

Assistive Transfer Device

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Outline

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- Problem Statement
- Current Lifting Methods
- Need for Effective Transfer Apparatus
- Transfer Device Designs
- Assessment of Lifting Methods and Mechanisms
- Device Construction and Validation

Problem Statement

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- Safely transfer patients from wheelchair to exam table
- Patients can hold on to device while being moved
- Reduce physical exertion by patient and medical personnel



Current Lifting Methods

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- Manual Labor

- Method

- ✦ Assistant wraps arms around patient
- ✦ Lifts patient vertically out of wheelchair
- ✦ Hold patient while slowly rotating toward destination

- Risks

- ✦ Large effort from assistant
- ✦ Uncomfortable for patient and assistant
- ✦ Dependent on assistant strength



<http://www.corpmed.com/images/patient-transfer.jpg>

Current Lifting Devices

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- **Hoyer Lift**

- Hydraulic mechanism
- Woven Nylon or Cotton Sling
- Adjustable with wheels for portability



- **Ambulation Assistive Device**

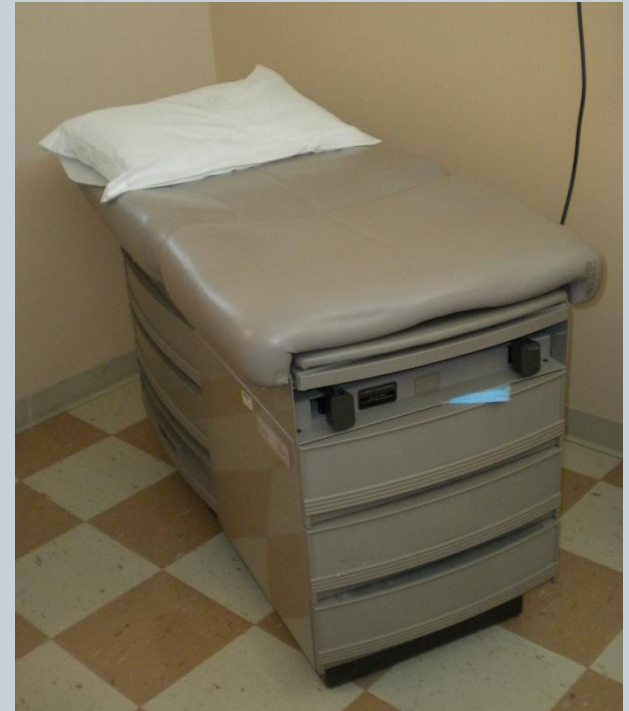
- Automated hydraulic system
- Nylon safety harness and straps
- Wheels for easy transport



