

EVALUATION OF THE AGILELIFE PATIENT TRANSFER AND MOVEMENT SYSTEM

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ABSTRACT

Mobility is one of the most crucial, yet difficult, opportunities to give recovering patients in hospitals, nursing homes, private homes, and other healthcare facilities. Unfortunately, many patients require assistance from nursing staff, caregivers, or family members in order to transfer in and out of bed. As the need for patient assistance continues to grow with an increasingly obese and aging population, so does the necessity for alternative patient transfer methods that can reduce the increased burden on caregivers. The AgileLife Patient Transfer System (PTS) is a device that has been designed to lower the amount of effort required and risk of injury involved with patient transfer by providing a simple, safe, and streamlined process. In this focus group study, eighteen rehabilitation professionals were recruited to use and experience the PTS, providing feedback for the system and expressing any concerns they had. Feedback was overall positive, and the PTS received favorable responses to all activities performed and assessed by the participants. Participants also rated the PTS to be safer, easier to use, and more timely than other transfer assist devices they had experienced in the past.

BACKGROUND

Immobility is detrimental to patient health. As the activity of a patient increases, the potential for other complications such as pressure ulcers, tissue damage, metabolic, and psychological decline decreases. To keep patients more active, caregivers, nurses, and other healthcare professionals are responsible for getting immobile patients out of bed. Unfortunately, despite efforts on behalf of hospitals, homes, and even the United States Government to impose standards regarding using of assistive devices such as ceiling and

floor lifts, these healthcare professionals frequently decide to manually lift patients, putting themselves and their patients at a risk for injury. Though mechanical transfer assist devices succeed at reducing risk of injury, they are not always immediately available, convenient, or intuitive for nursing and patient care staff to use (Charney W, 2004; Jagar M, 2013). Moreover, the forces involved with manipulating patients into lifts (e.g. slings) are high especially when the patient is larger, has high tone, or is agitated. To meet the demands of an increasingly dependent and bariatric population (Camden, 2009), while preventing work-related injuries to healthcare professionals and caregivers, the development of a device that makes the transfer process simpler and more efficient is merited.

The AgileLife Patient Transfer System (PTS), developed by Next Health, Inc. (Norwalk, CT), is a new transfer device that has been designed to improve patient activity, and reduce transfer-related frustrations and injury risks experienced by both patients and their assistants (Figure 1). This device also reduces the demands on caregiving staff by only requiring no-lifting and one assistant to operate the bed using a handheld pendant. It has two main components: a wheelchair and a bed. The wheelchair has a commode attachment, allowing for direct bed-to-toilet and toilet-to-bed transfer, as well as tilt-in-space capabilities to redistribute pressure and prevent pressure ulcers. The bed is designed like a standard hospital bed with controls to put patients in a comfortable position.

The device has been designed with patients and their respective caregivers in mind, however it is important that the current efficacy of the device be studied further to make necessary revisions and provide the best possible experience to hospitals and homes. Therefore, the purpose of this study was to evaluate usability and identify areas where the

AgileLife PTS may fall short or where it exceeds the functionality of other transfer assist devices.

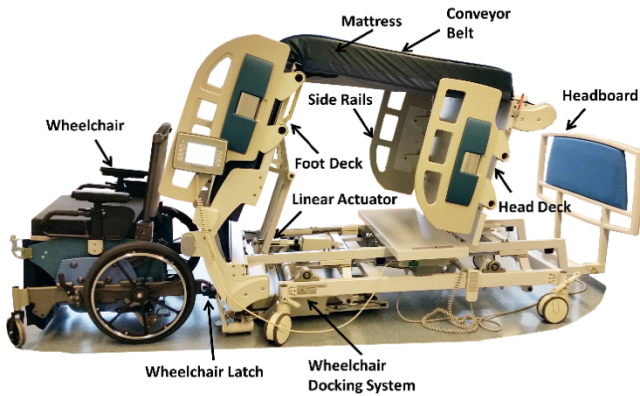


Figure 1. The AgileLife Patient Transfer System

METHODS

This focus group study took place at Human Engineering Research Laboratories (HERL) at the University of Pittsburgh (Pittsburgh, PA). All research activities were approved by the University of Pittsburgh Institutional Review Board.

Description of AgileLife PTS:

To transfer a patient to bed using the device, an assistant brings a patient seated in the PTS wheelchair to a docking base located at the foot of the bed. The wheelchair is reversed, and two pins present on the back of the chair are locked in place by a wheelchair latch present on the bed. Once the wheelchair has been docked to the base, the system is engaged. The assistant holds the pendant controller and follows simple on-screen prompts to begin the transfer process. The foot deck of the bed, using a series of linear actuators, gears, and other componentry, rises to meet the seatback of the wheelchair. The assistant is prompted to lower the seatback, so that the patient's back is in contact with the foot deck. The wheelchair rotates simultaneously as the foot deck is lowered, while a conveyor belt gently pulls the patient into the proper position into bed. The assistant may stop the transfer process at any time by releasing a button on

the pendant. The patient may be transferred back into the chair, using the reverse process. The whole process takes roughly 2 minutes to complete. The PTS manual wheelchair comes in two sizes a 'standard' size (weight capacity < 300 pounds and 18" x 16" seat pan) and a 'heavy duty' model (weight capacity < 350 pounds and 22" x 18" seat pan). The PTS 'heavy duty' chair was tested in this study.

Subject Recruitment:

Rehabilitation professionals (professional caregivers, nurses, nursing aides, and physical and occupational therapists) with experience in transferring complex and obese patients were recruited to evaluate the current version of the AgileLife Patient Transfer System (PTS). Participants had at least 2 years of patient transport and transfer experience, could push and maneuver a wheelchair, and were at least 18. They were required to have been employed in the past two years, and could not have any recent back or neck pain.

