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MOBILITY ASSESSMENT MEASURES - A REVIEW

2.1 Introduction

This section consists of review of literature which summarizes existing methods used to measure mobility, types of mobility assessment tools, critical review of these tools related to their application in measuring mobility in home and community. The review also includes various domains related to mobility disability in community dwelling people, measures which include these domains and finally lacunae or shortcomings of the existing measures in relation to need of developing a new scale to measure mobility disability in community dwelling individuals. The literature was reviewed from textbooks, scientific journals, scholarly articles and from various internet search engines to broaden the scope of understanding mobility and mobility disability.

2.2 Mobility assessment tools

A number of assessment tools have been developed to measure mobility in research, clinical, and rehabilitation settings. The different assessment tools can be broadly divided into two types: performance-based measures and self-reported measures (Yong, 2012).

The performance based measures are generally applicable only for the patients in the hospital set up. The items that are relevant to community mobility cannot be simulated in performance based measures and shifting of these tools to community is not feasible. Self-reported measures typically include survey questionnaires and are commonly used for large-scale, population-based national
studies. The questions on mobility limitations often include difficulties in walking a particular distance, climbing one flight of stairs, and performing complex and role-fulfillment activities of daily living such as bathing, dressing, feeding, housekeeping, and working (Yong, 2012). Compared to performance-based measures, self-reported measures have an element of subjectivity, although they have the advantage of obtaining information on a wider range of activities and feasible in current clinical practice.

Accurate mobility assessment is required for decision-making in rehabilitation (Hache, Lemaire, & Baddour, 2011). Such assessments can be used to determine mobility issues outside a hospital environment, evaluate the progress made during and after rehabilitation, (Hache et al., 2011) and enhance clinical decision making about a rehabilitation program (i.e., assistive devices, exercises, treatment, etc.).

Currently, different types of mobility assessments are performed in clinical setting and are supervised by the rehabilitation specialists. These assessments include clinical tests, quantitative measures, and subjective feedback from the clients. Although clinical tests have their value, these may not be appropriate for determining the contributing factors for independent community mobility and the impact of the environment on the individual’s mobility (Corrigan & McBurney, 2008). Monitoring the mobility outside a clinical setting is important because mobility in the real world is typically different from the mobility measured in the clinic. The environment in which the assessment takes place is usually a flat, well-lit area, which is an exception in community mobility (Patla, 2001).
Existing mobility scales can be divided into several categories. One group contains instruments that are typically referred to as impairment scales. These instruments assess the person’s ability to perform active and rapid movements, as well as joint pain and sensation. Although these impairments may adversely affect mobility, this approach does not provide a method for measuring mobility as such in the home and community settings (Stanko et al., 2001).

From the clinical point of view, to assess functional abilities is more important than detailed analysis of joint angles, forces and muscle activations. For example, although many functional scales have been developed to measure walking ability, most measures fail to consider daily living situations such as walking over different terrains, obstacles and stairs (Stanko et al., 2001).

2.3 Critical review of different mobility assessment tools

Detailed analysis of existing mobility tools was done with the aim of identifying the need to develop a new scale for community dwelling individuals. The review consists of description about each measure, objective for which the measures are designed, target population, items in the measure, scoring options, psychometric properties and the shortcomings with respect to use of these measures to assess mobility disability in community dwelling individuals.

2.3.1 Rivermead Mobility Index

The Rivermead Mobility Index (RMI) is a measure of disability related to bodily mobility developed from the gross function subscale of the Rivermead Motor assessment (Collen, Wade, Robb, & Bradshaw, 1991). It was developed for patients who had suffered a head injury or stroke at the Rivermead Rehabilitation Centre in Oxford England. Rivermead Mobility Index (Collen et al., 1991) focuses
entirely on mobility function and perhaps the most widely adopted in the rehabilitation field (Forlander & Bohannon, 1999). This has 15 items, ranging from turning in bed to running, designed to be administered verbally, except for one item i.e. standing unsupported. The items are scored as 1 or 0 if the patient answers yes or no respectively. Higher scores indicate better mobility with the minimum score 0 and with the maximum score 30.

