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Evaluating the Efficacy of Low-Cost Patient Handling Interventions for Home Healthcare

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Abstract

The need for home healthcare workers is growing. To retain current workers and attract new ones, quality of worklife must improve for these essential workers, including reducing exposure to risk factors for work-related musculoskeletal injuries. Providing home care often involves physically strenuous patient-handling activities. While assistive equipment is utilized in hospital and nursing care settings, it is less likely to be available in home settings. There is little research on use of assistive equipment in home settings. This study assessed biomechanical efficacy and usability of several "small aids" for that use case. Experienced home healthcare workers performed several patient-handling tasks in a simulated home environment, using standard methods and also several small aids. For certain tasks, results showed biomechanical benefits to a patient-worn vest with handles and a small transfer board, as well as positive usability. This information is being shared through various means to reach stakeholders to encourage adoption.

Keywords

patient lifting, patient transfer device, musculoskeletal disorder, home care, occupational health and safety, ergonomics

Introduction

Almost everyone will at some point in their life be a care recipient or a family member of someone who receives home healthcare services, at least for some period of time. Currently 17 million people living in the community in the US need assistance due to physical, cognitive, developmental, and/or behavioral conditions (Paraprofessional Healthcare Institute, Inc.) (PHI, 2022). About 8 million community dwelling people in the US reported having a self-care disability, meaning a need for assistance with one or more personal care tasks (e.g., toileting, bathing; (Brunskill & Wysocki, 2022)). In order for home healthcare services to be available when and where needed, workers must be available. Currently there are (only) 3.6 million home healthcare and personal care assistants in the US, and the BLS Occupational Outlook Handbook shows a need for an additional 924,000 in the 10 years between 2021 and 2031 (Bureau of Labor Statistics, 2021). In order to retain current workers (median age 46 years; (PHI, 2022)) and attract new workers to the field, quality of worklife needs to be improved for these essential workers. One important dimension of that is reduction in exposure to risk factors for work-related injuries. While patient-handling assistive equipment is utilized in formal healthcare settings, it is much less likely to be available in home care settings. A recent report found "little literature or research on the prevalence of the use and effectiveness of assistive technologies and home modifications for lifting, transferring, and repositioning for reducing homecare worker injuries". . .. and barriers to obtaining and using such equipment in the home, including "difficulty identifying appropriate assistive technologies and home modifications,. . .., and limited training on appropriate use" (Brunskill & Wysocki, 2022). This study aims to contribute to addressing some of these issues in order to provide useable and accessible information to relevant stakeholders about benefits of certain lower cost assistive equipment for home care use.

Background

The literature and our prior research show that most home healthcare workers work alone (Czuba et al., 2012), yet many perform physically strenuous patient handling

