



# AssistoBot

## An Assistive Smart Walker and Wheelchair

Group 5

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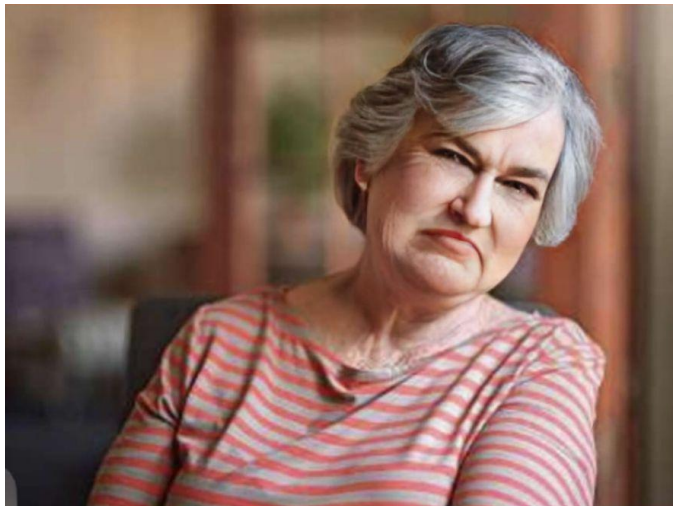
MIE1080H  
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# Introduction

## Meet Elena...



- **Demographics:**
  - Age: 77
  - Location: Urban ON
  - Background: Retired librarian
- **Challenges:**
  - Fear of falling and getting lost
  - Declining mobility
  - Increased social isolation
- **Desires:**
  - Maintain independence
  - Continue participating in community events
  - Embrace technology solutions



# Identification of Healthcare Problem

*Maintaining independence and safety for middle-aged seniors (75-84) living in urban areas who are experiencing declining mobility and increasing health concerns.*

**Mobility limitations:** Difficulty navigating their homes and urban environments safely.

**Health management:** Monitoring health conditions, taking medications on time, and maintaining a healthy lifestyle.

**Social isolation:** Staying connected with loved ones and remaining engaged in the community.



# Market Assessment

## Demographics (Canada):

- Age: 75-84 (middle-aged seniors)
- Location: Urban areas (> 80%)
- Education: Minimum post-secondary education (~ 62.2%)
- Income: Upper-middle class (ON : ~ \$106,717 and \$235,675)

## Market Size (Canada):

- The senior population is rapidly growing (18.3% in 2021, ~ 28.2% by 2041).
- Urban areas with tech-savvy seniors (~ 10%)

## Needs :

- Maintain Independence & Mobility
- Social Connection (especially for those living alone)



# Existing Solutions Review

## Lifeline Assistive Devices



Medical Alert system designed to provide the immediate assistance and support in critical situations

## Fraunhofer IPA Care-O-bot 4



A mobile robot assistant to actively support: help eating, cutting food, etc.

## TOYOTA Human Support Robot



An assist around the home robot by voice command: meal preparation, cleaning, etc.