The reliability and validity of this scale has been demonstrated in people with stroke, head injury and multiple sclerosis, (Rossier & Wade, 2001). Rasch analysis has showed it to be unidimensional with a hierarchy of easy-to-hard items and good overall validity. Item difficulty level was stable when used with different groups of patients on different occasions. (Antonucci, Aprile, & Paolucci, 2002). Two published modifications change the scoring to a 4-point scale and a 6-point scale with the intention of increasing sensitivity to change (Tyson & Connell, 2009). However, this has not been demonstrated and these more complex versions do not appear to have any advantage over the original. The scale includes only three outdoor items: walking on pavement, walking on uneven ground and running while the other 12 items represent very basic mobility activities such as transferring from lying to sitting, transferring from bed to chair and standing unsupported. Therefore, the Rivermead Mobility Index lacks sufficient items to represent the complex domain of activities such as driving abilities, attentional demands etc. required for mobility of patients in the community.

2.3.2 Performance Oriented Mobility Assessment

Performance Oriented Mobility Assessment (POMA) is a scale which is used to determine the mobility status of older adults or to evaluate changes over
time. The scale consists of 18 items which provides quantitative assessment of balance and gait. It is a 3 point scale with each item score ranging from 0 to 2. Higher score indicates better mobility which is used to evaluate the risk of fall in older individuals. Clinimetric properties of this scale have been demonstrated in the elderly population (Faber, Bosscher, & van Wieringen, 2006). POMA is considered useful in clinical setting for measuring mobility but lacks sufficient amount of items to be used in community. The functional items, which are relevant for mobility in community, are lacking and the validity of this scale in population other than elderly is questionable.

2.3.3 de Morton Mobility Index (DEMMI)

The DEMMI (de Morton, Brusco, Wood, Lawler, & Taylor, 2011) is a new mobility outcome measure, developed in the acute setting using Rasch analysis that also has face validity for measuring across the mobility spectrum in healthy, community-dwelling older adults. The DEMMI consists of 15 items arranged hierarchically for the unidimensional measure of mobility. It is easy to use, requires minimal equipment, and can be administered in a very short period of time, making uptake of this instrument into clinical practice both simple and attractive. It is one of the first mobility instruments to accurately measure the mobility of older adults across the whole spectrum of mobility (from bed bound to high levels of independent mobility) across clinical settings. The psychometric properties of DEMMI have been evaluated extensively in the range of clinical populations (Davenport & de Morton, 2011). However, the unidimensional nature of the scale makes it less useful in the context of community mobility, which requires a multidimensional approach for its assessment. The scale could not comprehensively measure the mobility disability and its impact in community
dwellings due to lack of dimensions like variable terrains, transport, attentional demands and psychosocial issues.

2.3.4 Elderly mobility scale

The elderly mobility scale (EMS) is a 20 point validated assessment tool for the assessment of frail elderly individuals (Smith, 1994). EMS evaluates individual’s mobility problems through seven functional activities including locomotion, balance and key position changes, all of which are intrinsic skills that permit the performance of complex activities of daily living. Total score is from a maximum of 20, where higher scores indicate better performance. EMS score <10 suggest that the patients need considerable help with mobility and activities of daily living. The reliability, concurrent validity and discriminant validity has been established for EMS. This test is appropriate for elderly patients in a hospital setting (Prosser & Canby, 1997; Smith, 1994) once the acute medical condition has resolved, or as outpatients in Day Hospital environment (Chiu, Au-Yeung & Lo, 2003). However it is not suitable for the community environments due to requirement of the additional resources. In addition, the scale does not possess the environmental dimensions of mobility which are vital for community mobility.

