Approach

1. Analysis of different base designs
2. Sensor based warning system
3. Modifiable design to optimize truncal position
Questions?
Image sources

https://www.clipartmax.com/download/m2i8i8b1Z5i8K9K9_research-clip-art-free-transparent-research-clipart/ - magnifying glass


https://www.flickr.com/photos/nextfabstudio/10411320983 - solidworks logo

https://twitter.com/comsol_inc - COMSOL logo

Statistics Sources

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4439269/
https://academic.oup.com/gerontologist/article/57/2/211/2631943
https://journals.sagepub.com/doi/pdf/10.1177/089826439801000106
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4439269/
https://academic.oup.com/gerontologist/article/57/2/211/2631943
Pocket Slides
External Contacts

External Advisors:
1. Dr. Neil Alexander (UM Geriatrics)
2. Dr. James Richardson (UM Physical Medicine)
3. Dr. Mary Janevic (School of Public Health)
4. Mitch Baldwin (MDP Stryker)
5. Leena Lalwani (UM Library Grant Mentor)

Community Partners
1. Assisted Living Communities:
   University Living, Lurie Terrace, Gilbert Residences
2. Potential New Communities
   a. Turner Clinic
   b. VA Ann Arbor
Goals

February 2019: Finish literature review

March 2019: Finish collecting needs assessment data

April 2019: Utilize data from research and interviews to motivate design ideation and prototyping
Literature Review

1. Walker user sizes
2. Gait info - kinesiology
3. Posture recommendations
4. How older adults best respond to different stimuli
5. Fall mechanics research
6. Collision sensor technology
7. Types of mobility users are limited to when using a device
Benchmarking

- Space has few-to-no innovations, completely unsaturated
- Innovations involve intricate and complicated systems
- Standard in-house procedures are still response-focused

U-Step Walker

Brigham and Women’s Fall Prevention Protocol
User Requirements and Design Specifications

https://docs.google.com/document/d/19ONXivCHOoZDjU0eDJqDagLOhWJtzktv3JfUTwYGuiE/edit?usp=sharing