Project Statement:

Leg-Holding Device for Medical Procedures

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Project For
RERC National Design Competition

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**Statement of Need**

Many medical examinations or procedures require patients to be placed in a leg-holding device such as stirrups or knee crutches. However, this creates problems for patients who deviate from the norm in terms of height, weight, or physical ability, as these devices cannot be easily adjusted to fit individual need. Often, patients with muscle weakness, paralysis, or amputation cannot independently position themselves into these supports, and being positioned at certain angles can cause pain and radiant stiffness in this population. Also, current models lack padding and coating to increase comfort for people in the populations mentioned above.

It is important for the patient to have a positive experience to increase likelihood of completing a screening test. Where traditional devices are used, patients often experience anxiety in addition to physical pain caused by the supports. The proposed clients require an anti-gravity device that will allow easy positioning of the legs either by the patient themselves or the practitioner. The device should be comfortable, versatile enough to be used by a wide variety of patients, and should adhere to medical standards.

**Basic Preliminary Requirements**

Patients with physical disabilities such as paralysis, amputation, arthritis, muscle atrophy, or obesity often have problems with traditional leg-holding devices. These problems stem from the lack of adjustability of such devices. The main requirement of this project is to produce an easily adjustable, low-cost device that reduces strain on the patient and practitioner. The device should be compact and easy to relocate so as not to hinder other examinations. Therefore it must be light and free of excess bulk. Another requirement is that it must meet medical sterilization requirements, and it must be easy to clean in between examinations. In order to improve a patient’s experience with this type of procedure, the device should not be imposing or intimidating, and should look and feel as comfortable as possible. Finally, the device should be durable and reliable throughout many examinations.

**Basic Limitations**

- The device may not be able to compensate for the extremes in terms of patient height or weight, due to the requirement of compact size
- Any padding used must be able to be easily sterilized between procedures
- Must be durable in order to withstand wear and fatigue that will occur over many procedures
- Must look and feel comfortable in order to improve patient experience
- Components should be easily replaceable in order to improve device life and safety
- Markers used to indicate length and angle should be easily visible by the practitioner
• The device should have an acceptable range of motion so that it can be adjusted for many patients, but the ROM should be limited enough to prevent a patient from being harmed
• A computer program should be implemented to indicate the optimum settings based on a patient’s measurements

**Other Data**

This is a project designed for the RERC competition. A list of proposed clients, who would need to use this device, as well as other information about the competition, can be found at the RERC-AMI National Student Design Competition website:
http://www.rerc-ami.org/ami/projects/d/2/

**Questions**

• What are other devices currently used for this problem?
• What is the protocol regarding positions for the device during examinations?
• What types of examinations must this device be used for?
• What is an acceptable range of heights and weights of patients that should be accommodated using this device?
• What materials are used currently in this type of design?
• What are the medical sterilization standards for this device?
• What is the expected time in between procedures, in which sterilization should occur?
• How long are the patients expected to be supported in this device?
• What types of medical problems can this device inadvertently cause?
• Where should the supports be placed in order to optimize comfort?
• Should restraint straps be included?
• What locking devices can be used to keep stirrups in place after adjustment?
• At how many locations should the device be made adjustable?
• At how many locations and at what locations does the device need to pivot?
• What are the alternative methods of accommodating for gravity that could be used for this device?
• What is the current cost for this type of device? (i.e. how much will hospitals be willing to pay for this device?)
• How much of a need is there for this type of device?
• How much will the materials cost?
• Will we be modifying existing models, or creating a new model from scratch?
• How do stirrups attach to medical tables?