Requirements for Device

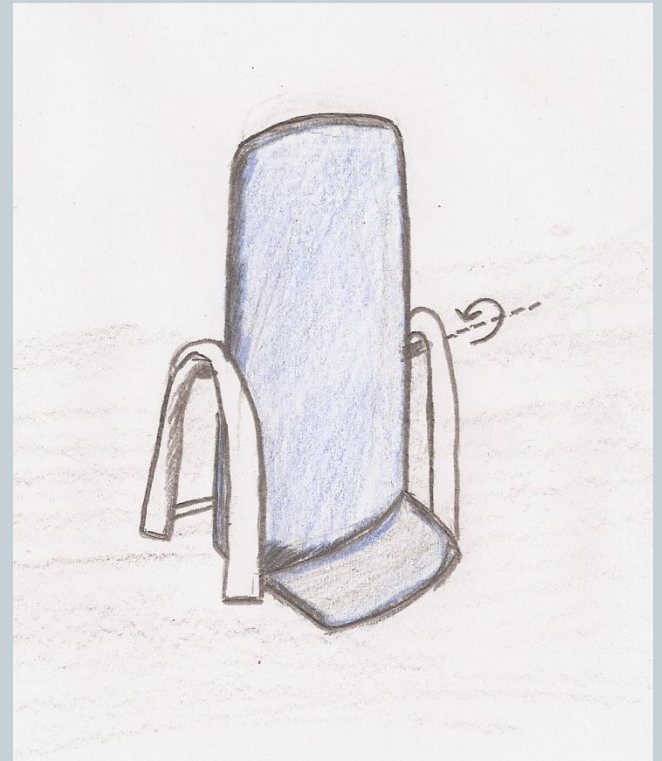
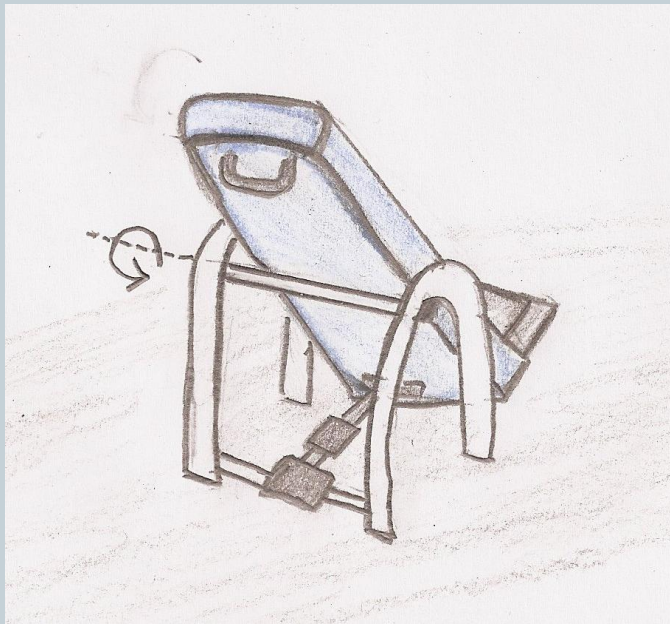
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- **Mechanical**
 - Small base, easily stored
 - Lift a max of 300 lbs
 - Less than 3" in height
- **User Friendliness**
 - Simple to operate; automated or manual
 - Easy to sterilize
 - Reduce patient anxiety during transfer



