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BIOMECHANICAL & CLINICAL EVALUATION OF THE PATIENT REPOSITIONING SYSTEM (PRS)

Principal Investigator: John Lloyd, PhD, MErgS, CPE

Co-Investigators: Brian Schulz, PhD; Shawn Applegarth, MSME; Andrea Baptiste, MA CIE;
Heather M. Monaghan, RN MHSc; Manon Short, MS, PT.

Background:

Nurses and other healthcare personnel have one of the highest job-related injury rates of any occupation in the United States.^{1, 2} Lateral transfers, turning and patient repositioning constitute activities that present high risk for musculoskeletal injuries of the back, neck and shoulders. A serious challenge, to the healthcare industry, is the rapidly growing, aging and bariatric populations in the U.S. coupled with the shortage of nurses and other health care personnel.

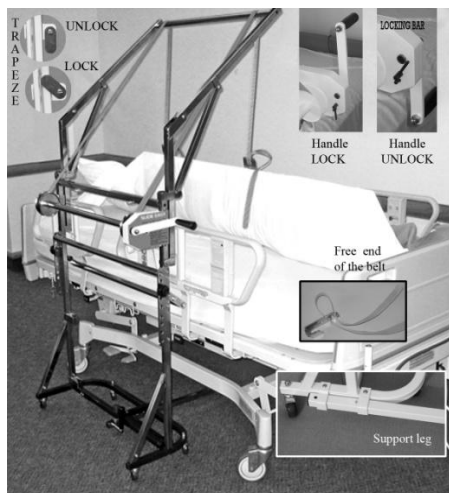
Many products attempt to address these patient handling challenges. Such products include ceiling-mounted lifts, floor-based lifts, air-assisted devices and non-mechanical devices such as slide sheets. Healthcare organizations now have a multitude of choices to make when purchasing equipment for transferring, turning and repositioning their patients, residents or clients. However, all these systems typically require more than one caregiver to move the patient.

The Patient Repositioning Systems (PRS) consists of three devices that can be used by a single caregiver, to easily transfer, turn or reposition towards the head of the bed, an immobile or bariatric patient.

Components of the Patient Repositioning Systems (PRS)



DS-10 for lateral transfer or patient repositioning



DS-10/20 for turning/rotating patients



DS-30 for repositioning patients to the head of bed

PART 1: BIOMECHANICAL EVALUATION OF PATIENT REPOSITIONING SYSTEMS (PRS) MODEL DS-10³

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Date of Report: January 17th, 2006.

A biomechanical evaluation of the Patient Repositioning System (PRS) Model DS-10 was conducted at the VA Patient Safety Center in Tampa, Florida.

Description of Biomechanics Research Laboratory:

Data collection was performed in the biomechanics research lab at the VISN8 Patient Safety Center, in Tampa FL. This laboratory is dedicated to promoting safe patient handling and movement through investigation of patient, provider, and technology defenses to prevent falls, bedrail entrapments, wandering, and pressure ulcers.

Measurement:

Objective data was captured using the Vicon MX motion capture system and an AMTI MC3A six-component load cell. AMTI force transducers are the gold standard for quantifying external loads and are calibrated by the manufacturer to meet exacting accuracy requirements.

Protocol:

A series of lateral transfer tasks were completed using the Patient Repositioning System DS-10 unit. A 90 kg mannequin representative of a normal US adult male (Denton ATD, Rochester Hills, MI) was transferred between a hospital bed and gurney. During a subset of these tasks, additional mass was added to simulate a bariatric representative mannequin.

Figure 1: Lateral transfer of simulated bariatric patient using PRS Model DS-10



Results of Biomechanical Evaluation of Patient Repositioning Systems Model DS-10:

The Patient Repositioning System DS-10 was shown to be considerably more biomechanically efficient than other lateral transfer devices (Table 1). The number of caregivers needed to transfer patients of various weights was also calculated and presented below.

Table 1: Biomechanical Efficacy of Lateral Transfer Devices

Device Evaluated	External Force Expressed as % Patient Weight	Max Patient Weight Handled per Caregiver as Function of External Force	Caregivers Needed to Transfer Patient Weighing 200 lbs	Caregivers Needed to Transfer Patient Weighing 300 lbs	Caregivers Needed to Transfer Patient Weighing 400 lbs	Caregivers Needed to Transfer Patient Weighing 500 lbs
PRS DS-10	2.1	525	1	1	1	1
Air-Assisted Device 1	21.5	103	2	3	4	5
Air-Assisted Device 2	21.6	103	2	3	4	5
Friction Reducing Device 1	24.1	92	3	4	5	6
Friction Reducing Device 2	27.0	82	3	4	5	6
Disposable Plastic Bag	44.2	50	4	6	8	10
Standard Draw Sheet	72.6	31	7	10	13	16

Conclusions:

A biomechanical evaluation of the Patient Repositioning System (DS-10 unit) yielded that it is reasonable for one caregiver to safely transfer a patient weighing up to 238 kg (525 lb).

