Development and Validation of Geriatric Assessment Tools: A Preliminary Report from Indian Population

Singh[1], **S., Multani**[2], **N. K. and Verma** [3] , **S.K.**
[1]Lecturer, Department of Physiotherapy, Punjabi University, Patiala-147002, Punjab
[2]Prof & Head, Department of Physiotherapy, Punjabi University, Patiala-147002, Punjab
[3]Prof. Department of Physiotherapy, & Dean Faculty of Medicine & Dean Research, Punjabi University, Patiala-147002, Punjab

Abstract

With the explosion in the number of older adults in India, it becomes more and more important to study alterations in their function. Although many assessment tools are available, most of them lack both sensitivity and reliability in Indian settings. ADL, IADL and modified POMA were developed and administered on the older adults living in community. Validity of the three assessment tools was suggested by their low correlation with age (r = -0.255, -0.485 and -0.436) and moderate to high correlation with frequency of falls (r = -0.496, -0.628 and -0.496) in Indian Geriatric population. Activities of Daily Living (ADL), Instrumental Activities of Daily Living (IADL) and Modified performance Oriented Mobility Assessment (Modified POMA) tools were developed which appears to have acceptable validity with reference to Indian geriatric population.

Key words: Elderly, Fall, ADL, IADL, Modified POMA

Introduction:

In the 20th century the elderly population has represented the fastest growing segment of total world population. However, these demographic changes were high-flying in developed countries. For example, in United Kingdom the population of people over 65 years has increased from 5 % to 16 % in this period. Population projections suggest that this trend will be continuing in 21st century and elderly will represent 10.8 % of total world population by 2025. Nevertheless these demographic changes will be more prominent in underdeveloped and rapidly developing countries than developed countries where these changes are slowing down. For example, in India over 82 million now, it will cross 177 million by 2025 and 324 million by 2050 which shows almost a two-fold increase in the proportion of elderly people. This is in contrast to America where currently 13 % of elderly population will approach 22 % by 2030.

The startling fact is that the aged population in India is currently the second largest in the world. This was highlighted by Prof J.J. Kattakayam, Director, Centre of Gerontological Studies, University of Kerala, Trivandrum, in his key-note address in the inaugural function of a two-day seminar on "Aging: issues and emerging trends, with special reference to women's problems" held at MCM DAV College for Women, Chandigarh, from October 21-22, 2005.

The changing scenario of the demography of elderly has a major impact on the health and social services. Life expectancy today is 74 years for men and 80 years for women, a remarkable rise in longevity from 100 years ago, when men lived an average of 48 years and women an average of 51 years *(Landefeld et al, 2004).* While a gain in average life expectancy is the indicator of nation's

well being, it does not imply that these additional years of life are the quality years. Rather, it has been postulated that there is an exponential increase in disability, and mental and physical morbidity, in individuals over the age of 75 years. In the UK, the estimated prevalence of those with severe disability is less than 1% in those aged 50-59, but 13% in those aged over 80 years *(Colledge, 2002). Olshansky (1991)* have also argued that there will be an expansion of morbidity as medical technology improves the likelihood of survival from previously fatal diseases without improving overall quality of life for these individuals. Hence it is imperative to evaluate the status of elderly in detail so as to understand the role of Geriatric Physiotherapy in modifying and upgrading the quality of life in older population.

Many resources that provide current, accurate information on geriatric patient evaluation are available. However, few of them are portable enough to be used in the examining room, on Hospital rounds or when the therapist is on call outside the office. Thus, the aim of present study was to develop and study the validity of geriatric assessment tools which would be especially suitable for Indian population.

The geriatric assessment tools developed in the present study were selected only in terms of potential applicability for the functional assessment and the frequency of falls in older population in India. Because when it comes to quality of life, the measurement of the level of function possible for the individual is of utmost importance.

Aims and Objectives:

a. To develop geriatric assessment tools
b. To establish the validity of these tools
c. To study the relation of frequency of falls with age in Indian geriatric population

Limitations

1. The present study was limited to a sample size of 30 older individuals.
2. It was restricted to the elderly residing in Punjab state especially in and around Patiala.

Material & Methods

The study was conducted on a sample size of 30 individuals within age group 65 to 85 year residing in Punjab especially in and around Patiala for the duration of 8 weeks.