2.3.5 High level Mobility Assessment Tool (Hi-MAT)

The HiMAT was developed to quantify the mobility of individuals following traumatic brain injury. The HiMAT items were generated from existing adult and paediatric neurological mobility scales and the opinions of expert clinicians (G Williams, V Robertson, K Greenwood, P Goldie, & ME Morris, 2005). The minimal mobility requirement for testing is independent walking over 20 meters without gait aids and suitable for any TBI clients who have goals which require a level of mobility
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beyond independent level walking. The HiMAT consists of 13 items that are measured using either a stopwatch or tape-measure. Measures obtained on each item are scored and summed for a total HiMAT score (maximum score 54). Higher scores indicate better mobility performance. Depending on the ability of the client and how many items they can perform, testing takes 5-15 minutes.

The HiMAT has been developed and content validated in TBI for clients who have high-level mobility goals, or whose goals required advanced mobility (GP Williams, Val Robertson, KM Greenwood, PA Goldie, & ME Morris, 2005). Although clinically it is being used in CVA, Multiple Sclerosis, Spinal Cord Injuries and Cerebral Palsy, it is yet to be validated in these populations. As the authors describe, HiMAT is suitable only for young patients with minimal mobility impairments. Community mobility, though require high level functioning, the HiMAT items does not suit to measure mobility disability of individuals in community. The lack of simple self-care activities and activities other than ambulatory dimensions may prevent its use in community dwelling individuals.

2.3.6 Community Balance & Mobility scale (CB&M)

The CB&M is one of the recently developed scales for measuring high level balance and mobility items in patients with traumatic brain injury (Howe, Inness, Venturini, Williams, & Verrier, 2006). The CB&M is valid and sensitive to change in assessing functional balance and mobility in ambulatory stroke survivors with moderate to mild neurologic impairments (Knorr, Brouwer, & Garland, 2010). It is a performance-based measure with 13 items on a 6-point scale with higher scores indicating better balance and mobility. The dynamic balance is evaluated during mobility, making the scale and its items much more applicable to real-life community
activity. The items are very challenging which tests the postural control system using tasks which are representative of the motor skills necessary for function and participation within the community. However this scale does not contain items to assess self-care, transport, and psychosocial domains which are essential components of community mobility.

2.3.7 Clinical mobility scale

The clinical mobility scale was used to assess a patient's degree of mobility over time. The scale consists of eight items including upright posture, walking, stair climbing, use of hand held device and wheel chair. Each item is scored on a 4 point scale ranging from 0 to 3. The minimum score is 0 indicating least mobility and maximum score is 24 indicating highest mobility (E Ware Jr, 1987). The scale though consists of few environmental dimensions like stairs and wheelchair access; it does not suit to measure the mobility disability in a comprehensive manner.

2.3.8 Ambulation category scales

Another group of scales provide broad classifications of walking disabilities. These include the Functional Ambulation Categories,(Holden, Gill, & Magliozzi, 1986) Hauser Ambulation Index (Hauser et al., 1983) and the Modified Emory Functional Ambulation Profile Scale (Liaw et al., 2006).

2.3.8.1 Functional ambulation categories

This scale classifies the individual into one of the six functional categories based on the ability to ambulate. (Kollen, van de Port, Lindeman, Twisk, & Kwakkel, 2005) For example, patients who could walk only in parallel bars or require supervision or assistance from more than one person to safely ambulate outside parallel bars are categorized as non-functional ambulators. Patients who could
ambulate independently in both even and uneven surfaces like stairs or ramps are classified as ambulator-independent. Similarly patients are classified as ambulator dependent for level-I, level-II, supervision or ambulator-independent for level surface only depending on the support required for their ambulation.

2.3.8.2 Hauser ambulation index

This index consists of 10 grades of walking ability from 0 to 9. The grades range from being asymptomatic and fully active (grade 0) to restricted in wheelchair and not able to transfer (grade 9). The other grades are described based on the amount of support required, distance moved and level of fatigue attained during ambulation (Hauser et al., 1983).

