PMR

Patient Monitoring Robot

December 17th, 2022

Team Members

Aditya Raj

Ekkachai Jet Ittihrit

Jack Edward Schofield

Null Atwood

Rohan B Ballapragada

Travis Hudson

Zachary Michael Smith

Zachary A Taylor

Table of Contents

Facets

- **Life goals:**
  - Values:
    - Low: The individual is not concerned with maintaining their independence or staying connected with their family. They are not interested in participating in activities.
    - High: The individual places a high importance on maintaining their independence, staying connected with their family, and participating in activities that keep them active and engaged.

Captures the individual's long-term goals and aspirations, including their desire to maintain their independence, stay connected with their family, and participate in activities that keep them active and engaged

- **Health challenges:**
  - Values:
    - Low: The individual has no health challenges.
    - High: The individual has significant health challenges that significantly impact their daily life.

Outlines the individual's current health challenges, including any mobility issues or difficulties with medication management.

- **Technology use:**
  - Values:
    - Low: The individual is not familiar with technology and is not interested in learning or using it.
    - High: The individual is familiar with technology and is willing to learn and use it to stay safe and connected with their family

Describes the individual's familiarity with and willingness to use technology to stay safe and connected with their family.

- **Support needs:**
  - Values:
    - Low: The individual does not need any assistance with mobility, medication management, or staying connected with their family and participating in activities.
    - High: The individual needs significant assistance with mobility, medication management, and staying connected with their family and participating in activities.

Identifies the individual's specific needs for assistance with mobility, medication management, and staying connected with their family and participating in activities.

- **Technology preferences:**
  - Values:
    - Low: The individual is not concerned with the simplicity or technical expertise required to use technology.
    - High: The individual prefers technology that is simple and easy to use and does not require a lot of technical expertise.

Outlines the individual's preferences for simple, easy-to-use technology that does not require a lot of technical expertise to use.

Persona

Emma, Female (Age: 71)

Description

Emma is an 71-year-old woman who has lived in the assisted home living for the past two years. She is a retired school teacher and enjoys reading, gardening, and playing card games with her friends. Emma has some mobility issues and is at risk of falling[1], and she has a hard time remembering to take her medications on schedule[2]. She is not very familiar with technology, but she is willing to learn and use it if it helps her stay safe and connected with her family.

Life Goals

- Maintain independence: Emma wants to continue living in the assisted living in her home for as long as possible.
- Stay connected with family: Emma wants to stay in touch with her family and participate in activities that keep her active and engaged.
- Importance: High

Health challenges

- Mobility issues: Emma has mobility issues and is at risk of falling[1].

- Medication management: Emma has a hard time remembering to take her medications on schedule[2].

- Severity: High (mobility issues), medium (medication management)

Technology use

- Proficiency: Emma is not very familiar with technology[3,4].

- Importance: High (willing to learn and use technology to stay safe and connected with her family)

----

[1] More than one out of four older people falls each year[3]

[2] Loss of cognitive functioning — thinking, remembering, learning, and reasoning — and behavioral abilities to the extent that it interferes with a person's quality of life and activities [4]

[3] This was that hand dexterity performance on steadiness and line tracking were better explained by age than strength, but aiming and tapping dexterity were better explained by strength than age [5]

[4] Technology continuously changes and the elderly lack educational opportunities to keep up with it [6]

Support needs

- Mobility assistance: Emma needs assistance with her mobility[1,3,].

- Medication management: Emma needs assistance with her medication management[5].

- Connection with family: Emma needs a way to stay in touch with her family and participate in activities that keep her engaged.[6]

- Importance: High (all)

Technology preferences

- Simplicity: Emma prefers simple, easy-to-use technology such as tablets.

- Low technical expertise required: Emma prefers technology that does not require a lot of technical expertise to use[7].

