Product Design Specifications

Product Design Specifications for Upper Extremity Fracture Model
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Function: To develop a pediatric forearm fracture model that provides temperature, skin surface pressure, and bone alignment feedback for use by medical school residents in order to practice and learn safe, effective casting techniques.

Client Requirements:

- Create distal fracture in model
- Computer interface that is easy to use
- Provide modular resistance for the fracture
- Record pressure and temperature during casting and removal
- Protect hardware from heat and force
- Create a realistic model of the pediatric forearm

Design Requirements:

1. Physical and Operational Characteristics

a. *Performance requirements*: As a teaching aid, the device must be reusable. It must withstand repeated temperature and pressure changes, with pressure and temperature sensors remaining accurate for an extended period of time.
b. *Safety*: The device must withstand changes in temperature up to 70^{o} C and mechanical force (pressure of approximately 150 mmHg) without catastrophic failure that could result in injury.
c. *Accuracy and Reliability*: The device should be accurate within 5% of true pressure and temperature values and should also be precise to create an optimal teaching tool.
d. *Life in Service*: The device will allow for multiple sequential casting procedures in order to give many residents the necessary experience before real time scenarios.
e. *Shelf Life*: The device should last at least 5 years assuming no damage to device during casting.
f. *Operating Environment*: The Platsil, wooden dowel and other materials must withstand pressure and temperature changes associated with the casting process. It should exhibit no reaction to any material used in this process. It must be able to maintain its physical characteristics with repeated use.
g. *Ergonomics*: Must resemble the average size of a child's forearm and allow for variable modular resistance to create different distal fractures of the radius.
h. *Size*: The model arm should be the size of a pediatric forearm.
i. *Weight*: Less than 20 pounds to be easily transported but not crucial to project.
j. *Materials*: The materials must be inert with respect to all materials used in the casting process and show no degradation from these materials or in the range of temperatures and mechanical forces utilized during use. The radius in the forearm will be represented with a wooden dowel and Platsil will be used to symbolize skin.

k. *Aesthetics, Appearance, and Finish*: This device must be representative of a human forearm including a representative radius and skin tissue. The software should display pressure and temperature readings on an easy-to-read screen with color distinctions.

2. Production Characteristics

a. *Quantity*: 1 initially

b. *Target Product Cost*: Under $200

3. Miscellaneous

a. *Standards and Specifications*: N/A

b. *Customer*: Medical Schools and ultimately residents.

c. *Competition*: Past design group's prototype. Simplistic models of extremities exist, but nothing of technical complexity that displays data.