

HIPsense

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Clinical Problem

The most common method that the elderly injure themselves is through falling. 30% to 50% of falls in the elderly result in minor injuries such as bruises, abrasions, and lacerations. However, 10% of falls result in major injuries such as intracranial injuries and bone fractures. And 1% of falls result in hip fractures which significantly increases the morbidity and mortality of injured. The risks of falling increases with increasing age, medication use, sensory deficits, and cognitive impairments such as traumatic brain injury, Parkinson's disease, and stroke. Risk factors that increase the chance of hip fractures are age, sex, race, bone mass, body weight, estrogen deficiency, and previous hip injuries. Elderly females are more at risk than elderly males because they have more porous bones due to the lack of estrogen after menopause.

Needs Statement

Falling often occurs in the elderly above the age of 65 due to deterioration in visual, sensory, and motor systems. Current fall prevention methods involve exercise, training, and environmental aids; however, accidental falls can still occur. A method is needed to protect individuals from injury after a fall begins.

Market Analysis

The elderly population will be our target audience. According to the CDC, more than $\frac{1}{4}$ of elderly people over the age of 65 fall every year, with 300,000 being hospitalized due to hip fractures. The current population in the US over the age of 65 is 46 million. Potential revenue would in theory \$15 million dollars w/ a profit of \$50 for each device sold for the 300,000 elderly people that are hospitalized each year due to a hip fracture. Current devices on the market do not target fall protection, only fall prevention. These products include walkers, rails, socks with rubber bottoms, and fall prediction alarms. While they have assisted in preventing falls in the elderly, those who are fall even with the assistance of these devices are not protected.

Medical Device Solution

Our solution for protecting the elderly from unpredictable falls is a fall detecting belt that inflates into a cushion for their hip once a fall is detected. Falls will be detected using an accelerometer and a gyroscope to measure sudden acceleration towards the ground and sudden change in angle. Once a fall is detected, a motor will be activated and release the valve on a CO2 regulator that is attached to a CO2 canister. Once the CO2 is released, the CO2 will enter a tube that is connected to a folded airbag thus inflating it and deploying it underneath the falling individual. The CO2 canisters will be single use but can easily be replaced into the CO2 regulator. After deployment, the airbag will slowly deflate allowing the user to lay flat on the floor. A potential future step would be to integrate this device into a hooded jacket that inflates once a fall is detected. An inflatable hoodie would allow for the protection of the hips as well as the upper body but most importantly the user's head. This would be able to protect the user from several forms of blunt force trauma that could result in bone fractures and intracranial injuries.

Team Photo

