

Oxygen Cylinder Trolley for Indoor Use

Technologies for Sustainable Global Health (01.101)

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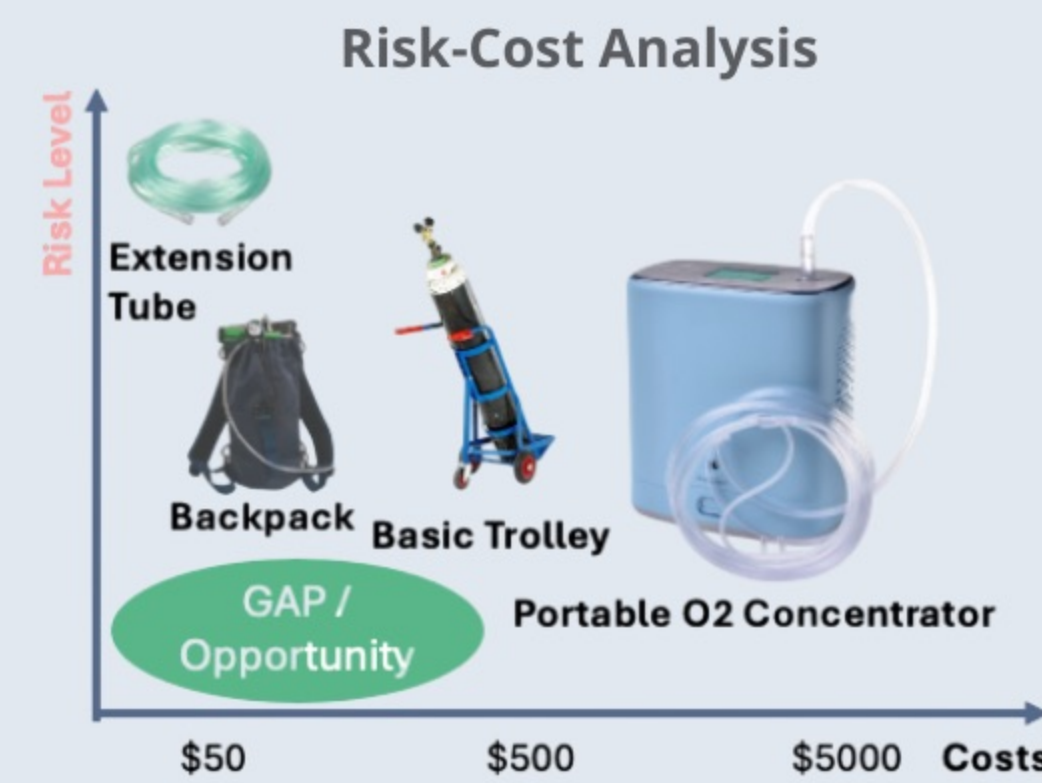


Background

In 2022, Singapore had over 8,800 palliative care patients, 10% of whom required oxygen support. Oxygen cylinders are essential but pose challenges due to their **bulk** and **weight**. Existing transport options are **inadequate**, **limiting** patient **independence** and **creating risks** for both patients and caregivers.

A **safer, self-reliant** enabling solution is needed to improve patient mobility and reduce strain on healthcare staff.

Existing solution landscape



Portable O2 Concentrators

Portable Generates heat Expensive Limited battery life

Backpack

Simple to use Cheap Sway easily Material traps pathogens
Difficult to clean

Basic Trolley

Readily available Tilting increase risk of toppling Bulky
Lack of multi-directional movement Difficult to maneuver

Extension Tube

Readily available Cheap Tripping hazard Entangles
Lowered pressure as length of tube increases

Main Pain Points

From on-site assessment and interviews: Patients are encouraged to move around within day care center, participating in activities like crafts, exercises, and outdoor walks. O2 cylinders are **bulky** to patients. Some require staff to move them on their behalf:

- **Decreased manpower** for other tasks
- Patients' **independence reduced**
- **Injuries risks** due to: dropping, toppling over, tripping, body strain

Need statement

A way to **safely provide adjustable continuous oxygen** to **patients who are Oxygen-tank dependent**, in order to **allow them to move around in a way that reduces risk to themselves and people around them**

Need criteria

Must have

- Consider **Social Stigma**
- Durable for regular use and cleaning
- Under \$150
- Secure current model of O2 cylinder
- Stable + Supports mobility
- Usable by different heights
- Intuitive use