Inclusion Criteria

- ✓ Men and women within age group 65 to 85 years
- ✓ Elderly having impaired balance otherwise are healthy individuals
- ✓ Should not have undergone any surgery in lower limbs

Exclusion Criteria

- ✓ People suffering from acute illness
- ✓ History of syncope
- ✓ Medication side effect
- ✓ Neurological diagnosis
- ✓ Orthostatic hypotension

Listing of familiar assessment tools:

- ✓ Index of Independence in Activities of Daily Living *(Katz et al, 1963)*
- ✓ The Barthel Index *(Mahoney et al, 1958)*
- ✓ The Physical Self-Maintenance Scale *(Lawton & Brody, 1969)*
- ✓ Instrumental Activities of Daily Living *(Lawton & Brody, 1969)*
- ✓ The Functional Status Index *(Jette, 1980)*
- ✓ Performance Oriented Mobility Assessment *(Tinetti, 1986)*
- ✓ Functional Independence Measure *(Grander & Hamilton, 1993)*

Based on a review of the above functional assessment tools three potential tools were developed for geriatric assessment.

- Activities of Daily Living (ADL)
- Instrumental Activities of Daily Living (IADL)
- Modified performance Oriented Mobility Assessment (Modified POMA)

ADL and IADL were developed to assess the functional independence whereas Modified POMA was developed to assess the likelihood of falling in older adults.

Geriatric Assessment Tool – I
Activities of Daily Living (ADLs)

A. Toilet
I: Able to get to, on and off toilet, cleans self
A: Needs help getting to and using toilet, soiling or wetting while asleep more than once a week
D: Completely unable to use toilet

B. Feeding
I: Able to completely feed self
A: Feeds self with assistance and is untidy
D: Completely unable to feed self or needs parenteral feeding

C. Dressing
I: Able to select clothes, dress and undress self
A: Needs assistance in dressing and selection of clothes
D: Completely unable to dress and undress self

D. Grooming (neatness, hair, nails, hands, face, clothing)
I: Able to groom well without assistance
A: Needs assistance for grooming
D: Completely unable to care for appearance

E. Physical Ambulation
I: Able to get in/out of bed, roam around without help
A: Needs human or mechanical (crutch, walker, cane) assistance
D: Completely unable to get in/out of bed/chair, walk

F. Bathing
I: Able to bathe (tub, shower or sponge) without assistance
A: Needs assistance for getting in and out of tub or washing more than 1 body part
D: Completely unable to bathe self

Directions: I – Independent
A – Requires assistance
D – Dependent

Geriatric Assessment Tool – II
Instrumental Activities of Daily Living (IADLs)

A. Ability to use telephone
I: Able to operate telephone on own initiative, look up numbers, dial and receive without help
A: Answers telephone but needs special phone or assistance in getting number, dialing
D: Unable to use telephone at all

B. Shopping
I: Able to take care of all shopping needs independently
A: Able to shop but needs to be accompanied on any shopping trip
D: Unable to shop

C. Preparing meals
I: Able to plan and prepare meals independently
A: Unable to cook full meals alone
D: Unable to prepare any meals

D. Housekeeping
I: Able to maintain house independently, e.g. scrubbing the floor
A: Able to do light housework but needs assistance with heavy tasks
D: Unable to do any housework

E. Laundry
I: Able to launder independently
A: Launders small items such as socks, handkerchiefs
D: Unable to launder at all

F. Traveling

I: Able to drive own car or travels independently on public transportation
A: Needs assistance for traveling
D: Unable to travel

G. Responsibility for own medications

I: Able to take medications in correct dose at the right time
A: Able to take medications if it is prepared in advance in separate dosages
D: Unable to take medications

H. Ability to manage finances

I: Able to manage finances independently, e.g. write checks, pay bills
A: Able to manages day-to-day purchases but needs assistance for banking or major purchases
D: Unable to handle money

Directions: I – Independent
A – Requires assistance
D - Dependent

Geriatric Assessment Tool – III
Modified Performance-Oriented Mobility Assessment (POMA)

Balance
Initial instructions: Subject is seated in hard, armless chair. The following maneuvers are tested.