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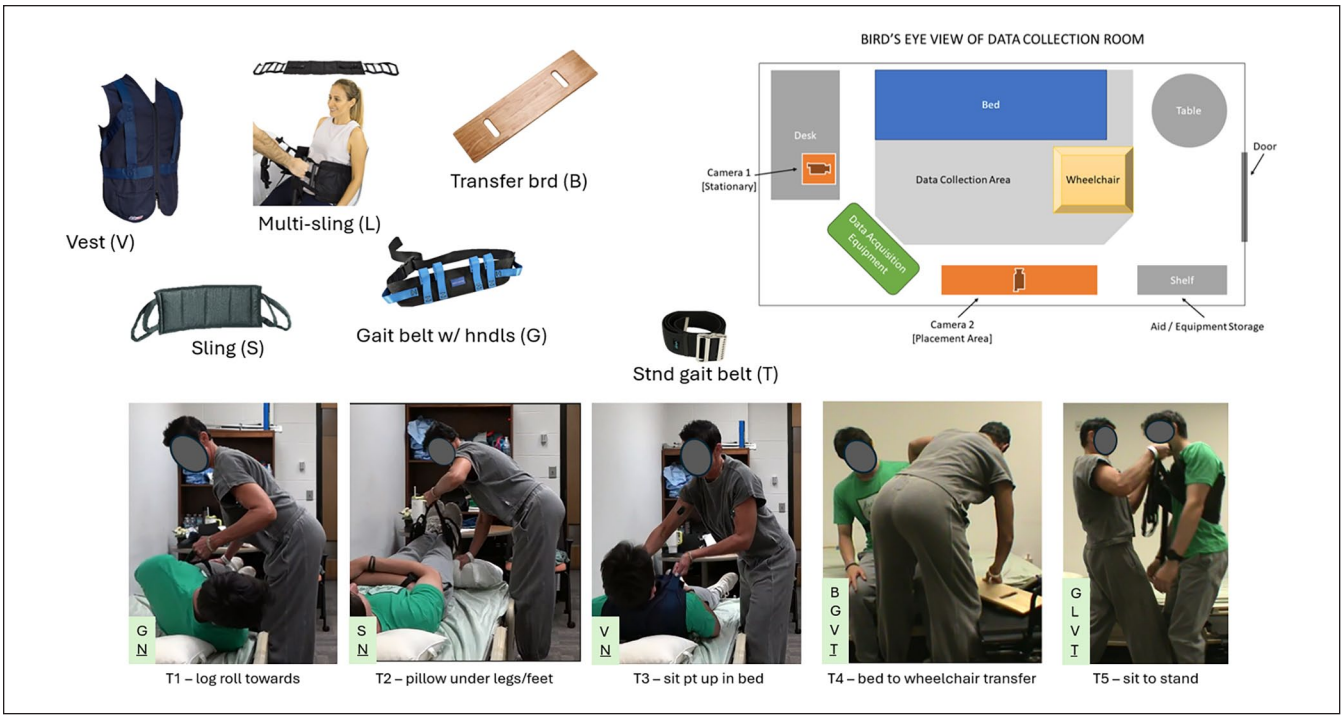

Figure 1. Top row, left are five low cost patient-handling aids evaluated in this study; standard gait belt (T) was the standard practice for tasks 4 and 5. Top right, room layout. Bottom row, five patient handling tasks; green box in lower left corner provides list of aids for the task; standard method is underlined; *N* is no aid.

activities, such as assistance with sit-to-stand, transfers between seated locations (e.g., bed-to-wheelchair), and positioning in bed (e.g., boosting). This is in contrast to working in a formal healthcare or long-term care facility where patient handling equipment and additional staff members are available to assist with these physically strenuous tasks.

There are some relatively low-cost patient handling interventions ("small aids"), more specifically pieces of equipment, that could be implemented in the home healthcare environment that have the potential to reduce physical demands on home healthcare workers as they perform different types of patient handling tasks (e.g., bed bath, transfers (bed to walker, bed to wheelchair), toileting assistance, and bath entry/exit). Some prior research has shown no effect on injury outcomes from small aids ("sheets. . .and. . .slings") (Freiberg et al., 2016; Hartvigsen et al., 2005). However, others have shown positive immediate effects from slide sheets and transfer boards (Amini Pay et al., 2021; Jäger et al., 2013; Sun et al., 2018). Thus, the aim of this study is to assess several small aids and share results with home healthcare agencies so they can make data-driven decisions about which piece(s) of equipment they should train their employees to use and encourage clients/clients' families to obtain in order to reduce the physical loading experienced by their employees and other care providers when performing some common patient handling activities.

Approach

The project began with focus groups and interviews with seven home healthcare workers, trainers, occupational therapists and similar subject matter experts to determine which low cost interventions should be evaluated and for which tasks. The results of the focus groups informed the design of the laboratory study, which evaluated five small aids based on biomechanics and usability/usefulness (Figure 1). The five patient handling tasks are listed in Table 1. In this study, task "method" refers to use of a given small aid or the standard practice method of performing a given task.

Participants were experienced home healthcare workers (two women, three men; years of experience ranging from 10+ years to 6 to 12 mo; mean ht 173 cm, mean wt 77 kg). All had experience using a standard gait belt, 4 had used a transfer board and a gait belt with handles, and three had used a transfer sling and a patient vest with handles. The order in which the tasks and methods were tested was randomized across participants. Prior to starting a task, participants watched an introductory video demonstrating how to use each aid within the assigned task-method combination. Prior to performing a task-method combination for data collection purposes, participants practiced using the aid for the given task. After they demonstrated they could use the aid appropriately, two data collection trials were performed. During the first trial, the participant

Table 1. Patient-Handling Tasks Performed by Participants in the Study.