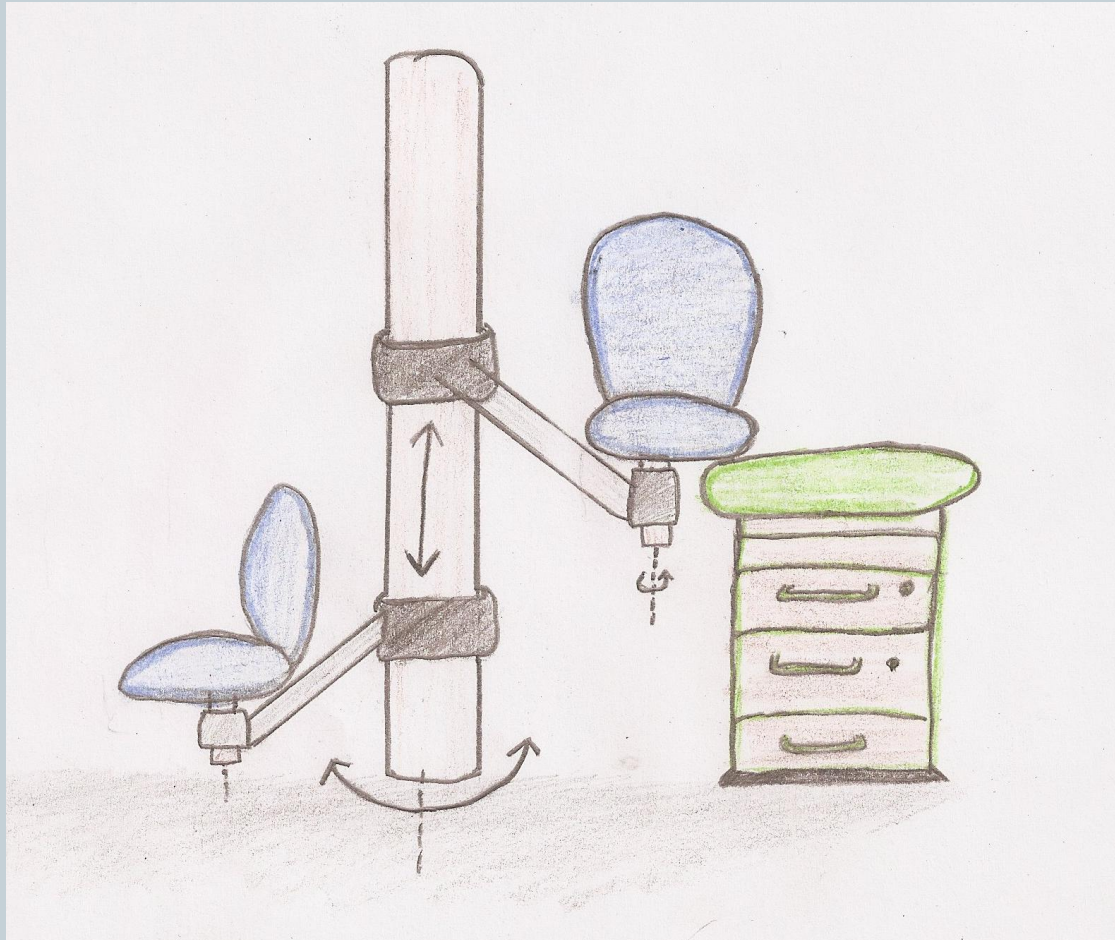
Supine Transfer

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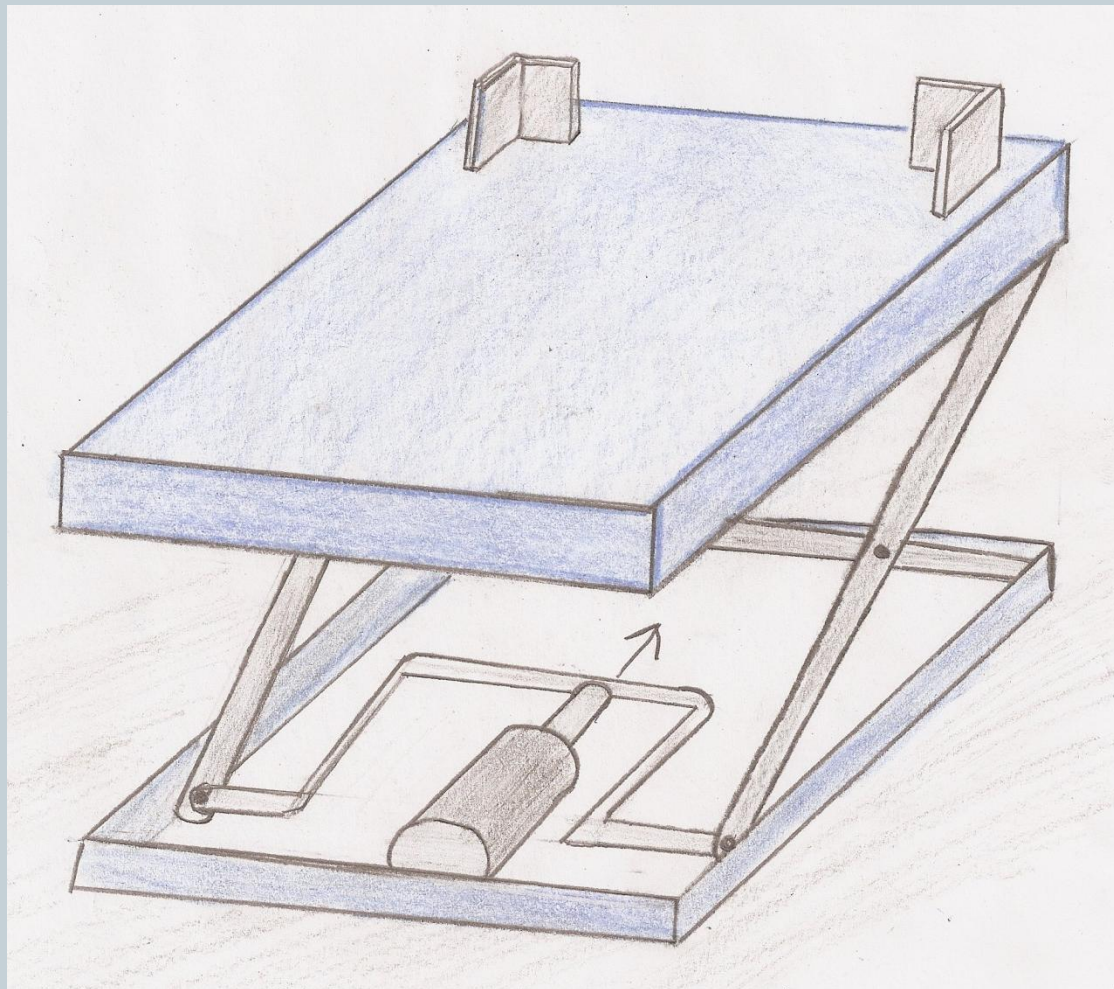
Sitting Transfer

