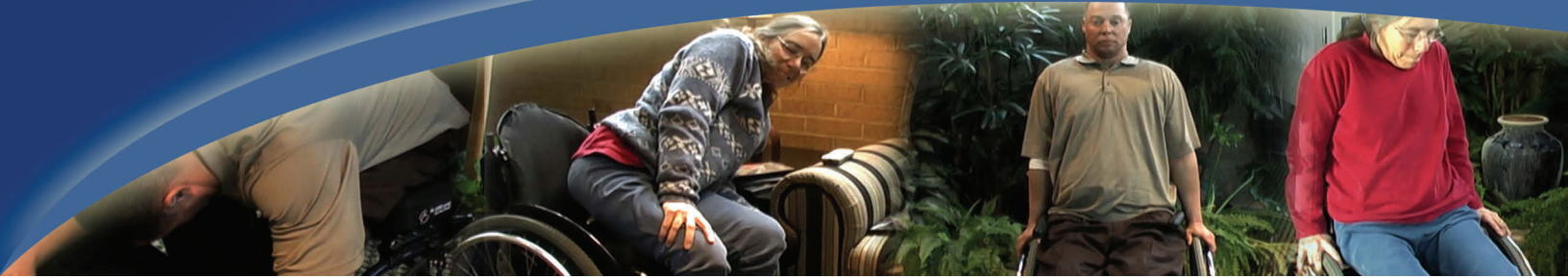


What a pain! Relief for pressure ulcers underway.

By Thomas Burnett



Do you know that feeling after a really long plane flight or car ride, after sitting for hours with no relief and little room to move? You ache all over, your muscles tighten, and the parts of your body in contact with your seat feel uncomfortable and sore. Though we usually just see these situations as a minor nuisance, they also provide us a glimpse into the life of individuals using wheelchairs or individuals that are bedbound for an extended period of time. Particularly for those with spinal cord injuries (SCI), this discomfort is an everyday affair.

Associated with prolonged periods of sitting are serious health risks, particularly pressure ulcers (PU). They affect approximately 45 million Americans and treating them costs an estimated \$3 billion dollars per year. Among those with spinal cord injuries, PUs occur at an even higher rate. Without proper treatment, pressure ulcers can lead to immobility, require surgery, and in the worst cases, cause death.

One of the most important strategies for avoiding pressure ulcers is to change positions frequently. Bedbound individuals should be turned, and individuals in wheelchairs, if they have sufficient arm strength, should push themselves up from their seat. But how often, and for how long? Current standards advise wheelchair users to relieve pressure for 30 to 90 seconds every 15 to 30 minutes. But is this timing optimal? For such a prevalent and pervasive problem there is surprisingly little supporting research data.

The Rehabilitation Research Training Center (RRTC) in Washington DC has big plans to change this paradigm and give relief to those at risk or already suffering from pressure ulcers. The RRTC is based at the National Rehabilitation Hospital, where Dr.'s Suzanne Groah, Alexander Libin and Jessica Ramellia-Roman have begun a five-year study to accurately assess pressure ulcer risk and develop better methods to prevent them.

How exactly do pressure ulcers form? Sitting or lying down puts pressure on our skin, and the vessels just below the surface are compressed, which reduces blood flow to the skin. Since red blood cells carry oxygen, a critical element for the proper functioning of cells, less blood means less oxygen. Deprived of oxygen for long enough, cells begin to die, leading to tissue breakdown. Normally, this causes us pain, and we change our position in order to avoid any more pressure on this area. But those with spinal cord injuries may have no sensation on parts of their body, and without a visual inspection, they may have no idea that their health is in jeopardy. And by the time a pressure ulcer is visible, significant damage to deep tissue has already taken place. Untreated, the dying tissue spreads, forming an ulcer that can reach down to muscles or even bones.

To monitor risk for pressure ulcers, Catholic University professor Jessica Ramellia-Roman has developed an exciting new instrument that enables her to capture important data that has eluded researchers until now. Whereas previous sensors only measured blood perfusion, her new sensors measure three variables simultaneously: (1) the exact pressure against the skin, (2) the strength of the blood flow coming to that area (perfusion), and (3) the amount of available oxygen on skin surface (oxygenation). Her instrument uses fiber optics and a laser Doppler anemometer for measuring the blood flow, as well as a spectroscope measuring oxygen in four different levels of the skin.

With the data collected from the study, the RRTC research team will be able to clearly answer the following questions for people with spinal cord injuries:

- How long can I safely sit without harming my skin?
- How effective are my pressure relief techniques?
- How long does it take the blood flow to increase and the oxygen to return to an area that's been compressed?

Using this device, clinical researchers will actually be able to measure how pressure relates to blood flow and oxygenation of the skin during sitting and during pressure reliefs. The new sensor and an embedded evaluation algorithm will monitor and provide individualized recommendations for pressure relief based on the analyzed information.

After completing this study, the project team will educate both consumers and doctors about the best way to prevent pressure ulcers. It is also likely that these new sensors will become commercially available so that persons with SCI and those at risk for PUs can receive individual assessments and develop customized pressure release schedules. Armed with this knowledge, those in wheelchairs will be better equipped to reduce or prevent pressure ulcers from occurring. And pain will give way to relief.

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