CHAPTER - 1

Mobility Disability - An Overview
1.1 Introduction

Chapter 1 presents the overview of mobility disability, its incidence, prevalence and the impact of mobility disability on patients living in community. This chapter also details the importance of environmental factors that influence the mobility disability in community dwelling individuals. The literature was reviewed from textbooks, scientific journals and from various internet search engines to broaden the scope of understanding mobility and mobility disability.

1.2 Definition of Mobility

The basic definition of mobility is the ability to move independently and safely from one place to another, which is the fundamental part of activities of daily living. This ability is the critical element for maintaining independence and an essential attribute to quality of life (Patla & Shumway-Cook, 1999). Mobility in a wide range of environment requires individuals to adapt how they sense and how they move. Hence it can be defined as “the individual’s ability to move about effectively in his/her surroundings (PRICE, 1980)”. According to ICF, mobility includes walking, moving around, changing or maintaining body position, carrying, moving and handling objects and moving around using transportation (Shumway-Cook et al., 2002). Mobility inside and outside the home is essential for basic activities of daily living such as eating, dressing, toileting and, as well as instrumental activities of daily living such as writing, shopping, cooking, gardening, visiting friends and temples. Involving in games, using transport, mobile phones and computers have also become important activities which require mobility. (Shumway-Cook et al., 2002).
1.3 Community mobility

Community mobility is characterized by start and stops, changes in direction and speed, accommodating surfaces with different geometric and physical properties, avoiding obstacles and concurrent execution of other tasks. Mobility must include not only the ability to walk safely in the simple and predictable environments, but also the ability to modify and adapt gait to both expected and unexpected challenges to locomotion (Patla & Shumway-Cook, 1999). Hence, recently community mobility has been defined as “independent mobility outside the home which includes the ability to confidently negotiate uneven terrain, private venues, shopping centers and other public venues” (Lord & Rochester, 2005). This definition was based on the environment and the various ambient conditions that participants frequently encounter during their activities of daily living.

Independent ambulation within the home and the community is an important rehabilitation goal for a person with physical impairments as well as for the treating physiotherapist (Corrigan & McBurney, 2008). The achievement of independent community mobility is dependent on various factors like, the skills and abilities of the performer, requirement of the task and challenges of the environment (Haché, 2010). Musculoskeletal factors, cardiorespiratory fitness, balance, vision and other senses, neurological and cognitive abilities all can affect these capacities.
1.4 Mobility disability

Impairments in mobility, when restricts the ability of individuals in performing the activities of daily living results in a condition referred to as mobility disability. (Patla & Shumway-Cook, 1999) The impaired mobility predicts the onset of disability in tasks essential to living independently in the community and caring for oneself. Thus, mobility disability is a strong predictor for dependency of individual especially in older age.

Earlier models of disablement generally focussed on individual, exploring the relationship between pathology, impairment, functional limitations and resultant disability. Recently, researchers have begun to consider the effect of factors extrinsic to the individual such as the environment, on the disabling process. (Patla & Shumway-Cook, 1999) New models suggest that determination of the degree of disability must include the extent to which the environment constrains a particular individual due to the condition. These factors include physical, social and psychological environments (Gitlin, 2003). Mobility limitations and disabilities are currently viewed largely from a person-environment perspective where the disabled outcome is often seen as a result of the dynamic interplay between the individuals’ capabilities and the demands of the environments in which they negotiate (Altman, 2001). Hence the current definitions of mobility disability include the spectrum ranging being bed bound to having difficulty with mobility only in highly challenging terrain.

1.4.1 Incidence and prevalence of mobility disability

Mobility problems are most common among older adults, although people of any age can experience difficulties in mobility. Incidence of mobility disability
increases dramatically as we age from 1% in the general population to over 35% in individuals over 80 years old. (Weiss et al., 2007). Mobility disability is a huge public health burden, with a prevalence on the order of 30% to 50% in adults 65 years and older. Mobility disability in the middle-aged is also relatively common since the associated conditions in the middle-aged are similar to those in older people (D. Melzer, Gardener, & Guralnik, 2005). Furthermore, the prevalence of preclinical disabilities in mobility tasks is considerable, ranging from approximately 20% to 40% (Mänty et al., 2007). The prevalence of mobility limitations is higher in developing countries than in developed countries. For instance, 47 percent reported having some difficulties with moving around in India compared to 26 percent in Denmark. The severity of mobility limitations is also higher in developing countries and considered as a huge public health burden. (Yong, 2012).