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Standing Transfer

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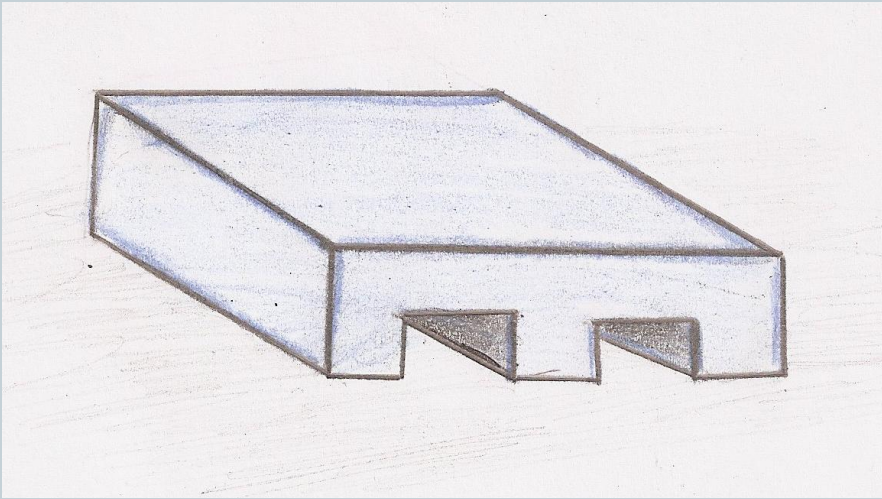
Assessment of Transfer Methods

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	Patient Anxiety	Size (x2)	Ease of Operation (x2)	Patient Effort (x2)	Ease of Fabrication	Cost	Total
Supine	2	6	4	6	3	3	24
Sitting	4	4	6	7	1	2	24
Standing	3	10	8	7	3	3	34
scale 1-5, 1 = poor, 5 = excellent							/45

