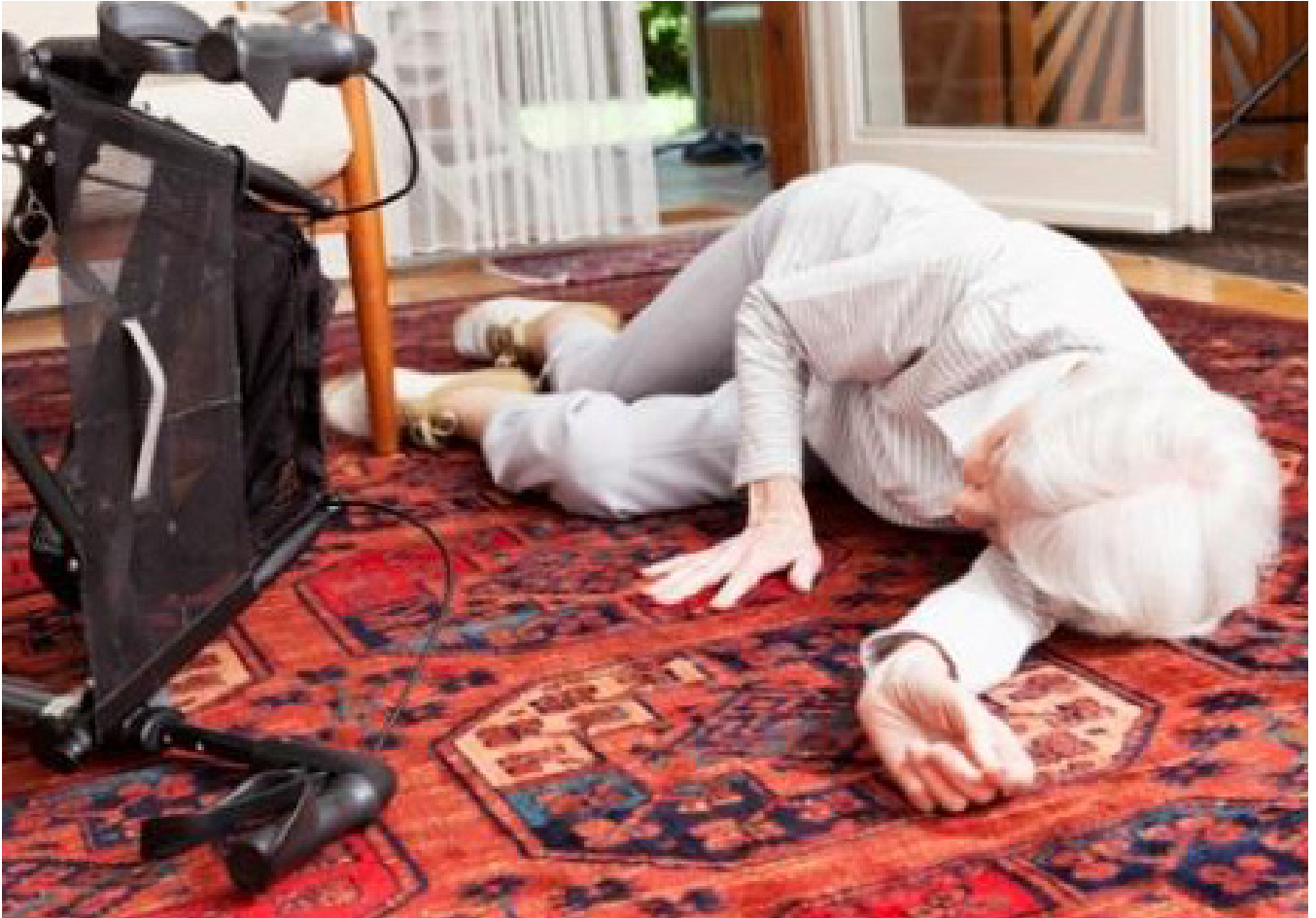


# Measuring fall risk and fall prevention

beyond the obvious





VTT has developed methods for estimating fall risk to prevent falls of older adults. Developed methods can be used for example as part of easy to use mobile application, which alarms the user of risen fall risk. The novel method is based on information of human movements collected by accelerometer sensors.

