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SAFER SLING INSERTION: REDUCING RISK OF BACK INJURY DURING PATIENT HANDLING

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SUMMARY

We measured loads on the low back of caregivers as they performed the sling insertion activity on a 93kg patient actor. Caregivers worked alone as well as in pairs to complete the sling insertion activity. 12 of 15 caregivers exceeded the 3400N NIOSH limit for spine compression during the sling insertion task, though a single caregiver was found to be at no higher risk of injury than two caregivers working together.

A device called SlingSertTM was developed and evaluated for its ability to reduce loading due to the sling insertion activity. SlingSert uses compressed air to inflate a set of lifting straps under a patient removing the need for rolling/turning. 10 clinicians were asked to perform the sling insertion activity using both the traditional method of “log-rolling” a patient as well as with the help of SlingSert with a 116kg patient actor. Participants needed an average (SD) of 192 (35)s to insert a sling using the SlingSert system and 40 (7)s with the conventional method. Caregivers agreed the SlingSert system could be helpful to them particularly for bariatric patients despite the increased time required.

INTRODUCTION

Caregivers injure their backs more than workers in any other industry [1]. Efforts to reduce injuries have been on-going for decades with limited results. Mechanical lift devices have been incorporated into clinical practice over the past 30 years to reduce the risk of injury from patient lifting. Yet injury rates remain high. While these devices assist with lifting patients, they also introduce new activities that result in caregivers experiencing unsafe loading on the spine. In particular, the activity of inserting a sling under the patient may be part of the problem.

This paper reports on a two-part investigation. In the first part, we measure the loads on the low back of caregivers performing a sling insertion activity and in the second part we evaluate a novel tool for making sling insertion safer called SlingSert (shown in Figure 1). A video describing this device is found here:

<http://www.youtube.com/watch?v=QK67Jm8o8EE>

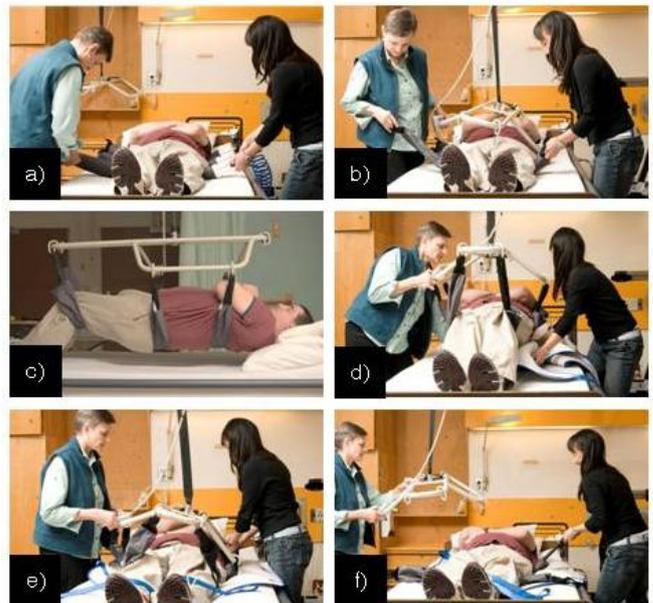


Figure 1: Using SlingSert to insert a sling. a) Three lifting sleeves are inflated under the patient. b) The stretcher frame is lowered over the patient, plastic cartridges are removed and the lifting sleeves are connected to the frame. c) The patient is lifted approximately 10cm off the surface of the bed. d) The sling is easily inserted and leg straps are positioned. e) The patient is lowered and the lifting sleeves can be disconnected from the stretcher frame spreader bar. f) The spreader bar is moved away and the lifting sleeves are removed leaving the patient positioned on the sling.

METHODS

In Part 1, 15 female caregivers were asked to place a sling under the patient actor using the following eight steps:

1. Roll the patient onto his right side (Roll Right)
2. Align and tuck the sling partially under the patient
3. Roll the patient back to supine
4. Roll the patient onto his left side (Roll Left)
5. Unfold the sling
6. Roll the patient back to supine
7. Adjust leg straps between the patient's legs
8. Connect the sling straps to the overhead lift

Caregivers were asked to perform the eight activities above in three different experimental conditions while force, moment and motion capture data were recorded. The three conditions were: single-caregiver (Solo); two-caregiver-primary (Primary); and two-caregiver-secondary (Secondary).

