

Comments on the article "Development of Test Methods for Evaluation of Wheelchair Cushions"

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This issue of the Bulletin reports some very commendable efforts to measure the pressure and shear stresses that impinge on human flesh as a result of sitting in a wheelchair on one cushion or another.

Other investigators have increased the sophistication of our ability to measure capillary bloodflow in tissues under pressure. Still others, engaged in the management of patients who lack sensation, have emphasized the value of intermittent relief of pressure by teaching the patient to lift himself or herself off the cushion at regular intervals, to compensate for the ischemia produced during sitting.

While we warmly encourage every attempt to develop "cushionology" into a science and to record pressures and shear stress by numbers, we were particularly pleased to find authors Cochran and Palmieri warning against any move at this time to rate cushions as "acceptable" or "unacceptable" as though we knew the answers to the problem of pressure sores.

The problem seems to me to be even more complex than Cochran and Palmieri have indicated in their excellent analysis. Consider two factors that are individual to each patient that could change an apparently correctly prescribed "acceptable" cushion to "unacceptable" in a particular case.

The first of those factors is intermittency. Most patients are being advised today that, if they have to sit in a wheelchair for many hours, they should lift themselves off the seat support at regular intervals. This is because there seems to be no way in which even the best cushion can prevent some degree of ischemia on some parts of the patient's buttocks. With lifting at intervals, the tissues under bony prominences can get enough relief to last until the next lift. But lifting is a strenuous muscular effort, and that effort is multiplied if the cushion is so soft that the patient has sunk far into it. There are cushions that achieve their maximum pressure relief only when the patient sinks 3½ inches into the soft material. Thus the pressure is fully relieved only on a 3½" lift. That is very hard work and will rarely be accomplished frequently and completely.

Really weak patients may hope to accomplish intermittent relief by only leaning forward to tilt their pelvis up, by increasing their thigh support, or by tilting sideways to lift one buttock at a time. Such maneuvers give only a small lift and may be futile with even a 2 in. cushion — if it is soft and elastic. In such cases, a more viscous cushion may give a patient time to lift off and come back before the cushion changes its shape.

There is a new "cushion" on the market designed by Kosiak (Michael Kosiak, M.D., Director of the Department of Physical Medicine and Rehabilitation, St. Paul-Ramsey Medical Center, St. Paul, Minnesota 55101) which has the patient sitting on metal rollers which move slowly across the seat area. Although these naked

^a George Van B. Cochran, M.D., Sc. D., and Vincent Palmieri: Development of Test Methods for Evaluation of Wheelchair Cushions. That article and a related paper on details of test equipment employed appear in this issue of The Bulletin of Prosthetics Research.

rollers produce pressures that are much higher than any "acceptable" level, they are described as safe and comfortable because of their complete intermittency.

The second individual factor is cushion (and patient) shape. Some patients are so poorly padded and have such prominent bones or pelvic tilt that even a thick, soft cushion will leave some high-pressure areas. One approach to such patients (or even to any patient with insensitive buttocks) is to mold the seat accurately to the patient — so that, as the patient lowers himself, every point of his skin surface will contact the seat at the same time. Such a seat, if perfectly made, may not need to be soft, although some degree of softness will allow a margin of error in shaping the seat or for poor placement of the patient. For such an arrangement, the concept of an "acceptable" cushion must relate only to that one patient and not to a cushion type. The relatively hard-molded surface has the advantage that it is easy to lift off it—pressure may be relieved by a ½ inch of lift.

The real reason for this essay is not to discourage attempts to rate cushion materials and design. Rather, it is to encourage measurement of the effect on the patient's skin and soft tissues. Cochran's article moves in that direction with the suggestion of "custom selection" by prescription only and custom application of approved cushions, and with the conclusion that comparative measurements using interface pressure transducers may be a useful tool in the prescription of a cushion for a patient with critical skin problems.

Isn't it likely that such a measurement procedure needs to be taken up and standardized as perhaps the normal method of rating any seating system for each individual patient? It may be thought expensive and time consuming to do this for each patient, but the alternative is to wait for the appearance of pressure sores to prove that our guesswork evaluation was wrong—even when we used an "acceptable" cushion, but for the wrong patient. Each such mistake costs many thousands of dollars to heal and many more thousands of dollars to use more expensive and sophisticated wheelchairs afterwards to prevent recurrence of the problem on the pressure point which has become extra vulnerable because of the first pressure sore.

It is gratifying to see the emphasis on clinical observation in the cushion testing procedures which are described in detail in this issue, and in particular it is good to see attention directed toward a cushion's tendencies to foster elevated temperatures and excessive humidity—or its ability to convey heat and moisture away from the patient. There remains room for a closer look at the way in which temperature alters the ability of tissues to survive ischemia and at the way moisture increases certain dangers.

In looking more closely at the patient, the use of thermometry and measurement of turgidity and erythema all have promise. Robin Black in Canada and we at Carville have demonstrated feasibility. Now we encourage others to pursue the careful evaluation of cushions—but more importantly, to develop better measurement of the earliest signs of pressure problems in the patient that sits on the cushion.