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A Study of Wheelchair Transfer Assistance Technology By The Three-Dimensional Motion Analysis

Mikako ITO[a*], Xiaodan Lu[b], Shodai Kawakatsu[b], Noriyuki KIDA[b], Noriaki KUWAHAR[b], Hiroyuki HAMADA[b]

[a]*Social welfare corporation KEISEIKAI*
[b]*Kyoto Institute of Technology*

Abstract

In September 2015, the proportion of aged population over than 65 years old in Japan is around 25%, which suggesting Japan has become one of the super-aged society in the world. With the aging society proceeding in the soon future, it is predictable that the aging people who need receive elderly care will increase continuously. Staffs in this serving area has a high turnover rate because of the overwork. Since the number of the skilled staff is small at present, it is a challenge to train the rookie staff into skilled ones with masterly care technology.

In this experiment, the more experienced caregivers observed a series of actions of the patient, from chewing to swallowing. They would also observe the patient's mouth from time to time. They understand that they have to be alert in the whole eating process so as to achieve safety in dining nursing. We are also able to dig deeper into the tricks of safe nursing by carrying out this experiment.

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Keywords: Nursing home; Skill to transfer assistance between wheelchair and bed; Motion analysis

* Corresponding author. Tel.:
E-mail address: kantamikako@hct.zaq.ne.jp

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1. Introduction

Japan is one of severe "super-aging societies" in the world today, with 24.1% of the nation's population over the age of 65. If the population continues at its current rate, the number of recipients of long-term care will likewise continue to increase. As the wave of elderly continues to swell, current long-term care facilities are exhausted. The turnover rate for caregivers in these facilities is also quite high compared to other occupations, causing even dedicated staff to quit from overwork.

Proper “transfer assistance between wheelchair and bed” are a fundamental element of senior care. However, large gaps in how to perform a safe transfer are noticeable amongst skilled and non-skilled caregivers. Each skilled caregiver has her/his own technique, but often it can’t be explained well, because these techniques are based on their long experience, which is called as tacit knowledge. Therefore, when skilled caregivers face to teach their technique to unskilled caregivers, what they can do is to show their movement without logical explanation. In this case unskilled caregivers can’t understand the concept of skilled caregiver’s movement, further it is high possibility that it leads to misunderstanding because they understand their own way and concentration. Tacit knowledge should be transformed to explicit knowledge that is knack in skilled caregiver’s movement is expressed by numerical data. In this paper acquired in the three-dimensional data of the data of the transfer assisted by a skilled and non-skilled staff to verify the safe and secure transfer assistance for the care recipient. In the chapter 2, three dimensioned movement analysis method was described. And one of authors, Ito, has 20 years experience of long term care, purposed 7 points of her own knack and measurement method for getting numerical data. In the chapter 3, comparison between expert skilled caregiver and non-expert (unskilled caregivers) was made by using obtained numerical data. Before conclusion, how to educate the non-expert was discussed. Skilled and non- caregivers care that to clarify the difference of how to use the body in transfer assistance of caregivers, to verify the method that can more early technology acquisition.

2. Experiments

2.1 Participants

One caregivers employed in the Japanese nursing home was considered as subjects for the whole study. One caregiver is 35years old with 10 experience years for elder nursing care occupation referred as “Expert”. Four caregivers participated and they have only 1 month working experience referred as “Non-expert”. Their body weight and height are 60Kg and 170cm, 80Kg and 170cm, 62Kg and 173cm, 71Kg and 170cm, 55Kg and 165cm respectively. Five different ‘hypothesis’ elder persons were employed and in Expert caregiver case elder person weight and height is 60Kg and 170cm, on the other hand in Non-Expert cases they are 80Kg and 170cm(Non-Expert ①), 62Kg and 173cm(Non-Expert②),71Kg and 170cm(Non-Expert③),55Kg and 165cm(Non-Expert④). The elder person condition was established, regarding the existence of support.

2.2 Experimental preparation

Transfer care work from wheel chair (WC) to bed (B) was predetermined for expert and non-expert’s care job investigation process. Prior to experimental process, both expert and non-expert caregiver subjects were required to attach 20 reflection markers throughout body positions as head top, head front, head left, head right, neck, back1, back2, waist, shoulder (left and right), elbow (left and right), hand (left and right), greater trochanter (left and right), knee (left and right), ankle (left and right) and foot (left and right). And six infrared video cameras captured the position of each marker in the X, Y and Z directions synchronously during the whole caregiver’s movement process with an interval of 100 frames per second. Experimental setup is shown in Fig.1.