Lumbar Puncture

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Function: A device should be built to properly support the head, arms and feet of patients undergoing a spinal tap procedure. Use of the device should enable patients to curl their back as much as possible to open lumbar spaces for the procedure, while providing maximum comfort. Finally, the device must be adjustable to provide support for a variety of heights and weights.

Client requirements (itemize what you have learned from the client about his / her needs):

- Device must fit around an adjustable height hospital bed
- Should be adjustable so the patient can be positioned properly
- The device must incorporate an adjustable foot rest, a handle, and a head rest
- Must allow for maximal curvature of the spine
- It must be sturdy and should not tip over during use or adjustment
- The device should be built within a $500 budget

Design requirements:

Our goal is to design a specialized chair to use for lumbar puncture procedures in the sitting position. Proper positioning of the person to open up the space between the lumbar backbones is critical for success of the procedure. Keeping the patient comfortable while maximizing the curve of the low back to optimize the access to the lumbar interspace is important, yet remains a difficult challenge using current positioning techniques.

1. Physical and Operational Characteristics

a. *Performance requirements*: The device will be used for thirty minutes, four to ten times a month.

b. *Safety*: During use, the device must provide adequate support to the patient and must be sturdy.

c. *Life in Service*: We would like the device to last at least five years.

d. *Operating Environment*: The device will be used in a hospital patient room and would not have to undergo extreme variations in temperature, pressure, and other external factors.

e. *Ergonomics*: The device should be able to withstand a bulk of the patient's body weight and must include cushions around the support areas to maximize comfort.

f. *Size*: Since the device should fit within the space between the hospital bed and the wall surrounding the room, the dimensions of the device should not exceed three feet wide and three feet deep.

g. *Weight*: The device will be transported frequently within the hospital and will need to weigh less than 50 lbs.

2. Production Characteristics

a. *Quantity*: one needed for client, however, if the product is desirable, it can later be mass produced.

b. *Target Product Cost*: The total cost in producing the support device should not exceed our client's proposed budget, $500. The nearest competition to the product, the massage chair, costs nearly $200.

3. Miscellaneous

a. *Standards and Specifications*: We must obtain the Institutional Review Board (IRB) approval to test our product on humans.

b. *Customer*: The client would prefer an adjustable angle for the footrest.

c. *Patient-related concerns*: Since the device will be used by multiple individuals, it should be cleaned with sterilized wipes between use. The design should maximize patient comfort.

d. *Competition*: The most popular supporting device used is a massage chair, however, our client reported that massage chairs do not provide enough curve to the spine to sucessfully withdraw spinal fluid. Further, there are no specialized chairs specifically designed for this procedure.