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ASSISTIVE DEVICES FOR USE WITH PATIENT HANDLING TASKS*

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Back pain among nursing personnel is common and usually attributed to involvement in patient handling tasks. Nursing assistants in a nursing home ranked the following tasks as most stressful to the back: transferring patients on and off the toilet, in and out of bed, and transfers needed for bathing. Criteria were established for selection of assistive devices to be used to help decrease back stress while carrying out these tasks. Strategies were developed for locating assistive devices. Assistive devices found were limited in number but included hoists, sliding boards, belts, slings, and a turn table. Preliminary trials were conducted to determine which devices should be studied in an attempt to decrease back stress while performing patient handling tasks.

INTRODUCTION

Back problems are prevalent among nursing personnel. Klein et al., (1984) found, through worker compensation data, that nursing assistants ranked fifth for back strains/sprains with an annual incidence ratio of 3.6 claims/100 workers. Only heavy laborer occupations such as miscellaneous laborers, garbage collectors, and warehouse men ranked higher than nursing personnel. Jensen (1987) found that nursing assistants in nursing homes/personal care facilities ranked highest among nursing personnel for worker compensated back problems. Lifting and transferring of patients have been perceived by nursing personnel to be the most frequent precipitating factors or causes of back problems (Harber et al., 1985; Jensen, 1985; Owen, 1989; Stobbe et al., 1988; Stubbs et al., 1981; Valles-Pankratz, 1989; Venning et al., 1987). These researchers concluded that assistive devices for use with patient handling tasks could reduce back stress for nursing personnel. However, few devices have been systematically evaluated to determine if their use would reduce back stress.

As part of a contract with the National Institute for Occupational Safety and Health (NIOSH), Owen and Garg (1989) delineated those patient-handling tasks perceived as most stressful by nursing assistants in a nursing home/personal care facility. An ergonomic evaluation was conducted in this facility which revealed elements important to the use of assistive devices:

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many stressful tasks were completed in confined work space, most wheelchairs and geriatric chairs did not have removable arm rests to facilitate ease of transfer, and brakes on some beds and wheelchairs did not hold. In addition, there were patient characteristics that could impact on use of assistive devices: weakness, combativeness, muscle rigidity, spasticity, pain, obesity, and inability to bear weight.

The next goal was to find assistive devices that had the potential to reduce back stress for nursing assistants while performing stressful patient handling tasks. The purposes of this part of the study were to: 1) establish criteria for selection of assistive devices to be used while carrying out stressful patient handling tasks, 2) develop strategies for locating available devices, 3) implement these strategies, and 4) conduct a preliminary trial to determine which assistive devices should be recommended for systematic laboratory evaluation.

CRITERIA FOR SELECTION OF DEVICES

1. The device must be appropriate for the task to be accomplished. The tasks delineated as most stressful by Owen and Garg (1989) and studied as part of the NIOSH contract are: transferring a patient from wheelchair to toilet and back to wheelchair, from bed to wheelchair and back to bed, and from wheelchair to shower chair (for toileting and bathing) and back to wheelchair. Devices that can only transfer patients in a horizontal position are not useful with these tasks; for example the Dixie Smooth Mover is a light weight polyethylene board 56 cm x 206 cm with cut out areas for hand grips to be used to transfer patients in a horizontal position, such as from bed to cart/stretcher.
2. The device must be safe for both patient and nurse. It must be stable, strong enough to secure and hold the patient, and permit the nurse to use safe biomechanics.
3. The device must be comfortable for the patient; this may also help to allay fears. It should not produce or intensify pain, bruising, or tear the skin.
4. The device should be understood and used with relative ease. Bell (1984) and Owen (1988) found nursing personnel were reluctant to use assistive devices because they could not understand how to use them or lacked experience in their use.
5. The device must be efficient in the use of time. According to Bell (1984) and Owen (1988) the most frequent reason given for not using a device was the time needed for use.
6. Need for maintenance should be minimal. The above two authors found lack of proper functioning a major reason for non use.
7. The device must be maneuverable in a confined work space. Owen (1988) and Valles-Pankratz (1989) found space to be a problem.
8. The device should be versatile. It could be inferred from Bell's findings (1984) that only a few assistive devices should be introduced at a time because the error rate and the need for time to execute the transfer increased when more than two devices were included in a teaching program.

STRATEGIES FOR LOCATING DEVICES

A literature search was conducted to find assistive devices that could be used with selected patient-handling tasks; few were found, and even fewer had been systematically evaluated. Gagnon et al. (1986) studied lifting a "patient" out of a chair with the hands, with forearms behind the patient's back at shoulder level, and with a belt around the patient's waist; they found the belt technique to be the most strenuous. Leinweber (1978) used the belt as a transfer device with 20 patients; she was successful with all but three patients (an uncooperative patient, one with arthritic back pain, and an obese patient). Bell (1984) evaluated seven different mechanical hoists and recommended improvement in the design and manufacture of the

hoists and slings and in the service provided by the manufacturers and their marketing agents. Mechanical hoists were the assistive devices most frequently described in the literature (Gifford, 1966; Kilbom et al., 1985; Lloyd et al., 1987; Takala and Kukkonen, 1987; Waters, 1988). Other devices described were slings, a turn table for pivoting, a walking belt with handles, and sliding boards (Bell, 1984; Hayne and McDermott, 1982; and Lloyd et al., 1987). Most basic nursing textbooks have a chapter relating to body mechanics and lifting/transferring techniques with information about hoists and belts.

