CHAPTER - 5

Discussion


**5.1 Introduction**

The objectives of this study were to develop and validate the mobility disability scale for community dwelling individuals. To achieve these objectives, the study was conducted in various phases and the results were obtained. This chapter discusses the results obtained in the various phases of study with the background of literature. The discussion was done under the following headings.

**5.2 Generation of domains**

Fourteen domains were identified from the literature review of which eight domains have been proposed by earlier studies (Patla, 1999) and four domains from the ICF. These domains, also called as dimensions provided the framework for assessing the impact of the environment in community mobility (Patla & Shumway-Cook, 1999). Environment being the major influencing factor for mobility disability of individuals living in the community, all these domains were included in the generation phase of our scale. These domains may have a significant role in influencing mobility of the community dwelling individuals. This is further supported by earlier studies, in which distance, time constraints and terrain were the most commonly assessed mobility dimensions to determine the impact of environment on community mobility (Corrigan & McBurney, 2008). The psychosocial domain, which measures the impact of mobility disability on personal factors, was also included. These factors were considered as important to measure the psychological domain of mobility especially for patients with chronic disability, though very few scales in the literature measure those.
5.3 Generation of items from literature

Thorough evaluation of the scales and questionnaire were done to extract the items relevant to community mobility. The items from literature primarily represented basic activities of daily living and transitions, which supports our notion that existing scales were suitable to assess only simple activities, and lacks sufficient items to represent the complex domain of community mobility. There were few items which considered the environmental demands such as narrow space, uneven surface, and obstacle; however these were too less considering the actual demands of the community mobility. These results suggest that the existing mobility scales lack items which comprehensively measure the mobility disability in community and hence, encouraged us to generate items from the patient interviews.

5.4 Generation of items by patient interviews

Direct patient interviews resulted in generation of more items relevant for mobility disability assessment in community. The variation in condition and its duration helped us to include items representing different types and phases of mobility impairments. This also led to generation of diverse items, which was the primary objective in this phase of our study. In the development process, wide range of views from the patients were included to ensure that items tap relevant aspects of the attribute they were intended to measure. The equal distribution of gender ensured to represent mobility components related to both the genders in the scale which also promoted the content validity testing.

Majority of the items generated by patients reflected their need to be independent in home and community. The responses from patients explained the
need for cultural specific scales with items such as vising temple, sitting on floor; climatic related items such as going out in rain and psychosocial factors involving motivation to perform activities, socialization and family role. The postural transitions have been given much importance along with the attention demands in terms of crossing roads, reacting to traffic lights etc. Pain and fatigue were considered as important factors by patients, which negatively influences their mobility.

Modernization has led to patients becoming increasingly dependent on electronic gadgets like mobile phones and computer. The use of these devices, when affected by their impairments, patients feel severely disabled both physically and socially. Some of the patients also considered recreational items and personal interests or hobbies need to be evaluated for mobility disability. Some of the items included, represented the primary impairments and secondary complications, which may significantly affect mobility. Patients also generated items based on their personal experiences, which was indicated by the inclusion of the items such as ‘usage of assistive devices’ by the patients who used assistive devices in our sample.

5.5 Grouping of items under domains

The items generated by literature and patient interviews were grouped accordingly under the domains proposed by the earlier studies (Patla and Shumway cook, 1999). The items were initially grouped together based on the type of activity, which was followed by placing those items under the relevant domains identified. The definitions for domains proposed by Patla and Shumway cook assisted us in identifying the commonalities of items and grouping those
under the relevant domain. The function of items was given more importance to group those items, for example the item squatting involves postural transition, however the primary function of squatting is related to toileting which is a self-care activity and hence it was grouped along with eating, combing, dressing etc. Similarly all the items which require instruments to perform the mobility activity were included under Instrumental Activities of Daily Living (IADL) domain. The items, which may influence the mobility of individual like pain, tiredness and the personal factors such feeling of depression, decreased interest were included under psychosocial domain.

5.6 Content Validation

When developing a new instrument, focus need to be given to have a clear conceptualization of the target construct. Thus without established content validity, users cannot be confident that variance in obtained scores is due to latent construct (Bowman, Lannin, Cook, & McCluskey, 2009). Expert panel method, which is the most commonly used and convincing approach (Downe-Wamboldt, 1992) for determining content validity was used. The expert pool consisted of members from diverse specialty which enabled us to identify the relevant items and domains suitable for the patients living in community. The experience of experts, which is an important prerequisite for the content validation, has been the added strength of our method.

