New wearable to aid healthcare professionals assess frailty

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Credit: AI-generated image (disclaimer)

Frailty in the elderly has multiple adverse health outcomes, including disability, morbidity, falls, hospitalisation, institutionalisation, and even death. One project is adding tools to help healthcare professionals treat an aging population.

That our population is aging is not news, neither is the fact that many senior citizens would prefer to remain independent for as long as possible and that accidents can curtail their independence and lead to hospitalisation. Once discharged they may no longer be able to live in their own homes. The result is devastating for the individual and costly for health services.

The FRAILSAFE project, supported by the EU, is doing what it can to further our understanding of frailty and to develop measures to define it. One development the project has made is an innovative new system that can measure several crucial parameters, enabling doctors and nurses to get a clear idea of their patients' health in an unobtrusive manner.

The Wearable Wireless Body Area Network System (WWBS) comprises a sensor-packed garment, an electronic device and a software tool for the visualisation streamed of data. The data can also be downloading from the electronic device to a PC, which can be uploaded to a cloud service.

The garment, a t-shirt, contains two fabric electrodes for electrocardiogram (ECG) monitoring and a fabric piezorestistive sensor for respiration monitoring on the chest. Each of the sleeves contain a small box which houses a 9-Degrees of Freedom (DoF) IMU sensor. On the chest there is also a pocket for an electronic device with a third, integrated 9-DoF IMU. All sensors are connected via cables to the device.

This device then collects all the information gathered by the shirt and stores it on a micro SD card. When needed, data can be transmitted via BluetoothTM to a computer or an Android device for real time analysis. Fifteen of the WWBS are being produced by the project partner Smartex as part of an ongoing pilot project.

The system can monitor:

- Posture
- Heart rate variability
- Respiration signal and rate
- Activity classification
- RR (distance in milliseconds between 2 QRS complexes)
- Steps taken

This new version of the FRAILSAFE Smart Vest is the second iteration. Designers first issued a prototype at the end of 2016 to partners where it was tested by clinicians. From May 2017, project volunteers participating in the Nancy, Nicosia and Patras tried out the vest and gave their feedback on the 1.0 version, making version 2.0 more user-friendly.

Adaptations include a highly visible LED that flashes information in a simple colour code, a stronger case (some of them were broken and replaced during the 9-month trial) and simple connectors (the previous one was too hard for weaker people). Suggestions also came from the clinicians for a better data collection including a more powerful battery to enable longer monitoring period and a dedicated battery for the internal clock, to ensure a correct date recording in files.

FRAILSAFE (Sensing and predictive treatment of frailty and associated co-morbidities using advanced personalised patient models and advanced interventions) is working to increase our understanding of frailty and its relation to co-morbidities. It wants to identify quantitative and qualitative measures of frailty through advanced data mining approaches to multiparametric data, and use the findings to predict short and long-term outcomes and risk of frailty.

More information: Project website: frailsafe-project.eu/news/62-smartvest

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