2.3.8.3 Modified Emory Functional Ambulation Profile (mEFAP)

The mEFAP (Baer & Wolf, 2001) is a more recent development of the Emory Functional Ambulation Profile (EFAP) (Wolf et al., 1999) and Functional Ambulation Profile (FAP). (Nelson, 1974) The EFAP was designed to measure quantitative time used in walking over a standardized array of surface and obstacles and recording the use of an assistive device. (Wolf et al., 1999) By incorporating the use of manual assistance, the mEFAP provides a measure of task-specific functional ambulation, and requires an individual to walk over different terrains (such as floor, carpet, up and go, obstacles and stairs). The mEFAP is performed with or without the use of an orthotic device or an assistance device, and manual assistance is provided as required. The level of manual assistance is recorded separately from the timed data, in accordance with an ordinal scale. The use of any orthotic device or assistance device is also recorded separately. The number of seconds taken to complete each subtask was recorded.
The time to complete each subtask was multiplied by a factor corresponding to the level of assistance device used. The five timed sub scores are added to derive a total score. Studies have reported that the mEFAP is reliable, valid and sensitive to change during hospital rehabilitation following stroke (Liaw et al., 2006). Furthermore, the instrument is designed for ease of administration, absence of apparent ceiling effect, and gait speed testing.

The ambulation category scales are designed to place people into categories such as physiological walker or community walker and do not contain items for measuring restricted mobility abilities. They are useful for describing the level of function of groups and for detecting major changes in the home and community, but are less likely to detect more subtle, yet clinically significant changes (Stanko et al., 2001). All the above mentioned scales evaluate only the ambulation component while other forms of mobility like carrying objects, using transport and driving abilities were neglected. Evaluation of mobility in the community settings requires other domains which influence mobility significantly.

2.3.9 Functional Scales

The most common set of outcome measures are those that measure basic self-care activities such as dressing, showering, toileting, basic transfers and locomotion. Examples include the Barthel Index, (Van der Putten, Hobart, Freeman, & Thompson, 1999) Functional Independence Measure (Kidd et al., 1995) and Functional Assessment Measures.

2.3.9.1 Functional Independence Measure (FIM)

FIM is a tool used to quantify physical and cognitive disability in terms of level of care required. This scale focuses on the burden of care – that is, the level
of disability indicating the burden of caring for them. FIM is a widely adopted tool in rehabilitation facilities (Haigh et al., 2001) and consists of items covering independence in self-care, sphincter control, mobility, locomotion, communication, and cognition. The scale includes 18 items, of which 13 are physical domains based on the Barthel Index and 5 are of cognition domain. Each item is scored from 1 to 7 based on level of independence, where 1 represents total dependence and 7 indicates complete independence. The scale can be administered by a physician, nurse, therapist or layperson. Possible scores range from 18 to 126, with higher scores indicating more independence. Alternatively, 13 physical items could be scored separately from 5 cognitive items. The rating is based on performance rather than the capacity. It takes one hour to train a rater to use the FIM scale, and 30 minutes to score the scale for each patient.

The FIM scale is used to measure the patient’s progress and assess rehabilitation outcomes. The FIM has been used extensively in rehabilitation, including that for stroke (Pallicino, Snyder, & Granger, 1992), spinal cord injury, multiple sclerosis (Granger, Cotter, Hamilton, Fiedler, & Hens, 1990) and orthopaedic conditions. The scales have shown excellent overall consistency with median inter-rater reliability of 0.95 and internal consistency ranging from 0.88 to 0.95. Concurrent validity with Barthel index ranged from 0.93 on admission and 0.94 on discharge scores. Scores are responsive to change and also reflect the patient’s discharge destination.

2.3.9.2 Functional Assessment Measure (FAM)

The FAM scale includes 12 new items, mainly covering cognition, such as community integration, emotional status, orientation, attention, reading and writing
skills, and employability. The FIM scale on its own had ceiling effects, so the FAM was proposed, which extends the coverage of the FIM. This scale was originally intended for patients with brain injury, but is in fact useful in all rehabilitation settings.

