

Austin Wang
01/19/19

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

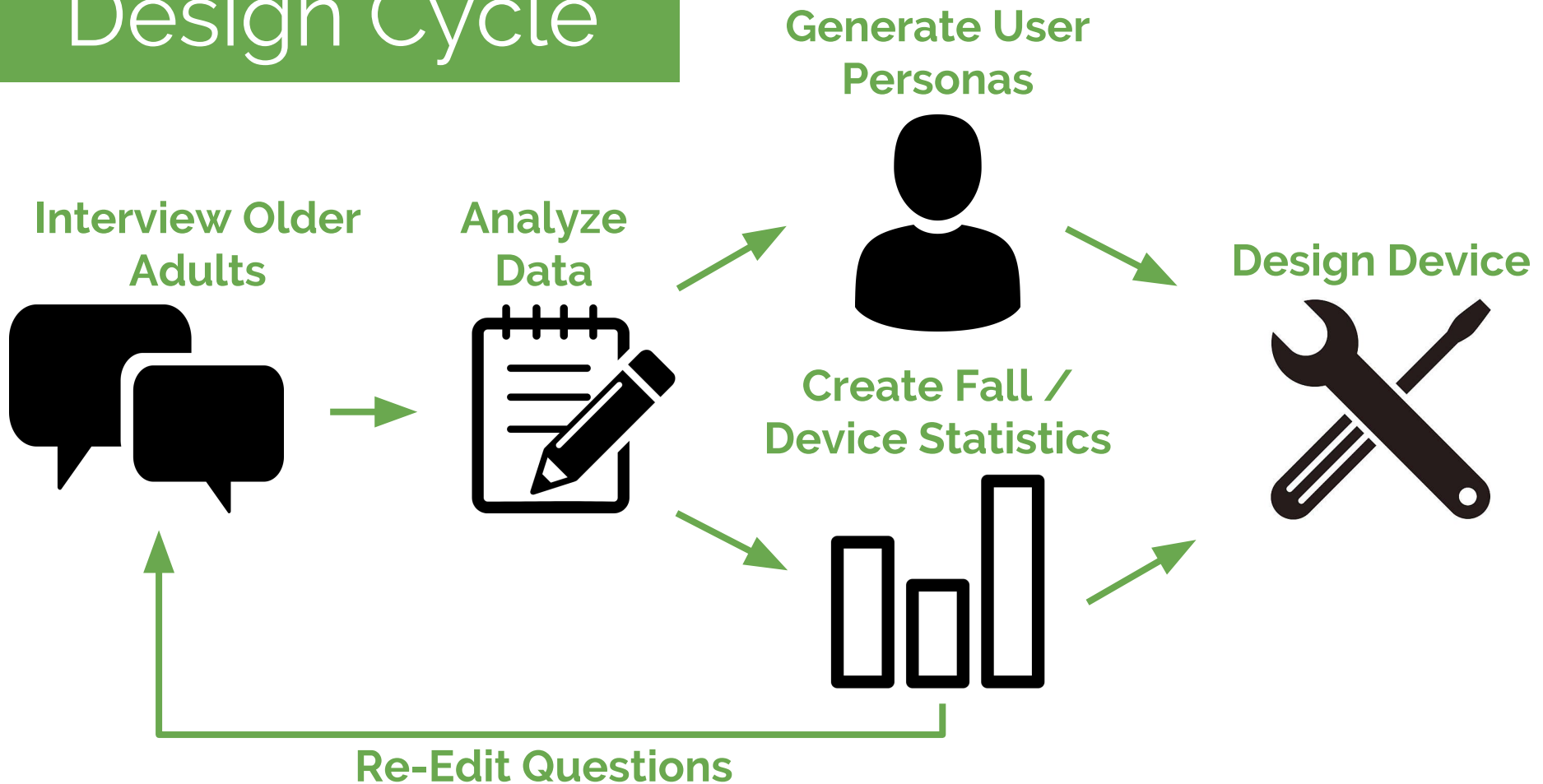
75% do not
have their
device
when they
fall

