

Suitable Combination of Bed Height and Foot Position for Turning Patient on a Bed

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Abstract— Turning patient for frequent reposition on a bed caused lower back pain (LBP) among caregivers. Previous studies mentioned that adjusting bed height and foot position of caregiver contributed to reduce lumbar loads of turning patient. However, suitable combination of bed height and foot position were not clarified. The objective of this study is to find suitable combination of bed height and foot position for preventing LBP while turning patient. The relationship between compression force of L4-L5 as lumbar load and combination of two bed heights and nine foot-positions was investigated via musculoskeletal simulation. The results showed that compression force of L4-L5 became smallest in combination of high-height bed (51% of body height) and short anteroposterior length foot-position (15 % of body height). Therefore, a caregiver had better use the above combination when turning a patient on a bed.

Clinical Relevance— This study can provide the suitable bed height and foot position for reducing lumbar loads of caregiver while turning patient on a bed.

I. INTRODUCTION

Caregivers have lower back pain (LBP) due to patient handling motions [1]. Especially, turning patient for frequent reposition caused LBP [1]. Previous studies suggested that adjusting bed height and foot position of caregiver was able to minimize lumbar load while turning patient [1–3]. However, suitable combination of bed height and foot position was not clarified. Then, the aim of this study is to find suitable combination of bed height and foot position for preventing LBP while turning patient.

II. METHODS

The participant were two young males. One participant simulated a caregiver (male, 22.0 years, 1.74 m, and 59.2 kg). The other simulated a patient (male, 22.0 years, 1.62 m, 58.3 kg). Caregiver turned the patient with combination of two bed heights and nine foot-positions (Figure 1). Two bed heights were selected based on previous research (32 % and 51% of body height (BH)) [2,3]. Nine foot-positions were defined by combination of three anteroposterior length (15, 25, and 35 % of BH) and three mediolateral widths (20, 30, and 40% of BH). Compression force of L4-L5 was selected as lumbar load, and it was obtained from the computational musculoskeletal simulator (3DSSPP, University of Michigan, USA). Compression forces of L4-L5 were calculated with 25 Hz sampling frequency. Compression forces of L4-L5 were compared for bed height and foot positions.

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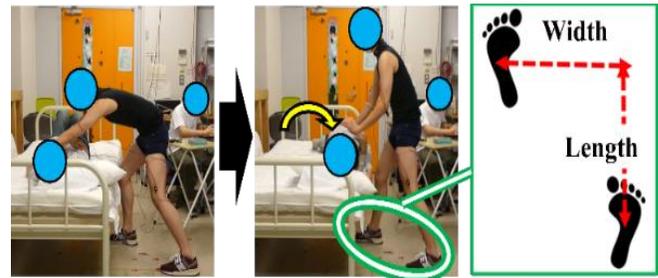


Figure 1. Turning patient on a bed.

III. RESULTS & DISCUSSION

The results (Figure 2) showed that compression force of L4-L5 became smallest in combination of high-height bed (51% of BH) and foot positions with short anteroposterior length (15 % of BH). These results indicated that caregiver should use high-height bed and foot positions with short anteroposterior length while turning patient on a bed.

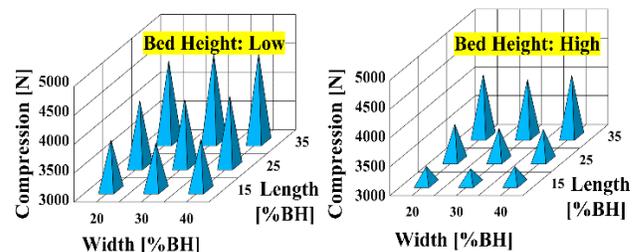


Figure 2. Maximum compression forces of L4-L5 in turning patient.

IV. CONCLUSION

This study provides suitable combination of bed height and foot position for preventing LBP due to turning patient. Future works will investigate other lumbar loads such as muscle activity.

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