2.3.9.3 Barthel index

The Barthel index (Shah, Vanclay, & Cooper, 1989) is a widely used ADL (Activities of Daily Living) scale to establish the degree of independence of the patient from any help however minor and for whatever purpose. It consists of ten items primarily of self-care and some aspects of mobility including transfer and stair climbing. A score of 0, 5, 10 or 15 is assigned to each level; overall scores range from 0 to 100. The scores are intended to reflect the amount of time and assistance a patient requires. The instrument was primarily designed to assess patients' abilities to perform simple self-care activities. The psychometric properties of Barthel index have been well researched and established (Hsueh, Lee, & Hsieh, 2001).

In spite of general use of these functional scales for measuring many domains including mobility, the limitations for its use in community exists. This could be because of the fact that these scales are primarily designed for the hospital setting and use of which to the community dwelling individuals may lead to applicability issues. Though these scales have mobility as one of the domain, the items are not sufficient enough to determine the mobility disability in community dwelling individuals. The important factors which determine the independence of lifestyle in the home and community settings like ambient conditions, transport, instrumental activities of daily living are not assessed in these functional scales.
2.3.10 Instrumental Activities of Daily Living

Instrumental activities of daily living (IADLs) are not necessary for fundamental functioning, but they let an individual live independently in a community. More recently, a number of outcome measures have been developed for assessing instrumental activities of daily living (Nouri & Lincoln, 1987). These scales include items that go beyond basic self-care skills to those representing outdoor and community based activities. Instrumental activity of daily living scales are designed for assessing peoples’ abilities to carry out a broad range of activities across several domains, including mental, interpersonal and social domains.

2.3.10.1 Katz index of IADL

Katz Index of Independence in Activities of Daily Living scale (Brorsson & Asberg, 1984) consists of basic self-care activities like bathing, dressing, toileting, transferring, continence and feeding. Each activity is scored as 0 or 1 and the total score ranges from 0 to 6, with higher score indicating better independence.

2.3.10.2 The Lawton Instrumental Activities of Daily Living Scale

The Lawton Instrumental Activities of Daily Living Scale is an appropriate instrument to assess independent living skills (Lawton & Brody, 1969). These skills are considered more complex than the basic activities of daily living as measured by the Katz Index of ADLs. The instrument is most useful for identifying how a person is functioning at the present time and for identifying improvement or deterioration over time. There are 8 domains of function which constitute use of telephone, shopping, food preparation, laundry, transportation, housekeeping, ability to handle finances and responsibility of own medications. Historically, women were scored on all 8 areas of function; men were not scored in the domains of food preparation, housekeeping
and laundering. However, current recommendations are to assess all domains for both genders (Graf, 2009). Persons are scored according to their highest level of functioning in that category. A summary score ranges from 0, low function and dependent to 8 which is high function and independent.

The Lawton IADL is an easy to administer assessment instrument that provides self-reported information about functional skills necessary to live in the community. It takes 10-15 minutes to complete the scale for an individual person. Specific deficits identified can assist nurses and other disciplines in planning for safe hospital discharge. Inter-rater reliability of the scale was found to be 0.85 and has been validated with the scales that measure the domains of functional status, physical activity and mental status.

IADLs are one of the important aspects of community mobility but there are other equally important domains, which need to be assessed to describe the mobility disability in community dwelling individuals. Since the IADL sales are not designed to focus entirely on mobility, they do not include items for measuring the more complex community-based mobility activities (Stanko et al., 2001) and hence does not suit for measuring mobility disability in community dwelling individuals.