A questionnaire was sent to nursing homes/personal care facilities to determine types of transfer assistive devices in use (Owen, 1988) and to seek the opinion of nursing personnel concerning these devices. Gait belts, bathtub lifts, hoists, and lift sheets were the only devices used frequently. Eighty percent (n=99) felt increased use of assistive devices could reduce back problems. The most frequently cited reasons for non use of devices were: too time consuming, staff lack knowledge/experience, inadequate staffing, and lack of availability. Some respondents had diverse but strong opinions about gait belts; thirteen indicated gait belts were required and had reduced back injuries by 75%, while five did not use gait belts due to broken ribs and tearing of skin.

At three medical supply stores, discussions were held with product specialists and consultants, and device catalogs perused.

Product coordinators and rehabilitation specialists (nursing, physical therapy, and occupational therapy) at two hospitals and three nursing homes were consulted about their knowledge and advice about assistive devices.

Nursing personnel experienced in the use of assistive devices were interviewed in three hospitals and five nursing homes/personal care facilities. Most stated they used hydraulic lifts and gait belts most often because of institutional policy; major problems cited were time and loss of independence for patients.

The category of Patient Transfer Unit (General) in the Directory of Products Index was examined at the University Reference Library. A vast array of assistive devices were found that could be used only for horizontal transfers or were stretcher-like devices that converted into a chair. The latter devices did not seem as appropriate as hoists because nursing home/personal care facility patients are generally transferred from chair to toilet and back in addition to transfer from bed to chair.

ASSISTIVE DEVICES

Few assistive devices seemed appropriate for study with the selected patient- handling tasks and fit the established criteria. The most frequently used devices for transfer were the gait belt (Fig. 1) and the Hoyer lift (Fig. 8). The Trans-Aid lift (Fig. 9) and sliding board (not shown) were used by several institutions. The Ambulift hoist (Fig. 10), walking belt with handles (Fig. 2), and MEDesign patient handling sling (Fig. 3) were discussed in the literature and recommended by a rehabilitation specialist. Also, the turn table (patient transfer disc) (Fig. 5) and sling with rings (Fig. 4) were described in the literature.

During an ergonomic study in a nursing home/personal care facility, it was found that several transfers could be eliminated if the patient was transferred from wheelchair to a shower chair that could accommodate the patient for toileting and showering. Two shower/toileting chairs (Fig. 6, Fig. 7) were selected on the advice of rehabilitation specialists.

PRELIMINARY TRIALS TO APPLY CRITERIA

Preliminary trials were conducted by the authors and two nurse research assistants to test the devices against the criteria and to determine which devices should be systematically evaluated in an effort to reduce back stress in nursing personnel. The laboratory was arranged as close as

Fig. 1
Gait Belt
is about 5 cm wide, of vary lengths with adjustable belt-like loop or buckle closure, has no handles, and is made of cotton-canvas or nylon material.. It should fit securely around patient's waist and is grasped with hands.

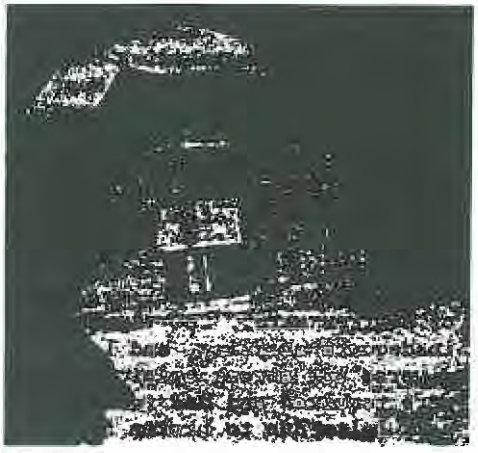

Fig. 2
Walking Belt
is 12.5 cm wide, of varying lengths, has handles on each side, has velcro and two quick-release buckles for closure, is made of cotton-canvas type material, fits snugly around lower abdoman, and is grasped at handles.

Fig. 3
MEDesign Patient Handling Sling
is 20 cm wide, 50 cm long, has a cut-out at each end allowing a hand grip, is made of flexible polymer material and is tucked securely around patient with bottom at buttock area.

Fig. 4
Patient Sling with Rings
is 23 cm at widest part, 90 cm long, 2 rings with 7 cm diameter attached for hand grip, made of stiff cotton/polyester type material.. Position sling around low back area.

Fig. 5
Turntable
patient transfer disc has rubber threads, rotates, has diameter of 30 or 38 cm, and is placed on floor between transferring locations. Patient places feet on turntable, and is helped to standing position, rotated 90°, and seated in new location.

Fig. 6
Shower/Toileting Chair
is light weight chair with a plastic non-moveable seat and has no foot rests.