Good to have

- **Multi-terrain capability**
- **Multi directional**
- **Easy tank changes**
- Foldable to save space
- Fits different tank sizes
- Fits multiple tanks
- Ergonomic design
- Equipped with brakes

Brainstorming



Categorization



Screening

- ✗ **Stroller Frame**
 - Too bulky
 - Costly
 - Hard to clean
- ✗ **Walker**
 - Social stigma
 - Hard to have foldable designs
- ✗ **IV Drip Stand**
 - Reminds one of hospital
 - CG will be off-centered
 - Not for different terrains
 - Requires metal work
- ✓ **Metal Cage/Body**
 - Most adaptable
 - Least bulky
 - Within budget
 - Considers social stigma

Chosen Concept

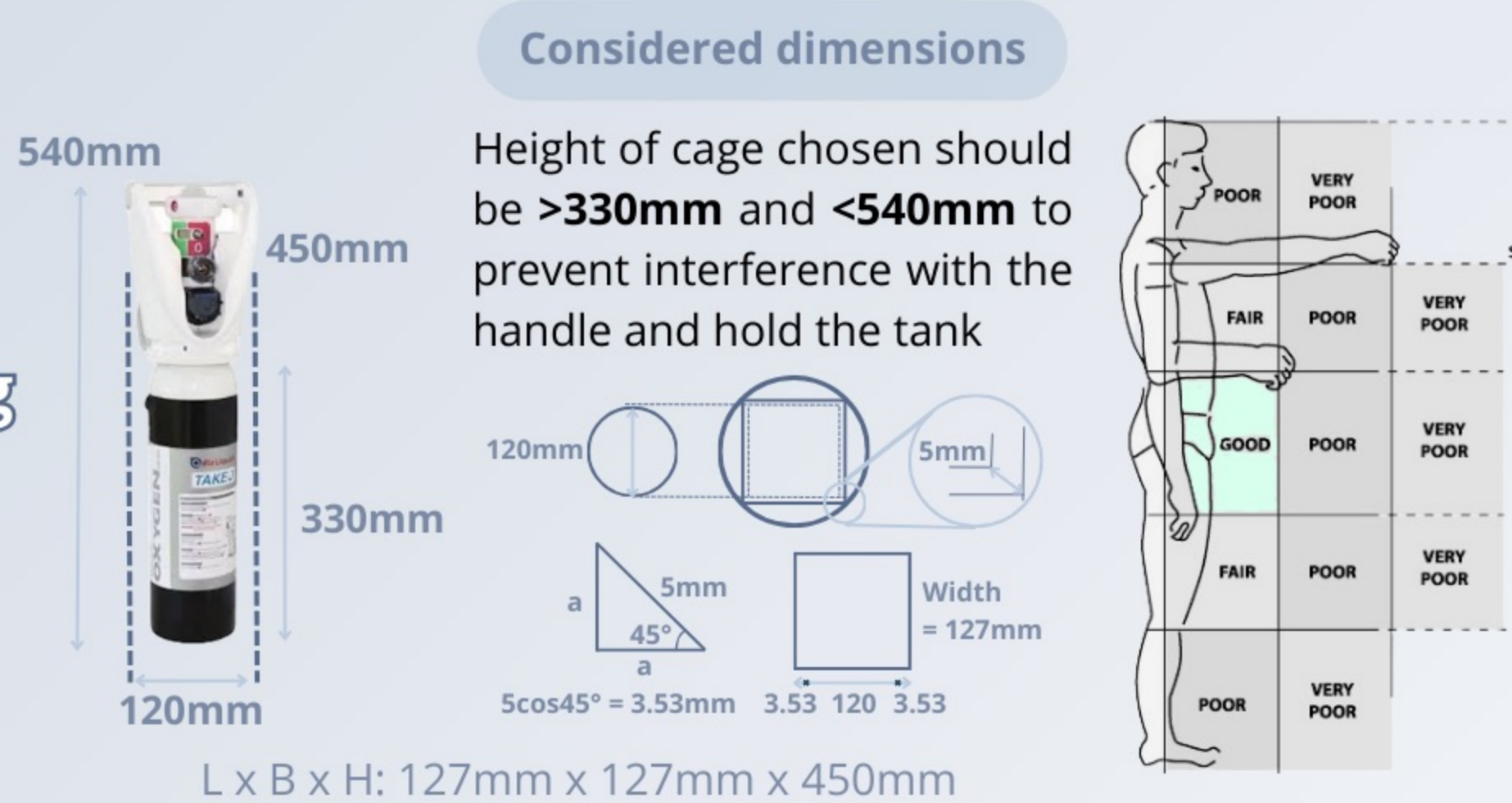
Enclosed metal cage design

Custom frame
Stands on wheels
One-handed use



Ideation & Screening

Prototyping



Material selection

Metal Plastics

Aluminium

- Lighter than other materials
- High structural efficiency
- Easy to modify using rails
- Medical-friendly material



Aluminium extruded profiles

Specifications O2 tank

Volume 0.4 m³ Pressure 200 bar
Capacity 450 - 480L Weight 4.5 - 5 kg
Flow Rate 1- 6L / min

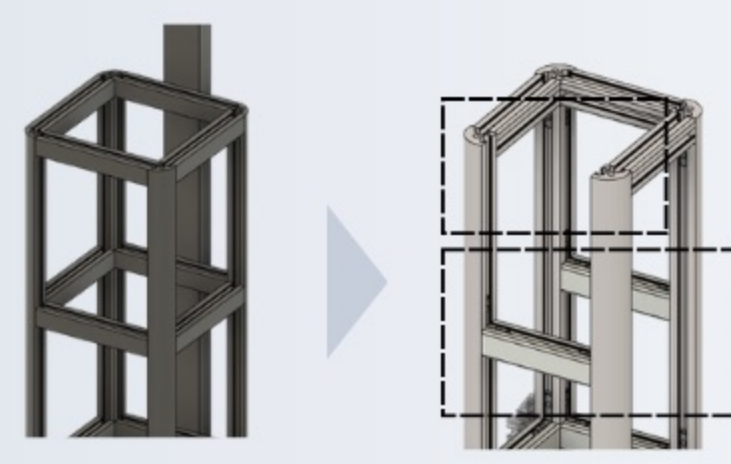


Refining



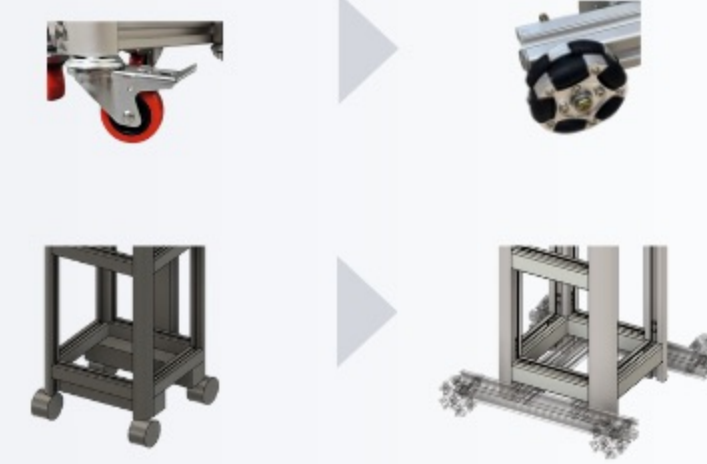
New telescopic profile with adjustable level, usable by >95% population

Main body



Removal of unnecessary aluminium profile

Wheels & Base



Wider base for stability and Omni wheels replaces 360 swivel wheels

Testing result

The prototype was brought on site to test with the actual O2 tank under the supervision of Assisi Hospice's personnels. The final prototype met **ALL** of the **Must Have**, and **3** of the **Good to have**.

Criteria	Results
Consider Social Stigma	"This is a dignified way for the patients to move the oxygen tanks. Very good. Our patients can feel good with this design"
Durable for regular use and cleaning	Both aluminium and plastic are alcohol resistant
Under \$150	Current per-unit cost to build is estimated \$135, expected to be lower in the future.

- Secures current model of O2 tank
- Stable and supports mobility
- Usable by people of different heights
- Intuitive

- Multi terrain
- Multi directional
- Easy tank changes



Conclusion

Despite meeting all objectives set, the team is eager to implement further improvements, such as exploring hollow aluminum pipes for **reduced weight** and **cost**, **increasing wheel diameter**, and **enhancing the handle design** for an even better user experiences.

Final Concept & Testing