Forklift

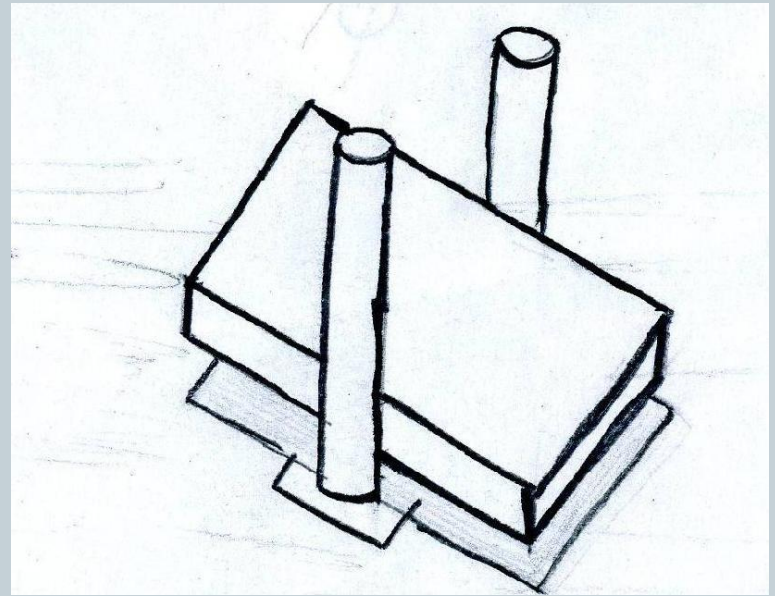
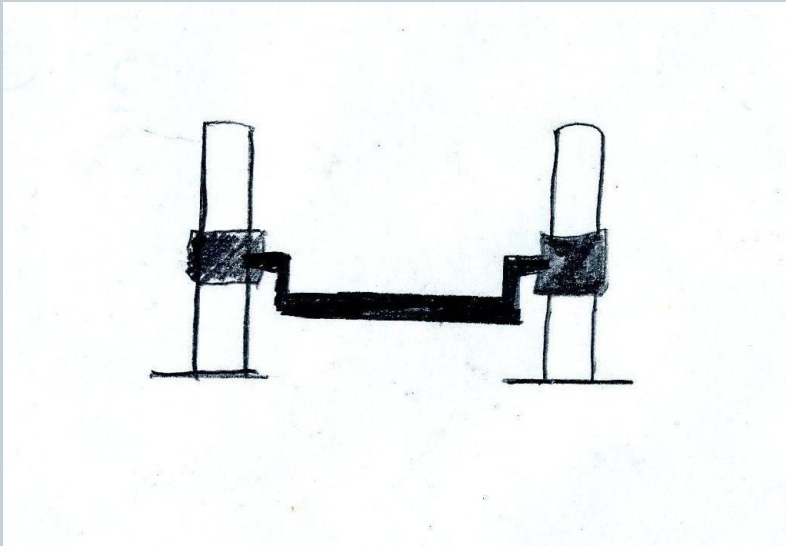
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www.alliedforklifts.com.au