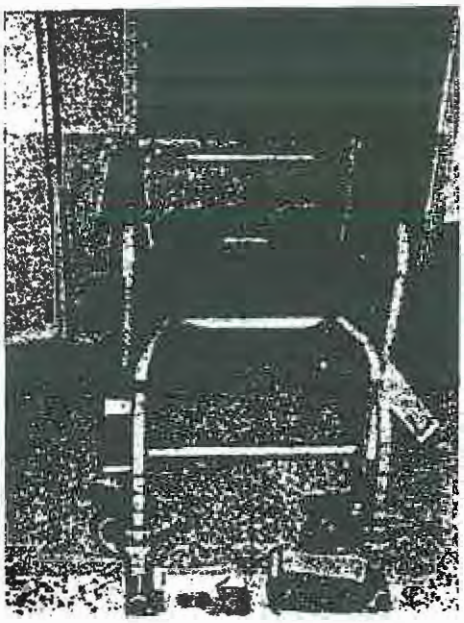

Fig. 7
Shower/Toileting Chair
is a heavy chair with padded removable seat and adjustable/ removable foot rests and arm rests that can be lowered.

Fig. 8
Hoyer Lift
is an hydraulic lift that has an adjustable base; a pump handle for raising and lowering the patient; and a variety of slings that attach through hooks, chains, or web straps.

Fig. 9
Trans-Aid Lift
has a non-adjustable "C" base, a ball- bearing screw lifting mechanism with crank in horizontal plane, and has a variety of slings that attach by hooks and dangling color-coded chains.

Fig. 10
Ambulift (C-3)
has a semi-adjustable base, a mechanical chain-winding mechanism for lifting/lowering with crank in vertical plane, and the sling attaches by loops and hooks.

A sliding board (not shown) is a smooth rectangular piece of wood about 20 cm wide and of varying lengths. It is bevelled at the edges so the patient (with good upper body strength) can slide from one surface to another of similar height.

possible to the patient environment of the nursing home/personal care facility. The research team served as patient and nursing personnel. It was difficult to simulate patient characteristics (combativeness, spasticity) but an effort was made for little or no weight-bearing during transfers.

The most difficult criterion to meet was the safety of the nurse when using the belts and slings. Body position and movement of the nurse were vital for the safe use of these devices. The ability to get close to the patient, keep the back as straight as possible, flex the knees, and keep the feet apart with one foot in the direction of the move so as not to rotate the spine were all important. The transfers were safer when a gentle rocking motion was used to provide the kinetic energy so a pulling (not lifting) action could be used to transfer the patient.

The walking belt and MEDesign patient handling sling met the criteria so were recommended for further study. The gait belt was not as comfortable as the other belts and slings but was studied further because it was used frequently in many nursing homes/personal care facilities (Owen, 1988).

The sling with rings was eliminated as it did not meet the criterion of safety for the patient or nurse (as perceived by nurse and patient). The belt is long so it cannot be "fastened" around the patient, and the large rings are not stable; these features created a feeling of insecurity and eliminated the ability to create a rocking motion.

The sliding board was not recommended for further study because it did not meet the criterion of appropriateness for tasks to be accomplished due to the following patient and environmental characteristics: many patients do not have the upper body strength and cognitive ability needed to make the transfer and the transfer surfaces must be similar in height, but many wheelchairs and geriatric chairs do not have adjustable arm rests so height cannot be equalized. This may be why Owen (1988) found infrequent use of sliding boards in nursing homes/personal care facilities.

The turntable was eliminated for reasons of appropriateness and safety. Many patients cannot bear weight or are unpredictable in their ability to stand; in addition, because of confined work space the turntable may be stored where patients or personnel could stumble over it.

The shower/toileting chairs were specifically selected for study so that toileting and showering could be done sequentially and hence several transfers could be eliminated. To ensure safety with the light-weight chair; it had to be placed against a wall so it did not tip during a transfer.

All three hoists were recommended for further study. During the pilot, the Hoyer was the least comfortable because the patient tended to be in a reclining rather than upright position; also, the patient swayed more during transfer and at times sensed a feeling of tipping over. The Hoyer was included because Owen (1988) found that it was used frequently.

SUMMARY

Use of assistive devices for transferring patients may be helpful in reducing back stress for nursing personnel. Criteria were established for selection of devices, and strategies were developed for locating available devices. A literature search was conducted, a questionnaire sent and visits made to nursing homes/personal care facilities, visits made to hospitals and medical supply stores, and specialists consulted. Slings, belts, sliding boards, turntables, shower/toileting chairs, and hoists were located. Through preliminary trials the walking belt, MEDesign sling, shower/toileting chairs, Trans Aid Lift and Ambulift hoist were recommended for further study. The gait belt and Hoyer Lift were recommended based on their frequency of use through questionnaire (Owen, 1988). The sliding board, sling with rings and the turntable were not recommended. The most difficult criterion to meet was safety of the nurse in relation to body

mechanics while using slings and belts. In the next phase of the NIOSH contract these devices will be systematically evaluated to determine if, with their use, back stress can be reduced when carrying out selected stressful patient handling tasks.

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