

**Project Statement:**

**Accessible Weight Scale for Seated Users**

*Team # 9*

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## ***Statement of Need***

Many people with health risks benefit from monitoring changes in their weight multiple times a day. Monitoring weight is not difficult for most patients who have full use of their legs, however, wheelchair users often find it difficult to use standing scales and many wheelchair-accessible weight scales are expensive and bulky. The accessible weight scale for seated users should be integrated into a shower chair or a toilet seat to allow for multiple uses in a day within a household or hospital setting.

## ***Basic Preliminary Requirements***

The accessible weight scale for seated users should have a design that is accessible to users that have limited use of their legs. The device may also incorporate mechanisms to offer support for transferring on and off the scale as well as maintaining posture of the user while the scale is in use. The scale should be easy to power, operate and sanitize. The scale should be able to take a reading in 10 seconds or less, accurate to 1/5 of a pound, have a display that can communicate multiple stored readings in multiple modal formats and be capable of weighing 500 pounds or more. In meeting all of these requirements it is also important that the scale remain inexpensive.

The scale should also meet the needs of the theoretical clientele provided by RERC. Several of the clientele have limited strength in their arms and hands, therefore the interface should be mounted or light weight and accessible to right-handed or left-handed users. The interface should also be simple, without complicated controls, as well as being easy to read for patients with some vision loss. Some of the clients do not have full use or any use of one arm. This should be taken into account when designing the transferring mechanisms that will aid the user in getting on and off the scale.

## ***Basic Limitations***

When dealing with a device with electrical components it is paramount that all wires and circuits are properly insulated to prevent shock to the user. In addition if the scale is integrated into a shower chair it will have to be waterproof and battery powered to ensure that the scale will not be affected from contact with water. While a toilet seat scale will not be immersed in water it should still be splash resistant because of its use in a bathroom. The wiring for the scale should be housed in such a way that will not impede the user from getting on and off of the scale.

Both a shower chair and a toilet seat are relatively low to the ground. This means that the user's feet may be supported by the floor, reducing the accuracy of the scale. A mechanism should be included to keep the weight distributed onto the scale or to incorporate the weight that is not distributed onto the scale without sacrificing the accuracy of the scale. Also a toilet seat scale will have to be safely secured to the toilet to prevent injury to the user. Along with these requirements it must meet the requirements of the FDA and ADA (Americans with Disabilities Act), which determines the specifications needed in order to be considered handicap accessible.

## ***Other Data***

Information about the theoretical clients for the accessible scale for seated users, provided by RERC, is included below.

1. Phylis is an active 77-year-old woman with rheumatoid arthritis that has caused diminished hand strength, joint stiffness, and pain. Phylis also has age-related

- macular degeneration and hearing loss, but she is determined to remain active and independent. Although she is outgoing and bold in general, she is easily intimidated by many of the high-tech gadgets her grandchildren use; she prefers simple interfaces.
2. Aaron is a 23-year-old man, a returning Iraq war veteran, with an arm amputation above the elbow, chronic neck pain and recurring headaches. Although Aaron sometimes wears a prosthetic device with a pinching mechanism, most often he improvises and uses one hand to complete tasks. He takes a number of medications, mostly for pain management.
  3. Keisha is an 84-year-old woman who recently had a stroke, causing hemiplegia on her right side that has affected the function of her dominant hand. She has also experienced some memory loss after the stroke, so she appreciates the reminders her family provides her. Before the stroke, Keisha had minor hearing loss, and it has continued to worsen in recent years due to aging. Although she wears a hearing aid every once in a while if she's going out, at home and at most other times she does not use it. She also has occasional challenges with incontinence.
  4. Jerry is an 82-year-old man with Parkinson's disease, which causes him to have tremor, rigidity, and decreased range of motion; he also has difficulty with urinary control. Jerry has recently started experiencing symptoms of Dementia, but with the help of his family he is determined to remain in his own home as long as possible.
  5. Jamie is a 42-year-old woman with a T11 spinal cord injury. She mainly uses a manual wheelchair and is a serious wheelchair basketball athlete. She would like to have better control of her urinary function while participating in athletic activities.
  6. Betty is a 65-year-old woman who has limited and asymmetrical lower extremity range of motion due to a bad hip. She also has limited strength in her right leg due to decreased use of her right leg because of the pain caused by her hip.
  7. Violet is a 32-year-old woman of short stature who is on blood pressure medication. She is also a mother of 3, and is very active within her family and community.
  8. Paul is a 43-year-old man with diabetes. The diabetes has caused neuropathy in his hands and feet, which eventually necessitated two below-the-knee amputations, and some loss of vision.

## **Questions**

What material should be used to for the scale?

Should the interface also be able to record time and date as well as the measurement of the user's weight?

Should the interface be detachable from the scale so that it may be brought into the hospital during check ups?

How many measurements should the scale be able to store?

Can we expect that a patient with signs of Dementia can accurately input the time and date themselves?