



Department of
Biomedical Engineering
UNIVERSITY OF WISCONSIN-MADISON

Medication delivery and use in home-based hospital care

Team Members: Aariel Moore, Alayna Allsop, Sascha Jameson,
Caiden Krzmarzick, Sarvesh Anandhaganesen, Sila Olcay

Advisor: Dr. Randy Bartels

Client: Dr. Jennifer Woodard

10/02/2025

Overview

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Problem Statement

- HBHC patients open their own medication
- Weak grip and low vision make blister packs hard to open
- Result: missed doses, unsafe workarounds
- Need: low-force handheld opener; packaging intact
- Low-cost, portable, reusable, no exposed blades



Figure 1: Blister Medication Packaging [1]

Client Information

- Client: Home-Based Hospital Care (HBHC) at UW-Health
- Jennifer Woodard, primary client
- Mandy McCowan, head of home-based hospital care
- Erin, associate medical director (inpatient)



Figure 2: Jennifer Woodard, primary client [2]



Figure 3: HBHC at UW-Health logo [3]

Background: Who is affected?

- Adults 18+, mostly 60+
- Reduced grip: arthritis, post-stroke contracture, muscle atrophy
- Many also have low vision
- Must self-administer daily blister-pack doses at home



Figure 4: Opening Blister Medication Packaging [4]

Competing Designs



Figures 5&6: Portable Pill Popper [5]

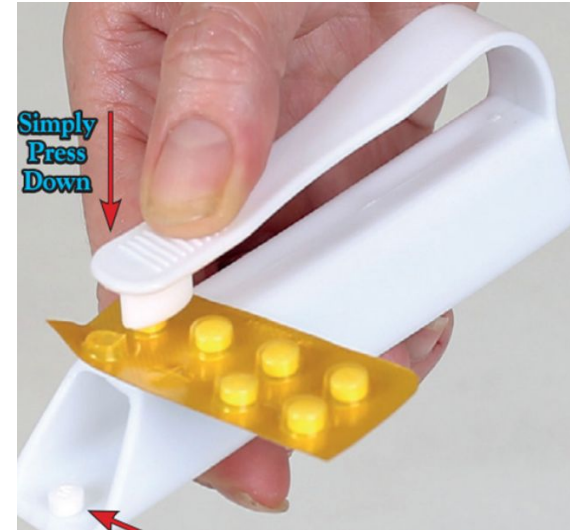


Figure 7: Easy Open Pill Popper Tool [6]

Product Design Specifications

Performance

- Opens a variety of medication packaging
- Pierces tough foil without crushing medication
- Designed for repeated daily use (20+ medications/day)
- Requires minimal force for users with reduced grip strength

Ergonomics

- Accommodates users with reduced grip strength
- Favors a power grip rather than a pinch grip
- Grip diameter target: 30–50 mm

Safety & Reliability

- Prevents medication from being crushed or damaged
- Limits exposure to sharp components

Size & Portability

- Compact and lightweight
- Maximum overall size: approximately 150 × 100 × 50 mm

Design 1 - “Switchblade”

- Square push button activates blade mechanism
- Internal slider/linkage extends blade through opening
- Spring returns blade to retracted position after release
- Curved lower opening guides blade and medication packaging
- Compact design allows controlled, low-force operation