## Legacy Two-in-one Walker-Wheelchairs



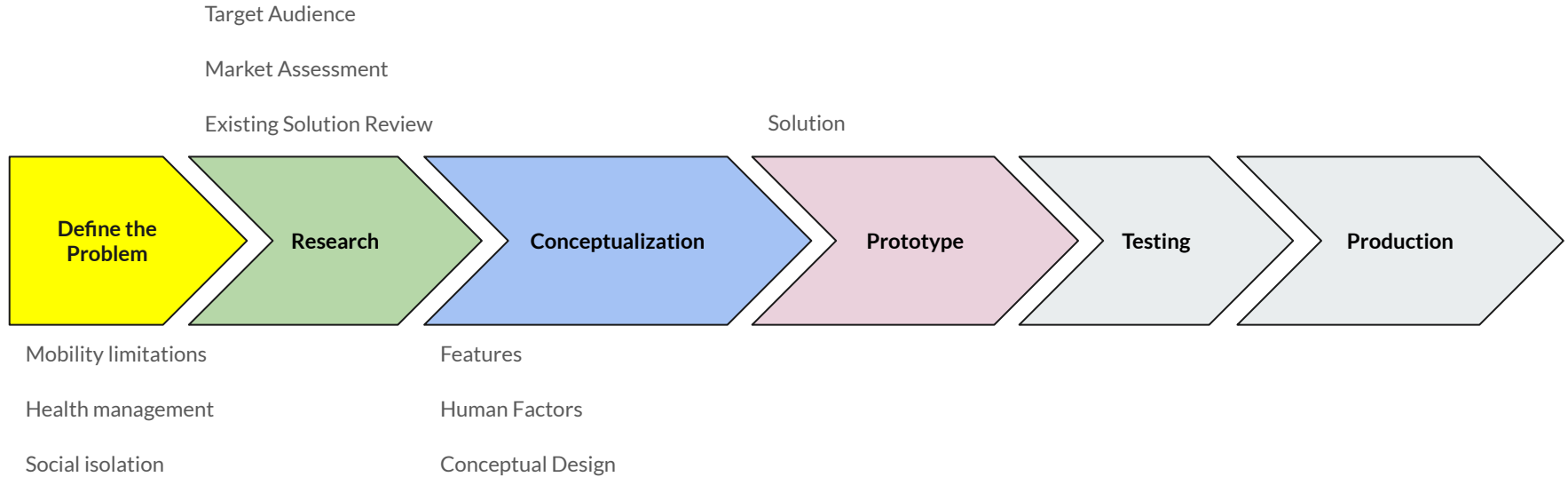
Mobility aid with convertible functionality between walker and wheelchair

# Design Process

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# Process





# Ideation

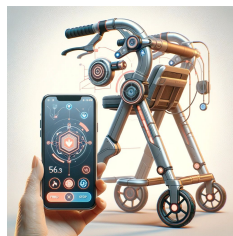
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1. Smart walker with a dashcam and voice-assistance



2. Similar to 10 but with a screen



3. Similar to 10 but with remote controlled capabilities



4. Smart walker that works as a telepresence robot too



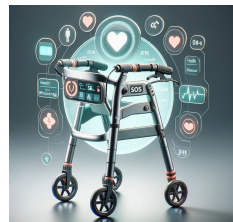
5. Smart walker that can also serve as a wheelchair with extendable parts



6. Smart walker with vision (embedding SLAM) to avoid obstacles



7. Smart walker that has a robotic arm and can walk around the house by itself



8. Smart walker equipped with health monitoring system and emergency services



9. Provides customizable physical therapy programs and tracks progress



10. Walker with smart lighting and sounds to increase visibility and safety while walking outdoors

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# Our Solution



# Smart Walker with Two Modes

Enhanced mobility with **integrated health monitoring**, superior to existing products by **offering personalized therapy**, and **advanced safety features**.

Walker Mode



Wheelchair Mode



# Features

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## Two Modes: Walker and Wheelchair

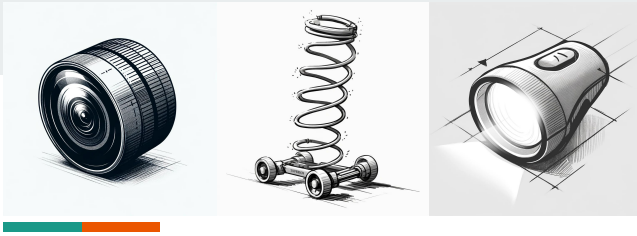
- The smart walker has two modes: walker mode and wheelchair mode.
- Wheelchair mode is **powered**
- Switching between modes is done through a **simple** mechanism.

### To overcome:

Mobility **limitations** in **navigating** homes and urban environments

### Why?

Allows users to choose the mode based on their **physical condition** at any moment, offering **flexibility** and promoting **independence**



## Enhanced Safety

- Real-time **AI-powered vision** to improve safety through:
  - Warning of safety hazards
  - Adaptive speed control and hazard avoidance
- The wheels are equipped with **dynamic suspensions**
- Multi-color **safety lights** that allows for safe use at night

### To overcome:

Difficulty in moving over **different terrains and low-light conditions**

### Why?

Enhances **comfort and safety**, making **outdoor trips more pleasant**, thus encouraging **physical activity and outdoor engagement**, and **extending the usability** hours of the device



# Health Monitoring System and Emergency Services

- Health Monitoring:
  - Monitors heart rate, blood pressure, oxygen levels, and physical condition
- Emergency Alert System
  - Automatically contacts emergency services
  - Provides the location and health information