Task name	Participant action
Hold log roll in bed	Turned supine patient to their right side (towards subject). Held the patient in the log roll position.
Lift legs while lying in bed	Lifted supine patient's legs and placed a pillow under their legs.
Sit up in bed	Sat supine patient up into a seated position.
Seated transfer from bed to wheelchair	Transferred patient ~90° from seated position in bed to seated position in wheelchair positioned to the right of the bed.
Stand from seated position	Stood seated patient up from wheelchair.

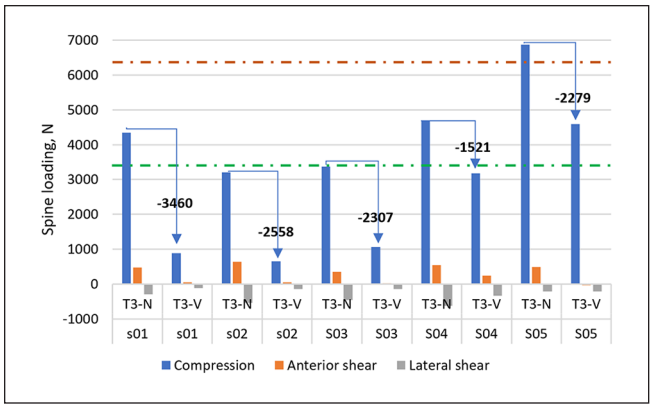

Figure 2. L4–L5 compression, anterior shear, and lateral shear spine loading for each participant, for Task 3—sit patient up in bed, using standard method (T3-N) and patient vest with handles (T3-V). Compression reduction, ranging from 1500 to 3400 N, is written on the graph for each participant. NIOSH Action (3400 N) and Maximum Permissible (6400 N) Limits are marked with dashed lines.

was instructed to be mindful of the moment at which they felt they were exerting the most effort during the task. During the second trial, participants were instructed to say "Now" at the point they felt they were exerting the most effort. At the end of each trial, participants were asked to rate their perceived exertion during the trial. Each trial was video- and audio-recorded. At the end of each task-aid condition participants were also asked a short set of questions about usefulness of the aid for that task and potential usefulness for their patients. Participants performed tasks with one of two "standard patients" of similar height and weight (176 cm, 70 kg).

Spine compression and shear at L4/L5 were evaluated at what participants perceived as the most strenuous part of the task, using the 3DSSPP (U. of Mich/VelocityEHS). Each participant served as their own control. Due to small sample size, no statistical analyses were conducted. Observations on absolute differences in compression and shear values and reference to NIOSH limits were used in comparing effects of the small aids to control methods.

Outcomes

For Task 1 (Log roll towards) and Task 2 (Lift legs) there were no benefits from the small aids (gait belt with handles and simple sling, respectively). For Task 3 (Sit up in bed), there was a reduction in compression and anterior/posterior (a/p) shear for all participants when using the vest with handles (Figure 2); however, usability/usefulness results were mixed. While only two participants would like to have the vest available to use with any of their current or former clients, all participants agreed that there are particular types of patients for whom the vest would be useful (e.g., patients with poor core strength, patients who have to get up and down frequently).

For Task 4 (Bed to chair transfer), compression was reduced for all participants when using the small transfer board, in comparison to the other aids and standard gait belt (Figure 3). Importantly, transfer board usability/usefulness was favorable across participants. One participant commented that "This tool takes nothing out of you energy wise, very low effort"; another commented that it would be "helpful for caregivers who can't lift patients."

The standard methods of performing Tasks 3 (no aid) and 4 (stnd gait belt) received the highest ratings of perceived exertion (RPE) across the five tasks, with average ratings of 5.5 and 4.8, respectively (Figure 4). The vest reduced the average Task 3 RPE to 4.2 and the transfer board reduced the average Task 4 RPE to 2.2.

For Task 5 (Sit to stand), for four of five participants the vest reduced spine compression when compared with the standard method (stnd gait belt). Usability/ usefulness of the vest for this task was positive for four of the five participants. One participant commented that "It helps with ease of transfer, provides good help, doesn't slip, good control over the patient."