2.3.11 Quality of Life Scales

Recently, there has been a proliferation of instruments that measure health-related quality of life. Examples include the Short Form-36 (McHorney, Ware Jr, & Raczek, 1993) and Nottingham Health Profile (Hunt, McKenna, McEwen, Williams, & Papp, 1981).
2.3.11.1 Short Form-36 (SF-36)

The SF-36 questionnaire is an established and widely used health-related quality of life measure (HRQL) (Ware Jr & Sherbourne, 1992). It has been used extensively in observational and randomised studies for a range of illness conditions and validated across a range of ages and participant characteristics (Brazier et al., 1992; Ferrucci et al., 2004). Its use extends beyond people with specific disease states, to determine HRQL in populations. (Singh et al., 2005). It is a 36 item questionnaire which measures Quality of Life (QoL) across eight domains, which are both physically and emotionally based. The eight domains that the SF36 measures are as follows: physical functioning; role limitations due to physical health; role limitations due to emotional problems; energy/fatigue; emotional well-being; social functioning; pain and general health. In summary, for each of the eight domains that the SF36 measures, an aggregate percentage score is produced. The percentage scores range from 0% (lowest or worst possible level of functioning) to 100% (highest or best possible level of functioning).

Recently, the physical functioning domain of SF 36 has been evaluated as a measure of mobility disability (Syddall, Martin, Harwood, Cooper, & Aihie Sayer, 2009). This domain asks respondents to report limitations on ten mobility activities, such as walking specified distances, carrying groceries and bathing or dressing. This raises the possibility that an established and widely-used instrument can be mapped to the ICF, and validated as a standard measure of mobility disability. The association between poor physical performance using a variety of objective performance measures, and an increased risk of mobility disability, has been well researched. Poorer SF-36 PF scores were found to be related with worse outcomes across the range of physical performance tests in
men and women. The internal and construct validity for SF 36PF (Syddall et al., 2009) was found to be satisfactory however; other psychometric properties need to evaluated for its use as mobility disability measure. In addition, SF 36 does not include the all the environmental dimensions which are vital to measure mobility disability of community dwelling individuals.

### 2.3.11.2 Nottingham Health Profile (NHP)

The Nottingham Health Profile is intended for primary health care, to provide a brief indication of a patient's perceived emotional, social and physical health problems. The NHP is well-documented with regard to reliability and validity, and is useful in describing the impact of chronic disease (Sharples, Todd, Caine, & Tait, 2000). The NHP is, moreover, a useful evaluative tool in patients with more pronounced disability (Ebrahim, Barer, & Nouri, 1986; Jenkinson, Fitzpatrick, & Argyle, 1988).

The profile is divided into two parts where part I consist of 38 questions pertaining to 6 subareas including physical mobility, energy, sleep, emotions, pain and social isolation. The number of items in each area range from 3 to 9 and each question has been assigned a weighted value. The sum of all weighted values in a given subarea adds up to 100, where lower score indicate better health. The physical mobility subscale consists of items related to standing, bending, stair climbing, walking indoors and outdoors, but are not adequate enough to quantify mobility disability of individual living in community. The part II of profile consists of frequency of health-related problems pertaining to paid employment, housework, hobbies, family life, social life, sex life and holidays. These items assess the impact of general health on these areas which cannot be generalized to mobility disability.
Health-related quality of life scales are primarily designed to measure the broader concepts of life, for example employment, mobility, economic and mental health domains (Stanko et al., 2001). Justifiably, they cover several domains of health each of which are measured by the single instrument (e.g. a mobility or mental health measure). Hence it is clear that quality of life scales could not measure one of the dimensions of health like mobility disability in detail.

2.3.12 Condition specific scales

There is a list of scales which measure some component of mobility but they are condition or population specific. The list includes STREAM, Stroke impact scale, Stroke specific quality of life, Motricity index etc for stroke population (Ahmed et al., 2003) SCIM(Catz, Itzkovich, Agranov, Ring, & Tamir, 1997) for spinal cord injured, HiMat tool (GP Williams et al., 2005) for traumatic brain injured patients etc. These scales as they report measure the individual disease status and are not proved for their reliability in other conditions or population. These scales though assess mobility in hospital setting, do not contain many items which could measure mobility in home and community environment.