Majority of the items which experts considered relevant were in self-care and postural transition domains. This indicates that rehabilitation specialists have common consensus about self-care and balance components to be the important components of any mobility assessment tool. This is further supported by earlier
studies which consider independence in self-care and ability to sit or stand as the criteria for discharge of patients from the hospital (Granger et al., 1990).

Experts have given reasons for marking the items and domains as not relevant which were considered during the scale drafting. For example, many of the experts felt in common that some of the items suit as scoring option rather than being a separate item by itself. The experts also felt that some of the items may not be relevant to individuals due to the cultural reasons and hence marked those as irrelevant. The experts, those who marked domains as irrelevant mentioned that these domains were ambiguous and the items under these domains could also be included under the other domains which were marked relevant. Some of the domains were also eliminated due to lack of adequate number of items to be considered as domain. These reasons suggest that experts required the scale not only to be comprehensive, but also to be measurable and relevant for majority of individuals living in community.

Experts suggested that the domains and their items have to be thoroughly described and needed to be clear, which was considered during the scale drafting. Thus the expert analysis helped us in refining the domain and item clarity along with the relevance to community dwelling individuals.

5.7 Pilot testing:

The pilot testing was done with the aim of improving the assessment tool by virtue of feedback from the representative individuals. The feedback from the patients was considered which resulted in modification of stem of items and scoring criteria to eliminate ambiguity and improve item clarity. The inclusion of patients with wide range of mobility impairments helped us to test the scale more
comprehensively. The procedure also helped us in combination or deletion of certain items according to the relevance.

The average time taken to complete the scale was less, considering the comprehensiveness of items present in the scale. This also suggests that the items and scoring criteria were simple and clear enough to complete the scale in quick time. This is one of the important properties which facilitate the acceptability of scales by both users and the responders (Jerosch-Herold, 2005).

The item using tricycle was removed as the patients in the pilot testing failed to score the item suggesting that the frequency of its use was rare and subjected only to specific situations. The item carrying object while walking was also removed as it was covered under the item going to market or temple which necessarily involves carrying objects in hand. Similarly two items, squatting in toilet and getting up from squatting were combined because both the items were interdependent and inability to perform any of those will lead to same amount of disability. The items specific to males or females like cooking and shaving were combined of which shaving will be evaluated for males and cooking for females. This was done to ensure that gender differences would not affect the mobility disability score.

Items wheelchair household and wheelchair community were combined with items walking household and walking community respectively as they both represent the same depending on the condition of the patients. However it was ensured to evaluate the respective item according to the need i.e. walking household and community for all the patients who can walk and wheelchair household and community for all the patients who could not walk and needed
wheelchair. Hence the scoring options for both the items were maintained. Item writing/ signing was split into two items as the patients considered each item need to be evaluated separately due to the different level of skill involved.

The frequency of scoring responses of the scale showed that there were significant variations in the mobility disability of patients across each domain. These variations represent the diversity of patient conditions and its durations, which would have affected each domain of mobility disability respectively. This could also be attributed to the common scoring criteria, which would have over/underestimated the items in domains depending on its complexity. This suggested for modification in the scoring criteria to express the mobility disability of an individual with respect to each domain.

Quantification of mobility disability across each domain is important as the mobility disability may not be associated with a uniform decrease in scores across all domains(Shumway-Cook et al., 2002) and the total score may not adequately represent the quantum of disability. In addition, the presence of items ranging from simple to complex in the scale warrants the equally challenging scoring criteria to suit the items. Considering the above mentioned need, suitable scoring criteria for each of the domains in the scale was developed. However it was ensured that the scoring pattern remain uniform throughout the scale, ranging from 0 to 4 i.e. 0% disability to 100% disability for each item. Thus the pilot study helped us to not only evaluate the content, comprehensibility, procedure for administration and applicability of scale, it also paved way to improve the above mentioned properties.
5.8 Reliability

Reliability or measure of consistency in our study was tested by two methods, internal consistency and test retest reliability of the new scale. Internal consistency of a scale is the extent to which subparts or items of an instrument measure the same attribute or dimension, and represents an index of an instrument’s reliability. As the scale developed consist of various items under the domains related to mobility disability, it becomes important to measure whether items under the domains were related and all the items of the scale were related to the latent variable i.e. mobility disability.

A high Cronbach’s alpha was desirable since it reflects that the items were homogeneous and measuring the same underlying property. The Cronbach’s Alpha of 0.981 in the new scale suggests that all the items were related to the construct and hence capable of measuring the mobility disability in community dwelling individuals. The general rule of thumb suggest that ‘good’ scale require alpha of 0.80.(Page & Garner, 2005) and the new scale had exceeded this requirement. The internal consistency was also tested for the individual domains, which shows that the Cronbach’s alpha of all the domains meets or approaches the standard of 0.8. This suggests that items in the subscale or domains were adequately grouped in the new scale and possesses good internal consistency.