Data from the National Health Interview Survey (NHIS), a nationally representative survey of non-institutionalized civilian residents of United States, showed that over the period 2001 to 2005, the most common difficulty is related to movement, with 21.7 percent of the population aged 18 and older reporting difficulties with basic physical actions such as walking, bending, reaching overhead, or using their fingers to grasp something (Altman & Bernstein, 2008).

The U.S. Census Bureau reported that in 2005, of Americans aged 15 and older, 11.9 percent had difficulty with ambulatory activities of the lower body, 9.8 percent had difficulty walking a quarter of a mile, and 9.4 percent had difficulty climbing a flight of stairs (Brault, 2009). Importantly, because of differences in measurements and definitions as noted, international comparability of prevalence
estimates of disability is difficult and complex; thus, the results from various surveys cannot be compared directly.

Different prevalence rates for disability are available in India. According to the Census 2001, 21 million people with disabilities are in India who constitutes 2.13% of the total population (Census 2001). In contrast, the National Sample Survey Organization (NSSO) estimated that the number of persons with disabilities in India is 1.8% of the Indian population (NSSO 2002). NSSO also includes the persons with visual, hearing, speech, locomotor and mental disabilities, but the distribution in each category according to the two surveys differs drastically. For example, the locomotor or mobility disabilities constitutes about 28% according to Census 2001, whereas, it is 51% according to NSSO. The difference in estimates can be explained by the lack of universal definitions and assessment criteria of mobility disabilities used during the surveys.

Patel et al. (2009) using NSSO 2002 data, observed that locomotor disabilities are the most prevalent type of disabilities affecting of all ages in India, whereas visual and hearing disabilities are the highest in the aged. Further, onset of locomotor disabilities mainly occurs at early ages, whereas severe disability is concentrated at later ages. Between the two sexes, the prevalence of disability was marginally higher among males than the females. Among the rural residents, the prevalence of mobility disability was 1% and that among the urban was 0.9%. Incidence rates have declined during 1991-2002 for all types of disability groups in lower and high age groups, however, the incidence rates for locomotor disabilities among the age groups of 15-29 years have increased (NSSO 2002).
1.4.2 Conditions leading to mobility disabilities

In the context of disability, an individual’s mobility could be affected as a result of any of, or a combination of the diseases, which may be congenital or traumatic, short term, progressive or permanent. The causes of mobility disability are diverse and span a variety of health conditions. These conditions include but are not limited to osteoarthritis, rheumatoid arthritis, chronic neck and low back pain, stroke, parkinson’s disease, motor neuron disease, neuromuscular conditions like muscular dystrophy, multiple sclerosis, and ataxia, which result in degeneration and atrophy of muscle or nerve tissues. Cardiopulmonary conditions like bronchial asthma, metabolic conditions like diabetes mellitus, complications of diabetes including periarthrits, amputation of parts of limb etc. also account for diseases leading to mobility disabilities.

Physical injuries resulting from trauma include conditions like fractures, brain injuries, spinal cord injuries and other fall associated conditions. Additionally, high body mass index (BMI), which stresses joints resulting in obesity-related mobility disability, is on the rise with 42.2% of persons with obesity reporting functional impairment in the National Health and Nutrition Examination Surveys (Rosenberg, Bombardier, Hoffman, & Belza, 2011).

1.4.3 Classification of mobility disabilities

Mobility impairments range in severity from limitations of stamina to paralysis. Mobility impairments range from lower body impairments, which may require use of canes, walkers, or wheelchairs, to upper body impairments which may include limited or no use of the upper extremities and hands. People are classified as having mild, moderate, or severe mobility limitations based on the
level of difficulties they addressed. The total number of those with mobility impairments in 2001 was 14.1 million. Out of these, 9.5 million had mild mobility impairment, and 1.2 million had severe mobility impairment (Rosenberg et al., 2011). Overall, 28.3% of medicare beneficiaries had moderate to severe functional impairments (Shumway-Cook, Ciol, Yorkston, Hoffman, & Chan, 2005). It has been observed that mobility disability has been highest for those with musculoskeletal diseases followed by neurological disorders, heart diseases, lung diseases, diabetes, and cancer.