The PRS DS-10 was also shown to be considerably more time efficient than other lateral transfer devices. It has the advantage of not requiring the patient be placed on a specialized sling, sheet or mattress, as it uses the bedding sheet on which the patient already lies. The average time to complete the transfer can be made in approximately 33 seconds (not including set up and take down).^{3,4}

Based on calculated safe working limits and task completion time, this product is an excellent solution for lateral patient transfers and repositioning in bed.

PART 2: CLINICAL EVALUATION OF THE PATIENT REPOSITIONING SYSTEMS (PRS) DS-10, DS-10/20 & DS-30⁵

Principal Investigator: John Lloyd, PhD, MErgS, CPE

Co-Investigators: Heather M. Monaghan, RN MHSc; Manon Short, MS, PT

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Date of Report: July 3rd, 2009

Objectives:

The purpose of this clinical evaluation was to analyze the three devices that make up the Patient Repositioning Systems, with the following objectives:

- Identifying any clinical issues when using the PRS in hospitals, nursing homes, hospital medical-surgical and critical care settings.
- Soliciting clinical feedback from nurses, caregivers and transport team members while using the PRS to perform lateral transfers, turning, and repositioning patients toward the head of the bed.

Location and Materials:

Following IRB approval, the evaluation was performed across two hospital sites, the James A. Haley Veterans Hospital (JAHVA), a VA Nursing Home in Tampa and Tampa General Hospital (TGH), which is one of Florida's seven, Level I Trauma Centers. The evaluations were conducted in five critical care units, two spinal cord injury units, a medical/surgical unit and at the VA Nursing Home.

Each clinical unit was provided with two DS-10's and two DS-10/20's to use in the evaluation. Four DS-30's were also provided and attached to specific beds, identified by the nursing staff at the VA nursing home. Several training sessions were conducted for staff, going over safety and operations procedures for each of the three pieces of equipment that compose the PRS. Staff was also given a handout with more information on the PRS, and laminated guidelines were attached to each piece of equipment for easy reference by the user. Information about the evaluation process was provided at the training sessions by a co-investigator.

Statistical Method of Evaluation:

The survey form employed a Likert score of 0-10 with 5 indicating no difference from the standard way the task was carried out at present, and greater than 5 indicating that the use of the PRS provides a considerably better approach than the existing procedure methods.

Data Collection:

Data (See Attachment 1 – Survey Form) was collected between October 2008 and April 2009. Clinical staff was asked to anonymously complete a survey after using the PRS devices, and then place the results in a box, which was emptied by a co-investigator on a weekly basis. The survey was comprised of 8 questions with space for additional, but optional, comments. Collecting data sheets, on a weekly basis, provided the co-investigator with an opportunity to determine how to help facilitate the project's completion, and address any concerns the staff may have.

Results:

A total of 91 surveys were completed, with 25 collected from TGH and 66 from the Tampa VA Hospital, spinal cord injury units & VA Nursing Home.⁵

Summary of Results

(All results presented on scale of 0-10)

Q1-Overall Comfort	Q2-Ease-of-Use	Q3-Stability	Q4-Versatility	Q5-Willing	Q6-Effective	Q7-Efficient	Q8-Safety
Total (91 completed surveys):							
8.32	7.83	8.49	6.95	7.35	8.32	6.68	8.35
James A. Haley Veterans' Hospital							
8.20	7.75	8.58	6.71	7.28	8.12	6.39	8.39
Tampa General Hospital							
8.14	8.04	8.24	7.54	7.52	8.84	7.48	8.24
JAHVA, VA Nursing Home							
9.00	8.59	9.00	8.08	8.13	8.65	8.11	9.17
<u>Scores for individual PRS models</u>							
Model DS-10 -Lateral Transfers							
8.07	7.52	8.41	6.67	6.85	7.92	5.88	8.38
Model DS-20 -Turning to Side							
8.47	7.84	8.29	7.42	7.50	8.66	7.05	8.16
Model DS-30 –Repositioning in bed toward the headboard							
9.00	8.59	9.00	8.08	8.13	8.65	8.11	9.17

The high average scores for each PRS model, demonstrates a considerable improvement over the current assisted and un-assisted methods of patient transfer, turning and repositioning toward the headboard of the bed.

Implications for Practice (Conclusion):

- Based on the Biomechanical Evaluation, the Patient Repositioning Systems can be operated by a single caregiver, who could easily and safely transfer an immobile patient weighing up to 238 kg (525 lb).³
- A clinical trial of the PRS was conducted in 2008-2009 for a period of over six (6) months at the James A. Haley Veterans' Hospital (JAHVA), Tampa General Hospital (TGH) and VA Nursing Home.⁵
- The high average scores for the PRS, demonstrates a considerable improvement over all other methods which require more than one care giver to accomplish the same tasks.
- At the VA Nursing Home, results showed high acceptance of PRS and specifically, PRS model DS-30 for repositioning a patient toward the head of the bed, which is otherwise a high-risk nursing task.