Conclusion

Some of the participants in this study were familiar with several of the small aids investigated in this study, while one was only familiar with the standard gait belt, in spite of each participant being an experienced home care provider. Lack of exposure to small aids is not unusual for home care workers. In a prior interview study of 22 home healthcare aids (unpublished), 4 had no experience with any small aids other than a standard gait belt, and 7 had experience with only 1 or 2 other small aids. Yet, the current study found some small aids appear to have the potential to provide biomechanical benefits for some patient handling tasks performed by home

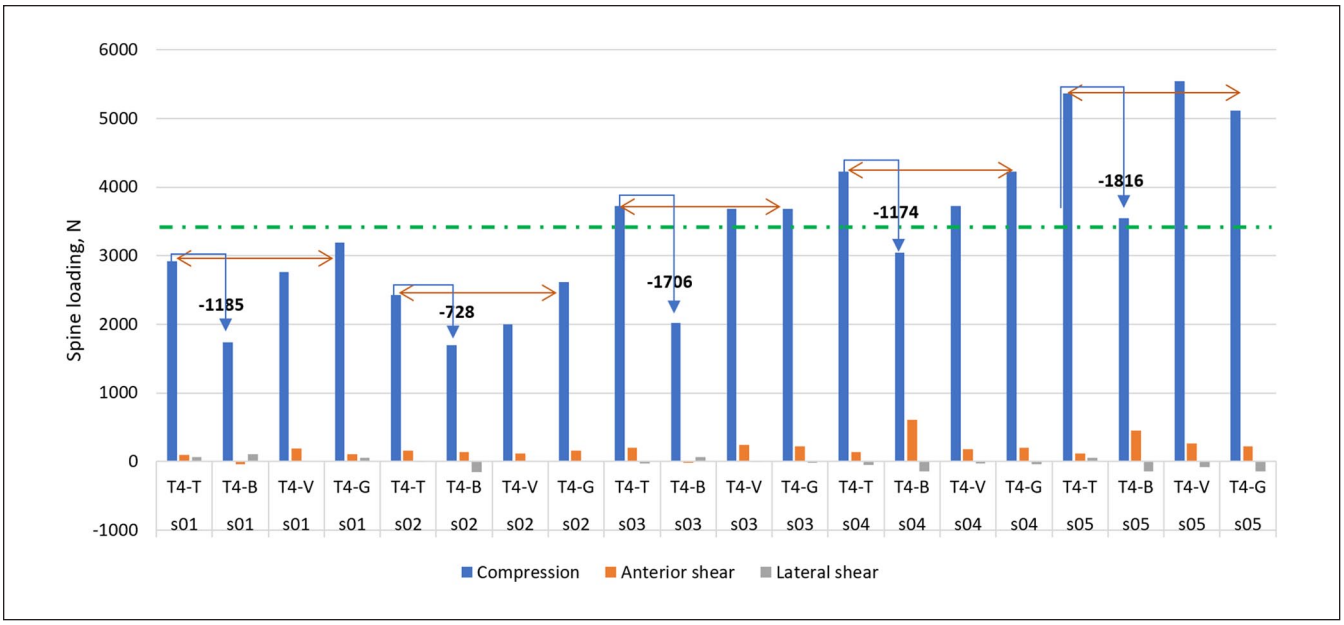

Figure 3. L4-L5 compression, anterior shear, and lateral shear spine loading for each participant, for Task 4—Transfer seated patient from bed to wheelchair, using the standard method (standard gait belt) (T4-T), Transfer board (T4-B), Vest with handles (T4-V), and Gait belt with handles (T4-G). Compression reduction, ranging from 700 to 1800 N, is written on the graph for each participant. NIOSH Action Limit (3400 N) is marked as a dashed line.

