**List of Criteria**

* Light-weight
* Wearable
* Durable
* Ergonomic
* Easy-to-clean
* Intuitive
* Cost-effective
* Accurate & Reliable
* Provides relevant readings
* Alerts errors / malfunctions
* Biocompatible
* Mobile
* Appropriate size for function
* Powered

**Preliminary List of Ideas**

| **Idea** | **Sensor** | **What is being measured?** | **End-User Group** |
| --- | --- | --- | --- |
| Active Heart Rate Monitoring Device | Heart Rate | Fluctuation in a user’s active heart rate is what is being measured. This device measures heart BPM during exercise or physical activity and outputs an alert to the user depending on the user’s pre-established target heart rate as well as relevant health standards. | Athletes of any age group who suffer from heart complications and thus need to monitor their active heart rate, avoiding further health issues. |
| Alzheimer’s Disease Predicting Device | Absolute Orientation | A user’s gait pattern is what is being measured. An absolute orientation sensor can record and compare Euler angles in the three different axis as well as the user’s walking acceleration. This data would then be transferred to the user’s doctor or care-taker, and can then be examined for an early Alzheimer’s Disease diagnosis. | Elderly users who have been labelled as being prone to Alzheimer’s Disease based on their genetics, lifestyle, and environmental factors. Their doctors will also benefit from this device in assisting them with diagnosis. |
| Obstacle Detection Device | Distance | Supplements a guidance cane by notifying the user when an object is within 2 meters of them, allowing them to navigate the space surrounding them. | Blind or hard of sight patients in need of aid with independent navigation and orientation. |
| Fainting (Syncope) Prediction Device | Heart Rate Monitor | The device would be able to notify in the case of a rapid decrease in heart beat, or an abnormally low heart beat. | Patients with irregular heart beats, seizures, low blood sugar (hypoglycemia), anemia (a deficiency in healthy oxygen carrying cells), and problems with how the nervous system (the body's system of nerves) regulates blood pressure are susceptible to sudden fainting. |
| Fainting (Syncope) Alert Device | Orientation Sensor | This device would be able to monitor orientation. A significant change in orientation or gravitational acceleration would produce an alert to draw attention. | Patients with irregular heart beats, seizures, low blood sugar (hypoglycemia), anemia (a deficiency in healthy oxygen carrying cells), and problems with how the nervous system (the body's system of nerves) regulates blood pressure are susceptible to sudden fainting. |
| Pressure Ulcer Reminder Device | Force  (Applied Pressure Over Time) | This device can detect large sudden changes in pressure or a constant amount of force (within a specific range) exerted over a long duration of time. Once triggered it can make a distinct notification to remind the user or the caregiver to switch position and prevent pressure ulcers. | Pressure ulcers tend to affect bedridden patients, the elderly (sensitive skin) and people who suffer from blood flow conditions such as type 2 diabetes.  It can serve as an alarm for family members and caregivers to switch an immobile patient’s position. |
| Sleep Apnea Monitor | Heart Rate | This device would utilize the output from a heart rate sensor to detect fluctuations in heart rate to determine a patient’s breathing pattern. Mechanisms in the device would then restore a normal breathing pattern and prevent the condition from worsening through correlations found between heart rate and breathing. | Sleep apnea is a common condition that can affect anyone of any age at any time. Therefore the end user for a device such as this one does not necessarily fall within ad specific age category. |
| Respiratory Rate Detection Device | EMG | This device assesses respiration rate by measuring diaphragm muscle contraction and relaxation over time.  It will trigger a notification if there are any abnormal changes in the patient’s breathing pattern (respiration rate under 12 or over 25 breaths). | Patients with abnormal breathing patterns caused by a variety of conditions such as asthma, heart failure, pneumonia, and anxiety. |
| Seizure Monitor  (Could work for fainting too) | Orientation Sensor | Measures location and acceleration with falling from spells. | Seizures may occur within seconds and many fall. More dangerous for the elderly who have fragile bones. Alerts medical personnel when acceleration measured is in the danger zone. |
| Muscle Strain | EMG Muscle Activity Sensor | Measure muscle movement. Can detect major muscle movements that would be of risk of muscle tear. | Many athletes as well as those who are sick with pneumonia are at risk. |

**Tentative End-User:** Population over 65 years of age.

**Need Statement**

The population with a predisposition (ie. genetic, environmental, lifestyle, etc.) for Alzheimer’s Disease needs a wearable device which will monitor symptoms common in the early stages of Alzheimer’s Disease, increasing the likelihood for early diagnosis.