

CHAPTER V

DISCUSSION

Walking devices are commonly prescribed for the patients in order to compensate for lower extremity muscle weakness and the impairment of balance control, and promote the patients to be more independence (Melis et al., 1999). However, walking with a walking device requires considerable demand onto upper extremities and energy expenditure. It induces abnormal walking manners, jeopardizes stability in a certain situation, and increases risk of fall due to limited forward and lateral movements of the legs (Faruqui and Jaebalon, 2010; Bateni and Maki, 2005; Melis et al., 1999). Thus, patients likely walk at an insufficient speed and distance to conduct daily activities in everyday environment (Bateni and Maki, 2005; Melis et al., 1999; Koh et al., 2002). Later, continuing use of a walking device facilitates the patients to develop muscle shortening, and retards their ability to withdrawn from the walking device (Bateni and Maki, 2005). Findings of the study demonstrated that the 10MWT, TUGT, and FTSST had excellent inter-tester reliability (table 2) and could clearly distinguish ability of subjects who walked with and without a walking device ($p < 0.001$, table 3). The time required to complete the tasks of FTSST, TUGT and 10MWT at least 14.13s, 18.23s, and 6.35s, respectively had good to excellent ability to predict the requirement of a walking device (table 4).

This is the first study that reported predictive values, and associated sensitivity, specificity and area under curve (AUC) for ability of patients with SCI to walk with and without a walking device. Among the 3 tests, the 10MWT is the best tool to predict the requirement of a walking device, followed by the TUGT and FTSST, respectively. Results of the 10MWT reflect walking speed that associates to motor function, walking endurance, and overall quality of gait (Jackson et al., 2008). The TUGT requires subjects to perform sequential locomotor tasks that incorporate sitting-to-standing, walking and turning activities (Shumway-Cook et al., 2000). Results of the test associate with levels of functional mobility, balance and postural control, walking ability, and risk of falls (Podsiadlo and Richardson, 1991). The FTSST has been proposed as a sensitive and responsive tool to assess LEMS

(Mong et al., 2010; Lord et al., 2002; Bohannon et al., 2007). Results of the tests also relate to balance control, sensation, and spasticity (Whitney et al., 2005). These are vital components for ability of walking without a walking device. Thus subjects who required a walking device demonstrated significantly less functional ability as determined by the 10MWT, TUGT and FTSST than those who walked without a walking device (table 3). High predictive ability of the 10MWT and TUGT may be that these tests incorporate more complex tasks relating to walking ability than those of the FTSST.

Findings of this study indicated that ability of walking at a speed higher than 0.63 m/s suggested individuals who were independent from a walking device (sensitivity 86.67%, specificity 90%). Since the test can easily be measured, it has been verified for its effectiveness to predict ability of patients with SCI and other conditions. In patients with SCI, the increment of walking speed at least 0.3 m/s is important for the patients to advance their ability from outdoor wheelchair dependency to assisted walking (van Hedel et al., 2009). To safely cross a street, patients have to walk at a speed at least 0.6 m/s. This speed is also used to classify patients with SCI into functional and non-functional walkers (Zörner et al., 2006). In elderly, improvement in walking speed predicts a substantial reduction in mortality (Hardy et al., 2007). A preferred walking speed less than 1 m/s identifies elderly with a high risk of health-related outcomes whereas a walking speed above 1.0 m/s associates with an independent lifestyle (Cunningham et al., 1993). The best estimates of small, meaningful changes of walking speed in elderly are 0.05 m/s, while substantial changes are 0.10 m/s (Perera et al., 2006). Because walking speed can easily be measured, clinically interpretable, and potentially modifiable, it is suggested to use as a useful “vital sign” for elderly (Hardy et al., 2007).

TUGT has been suggested as a valid and reliable tool to assess functional ability in patients with SCI (van Hedel et al., 2005). Data of this study demonstrated that the requirement of TUGT at least 18.23 seconds inferred the need of a walking device (sensitivity 83.33 %, specificity 86.67 %). Previously, Lam et al (2007) found that a change of TUGT time 10.8 seconds indicated minimal clinical detectable change in patients with SCI. Flansbjer et al (2005) reported that minimal detectable change of TUGT time in patients with stroke were 2.9 seconds. Furthermore, there are

other studies that propose the TUGT cut-off scores to indicate risk of fall in elderly (Thomas et al, 2005; Shumway-Cook et al, 2000; Whitney et al, 2005).

Data of this study indicated that the FTSSST had lowest but good predictive the requirement of walking device (cutoff scores = 14.13 seconds, sensitivity 70 % and specificity 73.33%). This may be that, the test mainly reflects strength of proximal muscles of the legs, ability of balance control while changing from sitting to standing (Whitney et al., 2005). However, there are many other factors that attribute ability of walking without a walking device, i.e. age, balance and postural control, residual motor and sensory functions, the presence of contractures, pain, and uncontrolled spasticity (Subbarao, 1991). These factors may contribute significant impacts when performed a more complex task of walking than when conducted a simple task of sitting to standing activity. Thus the FTSSST showed lowest predictive ability among the 3 tests. Previously, Bohannon (2006) reported average reference values for elderly aged 60-69, 70-79, and 80-89 years which were 11.4 seconds, 12.6 seconds, and 14.8 seconds, respectively. Elderly who required time to complete the FTSSST longer than 15 seconds had a high risk of recurrent fall (sensitivity 55%, specificity 65%) (Buatois et al., 2008). The data of this study suggested that the time required complete the FTSSST \geq 14.13 seconds had good predictive ability to indicate the requirement of walking devices (table 4).

Although this study captured subjects mainly from a tertiary hospital, their baseline demographics represented general characteristics of patients with SCI (Wyndaele and Wyndaele, 2006). Thus, findings of this study provided important data for screening and follow-up process to direct decision-making to promote levels of independence of patients with SCI. The incorporation of these tools with specific cut-off scores into clinical practice may help to promote rehabilitation outcomes and minimize negative consequences of long-lasting use of a walking device.