50% have
received
proper use
training

4000+ per year
hospitalized
due to falls
with device

Current Work / Progress

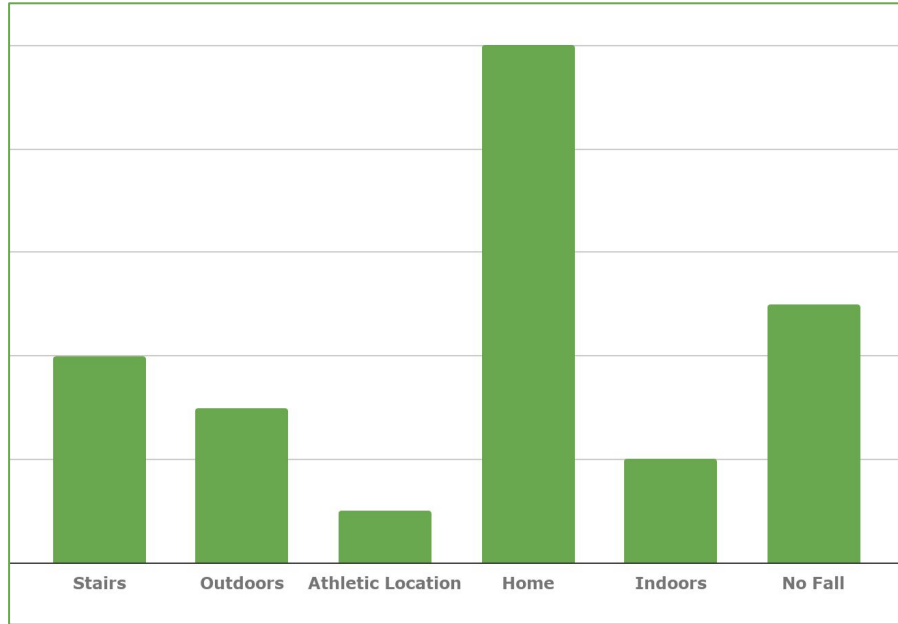
Design Cycle



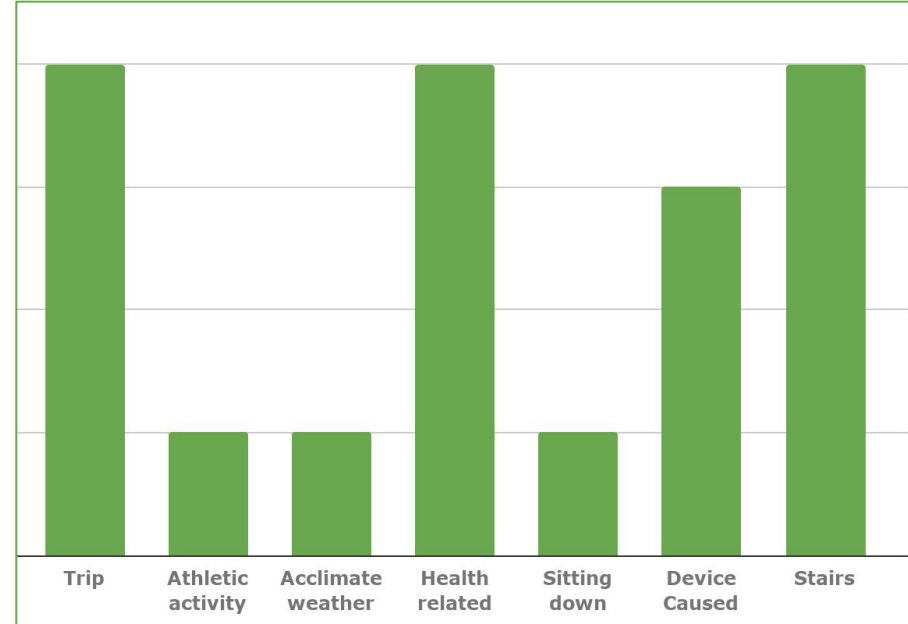
Interviews

- 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?

