Arm Rest for CT Scanner

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Overview

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Problem Statement

Need Device to Increase Patient Comfort

→Reduce Patient Heart Rate & Movement

→Improve CT Scan Image Quality

- **Supports arms**
- **IV accessibility**
- **Adjustable**
- **Wide-range of users**

Background Info

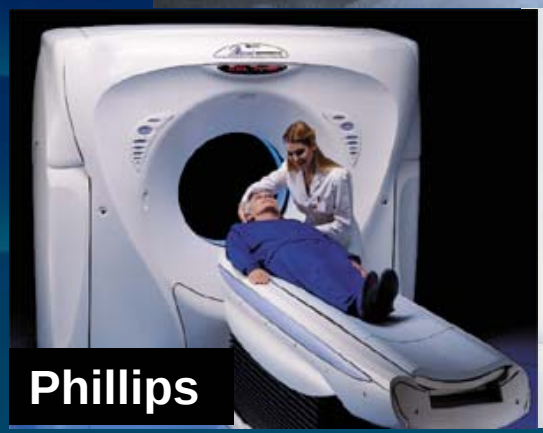
CT Scanning & Best Sellers

- **GE**
- **Siemens**
- **Phillips**

Cardio-scans for disease detection

Heart-rate below 65bpm

- **Beta-blockers via IV**
- **Comfort & Relaxation**



Client Requirements

- Elbow bend can’t interfere with IV
- No ECG interference
- Comfortable for ~20 minutes
  lower heart rate/movement
- Held to table by Velcro straps

Current Devices

- 2 versions of arm rest
- Unsupported arms
- Not adjustable
- Not comfortable for all patients
- Secured by Velcro straps

Arm holder attached using Velcro

Current Devices

Version 1

- Made of PVC
- Angled handle bar

Dr. Keevil's Version 1

Version 2

- Made of PVC
- Straight handle bar
- Improved rigidity

Dr. Keevil's Version 2

Research Competition

- No commercial product
- Some work done by client in Germany

→ But nothing marketed

Suggested Materials

- Expanded rigid polyvinyl chloride (PVC)
- Aluminum
- Vinyl grips
- Padding for arms (Tempur-Pedic pillow covered with vinyl)

Design Constraints

- One staff member
- Dimensions
- Weight of device
- Quantity
- Hospital cleaning standards
- Generally older patients
  → Range of Motion

Problem Overview

Lynn tests out the ‘wedge’