1. Sitting down

0 = misjudged distance, falls into chair or lands off center of chair
1 = uses arms or not a smooth motion
2 = sits in a smooth, safe motion and ends with buttocks against back of chair and thighs centered on chair

2. Sitting balance

0 = leans or slides in chair
1 = holds onto chair to keep upright
2 = steady, safe, upright

3. Arising

0 = unable without help or requires
1 = able but uses arms to help to pull or push up; and or moves forward in chair before attempting to arise
2 = able without using arms

4. Attempts to arise

0 = more than 3 attempts required
1 = more than 1 attempt required
2 = single attempt

5. Immediate standing balance (first 5 seconds)

0 = any sign of unsteadiness (swaggers, moves feet, marked trunk sway or grabs object for support)
1 = steady but uses walker or other support but catches self without grabbing object
2 = steady without walker or other support

6. Standing balance (Romberg position)

0 = unsteady
1 = steady but wide stance (medial heals > 4 inches apart) and uses cane or other support
2 = steady, narrow stance without support for 10 seconds

7. Eyes closed (Romberg position)

0 = any sign of unsteadiness or needs to hold onto an object
1 = steady with feet apart
2 = steady without holding onto any object with feet together

8. Nudge on sternum (patient standing with feet as close together as possible, examiner pushes with light even pressure over sternum 3 times)

0 = begins to fall
1 = needs to move feet, but able to maintain balance
2 = steady, able to withstand pressure

9. Semi – tandem stand (stand with the heel of one foot placed to the side of the big toe of the opposite foot for 10 seconds)

0 = unable to semi – tandem stand or begins to fall or holds for ≤ 3 seconds
1 = able to semi – tandem stand for 4 to 9 seconds

2 = able to semi – tandem stand for 10 seconds

10. Full tandem stand

0 = unable to tandem stand or begins to fall or holds for ≤ 3 seconds
1 = able to tandem stand for 4 to 9 seconds
2 = able to tandem stand for 10 seconds

11. Standing on one leg

0 = unable to stand or begins to fall or holds for < 3 seconds
1 = able to stand for 3 to 4 seconds
2 = able to stand for 5 seconds

12. Reaching up (ask patient to remove an object from a shelf high enough to require stretching or standing on toes)

0 = unable or is unsteady
1 = able to get object but needs to steady self by holding on to something for support
2 = able to take down the object and is steady

13. Heel stand

0 = unable to stand or begins to fall
1 = able to stand for < 3 seconds
2 = able to stand for 3 seconds

14. Bending over (ask the patient to pick up a pen that is placed approximately 12 inches from the patient's foot on dominant side)

0 = unable or is unsteady
1 = able, but needs more than one attempts to complete the task
2 = able and is steady

15. Turning balance 360°

0 = unsteady (grabs or staggers)
1 = discontinuous steps (patient puts one foot completely on floor before raising other foot)
2 = steady, continuous steps (turn is a flowing movement)

Balance Score: -----/30

Gait

Initial instructions: Subject stands with examiner, walks down 10-ft walkway (measured), first at "usual" pace, then turn and walk back at "rapid, but safe" pace. The subject should use customary walking aid.

16. Initiation of gait (immediately after told to "go")

0 = any hesitancy or multiple attempts to start
1 = no hesitancy

17. Step height

0 = swing foot is not completely raised off floor
1 = swing foot completely clears floor

18. Step length

0 = swing foot does not pass the stance foot with step
1 = swing foot passes the stance foot

19. Step symmetry

0 = right and left step length not equal,
1 = right and left step length appear equal

20. Step continuity

0 = places entire foot on floor before beginning to raise other foot or stops completely between steps
1 = begins raising heel of one foot as heel of other foot touches the floor, steps appear continue

21. Path deviation

0 = foot deviates from side to side or toward one direction
1 = foot follows close to straight line as subject advances

22. Trunk stability

0 = presence of marked trunk sway or flexion of knees or flexion of back or abduction of arms in an effort to maintain stability
1 = trunk does not sway, knees or back are not flexed, arms are not abducted in an effort to maintain stability

23. Walking stance

0 = feet apart with stepping
1 = feet should almost touch as one passes other

24. Turning (while walking)

0 = staggers, stops before initiating turn or steps are discontinuous
1 = no staggering, turning continuous with walking and steps are continuous while turning

Gait Score: -----/ 9

Directions: Total score (Gait + Balance) = -----/ 39
"0" indicates the highest level of impairment.
Higher score indicates lower risk for falls.

