

10th World Congress on

HEALTHCARE & TECHNOLOGIES

July 17-18, 2017 | Lisbon, Portugal

DEVELOPMENT OF AN INFLATABLE SHOULDER REHABILITATION DEVICE FOR HOME CARE USE

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Cerebrovascular disease is commonly known as stroke and is ranked as third in the top 10 leading causes of death in Taiwan. According to the Ministry of Health and Welfare in 2007, the prevalence rates of hypertension and hyperglycemia increase with age. Changes in the age composition of the Taiwanese population will lead to it becoming an aged society by 2018 and a “hyper-aged” society by 2025. Therefore, it can be inferred that the Taiwanese society will encounter severe public health problems regarding stroke and post-stroke rehabilitation needs. To counter this, many studies have proposed early passive movement and shown that providing support and protection in the flaccid stage can prevent immobility and soft tissue contracture, and minimize the risk of hemiplegic shoulder pain. Rehabilitation places a heavy burden on physical therapists because a one-on-one interaction with the patient is required. The purpose of our study is thus to develop a low-cost and portable rehabilitation device for the rehabilitation of patients at home. Home-based rehabilitation is not only more convenient but also reduces the cost of rehabilitation and burden on physical therapists. The rehabilitation device we developed produces shoulder abduction and adduction by inflating and deflating airbags in the device. The device includes one inflatable vest (using Velcro to fix the vest on the body, being suitable for either arm) and one control box. The control box has three mode buttons: modes I/II/III. Patients simply need to wear the inflatable vest and press the particular mode button as advised by a physical therapist. Then, the rehabilitation device helps patients to complete passive movement. The results of a system stability test showed that the lifting angle variation of our device under different external forces (0–3 kg) was below 3°. It appears that our device has good suitability for users with a wide range of body weights. A positive correlation between external force (0–2 kg) and the pressure in the airbag was identified in a loading vs. airbag pressure experiment. If the same patient’s pressure in the airbag steadily rises during the course of rehabilitation, close attention should be paid to the increase in muscle tension. Our shoulder rehabilitation device is one of the most cost-effective and user-friendly devices for stroke patients to conduct passive movement at home.