Test retest reliability was done to demonstrate the extent to which scores on a scale can be generalized over two different occasions within the period of one week. One week period was chosen, so that effect of progression or worsening of the condition does not affect the reliability values. However, more
than 50% of the subjects were assessed within five days of the initial assessment. The ICC value of the total score was very high indicating excellent test retest reliability of the scale.

Excellent reliability in spite of variability in the conditions and its severity can be attributed to the non-ambiguity of items and clarity of scoring options in the scale. The range of ICC values (0.97 to 0.99) across domains indicates that all the domains of new scale show high degree of consistency and hence meets the requirements of a measure to assess the same patient across time. This is an important finding, as the scale was intended not only to screen the patients in community at a given point of time but also to measure the change in the mobility disability of community dwelling individuals at different points of time. If the scale did not demonstrate temporal stability, users cannot be confident that the change in scores represents change in the construct rather than measurement error. These findings indicate that the new scale was capable of measuring the mobility disability in community dwelling individuals with consistency and hence can also be used to test the effect of interventions.

5.9 Concurrent validity

Concurrent validity of the scale was tested by correlating the domain and total scores of the newly developed scale with the domain and total scores of FIM FAM scale. Since there were no gold standard tools available to measure the mobility disability for community dwelling individuals, the FIM scale, which was the most commonly, used scale to grade the independence level of individuals in the important domains including mobility was used. The FAM scale, which includes components important for community mobility was also added to the FIM
components to assess the concurrent validity of the new scale. Both these scales in combination consist of more items relevant to measure mobility disability of individuals living in community than other scales do. Both these scales have been studied extensively in different group of patient populations and possess excellent psychometric properties. The scoring criteria of the FIM FAM scales were similar to the new scale, which also supports the decision to consider these scales to compare with the new scale for testing its concurrent validity.

The significant variations in the conditions and its severity of patients included provided the best situation to determine the concurrent validity. Thus, it was possible to assess, whether the variations in the severity as evaluated by FIM FAM scales were adequately evaluated by the new scale as well. The high correlation of the new scale with FIM FAM scores suggests that the new scale possesses good criterion validity with this scale. The negative correlation suggests that the new scale quantifies the mobility disability as opposed to FIM FAM, which measures the independence level of the patients in relation to their activities of daily living.

FIM and FAM scales are generally used in isolation according to the situations and hence the new scale scores were correlated with FIM and FAM scale scores separately. The decrease in the correlation with FIM scale separately as compared to FIM FAM total score could be due to the lack of FAM items like community access, car transfer, employability etc which are the important components of the mobility assessment for community dwelling individuals. Similar results were noted when FAM items were correlated with the new scale. These results also suggest that FIM or FAM scale alone may not comprehensively
assess mobility in community dwelling individuals. This could also be assumed
that mobility components being present in both FIM and FAM scales, when
separated could not assess the mobility comprehensively.

These results were further supported by our findings which showed that
mobility related components of FIM and FAM scale when correlated with the total
score of our new scale showed higher correlation. The items combined under mobility
domain were bed/chair/wheelchair transfer, toilet transfer, bath tub/shower transfer,
car transfer, walking/wheelchair use, using stairs and community access. This higher
correlation value also indicates that the new scale measures the construct, i.e.
mobility disability effectively in comparison with the commonly used scales which,
further strengthens the concurrent validity of the new scale.

The mobility components of FIM FAM scale showed high correlation with all
the domains of new scale except psychosocial domain, which had moderate
correlation. The psychosocial domain, though considered as an important domain,
it could not be compared with the adequate gold standard measures. These are
self-perceived measures which, when correlated with the observation based
measures like FIM FAM may not correlate strongly. The low correlation of
psychosocial domain even with the related item, emotion could be due to the
difference in the scoring options of the items in both the scales. The new scale
used frequency options to score the psycho-social items, whereas the FIM FAM
scale used the observation rating method. FAM scale measures the ability of
individual to control or cope up with these issues in general life situations,
whereas the new scale measures the frequency of the impact of these items on
community mobility. Emotions, being an item which is related to self-perception of
individual, it may not be possible to assess appropriately by an observer based measure and hence require psychological scales to compare the psychosocial domain items of the new scale. The strongest correlation existed between the self-care domains of both the scales, which could be well explained by the presence of related items in both the scales of these domains.