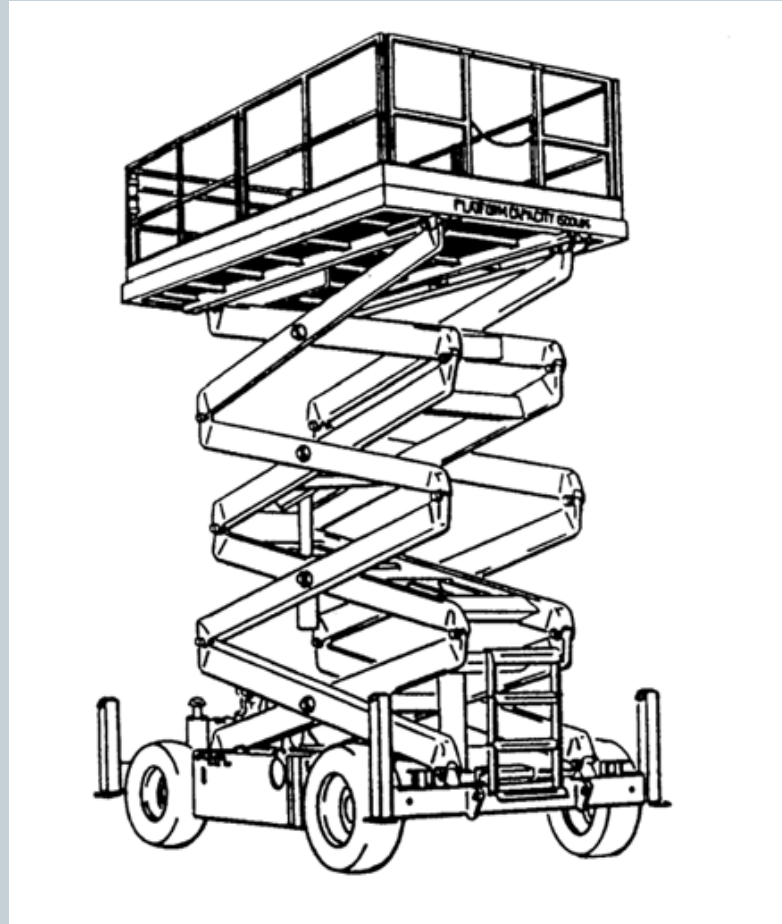
Parallel Pistons

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Scissor Links

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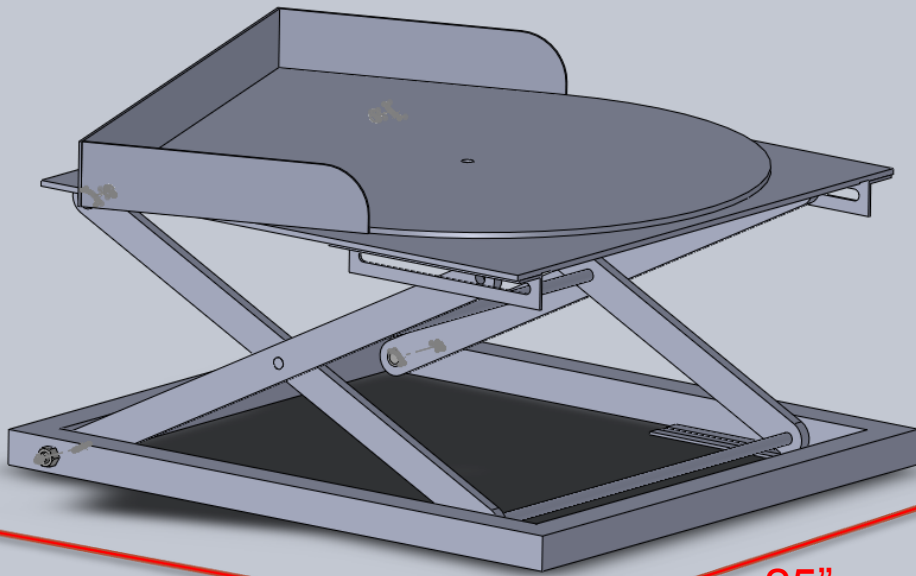
Comparison of Lifting Mechanisms

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	Safety	Size (x2)	Ease of Operation (x2)	Aesthetics	Ease of Fabrication	Cost	Total
Forklift	3	2	6	1	4	3	19
Parallel Pistons	4	4	4	3	2	3	20
Scissorlift	5	8	10	5	3	4	35
scale 1-5, 1 = poor, 5 = excellent							/45