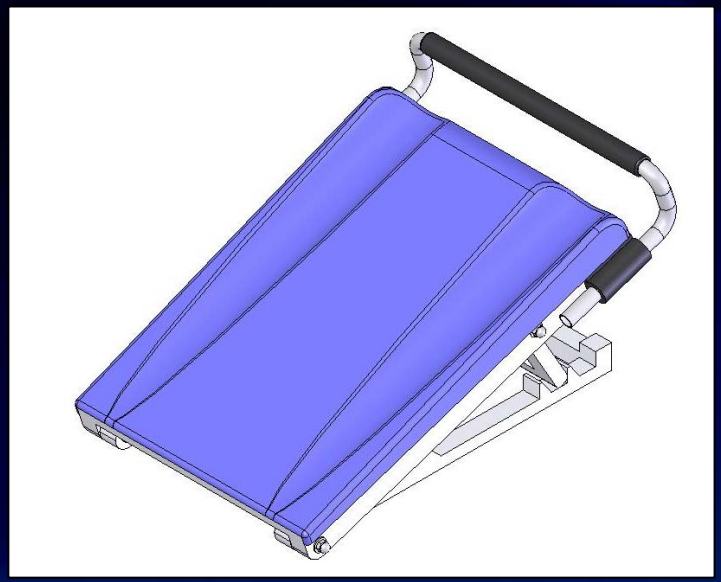
Need to maintain low heart rate

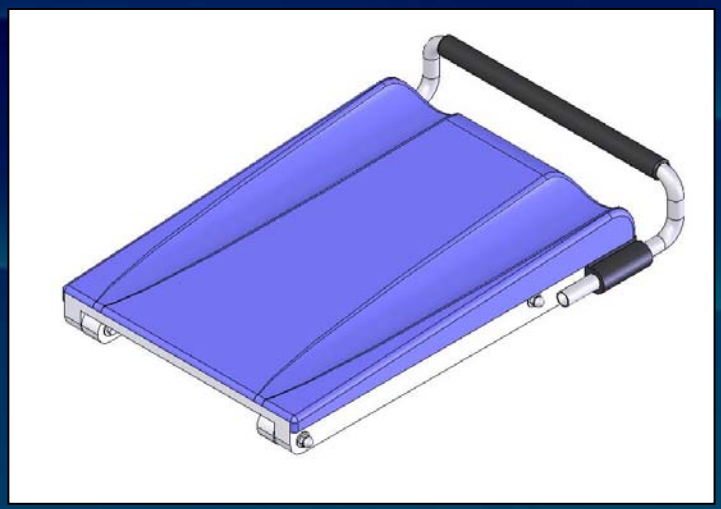
- **Improve image clarity[3]**
- **Make diagnosis clearer**

Need to support arms above head

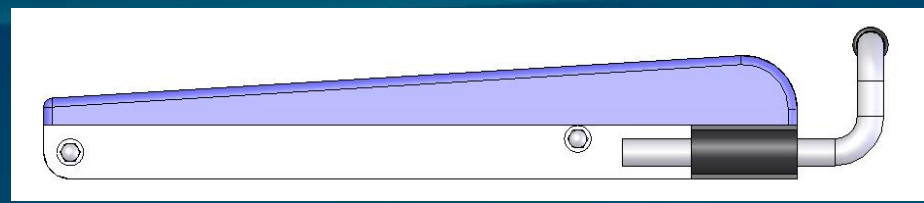
- **Can’t be in scanning area**
- **How to comfortably support the arms?**

