Smart textiles system prevents the development of pressure ulcers in wheelchair users

March 16 2015

PUMA project

The European research project PUMA (Pressure Ulcer Measurement

and Actuation) technically coordinated by the Biomechanics Institute (IBV) has developed an innovative portable and non-invasive device to prevent and early detect the risk of pressure ulcer (PU) development and revert its onset for tetraplegic spinal cord injured (T-SCI) individuals relying on wheelchairs.

Nowadays, PU treatment costs €20 billion per year to the EU Public Health Care System. Although PU prognosis is excellent at early stages being 95% preventable, current solutions are not effective, as they rely on pressure reduction instead of tissue viability, and do not consider user state, characteristics and context, and do not optimally combine current strategies to prevent PU.

According to the IBV Innovation Director of Rehabilitation and Personal Autonomy, Ignacio Bermejo, "The PUMA device has three independent systems that prevent PUs by detecting and eliminating the risk of PU development by proposing different strategies to the users."

Specifically, "we refer to the postural control system of the wheelchair, a dynamic cushion and a smart textile embedded in a pair of shorts for measuring pressure, tissue viability and application of functional electro stimulation (FES)."

The cushion and the shorts send information in real time to a computer system embedded in the wheelchair, which is controlled by the user using a smartphone app. This application evaluates the data and is able to identify postural risks in each situation.

"For example, the application could detect the limit time spent in the same position and, depending on the context, propose various actions to prevent the PU formation: changes in chair position (back, seat and footrest), modification of the cushion, or directly applying electro stimulation in risk areas," adds Ignacio Bermejo.

As explained by the technical project manager, José Laparra, "The PUMA solution is the result of a two-year research project. During the first stage, we gathered information about the needs and anthropometric and physiological characterization of T-SCI patients that adversely affect the occurrence of PU. Afterwards, we studied and compared different tissue viability measuring systems in order to embed them in smart textiles."

PUMA project