Sila

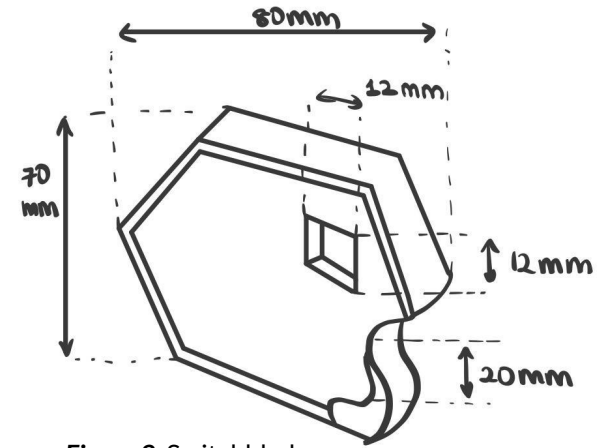


Figure 8: Switchblade

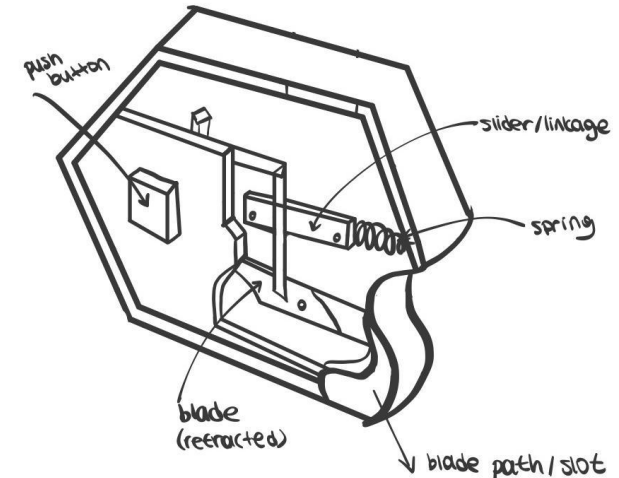


Figure 9: Switchblade Mechanism

Design 2 - “Push, Cut, Pop”

- 2 components connected by rails the top can slide along
- Point in the bottom pierces the foil backing
- Top component pushes against the plastic side with applied force

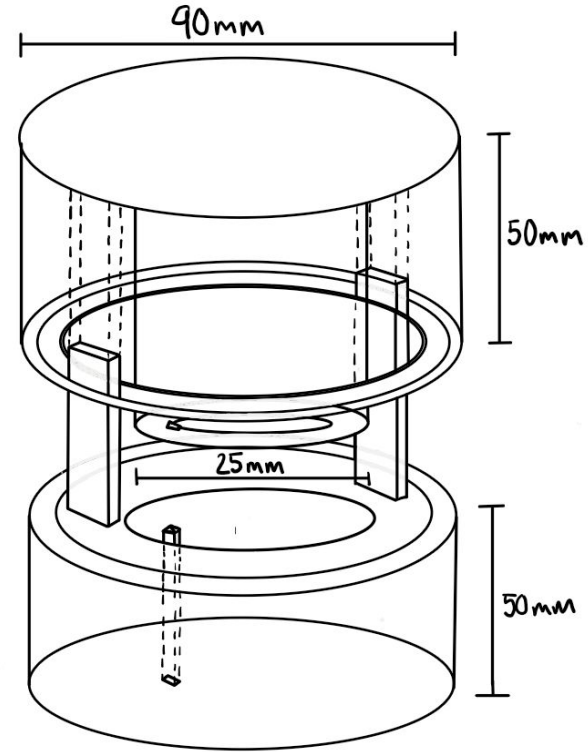


Figure X: Push, Cut, Pop Drawing

Design 3 - “Salad Spinner”

- Pushing on the top actuates the spinning component
- Spiral drill pushes against the plastic packaging side
- Point of contact is flat to minimize breaking