General Design

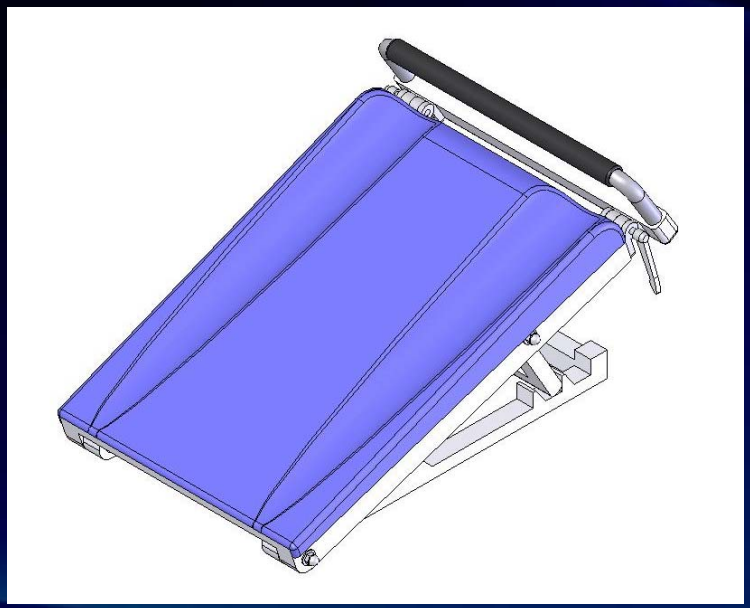


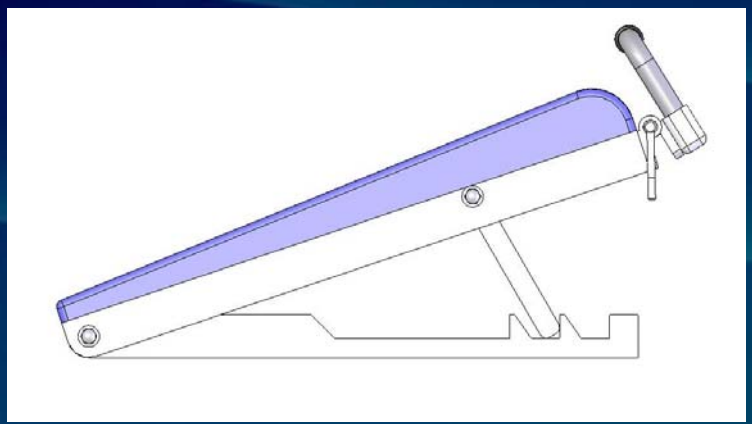


- Three designs based on wedge design
- Combines existing wedge and arm grip
- Angle adjustable wedge- beach chair mechanism
- Padded arm indentations
- Adjustable arm grip
- Easy set-up, cleaning, & storage