ADL and IADL were administered via personal interview. However, modified POMA is task-oriented test that measures an older adult's balance and gait abilities. Hence, subject was asked to perform a task, his/her performance was judged and then scored by a physiotherapist. Regardless of the method of administration, each subject was queried concerning his/her understanding of instructions to avoid poor judgment.

Statistical Analysis: The cross-sectional data were analyzed using Pearson's Correlation Coefficient (r) to know how the variables in the present study were related. SPSS 7.5 was used for this purpose.

Results

Validity of the three assessment tools namely ADL, IADL and modified POMA was suggested by their low correlation with age (r = -0.255, -0.485 and -0.436) and moderate to high correlation with frequency of falls (r = -0.496, -0.628 and -0.496) in Indian Geriatric population. In addition to this, results displayed in table 3 indicates that as the individual ages, the occurrence of falls increases (r = 0.743).

Table 1: Correlation Analysis between age and Geriatric assessment tools

Variables	Correlation	N	Sig
Age & ADL	- 0.255	30	NS
Age & IADL	-0.485**	30	0.01
Age & Mod. POMA	-0.436*	30	0.05

* p< 0.05 significant, ** p< 0.01 highly significant

Table 2: Correlation Analysis between frequency of falls and Geriatric assessment tools

Variables	Correlation	N	Sig
Frequency of falls & ADL	- 0.496**	30	0.01
Frequency of falls & IADL	- 0.628***	30	0.01
Frequency of falls & Mod. POMA	-0.496**	30	0.01

** p< 0.01 highly significant, *** p< 0.01 Very highly significant

Table 3: Correlation Analysis between age and frequency of falls in Indian geriatric population

Variables	Correlation	N	Sig
Age & frequency of falls	0.743***	30	0.01

*** p< 0.01 Very highly significant*** p< 0.01 Very highly significant

Discussion

The positive relationship established between the age and frequency of falls in the present study has been supported by many researchers. Falls occur in approximately one third of adults over the age of 65 years and account for 65% of all injuries in this group. Approximately 30% of people over the age of 65 fall each year *(Mahoney 2004).* In about 3% of falls, the older adult lies on the floor for at least 20 min. Up to 20% of community dwelling elderly persons fall each year in the U.S and this figure has doubled in institutionalized ambulatory populations *(Prudham and Evan 1981).* These falls have serious immediate as well as long term complications. Nearly 200,000 aged Americans have a fracture of the hip each year usually during a fall and often with little obvious environmental provocation

(Wylie 1977). About 10% of falls require hospitalization due to fractures and other injuries. Approximately 50% of fall injuries seen in an emergency room will have continued pain and mobility limitations *(Mahoney 2004).*

This demonstrates the need to develop geriatric assessment tools and study their validity with special reference to the frequent occurrence of falls in older adults. As the Geriatric Assessment tools ADL, IADL and modified POMA are valid, easy to score, quick to administer, requires little space and needs no special equipment. ADL is a dichotomous rating (dependent/independent) of six functions of daily living: toilet, feeding, dressing, grooming, transfer from bed and bathing. IADL is also a dichotomous rating that measures functional independence in the domains of instrumental activities such as ability to use telephone, shopping, preparing meals, house keeping, laundry, traveling, taking medications and managing finance. *Katz et al (1963)* has also included six daily functions in his Index of Independence in Activities of Daily Living (ADL). However, it lacks the important function of grooming. The Barthel Index covers 10 activities regarding personal care and mobility. However, it omits everyday tasks essential for life in the community for example, housekeeping and shopping.

Both Katz's Index of Independence in Activities of Daily Living and the Barthel Index are appropriate for severely ill patients since low levels of disability may not be detected and so do not show the limitations in the activities covered in these scales. Thus, they are not suitable for health surveys or in general practice as they are not sensitive to minor deviations from complete well-being. This is in contrast to present study because most of the subjects included were living in the community which suggests that ADL and IADL are valid for clinical and survey research.