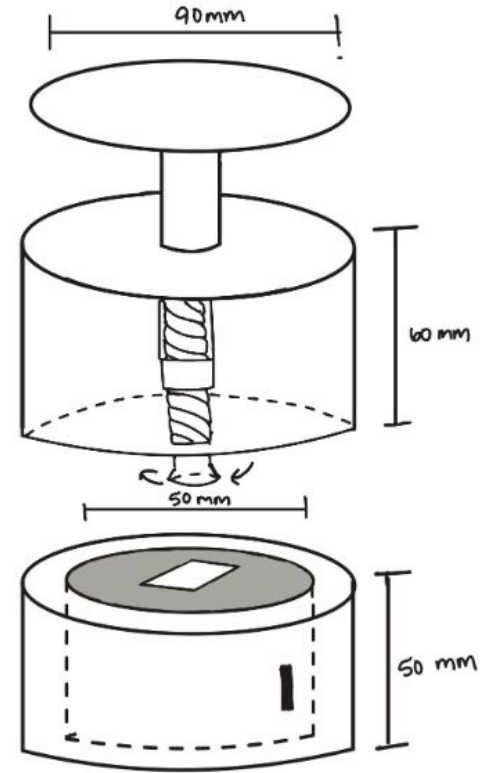
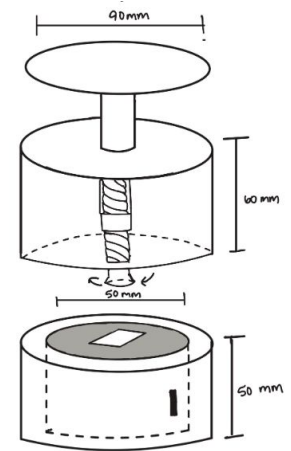
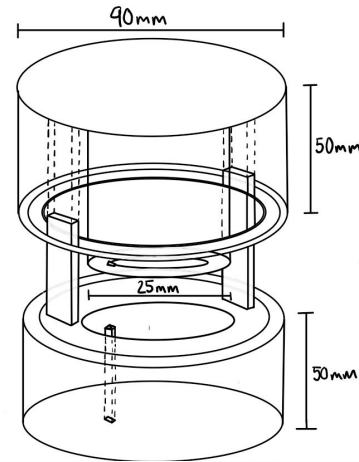
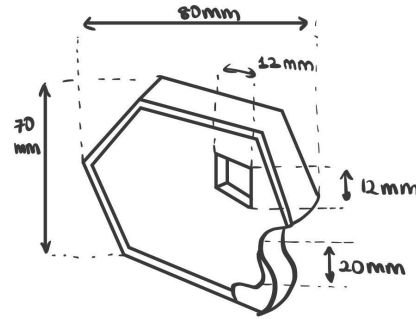


Figure X: Salad Spinner Drawing

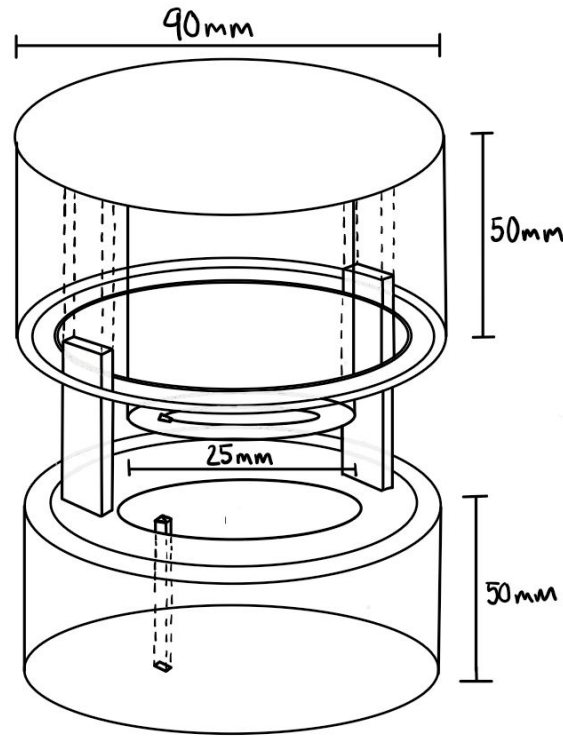
Design Matrix

Table 1: Design Matrix



Rank	Criteria	Total Possible Points	Switchblade			Push, Cut, Pop			Salad Spinner	
			Score/10	Weighted		Score/10	Weight		Score/10	Weight
1	Minimal Actuation Force	25	6	15		8	20		5	17.5
2	Simplicity/Ergonomics	20	8	16		9	18		8	16
3	Patient Safety	20	5	10		8	16		8	16
4	Ease of Fabrication	15	4	6		7	7		6	6
5	Reliability	10	6	6		9	9		7	7
6	Portability	10	9	9		7	7		7	7
Total		100		62			77			69.5