## To overcome:

Health management issues and emergency situations

## Why?

Continuous monitoring of vital signs can prevent health crises, and the ability to alert emergency services ensures **timely assistance**, enhancing **peace of mind for users** and their families





# Customizable Physical Therapy Programs

- Tailored to the user's specific needs
- Aid in recovery, help users maintain their mobility
- Tracks the use of the walker, user's mobility levels, progress in physical therapy program

## To overcome:

Need for **personalized health management** and **rehabilitation**

## Why?

Supports recovery and **maintenance of mobility** by offering **tailored therapy options**, encouraging users to **stay active** and engaged in their health journey



# Remote Monitoring and Smartphone Connectivity

- Remote monitoring and health data sharing with trusted individuals and healthcare professionals
- Easy-to-use app interface

## To overcome:

**Social isolation** as well as **device control** and data sharing **challenges**

## Why?

Remote monitoring capabilities **ensure users are safely overseen** by caregivers, reducing feelings of isolation, and smartphone connectivity facilitates **easy control and customization**, and seamless data sharing, enhancing **collaborative health management**



# Integration of Human Factors

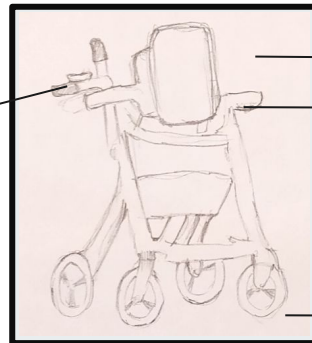
- **Ergonomic design** is crucial:
  - Ensuring **comfort**, enhancing **dexterity**, and promoting **mobility**
  - Reducing the risk of **discomfort** or **injury**

Features	Size
Sitting seat size	50 cm × 42 cm
Back Seat Size	56 cm × 50 cm
Arm Rest Length	42 cm
Height between Arm rest and Sitting Seat	12 cm
Treadle Length	38 cm
Distance Between Front Wheels and Rear Wheels	70 cm
Wheel (Diameter)	Rear wheel 210 mm with solid tire Front wheel 210 mm with solid tire

## 1. Walker Mode - Standing case



polyurethane (PU) and sponge/memory foam inside



thick aluminum tubes: lightweight with load  
100kg/220lbs

Stand-up aid feature

55.0 ~ 65.0 cm

70.30 ~ 97.20 cm

## 2. Wheelchair Mode - Sitting case



platinum foam D-26 and composite materials



## Existing Solutions vs. AssistoBot

Feature	Existing Solutions				Our Product
	Lifeline	Care-O-bot	Toyota's Human Support Robot	Two-in-one Walker-Wheelchair	AssistoBot
Price Range	\$\$	\$\$\$\$\$\$	\$\$\$\$\$	\$\$ ~ \$\$\$	\$\$\$ ~ \$\$\$\$
Emergency Alert System	✓	✗	✗	✗	✓
Household Tasks Assistance	✗	✓	✓	✗	✗
Mobility Aid	✗	✗	✗	✓	✓
Two Modes: Walker and Wheelchair	✗	✗	✗	✓	✓
Real-time AI-powered Vision for Safety	✗	✗	✗	✗	✓
Adaptive Speed Control and Hazard Avoidance	✗	✗	✗	✗	✓
Health (Vital Signs) Monitoring	✓	✗	✗	✗	✓

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# Feasibility Analysis



# Technology Integration

- **Motors:** Brushless DC electric motors for **quiet, efficient operation** and **durability**.
- **Camera:** RGB camera for **real-time monitoring** and **navigation assistance**
- **Connectivity:** Bluetooth and WiFi for seamless **smartphone app** integration.
- **Computer Vision:** Edge **AI-powered** computer vision.
- **Materials:** Lightweight, durable aluminum frame.
- **Batteries:** Batteries with **sufficient capacity** for extended use.



# Operations

- **Expertise:** Multidisciplinary team comprising **software developers** for app and firmware, **robotics engineers** for hardware integration, and **healthcare professionals** for user needs and safety compliance.
- **Estimated Production Cost:** The cost per unit is estimated to be **under \$1000**
- **Marketing and Distribution Channels:** **Online platforms**, healthcare facilities, **partnerships** with senior living communities, and **direct sales** through product website



# Safety and Compliance

- **Safety Features:** Adaptive speed control, night visibility lights, emergency stop.
- **Compliance Strategy:** Collaboration with regulatory bodies for adherence to health and safety standards, ongoing testing and certification processes.
- **Privacy:** Data encryption, user consent protocols, compliance with **data protection regulations** (e.g., GDPR, HIPAA).



