Various authors have delineated problems associated with wheelchair seating for elderly residents of nursing homes (Krasilovsky, 1993; Raible, 1995; Redford, 1993; Taylor, 1987). Both Redford (1993) and Krasilovsky (1993) cited pelvic obliquity while the resident is sitting on sling upholstery as the most common positioning problem in this population. According to Redford, closely related to the pelvic obliquity problem is leaning to the side of the chair. The solution Krasilovsky and Redford offered to solve the pelvic obliquity problem is a commercially available solid seat insert or cushion with a base that is contoured to level out the sling seat.

Currently, there is limited literature that addresses low-cost solutions to the problems of lateral leaning, despite intervention for pelvic obliquity, and lower extremities that refuse to remain on the wheelchair rigging system. Durable medical equipment (DME) vendors offer costly solutions to these problems, and few nursing home residents fit the stringent criteria that justify Medicare and Medicaid reimbursement for such seating support (Krasilovsky, 1993; Raible, 1995). This article describes the lateral padded trunk supports and the padded foot and calf boards that we designed to address these problems in our nursing home.

Lateral Supports

Lateral leaning may persist despite intervention with a solid seat insert or a cushion contoured to correct pelvic obliquity. The physical problems associated with lateral leaning are (a) increased risk of skin breakdown; (b) poor vertical trunk alignment; and (c) poor upper-extremity positioning for self-feeding and drinking that, in turn, could lead to decreased intake and increased spillage of food.

We choose lateral supports for wheelchairs on the basis of the resident's trunk width while he or she is seated in the wheelchair. When a resident fills the entire width of the wheelchair, or has only 1 in. of room on either side of the trunk, we use leg-rest calf pads as lateral supports because they take the least amount of space in the wheelchair. When a resident has 2 in. or more room on either side of the trunk while seated, we use custom lateral supports to maintain the most vertical trunk alignment.

To apply a calf pad as a lateral support, it is first removed from the wheelchair leg-rest and mounted either just above or below the armrest pipe after the top two screws are removed from the back upholstery upright (see Figure 1). Before the calf pad is dismantled, we study how the apparatus fits together, and may even draw a dia-

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Calf pad mounted above armrest pipe, providing lateral support. So that the calf pad can be reassembled properly on the back upholstery upright. The mounting is determined by holding the calf pad in each position to see which supports the resident high on the trunk while continuing to have 2 in. to 3 in. below the axilla for unimpeded upper-extremity movement. After the calf pad is mounted on the back upholstery upright, without the resident in the chair, the upholstery screws are replaced.

The wheelchair calf pad is applied to the leaning side to limit lateral leaning. It also acts to disperse pressure that results from leaning onto a large surface area, thus decreasing the possibility of skin breakdown. An additional cover can be attached to the calf pad in cases where skin is extremely fragile. If a resident leans to either side, calf pads are attached to both sides of the wheelchair. We have observed that the improved vertical trunk alignment resulting from the use of this device promotes better upper-extremity movement for self-feeding and drinking.

If a resident has more than 2 in. on either side of his or her trunk while seated in the wheelchair, one or more customized lateral supports are indicated, depending on the resident’s leaning habits. The measurement from the bottom of the resident’s ischial tuberosities (with hips flexed to 90°) to 2 in. to 3 in. below the axilla is used for the length measurement; 6 in. is the average for the width measurement. Half-inch plywood is then cut to these dimensions and covered with 1 in. to 1 1/2 in. of foam rubber over which is stapled upholstery. A broom clip is attached to the board with a short screw (~1/2 in.). It snaps onto the armrest pipe behind the armrest pad (see Figure 2). Placement of the broom clip is determined by aligning the board with the top of the seat cushion and marking where the middle of the armrest pipe meets the board when it is all the way back into the wheelchair. The top and bottom of the lateral support can be labeled to avoid confusion for staff members who are responsible for carrying out positioning recommendations. Occasionally, an agitated resident with dementia, excessive involuntary movement, and extremely fragile skin could potentially experience skin breakdown from the front corners of the lateral support. In these cases, the front corners can be removed and the edges covered with foam rubber and vinyl (see Figure 3).

Lateral supports for attendant-propelled wheelchairs are longer and fit on the outside of the shoulders rather than against the trunk. These supports can be used in conjunction with rolled pads for thinner residents (see Figure 4). A notch cut into the bottom of the lateral support rides on a support bar of the chair and pivots as the chair reclines and returns to the upright position (see Figure 5). The width is still appropriate at 6 in., but the length for the model pictured in Figure 4 is 32 in., with the bottom 12 in. being bare wood and the remaining 20 in. covered with foam rubber and vinyl. The padded side

Figure 1. Calf pad mounted above armrest pipe, providing lateral support.

Figure 2. Lateral support covered with foam and vinyl and anchored to armrest pipe with a broom clip.

Figure 3. Lateral support with edge out to decrease risk of skin breakdown.
Foot and Calf Boards
Another problem we have encountered in positioning nursing home residents is keeping legs and feet on the wheelchair footrests and leg-rests. Problems paired with poor positioning of feet and legs are skin tears from contact with hard metal edges and resultant infection and, in worst cases, potential limb loss. Commercial calf panels used by some facilities are made from vinyl or artificial sheepskin and have hook-and-loop or snap straps that fasten the panel to the leg-rests and footrests. The following problems are associated with these panels: (a) the feet still slip off the rests; (b) excessive time is used in removing or applying panels during patient transfers; and (c) the hook-and-loop straps wear out or fill up with lint, rendering them less effective. Thus, we prefer to use calf and foot boards that we construct. These devices have no straps or buckles, so they are easier and faster to place or remove during transfers. They prevent the legs and feet from sliding off the wheelchair footrests, and the foam and vinyl coverings protect skin from breakdown. Highly agitated residents who move their legs excessively may knock these boards off and may need to use a three-point recliner instead. Usually, the boards are kept in place by the weight of the legs and feet (see Figures 6 and 7).

For residents with diabetes who wear thin-soled slippers, the padded footrest board can prevent skin breakdown from pressure of the weight of their legs on the plantar surfaces of their feet. These padded footrest boards have allowed earlier skin breakdown problems to heal. They have also been useful for preventing residents' feet from falling through the gap between the footrests.

Conclusion
These positioners have been used in our 150-bed facility for 3 years with 20% of the residents (10% calf boards, 4% foot boards, 3% wheelchair lateral supports, 3% three-point recliner lateral supports). Use of these custom devices has saved the facility up to 75% over commercial-
Figure 7. Foot board mounted onto footrests. Notice that shoe molding is being used to keep board in place.

The lateral trunk supports and padded foot and calf boards described in this article provide a valuable service to nursing home residents because they can be inexpensively manufactured with team effort in order to provide satisfactory positioning with little cost to the resident or the nursing home.

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