

Automated Near-Fall Detector

PI: Prof. Jeffrey M. Hausdorff & Prof. Nir Giladi

The Problem- Falls

Falls are a significant cause of morbidity and mortality, especially among older adults and many other patient populations. In the US alone one in three adults 65+ falls each year. Of those who fall, **10% - 30%** suffer from moderate to severe injuries. **The Economic burden:** Treating falls is extremely expensive; in 2015 Medicare evaluated the costs for falls at over **\$31 billion**. Since the population is aging, all these numbers are about to rise up drastically.

The Need- An Accurate and Objective Assessment of Fall Risk

The most common means of quantifying falls remains **self-report**. Despite its widespread use, it has three key limitations: subjective in nature, it requires a long observation period (6 months or a year) and it lacks sensitivity. Another approach to quantifying fall risk is to use **balance platforms**, which are expensive. Clinical tests (e.g. Timed Up and Go) have poor sensitivity and inadequate accuracy.

Our Vision- The Near Falls (NF) system

Imagine that a few weeks before a clinical exam the patient receives in the mail a body-worn sensor, the size, and weight of a small sticker. After the patient has put on the sensor, it starts to record his movements and then it detects and monitors NF and documentation of any changes in the walking pattern. The clinician then receives a detailed report of the patient's motor function and fall risk. The clinician can conduct the clinical examination informed with details about the patient's motor abilities, performance, and risk of falls. The near falls device is a Holter-monitor like that is composed of accelerometers, computation, storage, communication with caregiver/physician.

The Advantages of the Near Falls system

- ✓ The NF system gives an objective, accurate and sensitive measurement that is based on everyday performance and allows **early detection**.
- ✓ Early detection of fall risk using the NF can lead to **improved healthcare**.
- ✓ **Time saver**- A typical neurologist and geriatrician only have a few, rushed minutes to conduct a motor examination and to assess the risk of falls. With the "Near Falls" system, the doctor receives an accurate analysis of fall risk right to his computer.
- ✓ The "Near Falls" system is **low cost**.

The Research

In the past few years, studies were conducted testing the accuracy of the NF system to evaluate fall risk in different populations such as older adults and Parkinson's disease (PD) patients. The findings indicate that new measures of NF reflect fall risk in patients with PD and that these metrics have the potential to enhance the evaluation of fall risk. We have also shown that a sensor-derived metric that reflects gait quality can predict the time to a first fall and future fall status in patients with PD, even among subjects who reported no falls in the year prior to testing, demonstrating the potential of this approach.