Final Design



Testing Plans

Quantitative Testing:

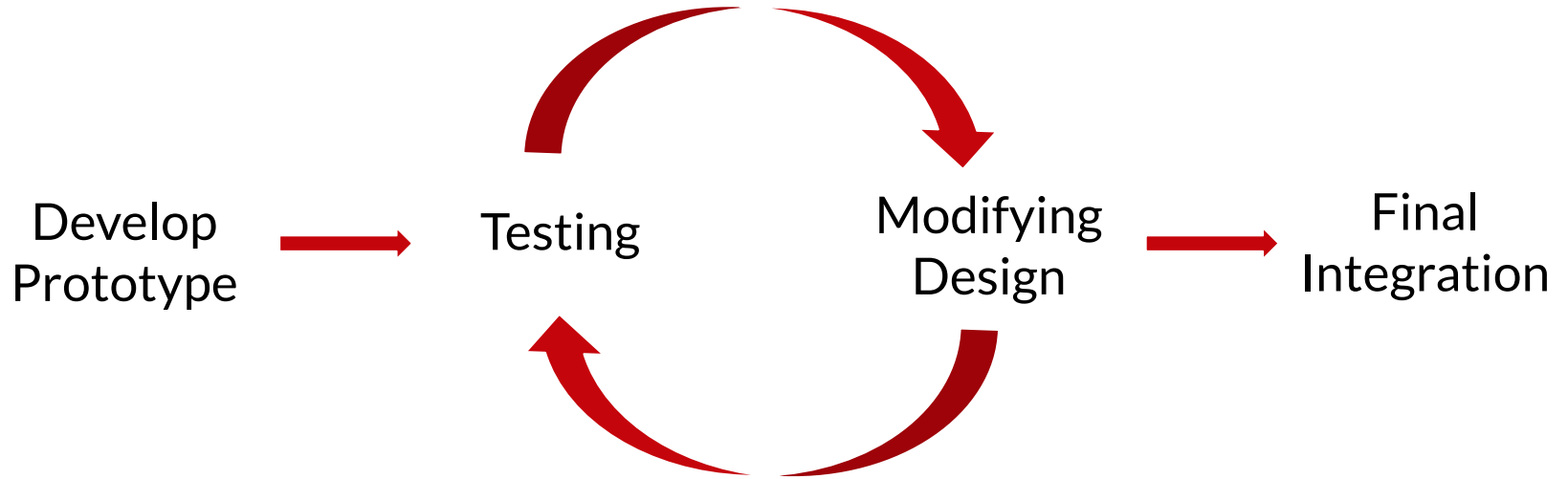
- Actuation Force
 - MTS testing to measure force required to operate device
 - Compare to force required to open blister pack directly
- Successful Pill Removal
 - Measure successful pill removal rate
 - Test across different packages
- Durability/Reliability
 - Repeatedly open package with the same prototype and assess condition of device

Qualitative Testing:

- Ergonomics & Comfort
 - Evaluate grip and ease of use
- Safety
 - Examine for exposed blades and sharp edges
 - Assess likelihood of injury while using



Future Work



Acknowledgements

Thank you to, Dr. Bartels, Dr. Woodard, and Mandy McGowan for your continued guidance and support, we look forward to moving forward with you guys!!

References

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- [4] “Pharmacy Blister Packs: Protecting Medication and Patient Safety - Pharmaceutical Machinery Manufacturer & Supplier In China,” *JINLUPACKING*, Dec. 2025. <https://www.jinlupacking.com/blogs/pharmacy-blister-packs-medication-safety/> (accessed Sept. 30, 2026).
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