In Part 2, 10 female caregivers were asked to perform sling insertion using both the conventional method from part 1 and the SlingSerter method (shown in Figure 1). Slings were inserted under a 116kg, 182cm tall surrogate patient.

RESULTS AND DISCUSSION

The main finding of the first part of this study is that having two caregivers working together to perform sling insertion does not reduce loads on the spine, compared to a single caregiver as shown in Figure 2.

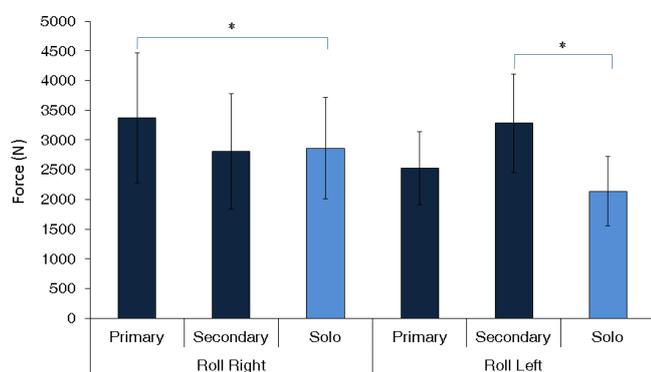


Figure 2: Comparison of single (Solo) and two-caregiver (Primary and Secondary) peak compression at the lumbosacral joint for rolling activities. In the Solo caregiver cases, Roll Right refers to rolling the patient away from the caregiver and Roll Left results in the patient being pulled closer to the caregiver. Significant differences (*) if $p < 0.05$.

We were surprised to find that one of the two caregivers working together in the Roll Right and Roll Left activities experienced higher compression at the lumbosacral joint than the Solo caregiver. We found significantly higher twisting moments for both caregivers working as a pair than for the single caregiver. These findings along with a review of video footage of these trials indicated the explanation for these higher loads in the two-caregiver case are the result of asymmetrical loading of the Primary caregiver for the Roll Right activity and the Secondary caregiver for the Roll Left activity. While the Solo caregiver was able to freely position her body relative to the patient to attain a balanced load, in the two-caregiver case, the force with which the co-caregiver will push is unknown and this unpredictability may lead to the imbalances we measured.

Table 1: Comparison of conventional and SlingSerter method for performing sling insertion.

Method	Average (SD) time to complete sling insertion (s)	Perceived exertion for performing sling insertion	Caregiver preference
Conventional	40 (7)	4.6 (0.5)	3
SlingSerter	192 (35)	1.0 (2.6)	7

The results of the second part of our study are shown in Table 1. Participants indicated SlingSerter was less strenuous but more time consuming than the conventional method.

CONCLUSIONS

The peak compressive loads on a single caregiver were not higher than the loads on either of the two caregivers working as a pair during sling insertion. In fact, loads on one of the caregivers working as a two-caregiver team were higher than the loads on the Solo caregiver for activities when the patient actor was being turned and when the sling was being tucked under him. Therefore, a single caregiver performing sling insertion under a 93kg patient is at no higher risk of injury than if two caregivers work together.

Clinicians agreed that SlingSerter would be useful for inserting slings under bariatric patients and other special patient populations who are challenging to turn. Other applications thought to be suited to SlingSerter are those where the patient is lifted a short distance off a bed such as positioning bed pans or changing bedding. The SlingSerter system was found to take nearly five times longer to insert a sling compared to the conventional method with a 116kg patient, however the perceived exertion on caregivers was considerably less and the majority of caregivers stated that they preferred the SlingSerter system overall. We expect the costs associated with the increased time required to use SlingSerter may be balanced by reduced personnel requirements for bariatric care tasks.

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1. Waehrer G et. al, "Costs of occupational injury and illness within the health services sector," *International Journal of Health Services*, **35**: 343-359, 2005.