Fall Location

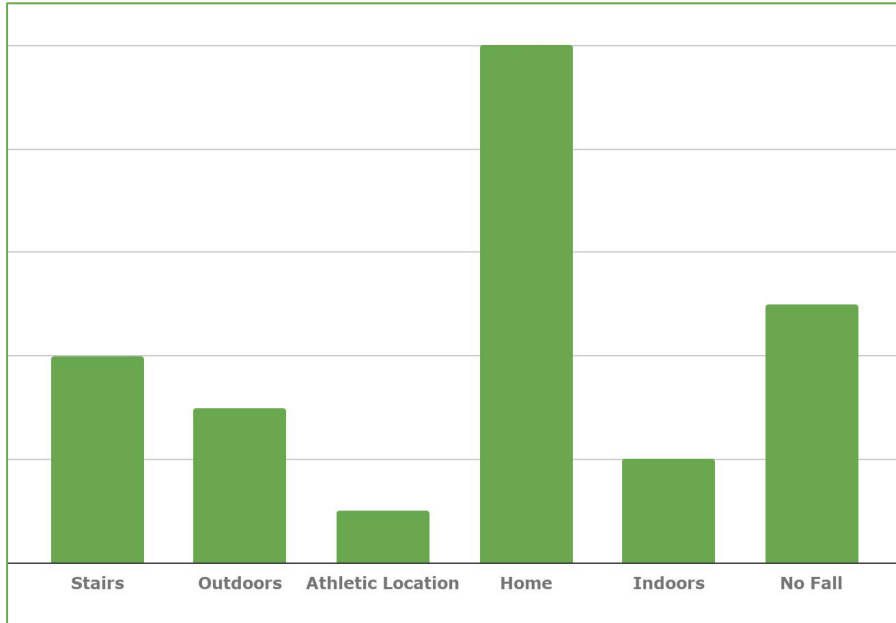


Fall Cause



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

Fall Location

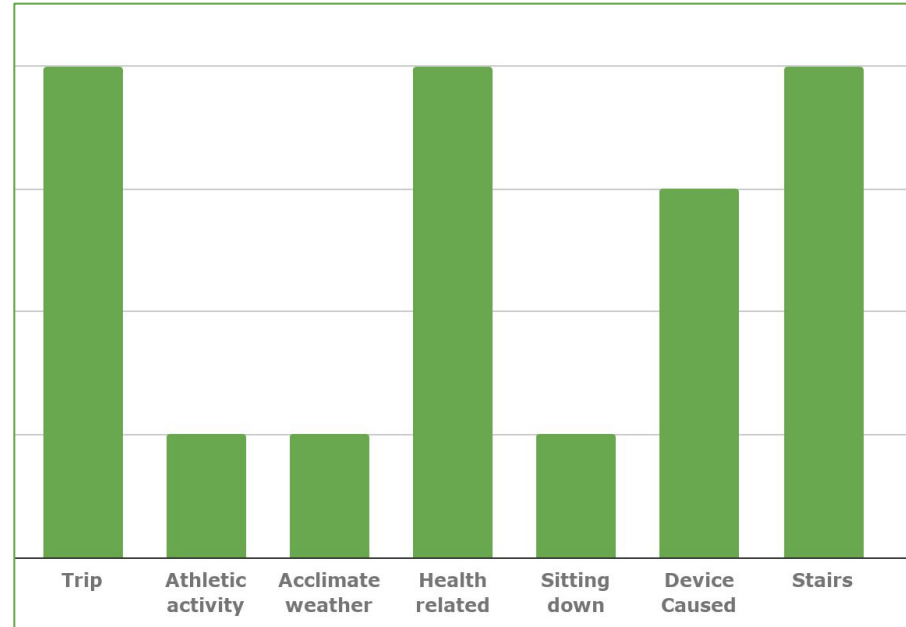


Suggests people most often fall **at home** – where they are least likely to use/have their device

* 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**

Fall Cause



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

Interviews

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Design Approaches

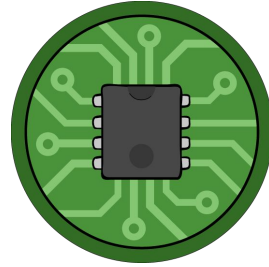
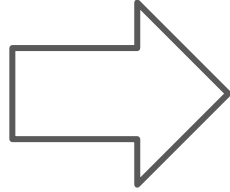
Designs

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

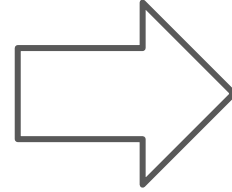
Timeline



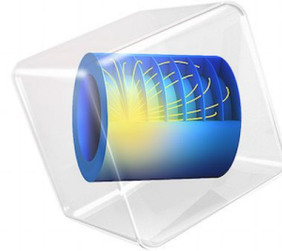
Research



Electrical



Build



Mechanical

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.kisspng.com/png-printed-circuit-board-electronic-circuit-electroni-847406/> - circuit board

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

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

<http://darlenefranklinwrites.com/bow-down-clipart/new-bow-down-clipart-our-services-mechanical-design-engineering-electronic/> - Wrench

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

Patient Name: _____		Date: _____	
Fall Risks (Check all that apply)		Fall Interventions (Circle selection based on color)	
History of Falls <input type="checkbox"/>	Medication Side Effects <input type="checkbox"/>	Communicate Recent Falls and/or Risk of Harm 	Walking Aids Crutches Cane Walker
Walking Aid <input type="checkbox"/>	IV Pole or Equipment <input type="checkbox"/>		IV Assistance When Walking
Unsteady Walk <input type="checkbox"/>	May Forget or Choose Not to Call <input type="checkbox"/>	Bed Alarm On 	Assistance Out of Bed 1 person 2 people
You are at high risk for injury if you fall! <input type="checkbox"/> <input type="checkbox"/> Age: 85 years old or older; frailty <input type="checkbox"/> Bones: osteoporosis, risk or history of fracture, etc. <input type="checkbox"/> Coagulation: risk for bleeding, low platelet counts or taking anticoagulation <input type="checkbox"/> Surgery (recent): lower limb amputation, major abdominal, or thoracic surgery		<small>Fall TIPS ©Brigham & Women's Hospital 2016; do not alter without written permission.</small>	

Brigham and Women's Fall Prevention Protocol



User Requirements and Design Specifications

<https://docs.google.com/document/d/19ONXivCHOOZDjU0eDJqDagLOhWJtzktv3JfUTwYGuiE/edit?usp=sharing>

