

WOUND & SKIN CARE

Can pressure mapping prevent ulcers?

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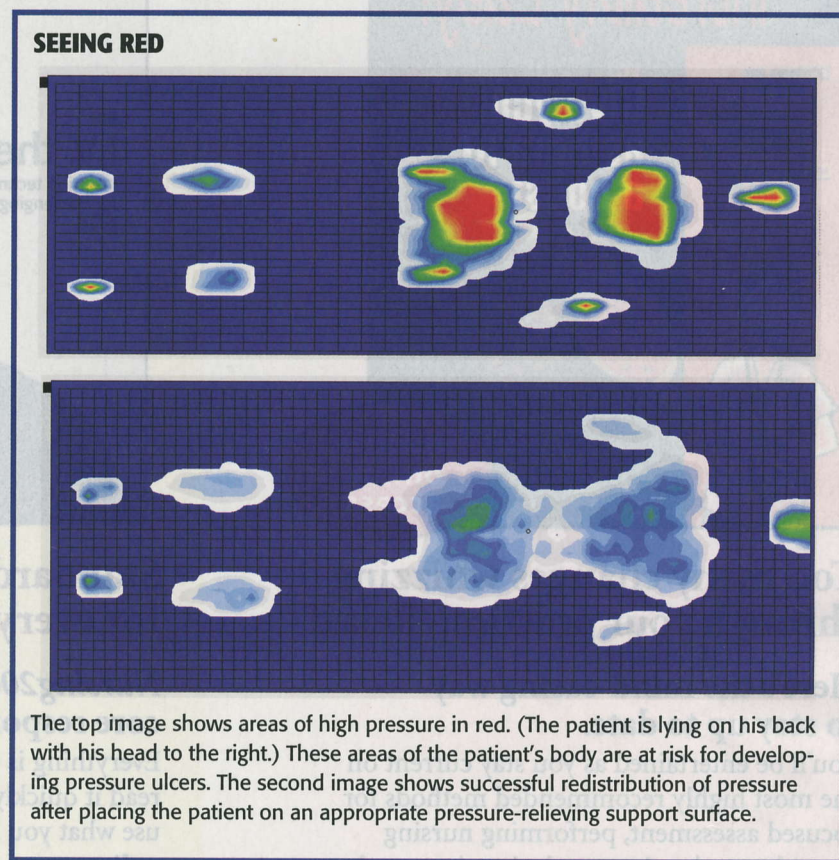
BEFORE HER TOTAL hip arthroplasty, your patient had no known risk factors for skin breakdown. But now she has a Stage II pressure ulcer on the left heel and a Stage I pressure ulcer on the right heel, impeding her mobility and placing her at risk for additional postoperative complications.

An emerging technology called pressure mapping, although not a replacement for pressure ulcer risk assessment and regular skin assessments, may help prevent pressure ulcers by acting as a screening tool. A pressure map can provide information about what's going on under your patient's skin, potentially alerting you to high-pressure areas before skin reddens.

What is pressure mapping?

Pressure mapping systems determine the actual pressure between a body surface and the bed the patient is lying on or the wheelchair she's sitting in, or between the patient's foot and the floor. Various devices exist; one type can be inserted into a patient's shoes and worn while he's walking.

The mapping system consists of a thin, sensor-filled mat with monitoring capabilities that's placed between the patient and the surface he's lying, sitting, or standing on. The sensors convey interface pressures to a computer, which produces a color-coded image of the pressure distribution on a computer screen. Different colors represent different pressure ranges. Typically, blues and greens represent lower pressure ranges, and yellows,



The top image shows areas of high pressure in red. (The patient is lying on his back with his head to the right.) These areas of the patient's body are at risk for developing pressure ulcers. The second image shows successful redistribution of pressure after placing the patient on an appropriate pressure-relieving support surface.

oranges, and reds indicate progressively higher pressure levels. (See *Seeing red* for one example.)

By looking at the computer screen and noting higher areas of pressure, a caregiver trained in this technology can make appropriate pressure-reducing changes in the patient's seat or bed surface, body position, shoes, or orthotics. These interventions may help prevent pressure ulcers, saving the patient's skin as well as

healthcare costs. (See *Pressure problems* for more information.)

In the case of our postoperative patient, pressure mapping could have helped identify high-pressure areas under the calcaneus and provided an early alert to potential damage. Heels are inherently difficult to clinically assess because of their location, and may be overlooked, although physical assessment can be enhanced by using

a mirror or placing the patient in a sidelying position.

Although pressure mapping equipment can be expensive, in the long run it may be much less expensive than the cost of treating pressure ulcers. (More data is needed on the cost-effectiveness issue.) Monitoring when pressure ulcers occur and under what circumstances can help facilities develop guidelines and prevention protocols for pressure ulcers.

It's not perfect

Pressure mapping systems have been used to assess pressure distribution for various anatomic locations of patients in bed, sitting, or standing, but seat pressure distributions have been most widely tested, with promising results for clinical decision making.¹ A concern with pressure mapping is a lack of standardization in how pressure readings are reported by different devices. Some report the pressure directly under a bony prominence (thereby letting you easily pinpoint vulnerable areas); others report average pressure readings over a larger surface area that includes the body part of interest. With the latter pressure mapping system, you may not be able to identify pressure over a specific bony prominence. For example, a specific area of the patient's sacrum may have very high pressure, but if the device averages this pressure with lower pressures in the surrounding area, the pressure reading may appear fine when it's really not. A pressure mapping device that pinpoints areas of concern is more helpful.

Using the highest pressure reading also may help you teach caregivers how to position patients. For example, if high pressures are noted over the patient's heels, the caregiver can provide positioning changes and monitor the situation closely until the pressure is reduced.

PRESSURE PROBLEMS

In an alert person with normal motor and sensory function, nociceptors sense increased heel pressure and alert the brain, and the person naturally repositions her foot. But if a patient is anesthetized, has a condition that impairs her ability to reposition herself (such as decreased level of consciousness or paralysis), or is taking opioids that decrease the pain messages, this protective mechanism is lost.

How much pressure is too much? Although researchers don't know specifically how much pressure over how much time causes skin damage, 30 mm Hg has long been the "gold standard" of pressure measurement. Any pressure higher than this is believed to exceed capillary filling pressure, causing ischemia and skin damage.

The National Pressure Ulcer Advisory Panel is developing standardized testing methodology for pressure redistribution surfaces, so that healthcare providers can accurately compare products and choose the most appropriate one for their patients. Further testing of the capabilities and applications of pressure mapping is warranted, along with specific guidelines to encourage best practices in preventing pressure ulcers.

Pressure mapping in practice

Now let's return to our hypothetical patient. Because many factors contribute to pressure ulcer development, you may never learn whether your patient's heel ulcers were avoidable. But if you'd had a pressure mapping system to monitor skin pressures after her surgery, you may have noticed a high-pressure area on her heels, and been able to use heel elevation or repositioning techniques to

relieve the pressure. Although many surgical patients are considered mobile, they still spend a significant amount of time in bed during recovery. They may tend to use their heels to help position themselves in bed, causing friction and shear. If they're older, this also increases their risk of pressure ulcers.

Heel elevation has been shown to alleviate tissue hypoxia by significantly increasing microcirculation within the heel, but not all heel pressure redistributing or relieving devices are thought to be helpful, and more research is needed.²

Nothing can substitute for careful nursing care and regular skin assessments, but pressure mapping may help augment your assessment skills and save your patient's skin. ♦

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