- Importance: High

----

[5]It's normal to forget things once in a while as we age, but serious memory problems make it hard to do everyday things like driving, using the phone, and finding your way home.[4]

[6]Older people are turning to screens because of loneliness and isolation. According to the U.S. Census Bureau, more than 11 million elderly Americans live alone, and the likelihood of being without other human companionship increases the older a person gets[8]

[7]Elderly requires a step by step approach at a slower pace while the cognitive structure of millennials enables them to process multiple information at once[7]

References

[1] Smith, Aaron. "Older Adults and Technology Use." Pew Research Center: Internet, Science & Tech, Pew Research Center, 30 May 2020.

[2]Martin JA, Ramsay J, Hughes C, Peters DM, Edwards MG. Age and grip strength predict hand dexterity in adults. PLoS One. 2015 Feb 17;10(2):e0117598. doi: 10.1371/journal.pone.0117598. PMID: 25689161; PMCID: PMC4331509.

[3]Bergen G, Stevens MR, Burns ER. Falls and Fall Injuries Among Adults Aged ≥65 Years — United States, 2014. MMWR Morb Mortal Wkly Rep 2016;65:993–998. DOI: http://dx.doi.org/10.15585/mmwr.mm6537a2

[4]"Memory, Forgetfulness, and Aging: What's Normal and What's Not?" National Institute on Aging, U.S. Department of Health and Human Services, https://www.nia.nih.gov/health/memory-forgetfulness-and-aging-whats-normal-and-whats-not.

[5]Martin JA, Ramsay J, Hughes C, Peters DM, Edwards MG. Age and grip strength predict hand dexterity in adults. PLoS One. 2015 Feb 17;10(2):e0117598. doi: 10.1371/journal.pone.0117598. PMID: 25689161; PMCID: PMC4331509.

[6] Dellinger, AJ. "Seniors Are Using Screens to Make up for Lost Human Connections." Mic, Mic, 15 Aug. 2019.

[7]UX Case Study: Designing Mobile Banking App for the Elderly, Alfiani

[8]Nassar, Matthew R, et al. "Age Differences in Learning Emerge from an Insufficient Representation of Uncertainty in Older Adults." Nature Communications, U.S. National Library of Medicine, 10 June 2016.

Use Cases

1. The patient monitoring robot follows the elder throughout the day, detecting any abnormal movements that may indicate a potential fall or other medical emergency. If the robot detects an abnormal movement, it sends a notification to the web app, which is accessed by the elder's family members and living assistance staff.

2. The patient monitoring robot uses its sensors and cameras to track the elder's movements and monitor their overall health and well-being. If the robot detects any changes in the elder's behavior or physical condition, it sends a notification to the web app for further evaluation.

3. The patient monitoring robot can be programmed to remind the elder to take their medications on schedule. If the elder misses a dose or takes their medication at the wrong time, the robot can send a notification to the web app to alert the elder's family members and living assistance staff.

4. The patient monitoring robot can be programmed to alert the elder's family members and living assistance staff if the elder leaves their assisted living facility without permission. This can help prevent the elder from getting lost or wandering away from the facility.

User Stories

1. As a family member of an elder living in assisted care, I want to be notified if the elder has an abnormal movement so that I can check on their well-being and potentially prevent a fall or other emergency.

2. As a living assistance staff member, I want to be notified if the elder's behavior or physical condition changes so that I can take appropriate action to ensure their health and safety.

3. As an elder living in assisted care, I want to be reminded to take my medications on schedule so that I can maintain my health and well-being.

4. As a living assistance staff member, I want to be notified if the elder leaves the assisted living facility without permission so that I can ensure their safety and prevent them from getting lost or wandering away.

Storyboard Use Case 1 (Fall Detection)

1. The patient is going about their day in the assisted living home, accompanied by the patient monitoring robot.
2. The robot detects an abnormal movement, indicating a potential fall or other emergency.
3. The robot sends a notification to the web app, which is first accessed by the living assistance staff.
4. The living assisted staff confirms the vitals of the patient by controlling the robot's movements and viewing the web-app's data.
5. They evaluate the situation and take appropriate action.
6. The staff confirm vitals and grant the family members permission to receive a notification to control the robot to look at their relative.
7. If necessary, the family members and staff call for emergency assistance.