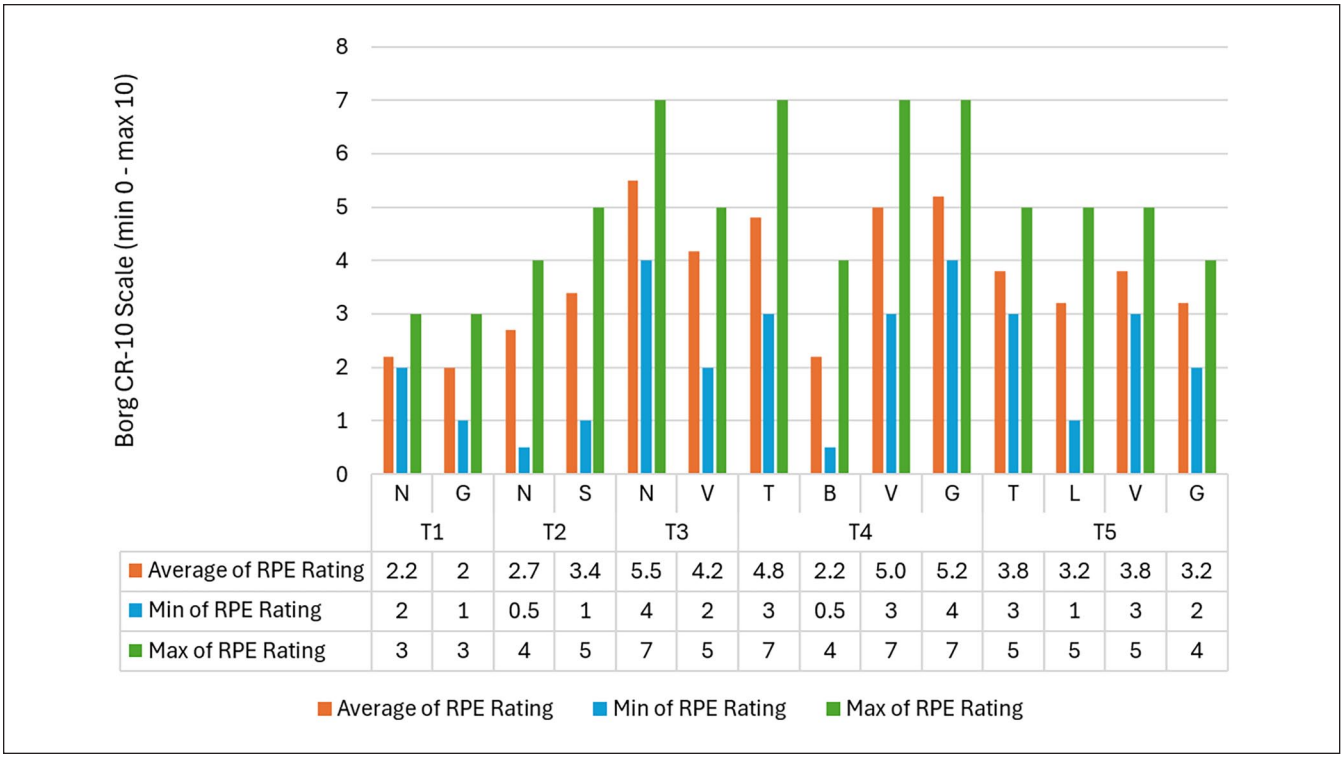

Figure 4. Ratings of perceived exertion (RPE) for the five patient-handling tasks (T1–T5) in this study. The standard method is listed first followed by each of the small aids that were used for the given task.

healthcare workers, and the aids were viewed as useful which bodes well for adoption.

A small number of prior studies investigated effects of small aids for patient handling activities performed by a single individual (often the situation in home care settings). Sun et al. (2018) reported that hand forces were reduced when using a transfer board for seated transfers (similar to Task 4 in this study) and usability was favorable. Jäger et al. (2013) also reported positive effects on spine loading with use of small aids for seated transfer (slide board) and moving patients in bed (slide sheet). Amini Pay et al. (2021) also reported positive effects of using a slide sheet for moving patients in bed (boosting and turning away).

Given the fact that home healthcare workers commonly perform patient handling activities alone, the provision of patient handling tools in the work environment that reduce loading on the user and are perceived as useable and useful should be encouraged. Researchers are urged to share results from small aid studies in formats and via media that home healthcare agencies, their workers, and family members of clients can obtain and understand. Understanding which small aids have been shown to provide immediate benefits to users may encourage clients or family members to purchase some small aids, thereby making them available to home healthcare workers and members of the family who may perform similar patient handling activities when paid caregivers are not in the home.

Declaration of Conflicting Interests

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