DS1: Rotational Handlebar

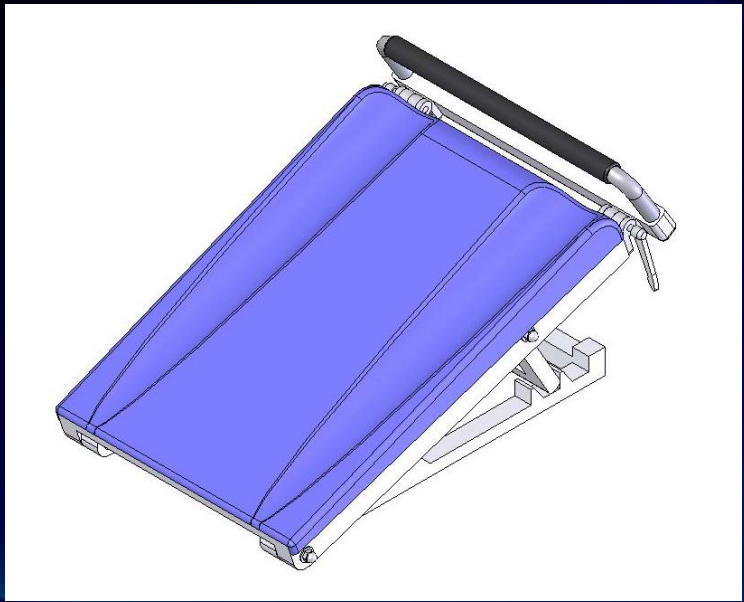


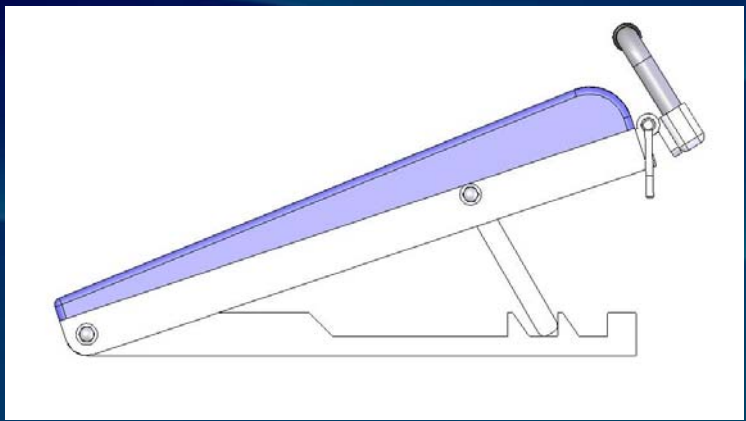


Variation

- Locking hinges allow rotational adjustment
- Single handlebar

DS1: Pros/Cons





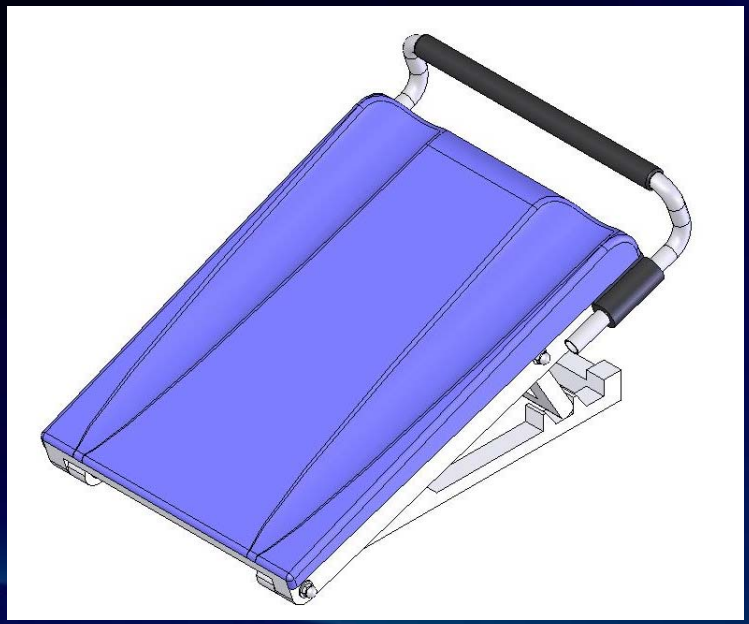
Pros

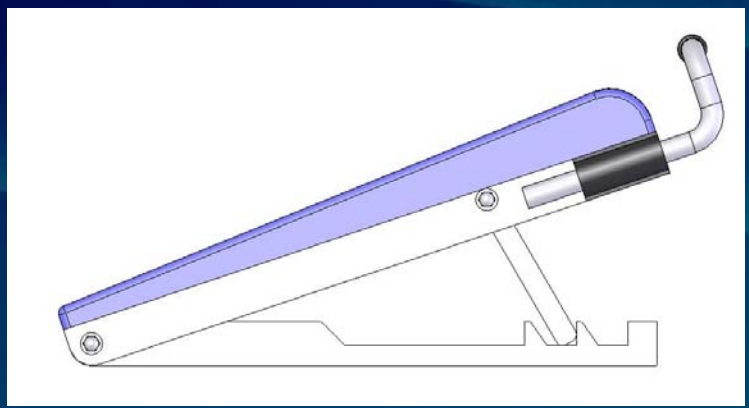
- Folds flat (approx. 4.75 inches)
- Some handlebar height adjustment
- Some handlebar distance adjustment
- Easy lock hinges

Cons

- Handlebar is limited by rotation
- Requires locking of two hinges
- Possible pinching

