Standing Paraplegic O.R. Device

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Function/Problem Statement:

To design and construct a device that will enable our client, a T-12 paraplegic, to perform standing orthopedic surgeries in the O.R. for up to three hours. The device should allow the client to cover a range of motions including: clockwise and counterclockwise rotation, as well as vertical and horizontal translation. It must be stable, serviceable, compact, cleanable, portable, safe, comfortable, affordable, and comply with hospital standards. Our intention is to design and construct a device for our client over the timeline of two semesters.

Client Requirements:

- Must allow for standing O.R. procedures
- Be able to rotate clockwise and counterclockwise
- Must support vertical and horizontal translation
- Stable, compact, portable, cleanable, safe, comfortable, affordable
- Comply with hospital standards
- Be in use for up to 3 hours
- Support client build of 6'1'' 215 lbs, safety factor of 2
- Device must leave small footprint in O.R
- Less than $10,000
- Materials capable of being autoclaved
- 10 years of device use
- Make of simple, easily fixed parts
- Easily disassembled – easier portability, cleanability

Design Requirements:

Our final constructed device will be designed and constructed for intended used by our client within a hospital O.R. setting. As such, all appropriate hospital standards as well as the functional standards of the device must be considered.

1. Physical and Operational Characteristics

A. Performance Requirements:

- Support a 6’1’’ individual weighing 215 lbs in a standing position for up to three hours

- Able to support clockwise and counterclockwise rotation, and vertical and horizontal translation.

B. Safety

- Must not harm the client during periods of use lasting up to 3 hours

- Pose no risk to contamination of O.R. environment – easily cleanable and stable

C. Reliability

- Able to withstand a service life of 10 years

- Be composed of materials that can take consistent cleaning (possibly in an autoclave)

- Made out of easily serviceable parts

- Disassembles easily for cleaning

D. Life of Service

- Consistent use within O.R. hospital setting for 10 years.

- Must be easily cleanable for O.R. setting

- Portable device within minimum footprint

E. Operating Environment

- Must comply with hospital and O.R. standards

F. Ergonomics

- Device must be comfortable for client during periods of extended use

- Small footprint so as to not interrupt the environment/work space of others in the O.R.

G. Size

- Small footprint in the O.R. as to not be obstructive

H. Weight

- As minimum a weight as possible for easier portability

J. Materials

- Common materials and components that could be easily serviceable incase of breakdown

- Materials that are easily to clean up to O.R. standards

- Possible consideration of autoclavable materials

- Easily disassembled parts

K. Aesthetics, Appearance, Finish:

- Minimum O.R. footprint

- Device that instills confidence in potential patients of our client

2. Production Characteristics:

A. Quantity: 1 Deliverable

B. Target Product Cost: Less than $10,000

3. Miscellaneous

A. Standards and Specifications

- We must adhere to O.R. and hospital standards for use.

B. Customer/Patent Related Concerns

- None identified through current research

C. Competition

- While there are standing wheel chair devices on the market, none of these devices specifically relate to our client's needs. That is, a device that can be used within an O.R. setting. As such, competition, through the current research, is not a primary concern.