Flexible, waterproof electrical yarn is being woven into bed linen, with the aim of using it in hospitals to alert staff of the need to move a patient or change the sheets.

It's part of a wave of research that is bringing smart technology to hospital beds in order to increase the comfort of patients and reduce the incidence of preventable problems, such as pressure sores.

The new bed linen, which is being developed by the EU-funded PASTA project, consists of electrical yarns made from conductive fibres that link together flexible nodes with microchips. Yarn acting as electronic sensors is woven together with yarn that carries electrical signals from chips.

Thanks to this combination, the resulting fabric can not only monitor moisture content from sweat and urine, but can also be wired up to a central communications unit to alert staff that the patient needs to be attended to.

Project coordinator Johan De Baets from Imec in Belgium says that the linen is even able to detect which part of the bed is wet.

‘These yarns are made into zones, for example five to seven zones, along the bed linen, and whenever there is some moisture in a certain zone, it is detected by the electronic circuit, and that sends a signal to the central control unit,’ he said.

Because the electronic circuitry is completely covered with silicone it does not come into contact with moisture.

De Baets says the new technology could also help hospitals to better manage staff resources.

‘There is the need, for example by hospitals, to first have diagnosis to see when and how much a bed has been wet, during certain periods, in order to adapt the changing routine or the control routine of the nurses – not on fixed times, as per now, but at intervals that are dictated by the sensing system.’

According to De Baets, the bed linen is functional, comfortable – and crucially, washable. ‘It’s more comfortable than a traditional electronic textile, because the modules we integrated are flexible, stretchable, and encapsulated in silicone so they are quite flexible and comfortably integrated into the textile.’

Greater comfort

One great cause of discomfort for people who are bedridden is pressure sores, which can easily lead to infections that can spiral out of control in people whose immune systems are already

struggling with disease.

Nurses normally have to adjust beds every few hours – a process that's not only awkward for patients, but is a leading cause for 85 % of nurses suffering a back injury at some point during their career.

The EU-funded EPOSbed-Demo project has designed an intelligent hospital bed, which comprises a moveable frame and a mattress containing sensors which work to automatically move the bed in response to the patient's movement. This would enable patients to adjust their position without help from nurses.

'The target of the project was to help people with disabilities, for example patients recovering after surgery, or elderly people with restricted movement,' said Manuel Chica Serrano, deputy principal researcher at the European Centre for Soft Computing, Spain, who led the bed's design.

The impression of a body made on the mattress's 1 000 sensors creates a pressure image. The intelligent software – based on image processing algorithms and artificial neural networks – then analyses this in real-time to decide upon the best movement.

The technology is now being patented, with the aim of having a commercial product available by mid-2015. The frame and sensors could be retrofitted into standard hospital beds.

'The technology could be applied to any sort of motorised beds, even to the air mattresses currently used in hospitals and care homes to relieve bed sores,' said Oscar Valdemoros Tobia, general manager and project leader based at Industrias Tobia S.A. in Spain.

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