1.5 Impact of mobility disability

Mobility disabilities can affect individual’s quality of life, health, productivity, independence and also the lives of their family and the people around them. Because of close association with the disability and increase in dependency, mobility limitations can often restrict activity and social participation, bring about isolation, anxiety and depression, and contribute to an overall poorer quality of life (Yong, Saito, & Chan, 2010). Mobility difficulties increase the risk of dependency and are an important public health concern. Limitations of mobility are one of the strong predictors of subsequent disabilities and the need for the assistance. Older persons who lose independent mobility are less likely to remain living in the community and more likely to be institutionalized. Other studies have found that impaired mobility among older adults is associated with a higher risk of mortality (Hirvensalo, Rantanen, & Heikkinen, 2000). The financial impact of disability on the family/household is significant and the conditions leading to mobility disabilities are associated with a significant socioeconomic burden. A recent cross-sectional study conducted in Delhi reveals that locomotor disability poses a
severe socio-economic burden on parents of the disabled children (Laskar et al 2010).

Difficulties in mobility are often the first noticeable signs of decline in functional ability and considered to be the risk factors for morbidity and mortality especially in older adults (Mänty et al., 2007). Walking or moving about was the primary activity that patients claimed to be affected by mobility impairment, while activities of daily life including work, shopping as well as sports and exercise were also impacted (Hartung, 2011).

1.5.1 Factors associated with mobility disability

Various risk factors have been found to be associated with mobility limitations. These can be classified into individual, social, environmental and organizational factors (Yeom, Fleury, & Keller, 2008). Individual risk factors include age, sex, gender, marital status, socioeconomic status, lifestyle and health behaviors and diseases (Shumway-Cook, Ciol, et al., 2005).

Numerous studies have documented a positive correlation between age and mobility decline suggesting that mobility disability is related to the normal aging process (Guralnik et al., 1993; David Melzer & Parahyba, 2004; Shumway-Cook, Ciol, et al., 2005). Nevertheless, a group of studies reveal that mobility decline is not part of normal aging but represents some underlying pathological process and other influencing factors (Yong, 2012).

1.5.2 Gender and mobility disability

Studies have shown that women tend to have higher prevalence of mobility impairments and are more likely to be disabled in later life compared to men.
(Ahacic, Parker, & Thorslund, 2000). This difference could be partly because of age and life expectancy, as women live longer and hence have a higher likelihood of more years of life with mobility limitations than men. Several studies have demonstrated that women have greater mobility disability than men irrespective of lesser reporting of disability by women. The gender gap seems to be greater in regions with the largest loss of human development due to gender inequality (Mechakra-Tahiri, Freeman, Haddad, Samson, & Zunzunegui, 2012). This gender gap is however becoming narrow in some countries due to changes in social class structure, increased employment among women and health behaviors.

1.5.3 Socioeconomic status and mobility disability

Mobility disability is found to be associated with socioeconomic status as measured by income and educational levels after taking into account other demographic characteristics. The British Department for International Development (DFID) has recognized that, ‘disability is a major cause of social exclusion and it is both the cause and consequence of poverty’ (DFID 2000). Being a major group, mobility disabilities could also be influenced greatly by the low socioeconomic status. Older people with less education and lower socioeconomic status have substantially higher prevalence rates of mobility disability. It is also clear from several studies that the prevalence of disability is lower in relatively privileged socio-economic groups in both developed and developing countries (Parker et al 1994; Melzer et al 2000; Rautio et al 2001; Seeman et al 2001).
1.5.4. Life style and mobility disability

Various studies have found that sedentary lifestyle, smoking, drinking alcohol, poor nutritional status and obesity were significantly associated with mobility limitations, after adjusting for other demographic factors (Østbye & Taylor, 2004; Wissing & Unosson, 1999). As reported earlier, diseases and conditions significantly influence the ability to walk and move around. Older adults with heart diseases, stroke, high blood pressure, diabetes, and dyspnea have a greater likelihood of mobility limitations (Guralnik et al., 1993). Those with knee pain and foot problems are also more likely to report difficulties with ascending and descending stairs, stepping, and stability (Rejeski et al., 1995). In addition, tiredness with daily activities, fatigue, and having metabolic syndrome predict mobility decline (Yong, 2012). Older people who complain about tiredness are at higher risk of becoming disabled than others (Kirsten Avlund, Rantanen, & Schroll, 2006).

1.5.5 Social participation and mobility disability

Active social participation in activities outside the home appears to have a positive effect on maintaining mobility (Kirsten Avlund, Lund, Holstein, & Due, 2004; Yong, 2012). However, it is possible that having mobility limitations may reduce social participation in the first place. Low social participation, poor psychological function, and physical inactivity were independent risk factors of onset of mobility disability among men. Home help, low sense of coherence and physical inactivity were independent risk factors of onset of mobility disability among women (K. Avlund, Vass, & Hendriksen, 2003).
1.5.6 Adaptations to mobility disability

General categories of compensation for mobility include behavioral adaptations, using technology or environmental supports, and receiving human help. The range of adaptations include ‘selection’ by performing the activity less often or slow, ‘optimization’ by avoiding activities or ‘compensation’ by using assistive devices or human help (Weiss et al., 2007). These modifications, though acceptable in the present situations, suggest the mobility disability and hence people use by need rather than by choice.