- At Tampa General Hospital, all patient transfer and repositioning tasks are assigned to lift teams. The high scores at this site are the result of several factors:
 - Through repeated use, the Lift Teams developed an experienced understanding of the various functions of the PRS and could use the device in an efficient manner.
 - The Lift Teams successfully used PRS in Critical Care Units (ICU, CCU, MICU and CSU) and surgical departments, where sophisticated patient transfers are required.
 - Use of PRS by trained healthcare worker or transfer teams, specially-dedicated to patient handling in hospitals, nursing homes and long term care facilities, can relieve nurses from patient handling tasks.
- Utilizing the standard flat or contour sheet on which the patient normally lies, the caregiver can laterally transfer, turn or reposition that patient, with minimum effort and discomfort to both caregiver and patient.
- PRS is a solution for one of the most significant challenges in nursing and long term care units, that of locating a colleague who is available to help with transferring, turning or repositioning a partially or totally immobile or bariatric patient.
- These tasks become an even greater challenge in home healthcare settings, where many caregivers work independently.
- The PRS was found to be safe, stable, easy and effective for use by a single care-giver when conducting, transfer, turning and repositioning operations, thereby improving efficiency and productivity and significantly reducing the possibility of injury to caregivers and their patients.
- Data collected at VA and Tampa General Hospitals and at the VA Nursing Home, demonstrates that PRS can be successfully used by both medical personnel and trained caregivers (without a medical background), enabling them to perform critical tasks for safe patient handling in hospitals, nursing homes, hospices, rehabilitation and home healthcare settings.

References:

1. U.S. Department of labor, Occupational Safety and Health Administration. (1999). Ergonomics program; Proposed rule. Fed. Reg., November 23.
2. U.S. Department of labor, Occupational Safety and Health Administration. (2000). 29 CFR Part 1910. Ergonomics program. Final rule. Fed.Reg., November 14.
3. Lloyd J, Shultz B, Applegarth S, and Baptiste A. (2006) Biomechanical Evaluation of Patient Repositioning Systems (PRS DS-10). VA Patient Safety Center of Inquiry. Tampa, FL.
4. Lloyd JD & Baptiste A. (2006) Biomechanical evaluation of friction reducing devices for lateral patient transfers. AAOHN Journal. 54 (3): 113-119
5. Lloyd J, Monaghan H M, Short M. (2009) Clinical Evaluation of the Patient Repositioning Systems (PRS). VHA Patient Safety Research Center, Tampa, FL

Attachment 1 – Survey Form

Product I.D: _____	Task: <input type="checkbox"/> Reposition up in bed <input type="checkbox"/> Lateral transfers <input type="checkbox"/> Turning a pt. to side	Facility: _____ Unit: _____
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Please compare your impression of the new product to the standard method for completing these tasks. Answer each of the following questions on a scale from -5 to +5, by circling the number that matches your impression, where minus five (-5) indicates considerably worse than standard task, zero (0) indicates no difference from standard task; and plus five (+5) indicates considerably better than standard task.

We encourage you to express any comments you might have directly on this form and thank you for taking the time to help us make the right purchasing decisions for your facility.

1. How would you rate your OVERALL COMFORT during use of this product?

-5 -4 -3 -2 -1 0 1 2 3 4 5

V. Uncomfortable

V. Comfortable

2. What is your impression of this product's OVERALL EASE-OF-USE?

-5 -4 -3 -2 -1 0 1 2 3 4 5

Very Difficult

Very Easy

3. How STABLE do you think the product is during use?

-5 -4 -3 -2 -1 0 1 2 3 4 5

Very Unstable

Very Stable

4. How VERSATILE do you think this product is for patient transfers?

-5 -4 -3 -2 -1 0 1 2 3 4 5

Not Versatile

Very Versatile

5. How WILLING are you to use this product on a day to day basis?

-5 -4 -3 -2 -1 0 1 2 3 4 5

Not Willing

Very Willing

6. How EFFECTIVE do you think this product will be in reducing CAREGIVER INJURIES?

-5 -4 -3 -2 -1 0 1 2 3 4 5

Totally Ineffective

V. Effective

7. How EFFICIENT do you feel this product will be in use of your TIME?

-5 -4 -3 -2 -1 0 1 2 3 4 5

Totally Inefficient

V. Efficient

8. How SAFE do you feel this product would be for the PATIENT?

-5 -4 -3 -2 -1 0 1 2 3 4 5

Very Unsafe

V. Safe

9. Make sure you checked box indicating what task you are doing-see top of questionnaire and check box (lateral transfer, reposition up in bed or turn patient to the side)

Additional Comments:

Thank you for participating in this evaluation