2.3.13 Terrain characteristics

A terrain refers to the different surfaces which the individual need to negotiate in the community very often. Stair negotiation is one of the most demanding and hazardous activities, with more than 10% of fatal fall in older adults occur while going down stairs (Oh-Park, Wang, & Verghese, 2011). Stair climbing and negotiating uneven surfaces is important for maintaining mobility and independence and is considered a key marker of functional independence in older adults (Oh-Park et al., 2011). Despite its importance and the high prevalence of
limitations in this activity, little is known about the actual limitations in climbing stairs perceived by patients at home (Roorda, Roebroeck, van Tilburg, Lankhorst, & Bouter, 2004). A prerequisite in addressing these research questions is the availability of a suitable measurement instrument. Currently available generic measurement and disease-specific instruments provide only a global measurement of activity limitations.

Although climbing stairs is included in many of the instruments, they do not provide methods to evaluate and quantify this disability adequately. In addition, different terrains like uneven surfaces or crossing obstacles which are important for community mobility have not been assessed in any of the existing scales. This suggests that there is a need to have scale which measures not just basic activities but also the challenging items like stair climbing which are important for individuals with mild to moderate disability in community.

2.3.14 Transport assessment

Healthy lifestyle requires people to interact within their community, while decreased mobility due to illness restricts the individual to effectively participate in community. Public and private automobiles and bicycles are the modes of transportation for all of us and these are the primary methods to engage ourselves in the community. There is tremendous sense of loss when we cannot drive/ ride any more (Patomella, 2008). Physicians and family members are frequently asked to provide information about driving ability of patients, yet there has been little research on the assessments of driving or riding performance. Although use of transport has been included in one of the existing scales like environmental status scale (Stewart, Kidd, & Thompson, 1995), it was not useful to evaluate
transport comprehensively. Use of public transport and ability to drive or ride has been considered as a single item and hence the different level of disabilities related to transport could not be evaluated. The quantification of disability in each of these has not been assessed in any of the existing measures. This suggests that there is a need to have scale which quantifies the ability of person to use public or private transport and drive or ride vehicles.

2.3.15 Self-report measures

Various methods of determining functional limitation include self-reports of actual function or perceived capability to perform actions, proxy-reports of functioning, and direct measures of actual performance made by an observer using standardized protocols (Jette, Jette, Ng, Plotkin, & Bach, 1999). Despite careful controls for physical health status and other determinants of mortality, self-rated health status has been found to have direct relationship with mortality that cannot be decomposed by the introduction of other factors into these models (Idler & Kasl, 1991). Treatment methods aimed to reduce disability without considering the self-perception of disability may lead to planning in the unwanted horizon of disability and prove limited worth.

Self-reported frequency of encounter and avoidance of specific environmental features appears to be a valid method for determining mobility disability in community (Shumway-Cook, Patla, et al., 2005). It was observed that there was no correlation between self-reported measures and directly observed mobility in certain dimensions of mobility (Shumway-Cook, Patla, et al., 2005). For example psycho social domain, one of the important domains in assessing mobility disability cannot be evaluated by proxy methods or performance. Thus the scale should possess self-reported aspects
of mobility disability as one of its domain to assess the mobility comprehensively. Self-report questionnaires that address mobility include the California Functional Evaluation instrument, (Fung et al., 1997) the Movement Ability Measure, (Allen, 2005) the Health Assessment Questionnaire, (Fries, Spitz, & Young, 1981) and the Functional Status Questionnaire.

2.3.15.1 Functional status questionnaire

The Functional Status Questionnaire is a self-administered functional assessment tool designed for a patient seen in primary care. (Jette et al., 1986) It provides information on the patient's physical, psychological, social and role functions. It can be used both to screen initially for problems and to monitor the patient over time. The physical function deals with the basic and intermediate activities of daily living where the patient answers the questions based on the difficulty they experience in each of the activity. The psychological function consists of questions related to mental health, where patients need to report the response in terms of frequency during the past one month. Role function is related primarily to the employment and work performance of the patient and social activity consists of questions related to visiting relatives, participating in religious functions and taking care of family members.