Studies have found that limitations with mobility are strong predictors of subsequent disabilities and the need for assistance (Hirvensalo et al., 2000). The effects of mobility disabilities may be visible in that the person makes use of aids such as wheelchairs, crutches and walking sticks. A person may experience lower body mobility impairment, requiring use of a cane, wheelchair or walker, or an upper body impairment requiring use of modified devices to achieve certain function or splints to maintain a position.

1.6 Environmental context of mobility disability

Models of disability have used either medical or social framework to evaluate the impact of mobility disability on an individual’s capacity to function in their community (Haley & Langmuir, 2000).

1.6.1 ICF and mobility disability

The International Classification of Functioning and Disability (2001) is an amalgam of the medical and social models and brings into focus the interaction of body’s structure and function, activities and participation in life situations. The contextual factors representing the individual’s life are divided into environmental
and personal domains. The environmental domain of the ICF comprises of physical environment, social and attitudinal factors, which comprise the lived environment. The physical environment includes variable distances, different terrains, obstacles, transport and different locations. The impact of physical environment is highly essential and relevant when assessing community mobility. The social and attitudinal aspects of environmental domain include family support and services such as non-profit organizations and government agencies. The personal domain of the ICF includes intrinsic factors such as individual’s age, sex, lifestyle, psychological assets etc. (Organization, 2001).

Mobility disability results from the interaction between individual and environmental factors, which is an emphasis of the new World Health Organization conceptual model of disability (Shumway-Cook et al., 2003). To support this notion, ICF classifies the mobility limitations under the “activity” component as ICF codes d410-d429, d430-d449, d450-d469 and d470-d489 for difficulties in changing or maintaining body position, moving and handling objects, walking and moving around, carrying and using transportation respectively (Organization, 2001).

Environmental factors, especially the barriers are important for determining the extent of mobility limitations. Environment barriers include poor housing and outdoor accessibility (e.g. presence of numerous steps, lack of ramps and handrails, and lack of lifts) that make physical movements from one place to another difficult (Iwarsson & Wilson, 2006). Physical conditions such as traffic safety, season of the year, neighborhood characteristics and organizational factors, particularly policy-related ones, such as urban planning and transportation regulations, can have an impact on the level of mobility difficulties (King et al.,
2006). Although older adults living in rural areas have lower levels of mobility limitations, they are more likely to develop mobility difficulties later in life compared to those living in urban areas (David Melzer & Parahyba, 2004).

1.6.2 Environmental dimensions of mobility disability

Using the ICF model enables the health professional to acknowledge that many physical and non-physical factors that can facilitate or limit an individual’s participation in community. It is suggested that understanding community mobility requires recognizing the environmental factors that determine the complexity and difficulty of mobility. These environmental factors, called dimensions operationally define the complexity of mobility in space and time. Eight environmental dimensions have been proposed that captures the external demands and have to be met for an individual to be mobile within a given community (Patla & Shumway-Cook, 1999). These dimensions include distance, time, ambient conditions, terrain characteristics, physical load, attentional demands, postural transitions and density (Patla & Shumway-Cook, 1999). It was also hypothesized that the development of mobility disability may not be associated with uniform decrease in abilities across all these dimensions (Patla & Shumway-Cook, 1999).

Disability is defined not by the number of tasks a person can or cannot perform, but rather by the range of environmental contexts under which tasks can be carried out. Thus assessment of mobility from a dimensional perspective means determining the range of an individual’s ability to move about safely and independently with respect to each dimension. It was also mentioned that there may be certain dimensions which are more critical to maintaining mobility in certain environments (Patla & Shumway-Cook, 1999).
1.7 Summary

The above chapter explains the overview of mobility including the definitions of mobility and community mobility. The review suggests that mobility disability is highly prevalent and its incidence increases along with the age. The review also explains the variety of conditions which result in mobility disability and the risk factors which are associated with it. The impact of mobility disability is found to be very high not only on the individuals but also on the society. People compensate and adapt mobility disability in different methods, which are considered to be predictors of mobility disability. The review also indicates that the environment has major role in influencing the mobility of community dwelling individuals which are further emphasized by the environmental dimensions proposed by earlier studies (Patla & Shumway-Cook, 1999). These eight dimensions capture the external demands that need to be met for community dwelling individuals to be mobile within a given community.