Even though the current scale contains greater number of items compared to the FIM FAM, this scale provides a more comprehensive assessment of mobility disability - which no other scale currently assesses. Patient interviews and expert opinions during generation stage of this scale, have also demonstrated that these number of items were important for comprehensive assessment of mobility disability. Thus, it could be concluded that the new scale has good concurrent validity compared with existing global measure like FIMFAM scale and also possesses adequate number of items to measure mobility disability in community dwelling individuals.

5.10 Responsiveness

Patients with sub-acute and chronic stroke were chosen for testing responsiveness to reduce the effect of spontaneous recovery in them, which most of the existing scales could measure. The new scale being designed for community dwelling individuals, need to be responsive even for the minimal changes that occur beyond the spontaneous recovery. The statistical significance in change scores suggests that the patients have improved and the new scale was adequately responsive to identify the change.

The change scores ranged from a minimum of 3 points to maximum of 10 points in the domains of the new scale. The significant change in domain scores
also suggests that the items in the domains were responsive to the treatment given and magnitude of responsiveness was associated with the number of items in the domains. The self-care domain, which had more items showed the maximum change of 10 points followed by the postural transition domain which showed 6 points. These changes could also be due to the focus of treatment given, which was more towards improving the basic activities of daily living and transition from one position to other.

Global rating of change scale was used to measure the self-perceived recovery of the stroke patients following treatment in our study. GRC scales are very commonly used in the research and the patients were asked to rate their change in condition. The “global” aspect of the scales is important and distinguishes them from other outcome measures that are typically directed towards one specific dimension of the patient’s health status. These scales allow the patients themselves to decide what they consider important, an approach that means that the specific constructs each patient takes into account are unknown and may vary. The presumption, however, is that this approach allows the individual patient to focus in on those concerns most relevant to him or her. Typically, the GRC scale has been used as an external criterion of change in studies testing domain-specific self-report measures, thus providing some evidence to the construct validity of the scale. These studies commonly present correlations between change scores on the index measure and GRC scale.

The significant positive correlation between the change scores of new scale and the GRCS scores in our study suggests that patients’ perception about their recovery changed linearly with the changes recorded by the new scale following treatment indicating good responsiveness of the scale.
5.11 Minimal Clinically Important Difference

Minimal Clinically Important Difference (MCID) is the smallest amount of change required for the patient to feel a difference in the variable that is measured. Mean change scores of the outcome measure may give statistically significant results, particularly if large samples are involved, however the interpretation of the clinical meaningfulness of the change may depend on the MCID of the measure. Pursuit of the MCID is therefore an important area of work in interpretation of the change scores; especially for clinical practice. This makes it important for the investigators to calculate MCID for the newly developed scales (Jaeschke, Singer, & Guyatt, 1989).

Several methods, such as anchor-based and distribution-based approaches (Hays & Woolley, 2000), (de Vet et al., 2007) have been proposed to determine the MCID. In this study, the criterion-based approach was used to determine the meaningfulness of clinical changes by using patient perception as the external standard. MCID is described as the ‘clinically important difference in patient function, that is perceived as beneficial and that would change the patient’s management (Jaeschke, Singer & Guyatt 1989). They have also referred that it is considered to be worthwhile if it involves patient’s criteria of recovery as a yard stick.

The calculated MCID of 32 points out of 200 is the minimal change required in the treatment group to consider that the intervention is effective. The MCID calculated for each domain may help in determining the effect of outcome across individual domains of the new scale. As the new scale was designed to evaluate all types of patients with mobility disability, MCID need to be established for
multiple conditions. However due to the study constraints, it was established only for stroke patients following physiotherapy treatment who were discharged from the hospital and living in home. Whether the established MCID of 32 points will hold good for determining the effect of intervention in other conditions or situations using this scale need to be tested in future.

5.12 Floor and ceiling effects of the new scale

The floor effect was calculated as the percentage of patients who scored the minimum possible score (0) and the ceiling effect as the percentage of patients who scored the maximum possible score (200). The new scale overcomes the limitation of floor and ceiling effects that were identified in existing instruments to measure mobility disability. These results suggest that the new scale could be able to measure the mobility disability of individuals ranging from mild to severe impairments and track recovery after acute illness back to full health. The floor and ceiling effects for the domain scores were also less compared to existing scales which have substantial effects. (Hall et al., 1996) The recommended flooring and ceiling effect for any scale would be less than 20%, (Hobart, Lamping, Fitzpatrick, Riazi, & Thompson, 2001) which, all of the domains except attention demand and terrain characteristics have met. These values also indicate that the new scale consists of items which are applicable and adequately challenging to evaluate mobility disability in community dwelling individuals.