The scale also consists of questions related to quality of social interaction and certain single items questions in each of the above mentioned domains. The scores for each domain range from 0 to 100 with higher scores indicating good function and lower scores indicate warning zones. If the person scores within the warning zone then the patient has a problem that needs to be investigated more. The scale has been tested for its reliability and validity only in primary care.
residents and hence may not suit for the assessment in community. In addition the, objective of the scale is to evaluate the functional status where mobility is assessed only in terms of self-care and intermediate activities of daily living. These domains may not be adequate to represent the mobility comprehensively in community dwelling individuals.

2.3.15.2 Environmental status scale (ESS)

ESS (Stewart et al., 1995) is a scale designed to measure the handicap of patients in the parameters including actual work status, financial and economic status, personal residence or home, personal assistance required, transportation, community services and social activity. Each parameter is scored in a 6 point scale from 0 to 5. The sum of all seven parameters scores is considered as the total ESS score, which ranges from 0 to 35. Higher ESS score indicate greater handicap. Studies have reported that ESS has limited validity with misleading scoring system in some sections as the scale fails to give sufficient weightage to the individual nature of handicap to varying roles and lifestyles (Granger et al., 1990; Rao et al., 1991). Researchers have also questioned about the sensitivity of the scale, as it does not reflect the degree of change in handicap status. In addition the scale does not include the primary components of mobility; hence it cannot be used to measure mobility disability of individuals living in community.

2.3.15.3 Environmental Analysis of Mobility Questionnaire

Environmental Analysis of Mobility Questionnaire (EAMQ) is a self-report questionnaire which collects information on 24 features of the physical environment, grouped within eight dimensions (Shumway-Cook et al., 2003). Subjects were asked to report the frequency of encounters or avoidance using a
five-point ordinal scale (never, rarely, sometimes, often, always) for each of the features. Preliminary results indicated that mobility disability is characterized by a reduction in the number and type of environmental challenges. A reduction of encounters could lead to a reduction in movement for an individual, which could potentially lead to further deterioration in physical status and social interactions. The questionnaire was suggested to be a valid method for determining environmentally specific mobility disability (Shumway-Cook, Patla, et al., 2005). However the mobility items are totally environment specific and hence items which are independent of environment were not evaluated. In addition, the scoring criterion was more subjective which makes it difficult to quantify the mobility disability for planning rehabilitation goals.

2.4 Summary

The need to deliver high quality health care based on the best available evidence is of paramount importance today. Clinical trials that are designed to assess the effectiveness of new treatments demand the use of outcome measures that have been demonstrated to be valid for the purpose and population, sensitive to small but clinically important changes in status and highly reproducible. This review of the literature indicates that there exist many scales to measure mobility disability; however none of those could satisfy all the demands that are required for assessing community mobility. Hence, there is a need to develop a scale which compressively measures mobility disability for the community dwelling individuals.
This scale should contain all the domains which influence mobility in the community set up and comprehensive to include items ranging from simple self-care to more complex activities like moving in uneven terrains, crossing roads, driving own vehicle etc. The mobility disability assessment tool should be culturally sensitive, in a manner that it contains items which are relevant to the people. For example, the items like ability to sit on the floor, going to temple, market or in rain, gardening, using mobile phone or computer etc. should be present in the scale of mobility disability assessment to make it more comprehensive. The mobility disability scale also needs to satisfy the requirements of psychometric properties like reliability and validity. (Jerosch-Herold, 2005) These important psychometric properties of validity, reliability and responsiveness may also need to be balanced against some more practical considerations, such as the portability, cost, ease-of-use and acceptability of the measures. Such a tool could help clinical professionals and rehabilitation researchers to determine mobility challenges and appropriate training to enhance mobility in the community. The tool could also help monitor progress or deterioration, thereby providing an indication of treatment effectiveness.