The Physical Self-Maintenance Scale *(Lawton & Brody, 1969)* appears to be a reliable and valid scale for health surveys. Nevertheless it has not been widely reported on in the literature on its own but primarily when used in combination with other instruments. In addition to this, *Katz and associates in 1966 & 1986* applied the index to the patients at the time of discharge from a hospital for the chronically ill. Index scores were found to correlate (0.50) with a mobility scale and with a house confinement scale (0.39), providing evidence of somewhat low degree of validity to not very well known instruments. The index of ADL was shown to predict the long-term course and social adaptation of patients with strokes and hip fractures and was used to evaluate outpatient treatment for rheumatoid arthritis.

Thus, it appears that not many studies have been attempted to correlate either ADL or IADL with the occurrence of falls in elderly. However, the present study has shown that the level of functional independence is not age dependent meaning it is not always true that the individual becomes dependent as he ages. On the other hand the significant negative relationship between these assessment tools and frequency of falls suggests that as there is improvement in the level of independence judged from ADL and IADL, the incidence of falls are

reduced. This indicates that ADL and IADL developed in the present study are valid assessment tools to predict the occurrence of falls in older adults.

The original POMA does not include all the items related with balance and gait such as balance in semi-tandem or full tandem. This is in contrast with Modified POMA that measures 30 items of static balance on three-point scale whereas 9 items related with gait on two-point scale. In addition to this, the original POMA does not consider the visual stimuli. Thus, it is reasonable to assume that modified POMA is a broad scale that measures the level of difficulty in performing various activities of balance and gait. Its research orientation is reflected in the validity test conducted in the present study.

Conclusion: Activities of Daily Living (ADL), Instrumental Activities of Daily Living (IADL) and Modified performance Oriented Mobility Assessment (Modified POMA) tools were developed which appears to have acceptable validity with reference to Indian geriatric population.

References

Colledge, N. R. 2002. Frail older people, In: *Davidson's Principles and Practice of Medicine,* 19th Ed, Churchill Livingstone, 237-244

Grander, C. V., Hamilton, B. B. 1993. The Uniform Data System for Medical Rehabilitation report on first admission for 1991. *Am. J. Phys. Med. & Rehabil.,* 72:33

Jette, A. M. 1980. Functional Capacity Evaluation: an empirical approach. *Arch. Phys. Med. Rehabil.,* 61: 85-89

Katz, S., Ford, A. B., Moskowitz, R. W. 1963. Studies of illness in the aged. The Index of the ADL: a standardized measure of biological and psychosocial function. *JAMA,* **185:** 914-919

Katz, S., Ford, A. B., China, A. B. 1966. Prognosis after strokes: II. Long-term course of 159 patients with stroke. *Medicine,* **45:** 236-246

Katz, S., Vignos, P. J., Moskowitz, R. W. 1986. Comprehensive outpatient care in rheumatoid arthritis: a controlled study. *JAMA,* **206:** 1249-1254

Landefeld, C. S., Palmer, R. M., Johnson, M. A., Johnston, C. B. and Lyons, L. W. 2004. *Current geriatric diagnosis and treatment.* International edition, McGraw Hill, 4-6

Lawton, M. P. and Brody, E. M. 1969. Assessment of older people: Self-maintaining and Instrumental Activities of Daily Living. *Gerontologist,* **9:** 179-186

Mahoney, F. I., Wood, O. H., Barthel, D. W. 1958. Rehabilitation of chronically ill patients: the influence of complications on the final goal. *Southern Medical Journal,* **51:** 605-609

Mahoney, J. 2004. Falls and mobility disorders. In: *Current geriatric diagnosis and treatment.* Eds. Landefeld, C. S., Palmer, R. M., Johnson, M. A., Johnston, C. B. and Lyons, L. W. International edition, McGraw Hill, 74-87.

Prudham D, Evan J G: Factors associated with falls in the elderly. Age Aging, 1981, 10: 141-146.

Olshansky, S. J. 1991. Trading off longer life for worsening health: The expansion of morbidity hypothesis. *J. Aging Health.,* **3:** 194-216

Tinetti, M. E. 1986. Performance-oriented assessment of mobility problems in elderly patients. *J. Am. Geriatr. Soc.,* **34:** 119

Wylie, C. M. 1977. Hospitalization for fracture and bone loss in adults. *Public Health Rep.,* **92:** 33-38