DS2: Distance Adjustable Handlebar

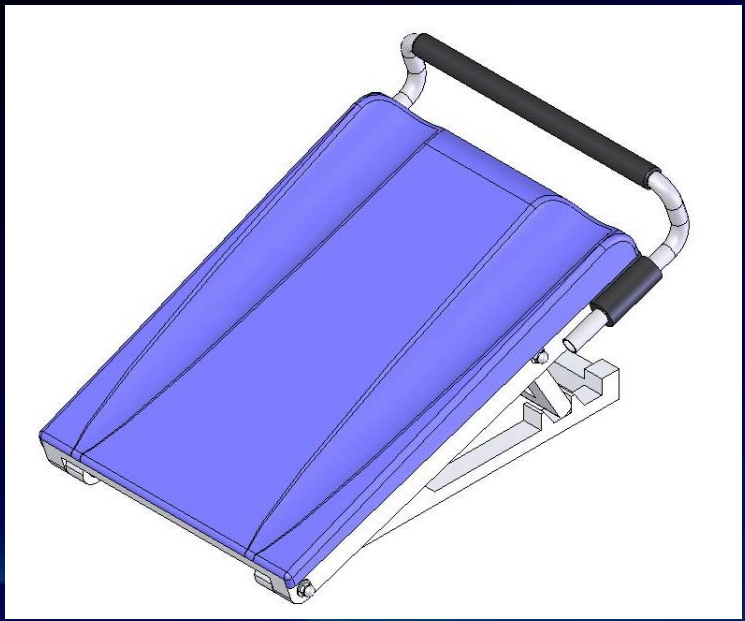


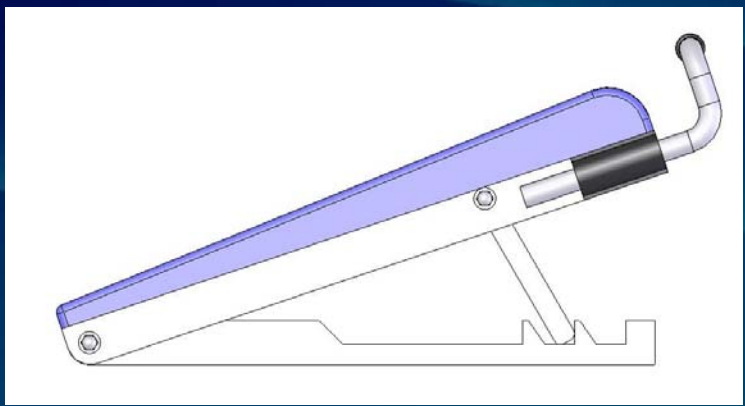


Variation

- Single handlebar
- Handlebar distance adjustable: 3 inches
- Turning knob squeezes handlebar to lock
  (Bike seat adjustment mechanism)

DS2: Pros/Cons





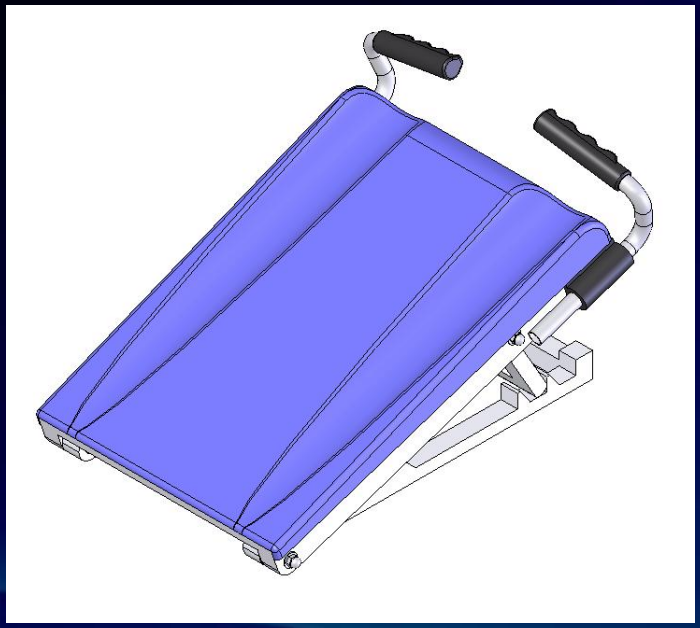
Pros

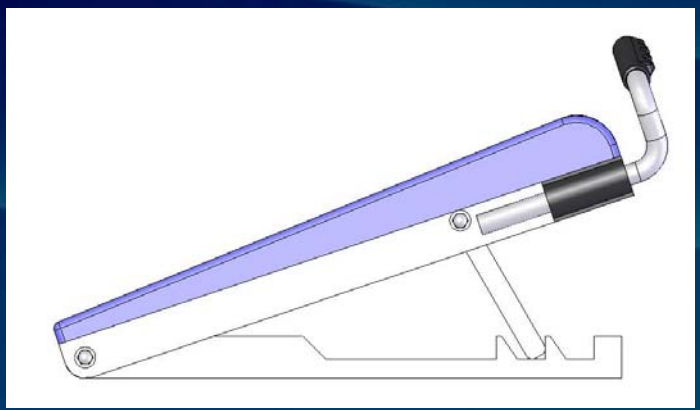
- Folds flat (approx. 4.5 inches)
- Handlebar distance adjustable: 3 inches
- One knob adjustment
- Sturdy rigid mounting