**Falls are a significant cause of costs**

Falls of older adults cause significant costs for societies and lower quality of life of older adults. As the population is getting older, societies need to pay more attention to prevention of fall injuries. The most expensive fall accidents are hip fractures. There are 2,3 million fall-related emergency visits yearly in EU. Health care expenditure related to fall accidents is 25 billion € each year in EU.

**Fall risk assessment**

Fall risk can be assessed clinically by evaluating the persons health state and medication and performing various tests which measure physical condition, such as muscle strength, balance and gait speed. VTT has developed technological methods for making fall risk assessment quicker and easier. The developed methods utilise accelerometers, which can be found for example from smart phones or activitymeters.

### **Continuous fall risk assessment**

Sometimes the physical condition of older adult can impair rapidly, when also the fall risk rises. Fall risk assessments are currently made only seldom and the risen fall risk can stay unattended. If fall risk assessment can be integrated as an unobtrusive, always-on application running in smart phone, the risen fall risk can be noticed earlier and preventive actions can be started earlier. The risen fall risk can be found from features in human daily movement, such as gait, standing up from chair or sway.

### **Self-assessment and own activity**

It would be good to start fall prevention early, during working age. The developed technology enables also self-assessment of fall risk, alarming of changes in movements and getting information about own physical condition. Technology helps in waking up older adults to take better care of their own functional capacity and preventing injuries.

### **Fall risk assessment as part of home care**

Technology is currently arriving to help home care personnel. Smart phones and tablet computers can be used for reporting and manage work tasks directly while visiting the home care customers. Technology also gives a possibility to make short fall risk assessment during a care visit, which allows getting better picture of the functional capacity of home care patient and earlier intervention on decreased status of the patient. The information of current status of patients can also be integrated to health care systems and provide wider view of all home care patients to decision makers, for targeting preventive actions to needing patients and for estimating the future need of services.

### **Technology utilising accelerometers**

Fall risk assessment utilising accelerometers is based on collecting information about human movements, such as gait. 3D-accelerometer signal can be used for extracting features, which describe person's balance, sway and gait. These features can be used for estimating the fall risk of a person and recommend preventive actions. ●

### **References**

- "Accelerometry-based assessment and detection of early signs of balance deficits." Similä, Heidi; Immonen, Milla; Ermes, Miikka. Computers in Biology and Medicine. Elsevier, vol. 85, 2017, ss. 25-32
- "Accelerometry-based Berg Balance Scale Score Estimation," Simila, Heidi; Mäntyjärvi, Jani; Merilahti, Juho; Lindholm, Mikko; Ermes, Miikka, IEEE Journal of Biomedical and Health Informatics, Volume: 18, No. 4. July 2014, Page(s): 1114 – 1121
- "Disease State Fingerprint for Fall Risk Assessment," Similä, Heidi; Immonen, Milla, 36th Annual International Conference of the IEEE Engineering in Medicine and Biology Society, Chicago, August 26-30, 2014, pp. 3176-3179

### **MEASURING FALL RISK BY USING METHODS DEVELOPED BY VTT'S**

- Quick and easy
- As part of home care
- Self-assessment
- Together with next of kin
- Supporting information sharing
- Activating older adults to take care of their own functional capacity

VTT is a visionary research, development and innovation partner. We drive sustainable growth and tackle the biggest global challenges of our time and turn them into growth opportunities. We go beyond the obvious to help the society and companies to grow through technological innovations. VTT is at the sweet spot where innovation and business come together.

**Get in touch with us:**

Milla Immonen  
Senior Scientist  
Project Manager  
Tel. +358 20 722 2168  
milla.immonen@vtt.fi

Heidi Similä  
Research Scientist  
Tel. +358 20 722 2061  
heidi.simila@vtt.fi