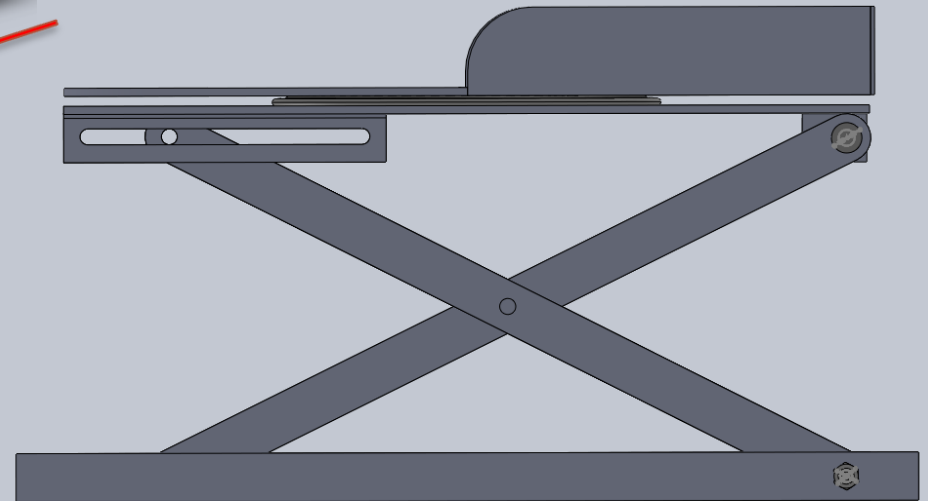
Proposed Design

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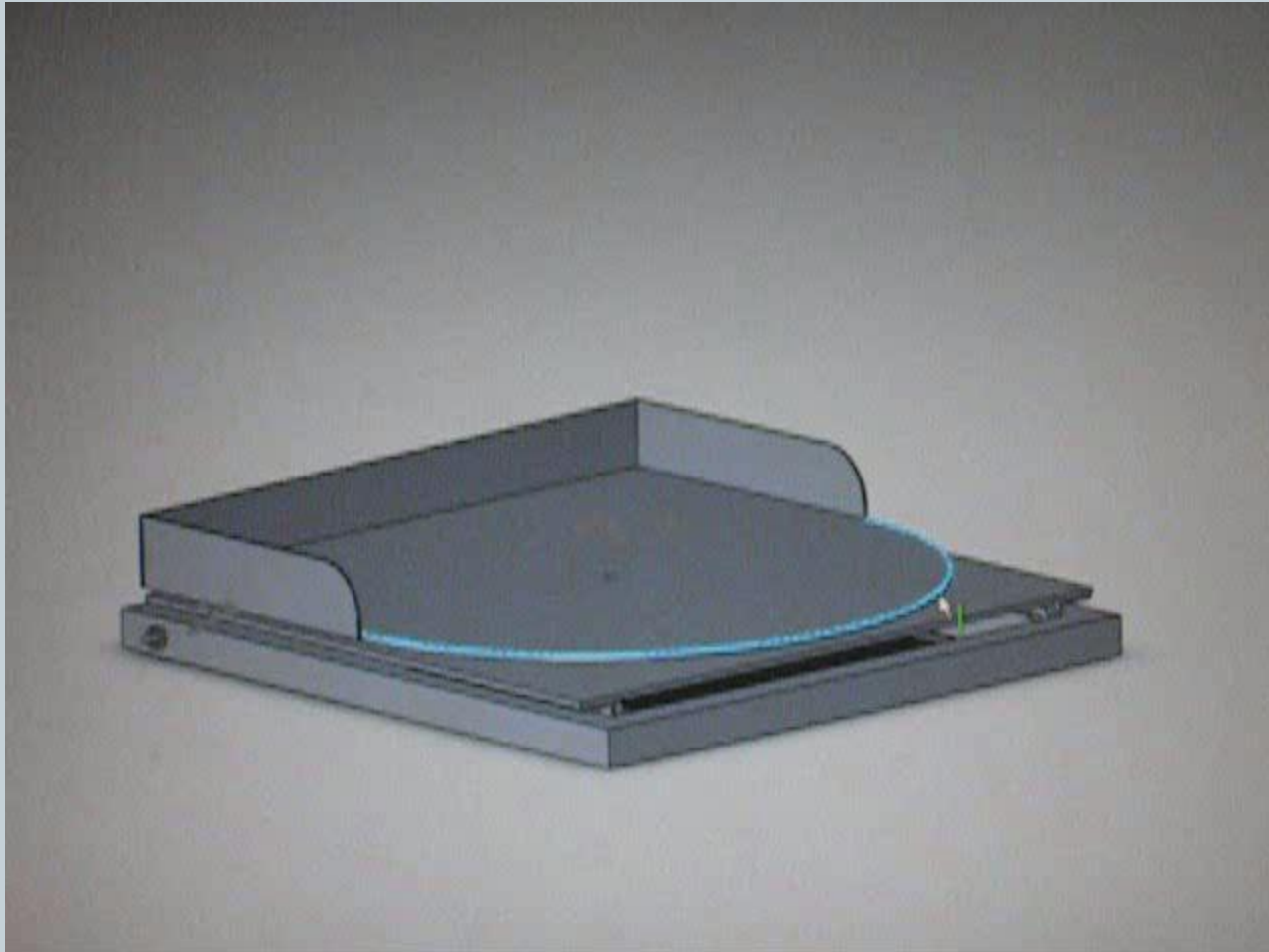
28"

25"



SolidWorks Demonstration

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Future Work

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- Design

- Hydraulics

- ✦ Design circuit
- ✦ Determine actuator size

- Materials

- ✦ Stress calculations

- Construction

- Order materials

- ✦ Raw materials
- ✦ Hydraulics

- Begin fabrication

- Testing



Testing

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- **Strength testing**
 - Ensure design can hold safety factor of twice the maximum weight (300 x 2 = 600 lbs)
 - Ensure hydraulics can produce enough force to lift maximum weight
- **Functional testing**
 - Can lift to height of 15 in
 - Lifts smoothly with low exertion for hydraulic pump
 - Damping mechanism safely lowers patient
- **Trial testing**

Acknowledgements

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- **Thanks to:**
 - Lisa Kaikuaana
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Questions

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