## Storyboard Use Case 2 (Behavior/Condition)

1. The patient monitoring robot is activated and begins monitoring the patient's overall health and well-being.
2. The robot uses its sensors and cameras to track the elder's movements and behavior.
3. The robot detects a change in the patient's behavior or physical condition.
4. The robot sends a notification to the web app for further evaluation by living assisted staff.
5. After seeing the notification the patient's family members and living assistance staff access the web app.
6. They evaluate the situation and take appropriate action, such as calling for medical assistance.

Storyboard Use Case 3 (Medication Schedule)

1. The patient monitoring robot is activated and begins monitoring the elder's medication schedule.
2. The robot holds the medication on itself and reminds the elder with visual and audio cues.
3. The elder takes their medication as directed.
4. The robot detects the elder has missed a dose or taken the medication at the wrong time.
5. The robot sends a notification to the web app to alert the elder's family members and living assistance staff.
6. They evaluate the situation and take appropriate action, such as reminding the elder to take their medication or contacting a medical professional.
7. The robot continues to remind and monitor the elder's medication schedule.

Storyboard Use Case 4 (Leaving Premises)

1. The patient monitoring robot is activated and begins monitoring the elder's movements.
2. The elder leaves their assisted living facility without permission.
3. The robot detects the elder leaving the premise.
4. The robot sends a notification to the web app to alert the elder's family members and living assistance staff.
5. They evaluate the situation and take appropriate action, such as contacting the patient themselves or contacting local authorities for assistance.
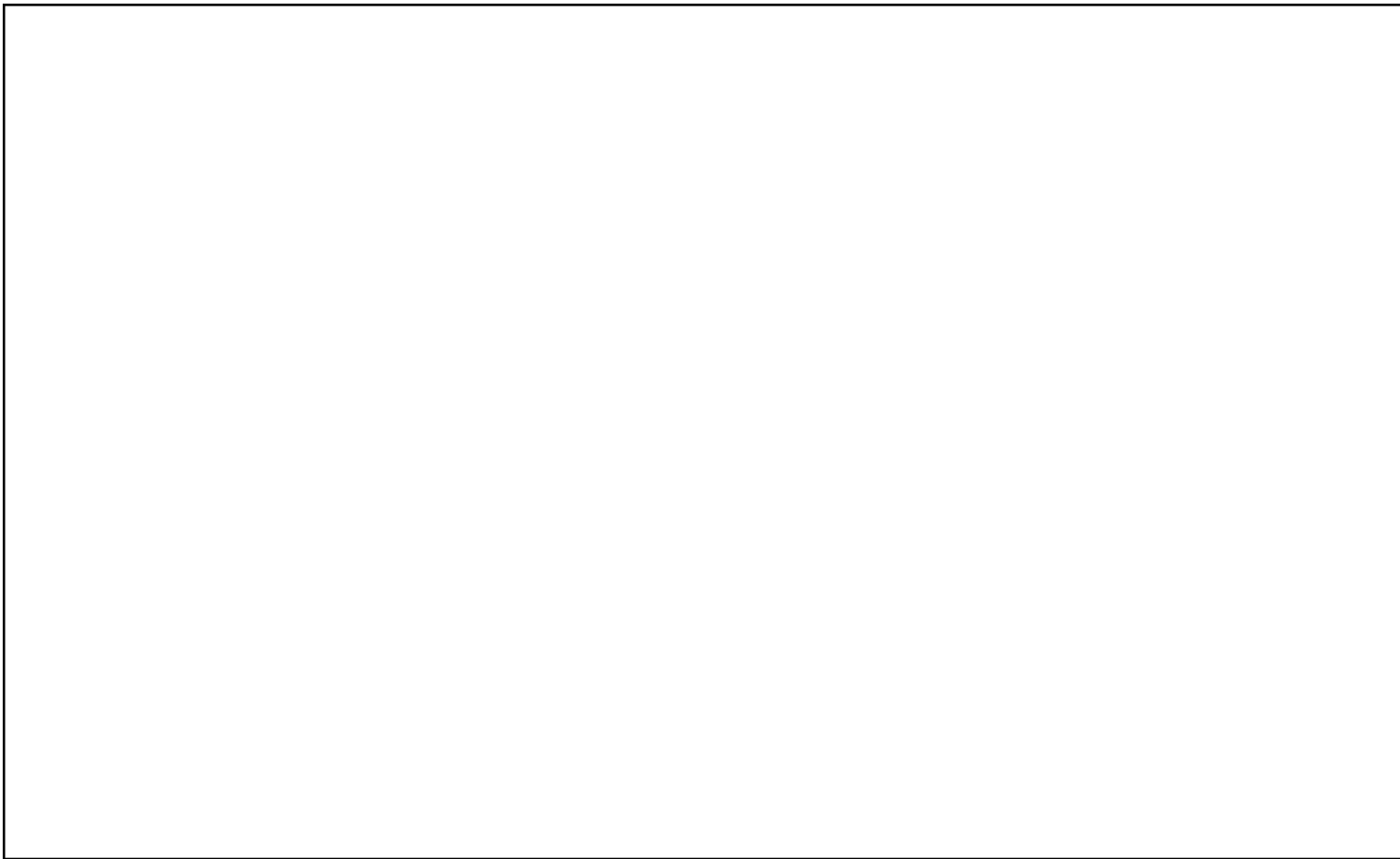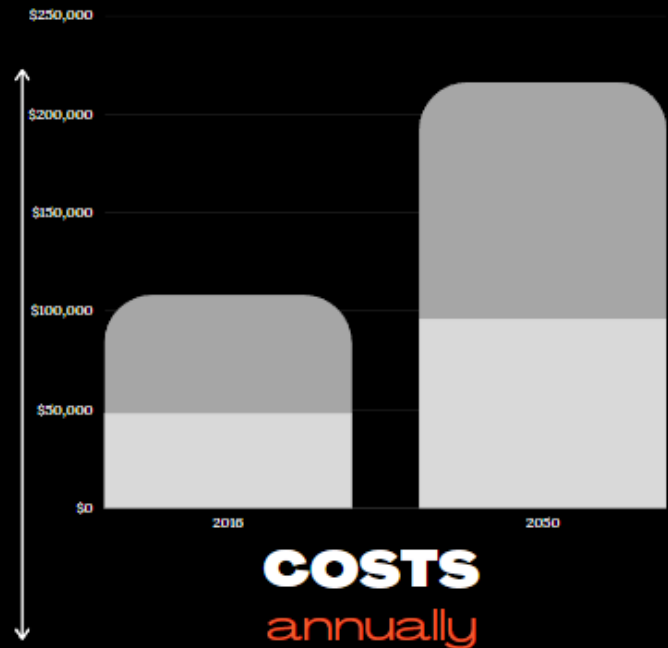
LET'S PROTECT

BENEFITS OF PATIENT MONITORING ROBOT

$250,000

$200,000

$150,000

$100,000

$50,000

$0

2016   2050

29% OF ELDERS
require living assistance

COSTS
annually

SOCIAL BENEFIT
- Loneliness
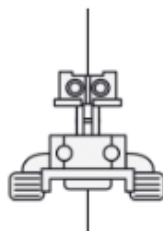- Lower stress levels
- Family engagement

RISK BENEFIT
- PMR will notify specialists and families in the case of fall detection.

MEDICINAL BENEFITS
- Reminds patients to take their daily medication.
- Medicine intake will be reliably monitored.

ANNUAL COST BENEFIT
- Saving patients/families $18K annually.
- PMR will be regularly updated.