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# Conclusion



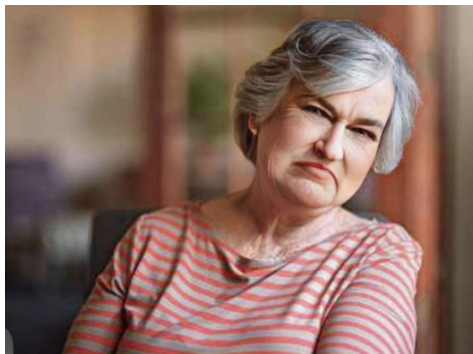
# Reflection

- Addresses target audience's **healthcare needs**
- Improved **user experience**
- Focus on **human factors**
  - enhances usability and comfort for users



## Future Direction

- Enhanced Connectivity
- Advanced Monitoring
- Expanded Functionality
- User Feedback
- Accessibility



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**Thank You!**  
**Questions?**

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# Appendix

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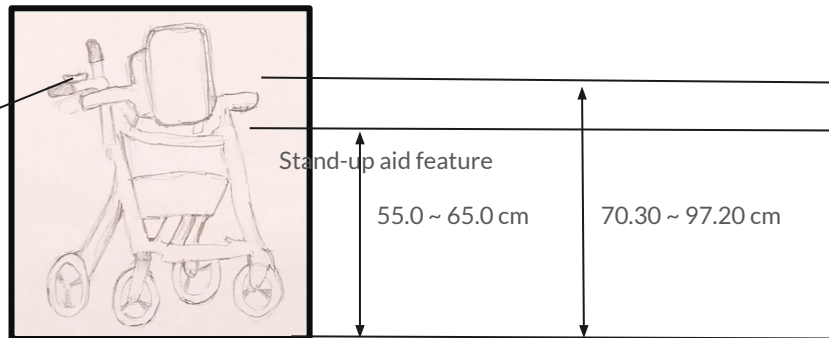


# Integration of Human Factors

Maintaining neutral positions for the elbow and wrist

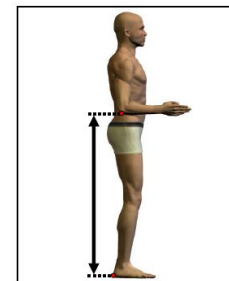


polyurethane (PU) and sponge/memory foam inside



thick aluminum tubes: lightweight with load 100kg/220lbs

(D14) ELBOW REST HEIGHT, STANDING



PERCENTILES					
FEMALES			MALES		
CM	IN		CM	IN	
90.30	35.55	1ST	97.20	38.27	
91.20	35.91	2ND	98.40	38.74	
92.20	36.30	3RD	99.10	39.02	
93.20	36.69	5TH	100.40	39.53	
94.80	37.32	10TH	101.90	40.12	
95.80	37.72	15TH	103.10	40.59	
96.60	38.03	20TH	104.00	40.94	
97.30	38.31	25TH	104.80	41.26	
98.00	38.58	30TH	105.60	41.57	
98.50	38.78	35TH	106.30	41.85	
99.10	39.02	40TH	107.00	42.13	
99.70	39.25	45TH	107.60	42.36	
100.20	39.45	50TH	108.30	42.64	
100.80	39.69	55TH	108.90	42.87	
101.30	39.88	60TH	109.40	43.07	
101.90	40.12	65TH	110.10	43.35	
102.60	40.39	70TH	110.80	43.62	
103.40	40.71	75TH	111.60	43.94	
104.30	41.06	80TH	112.40	44.25	
105.10	41.38	85TH	113.40	44.65	
106.20	41.81	90TH	114.70	45.16	
108.40	42.68	95TH	116.70	45.94	
109.10	42.95	97TH	117.90	46.42	
110.50	43.50	98TH	119.10	46.89	
111.60	43.94	99TH	120.80	47.56	

Accommodating the smallest user (e.g., 1st percentile) and fitting our intended users comfortably.





## Integration of Human Factors



platinum foam D-26 and composite materials

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