ElderCare Plain-Language AI: Reducing Cognitive Burden in Medical Instruction Understanding for Older Adults

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01 Social Good Problem

- Older adults often receive written medical instructions after a clinic visit.
- These instructions are often dense, text-heavy, and hard to turn into action.
- Misunderstanding may cause wrong medicine use, missed follow-up, or unsafe responses to symptoms.
- This is a social good problem because it affects health communication, patient safety, and independence.

02 Target Users and Context

- The primary users are older adults who review medical instructions after a clinic visit.
- The tool is designed for post-visit use, not during the consultation.
- Users may be alone at home or depend on family members for help.
- Caregivers are also important stakeholders because they often help explain and apply the instructions.

03 Proposed Technological Solution

- The proposed solution is ElderCare Plain-Language AI.
- It is a mobile tool that allows users to photograph or paste doctor-provided written instructions.
- The system reformats the original text into a simpler, low-burden structure.
- The goal is to support understanding, memory, and action.
- The system is not designed to create new medical advice.

03 Proposed Technological Solution: Key Features

- One key takeaway sentence shows the most important message.
- Three concrete action steps explain what to do, when to do it, and what to watch for.
- A memory prompt card provides checklist and calendar-style reminder support.
- Icons and grouped sections reduce visual and cognitive overload.
- A clear disclaimer explains that the tool does not replace medical advice and urgent or unclear issues should still be checked with a clinician.

04 Psychological Principles and Expected Behavioral Effects

Cognitive Load Theory

the design reduces unnecessary mental effort by chunking information into smaller and clearer parts.

External Cognition

checklists and reminders act as visible memory support.

Memory Encoding and Recall

short and action-based information is easier to remember than dense written text.

Gulf of Evaluation / Gulf of Execution

the design helps users understand what happened and what to do next.

Overall, the expected effect is better understanding and more accurate action in practice.

05 Relevant Sources Supporting the Idea

- Previous research shows that older adults often have difficulty understanding discharge and medication instructions.
- Studies also show that health literacy is linked to medication understanding and adherence.
- Simplifying and structuring health information can reduce cognitive burden and improve comprehension.
- Visualized and time-based medication instructions may improve understanding compared with less concrete formats.
- These sources support both the practical need for the tool and the logic behind the design.

06 Rough Hypotheses

H1

The AI-supported version will improve immediate comprehension.

H2

The AI-supported version will improve one-week delayed recall.

H3

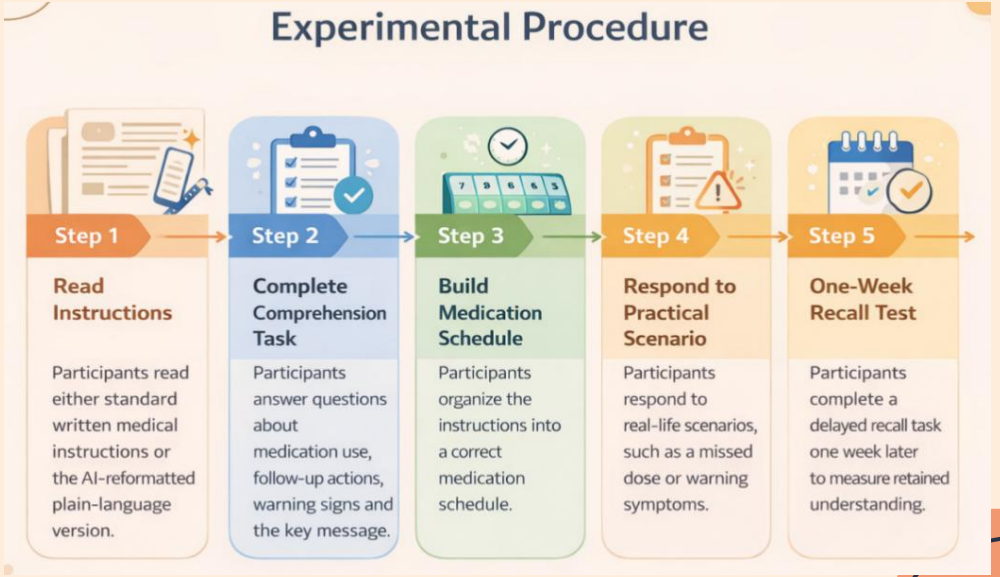
The AI-supported version will improve practical execution of instruction-based tasks.

H4

The AI-supported version will reduce the perceived need for family or caregiver clarification.

07 Initial Test Plan

- The project can be tested with a scenario-based comparative study.
- The design includes two conditions: a control condition and an experimental condition.
- The control condition uses standard written medical instructions.
- The experimental condition uses the same medical content reformatted by ElderCare Plain-Language AI.
- Participants will complete comprehension, schedule-building, practical response, subjective rating, and one-week recall tasks.



08 Main Variables

Independent Variable

Instruction format

- Standard written instructions
- AI-reformatted plain-language instructions

Right side – Dependent Variables

- Comprehension accuracy
- Delayed recall accuracy
- Execution accuracy
- Operational error rate
- Perceived difficulty / cognitive burden
- Perceived need for caregiver clarification

09 Measures: Performance Measures

- **Immediate Comprehension Score:** measures understanding of medication use, follow-up actions, warning signs, and the key message.
- **Medication Schedule Construction Score:** measures whether participants can build a correct medication schedule.
- **Applied Execution Score:** measures how well participants respond to practical scenarios such as missed doses or warning signs.
- **Delayed Recall Score:** measures how much important information participants still remember one week later.

09 Measures: Subjective and Efficiency Measures

- **Operational Error Rate:** measures mistakes that may lead to unsafe or incorrect real-world behavior.
- **Perceived Difficulty**: measures how hard the instructions feel to understand.
- **Action Confidence**: measures how confident participants feel about what to do next.
- **Caregiver Clarification Burden**: measures how much help participants think they need from family or caregivers.
- **Task Completion Time**: measures the time needed to understand the instructions and complete the tasks.

Reference

Haimovich, A. D., Mulqueen, S., Carreras-Tartak, J., et al. (2024). Discharge instruction comprehension by older adults in the emergency department: A systematic review and meta-analysis. Academic Emergency Medicine. https://pubmed.ncbi.nlm.nih.gov/39264024/

Gentizon, J., Bovet, E., Rapp, E., & Mabire, C. (2022). Medication literacy in hospitalized older adults: Concept development. SAGE Open Nursing, 8. https://pmc.ncbi.nlm.nih.gov/articles/PMC8973764/

Schönfeld, M. S., Berens, E.-M., & Kaduszkiewicz, H. (2021). Self-reported health literacy and medication adherence in older adults: A systematic review. BMJ Open, 11, e056307. https://bmjopen.bmj.com/content/11/12/e056307

Sharko, M., Wilkey, K., Wallace, L. S., & Dolansky, M. A. (2022). Strategies to optimize comprehension of numerical medication instructions: A systematic review and concept map. Patient Education and Counseling, 105(7), 2131–2143. https://pmc.ncbi.nlm.nih.gov/articles/PMC9203902/

Leppink, J., & Van den Heuvel, A. (2015). The evolution of cognitive load theory and its application to medical education. Perspectives on Medical Education, 4, 119–127. https://link.springer.com/article/10.1007/s40037-015-0192-x PubMed: https://pubmed.ncbi.nlm.nih.gov/26016429/

Nielsen Norman Group. (2018, March 11). The two UX gulfs: Evaluation and execution. https://www.nngroup.com/articles/two-ux-gulfs-evaluation-execution/

Thank You!