Cons

- Handlebar distance only adjustable

DS3: Wrist Rotation and Distance Adjustable Split Handles

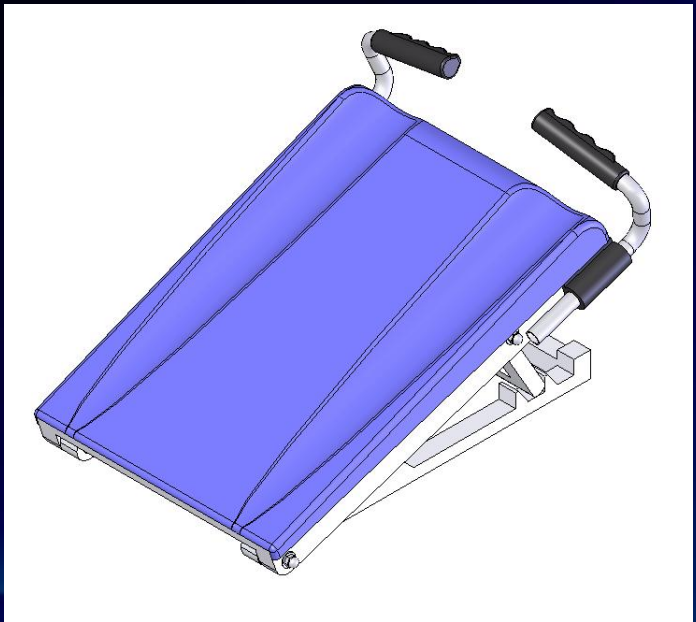


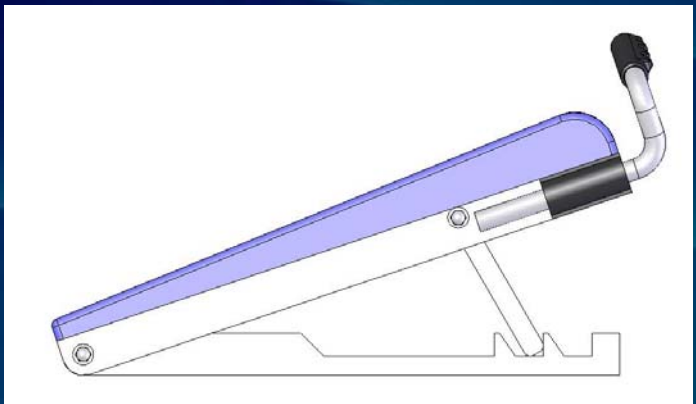


Variation

- Two separate handles
- Handlebar distance adjustable: 3 inches
- Rotational wrist adjustments: 45°
- Turning knob squeezes handlebar to lock (Bike seat adjustment mechanism)

DS3: Pros/Cons





Pros

- Folds flat (approx. 3.5 inches)
- Handlebar distance adjustable: 3 inches
- Rotational wrist adjustments: 45°
- Sturdy rigid mounting

Cons

- Requires two knob adjustments

Design Matrix

	DS1	DS2	DS3
Comfort (30)	20	25	28
Adjustability (30)	20	25	30
Portability (20)	20	20	19
Ease of Manufacturing (20)	13	15	18
Total (100)	**73**	**85**	**95**

Future Work

- Decide on materials
- Order components
- Build prototype
- Test the device
- Make necessary adjustments
- Begin paper work for a patent (WARF)?

References

1. GE's CT Scanner image: http://www.impactscan.org/

2. Siemen's & Toshiba Scanner images: http://www.numc.edu/

3. Dhanantwari, A. et. al. 2001. Correcting organ motion artifacts in x-ray CT medical imaging systems by adaptive processing 1: Theory. *Medical Physics*, 28(8): 1562-1576.

4. Tempur-Pedic image: http://www.tempurpedic.com

5. Materials information from http://www.McMaster.com

Questions?