The purpose of this paper was to describe the use of a commercially available alarm watch in training spinal cord-injured patients to relieve pressure periodically in order to prevent pressure ulcers.

Estimates of the incidence of pressure ulcers in the spinal cord-injured population vary from 25% to 80% (Staas & LaMantia, 1982). Although pressure ulcers are considered to be preventable, Maynard and Weingarden (1989) found that they are the most common complication of spinal cord-injured patients during their initial hospital stay. They found incidence rates between 35.2% and 46%, depending on the type of hospital the patient was initially admitted to (Maynard & Weingarden, 1989). The incidence of recurrent skin breakdown was determined to be 80% within 3 months at one facility (LaMantia et al., 1987) and 32% within 2 years at another (Krouskop, Noble, Garber, & Spencer, 1983).

The responsibility for pressure ulcer prevention is shared by all members of the health care team. At our hospital, the University of Virginia Medical Center, Charlottesville, the occupational therapists are involved in training patients with spinal cord injury in skin care practices, such as skin inspection and regular pressure relief. An effort is made to integrate skin care behaviors into the patient's habit system. We acknowledge that habits learned in the hospital may not carry over to the home situation, because the daily routines in the hospital and home are quite different. Our clinical experience has taught us that patients with recurrent pressure ulcers are frequently able to recount correct skin care behaviors but often fail to enact them.

**Literature Review**

Malament, Dunn, and Davis (1975) borrowed from operant conditioning theory and demonstrated that the use of an alarm signal to prompt pressure relief can be effective in improving skin care behavior, at least in the short term.

A variety of pressure relief training devices have been developed, all of which provide some sort of prompt signal, usually an auditory signal. A common design involves a sensor located under the seat cushion (e.g., Chawla, Andrews, & Bar, 1978-1979; Fordyce & Simmons, 1968; Temes & Harder, 1977). This device records the duration of sitting and emits an audible beep at preset intervals to prompt pressure relief. In addition, this type of device may also monitor the length of time the person sustains the pressure relief (Grip & Merbitz, 1986). These types of devices are problematic in that they can be quite cumbersome, are not readily available, and are expensive. Their practicality for clinical and home use is questionable.

A different approach to the problem was described by Jaeger and MacLantis (1983). Their device was attached to the armrest of the wheelchair. It emitted a reminder signal and then recorded the length of the pressure relief.

**Key Words:** equipment and supplies • spinal cord injuries
Obviously, this system can be used only when the pressure relief is done using the arms in a push-up motion. Although many patients do push-ups, some people relieve pressure by leaning from side to side or forward. Additionally, not all people with spinal cord injury use chairs with armrests. Thus, this method has somewhat limited use.

A highly sophisticated system for signaling and recording pressure relief was described by Cummings, Tompkins, Jones, and Margolis (1986). Developed specifically for research purposes, the equipment included an underseat pad that interfaced with a microcomputer. Although this system provides much useful information, its complexity makes it more suited to research settings than to a clinic or to a patient’s home.

Klein and Fowler (1981) described the use of a microcalculator that was programmed to beep at intervals. This device had several advantages, such as being lightweight, unobtrusive, and inexpensive. However, it had the disadvantage of being easily misplaced, because it is not attached to the person or to the chair. Additionally, it would not sustain such abuse as being dropped, sat on, or rolled over.

Selection of an Appropriate Warning Device

In searching for an instrument to use to prompt patients to do pressure reliefs, we established the following characteristics as necessary if the instrument were to be practical for both clinical and home use:

1. Emits auditory signal for at least 5 sec
2. Unobtrusive and cosmetically acceptable
3. Commercially available and inexpensive
4. Lightweight
5. Simple to use and to program
6. Attachable to the person or chair
7. Highly durable

The technology of electronic wristwatches is similar to that of microcalculators, but wristwatches have the advantages of being attached to the person and being quite durable. Another attractive feature of a watch is that it is something most people wear habitually. We investigated commercially available models to identify ones that would meet our particular needs.

After an extensive search, we found one watch, the Timex Triathlon, which met all our requirements. The features that distinguished this model from all the others we examined are as follows: (a) the alarm automatically resets after sounding; (b) it allows variable intervals between alarms; and (c) the alarm mode can be turned off.

The watch comes with a set of operating instructions, which we supplemented with a set of cue cards written in simple English to assist patients with low-level reading skills. Patients were shown how to operate the watch and how to set the alarm to go off at regular intervals. They were trained to respond to the alarm by relieving the pressure. The patients relieved pressure by doing a push-up, a forward lean, side-to-side leans, or a combination of these techniques.

Patients were trained to use the watch for approximately 1 week before they were discharged. They were given the watch to take home after discharge so that they could continue using it as a signal to relieve pressure.

Outcome

Sixteen patients with spinal cord injury who were admitted to our hospital for surgical repair of pressure ulcers were trained to use this watch. Twelve of these patients had paraplegia, and 2 of the 4 patients with quadriplegia could relieve pressure independently. The 2 patients who required assistance in pressure relief were encouraged to be responsible for prompting their caregivers. Prior to receiving the watch, 9 of the patients had had six or more pressure ulcers, and 7 patients had had between two and five ulcers since their injury.

The patients were followed once every 3 months regarding pressure ulcer recurrence and watch use. The mean length of follow-up for the group was 27 months (range = 6 to 48 months). Regarding skin breakdown, on follow-up, 4 patients had minor breakdown and were treated as outpatients, 4 had major breakdown requiring readmission for plastic surgery, and 8 maintained intact skin. Seven patients used the watch for at least 1 year after discharge, 7 discontinued using the alarm prompt upon discharge, and information was not available for the remaining 2 patients. Six of the 8 patients with intact skin on follow-up used the watch for at least 1 year.

These results suggest that the watch prompt may be a useful treatment tool, particularly with patients who have demonstrated poor skin care behavior in the past. The use of a watch alarm was also demonstrated by White, Mathews, and Fawcett (1989). They studied 2 children with spina bifida and determined the use of a watch alarm to be more successful in increasing the frequency of push-ups than a more elaborate alarm avoidance system.

Summary

A commercially available watch was used to prompt 16 patients with spinal cord injury and recurrent pressure ulcers to relieve pressure at appropriate intervals. Six of the 8 patients who continued using the watch after discharge maintained intact skin.
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References


