



## Announcing the RERC on Accessible Medical Instrumentation's 2005-2006 National Student Design Competition

Open to U.S. programs in biomedical and mechanical engineering, industrial design, and related disciplines.

Programs receive up to \$2000 in reimbursement for design costs.

First prize: \$1000, Second prize: \$750, Third prize: \$500.

\$500 awards also available for registration/travel to present a related paper accepted at a major conference.

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Design teams are welcome to enter in any of three target design areas for the imaginary clients indicated:

### Accessible Blood Glucose Monitor Interface

**Problem:** People who have diabetes need to measure their blood glucose levels manually, usually with a portable, battery-powered meter, generally several times a day. Diabetes can cause disabilities, especially visual impairments, which can make using these meters a very difficult process. Talking meters exist but are not designed for optimal ease of use, particularly by people who are blind.

**Aim:** A portable, reliable, low-cost interface that is easy to use, works with or is based on an existing, commercially available blood glucose monitor, and meets the needs of the clients below.

**Specs:** The blood glucose monitor must communicate effectively with the user through both a visual display and audio output. If the device uses test strips, consider their use, calibration, and expiration dates, and the use of multiple types and vials of insulin. Consider ease of learning, storage of all components, cleaning and maintenance.

**Clients:** Lloyd, Arnold, Dave, Wanda, Rose

### Accessible Medication Dispensing Device

**Problem:** A wide range of medication storage and dispensing systems are available, from simple and cheap to complex and expensive. Automated devices can dispense drugs only to a specific patient, and with patient-specific doses. Such devices, especially if linked with hospital bar coding, can reduce medication errors.

**Aim:** A moderately priced and dependable device that is easy to use and safely dispenses or assists with dispensing variable medication doses. The device must manage pills and tablets, and may manage capsules.

**Specs:** The dispensing device must be able to slice pills/tablets into halves or quarters. Ideally, it will interpret a container's bar code, and have a quality control mechanism (including the ability to track medication expiration dates). The device should be appropriate for use in a client's home or in a clinical setting. Consider including systems to remind users to take their medications and to track what medications have already been dispensed.

**Clients:** Bruce, Mary, Sophia, Arnold, Rose

### Patient Positioning Aid

**Problem:** Many individuals with disabilities lack access to imaging technologies because of difficulties related to patient positioning, which may include transferring onto medical devices and maintaining static positions during use. CT and MRI scan technologies often use static positioning aids such as foam wedges and/or wrap-around "coils" but more effective aids are needed.

**Aim:** A versatile, low-cost, easy-to-adjust patient positioning aid that works with a range of examination tables and imaging platforms and meets the needs of the clients below.

**Specs:** The positioning aid must support the segment weight of a large person (up to 500 pounds total body weight), be easy to adjust for transferring or position maintenance even for medical professionals who have limited strength or flexibility, easy to store, compatible with different imaging technologies and table types (e.g., CT, MRI, x-ray), and able to support a variety of body segments and positions.

**Clients:** Bruce, Joan, Lloyd, Sophia, Arnold, Dave

Bruce. Bruce was born in 1960. He is an aerospace engineer and vehicle enthusiast who lives with his wife and one cat. In 1999, he was involved in a serious motorcycle accident which resulted in the paralysis of his legs and now he uses a manual wheelchair. He experienced renal failure in 2003 and takes a large number of medications daily.

Joan. Born in 1919, Joan has raised 5 children and has many grandchildren and great-grandchildren. Now a widow and living in a convalescent home with heart failure, she is relatively sedentary and is fragile and weak. She is also hard of hearing.

Mary. Diagnosed with Multiple Sclerosis in 1994 at age 59, Mary's condition has declined steadily over the past 10 years. She now uses a walker and is able to stand without support for no more than 1 minute. She also has poor eyesight.

Lloyd. Lloyd, a retired pharmacist, was born in 1926. Diagnosed with Type 2 Diabetes in 1989, Lloyd has some hearing loss and, due to poor diet and lack of exercise, is very overweight (400lbs).

Sophia. Sophia was born in 1970 and emigrated to the U.S. from Poland in 1987. In relatively good health, Sophia had several small strokes in 2003, and now takes heparin as a precautionary measure. Sophia has limited right arm function and walks using a cane, but she continues her job as a social worker and is very active in the community.

Arnold. Arnold was born in 1952 and since his heart attack in 1999 has worked in the mailroom of a large manufacturing company. He has diabetes and Parkinson's disease, and experiences slight to moderate tremors. He lives alone.

Dave. Now 22, Dave was diagnosed with diabetes in 2000. He has limited use of his right arm and leg due to a head injury he sustained while playing football in college. Dave uses a cane and sometimes an electric scooter.

Wanda. Born in 1994, Wanda has low vision and diabetes. Wanda weighs 80 lbs. She is being encouraged to start administering insulin to herself, as her mother recently passed away and her live-in grandmother, Rose, is blind.

Rose. Born in 1941, Rose is blind and was recently diagnosed with lung cancer. With the recent death of her husband, Rose is about to move in with her daughter and son-in-law and her granddaughter, Wanda, but she wants to maintain her independence as well as help out around the house as much as she can.