PTS Evaluation:

The PTS was first demonstrated by a study investigator. Afterwards participants were trained and took turns acting as both a patient and caregiver. The 'caregiver' participant was asked to first demonstrate the tilt function of the wheelchair with the 'patient' in the chair, transfer the 'patient' to the bed, and then put the 'patient' in a comfortable position using the bed functions of the PTS. The 'caregiver' then prepared the wheelchair for a toilet transfer, and transferred the 'patient' to the chair. With the 'patient' in the wheelchair, the 'caregiver' completed an obstacle course, pushing the wheelchair in a straight line, turning 90 degrees, 180 degrees in a tight space, ascending and descending a 3-degree ramp, and finally maneuvering the wheelchair in an elevator.

Participants then completed a questionnaire based on the NASA task load index scale. For each completed task, participants were asked about their mental and physical exertion on a Visual Analog Scale (VAS). Questions asked included:

- "How mentally demanding was the task?"

- "How physically demanding was the task?"
- "How hurried or rushed was the pace of the task?"
- "How hard did you have to work in order to accomplish your level of performance?"
- "How insecure, discouraged, irritated, stressed, and annoyed were you?"

Another questionnaire, used in previous studies, was used to assess the ease of tasks completed during the wheelchair obstacle course (Pearlman J, 2009) and how the PTS compared to other transfer assist devices in terms of caregiver safety, patient safety, ease of operation, timelines, and overall functionality.

VAS ratings were quantified and adjusted so that a response of 10 was most favorable, while a response of 1 was the least favorable. Responses were then averaged by category. An average of 7 or higher was considered to meet the success criteria as a 'favorable' response for any category relating to evaluation tasks. An average of 5 or higher was considered 'better' and to meet the success criteria for any question asking participants to compare the PTS to other patient transfer assist devices.

RESULTS

Subjects:

Eighteen rehabilitation professionals, including nurses, caregivers, physical and occupational therapists, participated in this study (Table 1).

Sample Demographics	
N = 18	
Male	5
Female	13
Average Age	35.9 ± 15.4
Years of Transfer Experience	9.4 ± 9.4
Min. Years Experience	2
Max. Years Experience	36

Table 1: Demographics of rehabilitation professionals taking part in the study

Task Evaluations:

Participants, on average, rated the PTS favorably (greater than '7' on the scale) in all categories they were asked to assess. Transferring the patient to the bed and to the chair were rated most favorably, with an average of 9.4, while wheelchair maneuverability was rated least favorably, with an average of 7.7 (Table 2).

Task	Average (SD)
Tilt Angle Function	8.5 (2.3)
Preparing Patient for Transfer	9.3 (1.1)
Preparing Patient for Toilet	9.2 (1.6)
Transferring Patient to Bed	9.4 (1.3)
Transferring Patient to Chair	9.4 (1.1)
Wheelchair Maneuverability	7.7 (2.9)

Table 2: Average ratings for PTS tasks on a Visual Analog Scale, based on the NASA task index. Parentheses represent standard deviation.

Comparison to other transfer assist devices:

Participants also rated the PTS 'better' (greater than '5' on the scale) than other transfer assist devices they have used in the past (Table 3). The PTS received the most positive ratings when comparing patient safety, with a rating of 9.1, and the most negative ratings when comparing timeliness, with a rating of 6.3, where a '5' indicates a neutral response.

Comparison	Average (SD)
Caregiver Safety	9.0 (1.6)
Patient Safety	9.1 (1.3)
Ease of Operation	8.9 (1.3)
Timeliness	6.3 (1.8)
Overall Functionality	8.7 (1.8)

Table 3: Average ratings comparing the PTS to other transfer assist devices. Parentheses represent standard deviation.

DISCUSSION

The AgileLife Patient Transfer System was well received by study participants. Based on the task index survey results, participants found using the functions of the PTS, in general, easy and intuitive to use. As one participant said, the device is designed to make the patient feel "comfortable, safe, and at ease

during transfers." However, using the tilt angle function and maneuvering the wheelchair were the least favorably rated tasks performed. The heavy duty wheelchair design is heavier and wider than a standard wheelchair with a 22 in seat width, and 20 in seat height, and is meant to support and transfer up to a 350lb patient. This could possibly explain the lower averages observed in those task ratings. As one participant mentioned, "[The chair] is too large for those who do not require that size wheelchair." Despite this, the very high ratings participants gave the transfer process of the device indicate that the device has significant merit with regards to performing transfers in the clinical setting.

When comparing the PTS performance to that of other transfer assist devices, participants rated the PTS better in every category assessed. It is particularly noteworthy that the highest comparison ratings were in caregiver and patient safety, which are the highest priorities in any healthcare setting. The time it took to transfer a patient using the PTS scored just slightly better than other transfer assist systems. The PTS was programmed at a slow constant rate for the study however the rate is modifiable and can be adjusted based on caregiver and patient comfort and attributes.

Based on the feedback obtained from this study, Next Health will make the necessary modifications to the system to improve the PTS function in the hospital and home care environment. The time taken by the PTS to complete a transfer will be reduced by making the process even more efficient and modifying the timing of the actuators. Also, design changes to the heavy duty wheelchair will be suggested to increase maneuverability. To identify potential long-term usability and utility, the next phase of this study includes durability testing, as well as field trials where patients and their caregivers will use the system for an extended period of time. So far, the PTS shows promise in making the transfer process safer and more intuitive. Because of this, incorporating the PTS in patient care has the potential to improve not only patient activity and quality of life, but also the lives of the family, caregivers, and staff they may depend on.

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