

Evaluation of MPI as a prognostic tool among the hospitalized elderly patients at Ain-Shams University hospital

Mohamed Azzam, Somaia M. Ebeid, Salma M.S. El Said

Departments of Geriatric Medicine, Faculty of Medicine, Ain Shams University.

Abstract

Background: There is a steady progression in the number of the elderly population, with increase burden of their own problems; one of these problems is hospitalization with its drawbacks. This emerge the importance of developing prognostic tools which predict the outcome of the hospitalized elderly patient, one of these tools is MPI.

Aim: To investigate whether the MPI is an effective predictor of intra-hospital functional decline, longer length of hospital stay and intra-hospital mortality after admission to Ain shams university hospital medical wards

Methods: One hundred and sixty elderly were enrolled in the study, they were recruited from Ain Shams University Hospital, the following was done for them after taking consent, Comprehensive Geriatric Assessment, applying MPI tool

Results: showed significant relationship between MPI with polypharmacy, cohabitational status, number of drugs, comprehensive geriatric tools, simple basic laboratory data including hemoglobin levels, hematocrit and sodium levels. Age, sex, and cause of admission was found to irrelevant to functional decline and length of hospital stay and multidimensional prognostic index score. Depression and cognitive impairment were closely associated with higher MPI scores, prolonged length of hospital stay and increased incidence of mortality and finally Multidimensional prognostic index was found to be highly related to the outcome of hospitalized elderly patients.

Conclusions: Multidimensional prognostic index showed excellent specificity and sensitivity as a prognostic index among hospitalized elderly patients. So its study on larger size of participants is recommended

Keywords: Multidimensional prognostic index, Egyptian elderly, length of hospital stay

Background

Hospitalization of the elderly patients carry greatest risk for complications and unfavorable outcomes, so better outcome requires a comprehensive geriatric assessment by multidisciplinary teams to detect the patients at higher risk for functional decline and institutionalization, such care and assessment have shown to reduce the hospital stay and functional decline, also increases the chances of living at home, one of this multi-dimensional management is the use of prognostic indices which predict the outcome of the admitted elderly patients, of which is MPI.

The MPI showed good accuracy in estimating both short- and long-term mortality in hospitalized older patients with the most common conditions leading to

death (*Pilotto et al., 2012*).

Methods

A cross-sectional Study where data was collected between 1/9/2017 to 1/5/2018. The participants were recruited form Ain Shams University Hospital.

Inclusion criteria: Individuals aged 60 and over who accept to participate in the study

Exclusion criteria:

- Patients who are less than 60 years old
- Patients who refuse to participate in the research

- When the tools of MPI cannot be applied.
- Patient with dementia moderate to severe (was excluded by MMSE, verbal fluency, clock drawing)

Study tools: All subjects were subjected to the following:

1-Assent to participate in the study was taken

2-Comprehensive geriatric assessment including: Careful history taking, physical examination which includes: measurement of weight, height, waist to hip ratio and body mass index (BMI), assessment including:

a- Assessment of cognitive function using minimental state examination (MMSE) (Folstein et al, 1975) arabic version (Elokl et al, 2002).

b-Assessment of mood using geriatric depression scale GDS (Sheikh & Yesavage, 1986) arabic version (Shehata et al, 1998).

c-Assessment of function using activity of daily living (ADL) and instrumental activity of daily living (IADL) (Katz, 1963), timed up and go test (Podsiadlo, D., Richardson, S.1991)

d- assessment of nutritional status by (MNA) mini nutritional assessment and BMI considered nut. Assessment (Vellas B et al.,2006) with measurement of the Body Mass Index (BMI) and Waist Hip Ratio (WHR).

3 - MPI was calculated from the data derived from a standard CGA carried out using assessment instruments widely used in geriatric practice that included information on the following eight domains: functional status evaluated with the ADL and the instrumental ADL (IADL) scales; cognitive status evaluated by the Short Portable Mental Status Questionnaire (SPMSQ); nutritional status evaluated by the Mini Nutritional Assessment (MNA), the risk of developing pressure sores evaluated by the Exton Smith Scale (ESS); comorbidity was examined using the Cumulative Illness Rating Scale (CIRS); moreover, the number of drugs taken by patients at admission and the co-habitation status, i.e. alone, in family or in institute, were recorded. Scoring For each domain, a tripartite hierarchy was used, i.e. 0 = no problems, 0.5 = minor problems and 1 = major problems, based on conventional cut-off points derived from the literature. The MPI value ranges between 0 (no risk) and 1 (higher risk) of mortality. Also, based on previously calculated cut-offs, the MPI was expressed as three grades of risk, i.e. MPI-1 (low risk MP value ≤ 0.33), MPI-2 (moderate risk MPI value between 0.34 and 0.66) and MPI-3 (severe risk of mortality MPI value > 0.66) (Pilotto et al., 2011).

Statistical analysis: The statistical analysis of the research was performed with the SPSS 22.0 package program. Descriptive statistics were carried out for all variables and expressed as mean and \pm SD for quantitative data, whereas qualitative data were expressed as numbers and percentages. For quantitative data: comparison between groups' mean age was done

by using independent t test while for qualitative data: comparison between groups' categories levels was done using chi-square test. A P value of ≤ 0.05 was chosen as a level of significance and ≤ 0.01 as a level of high significance.

Results

50% of the participants were males with mean age 68.8 years with S.D +6.31. 36.9% were married, 48.1% were either illiterate or received less than 5 years of education. smokers were 53.8% of the participants ,and 42% of them were current smokers. Regarding Cohabitation status, 75% of the participants were living either with their spouses or their offspring. The median number of drugs taken by each participant was 4.

The mean value calculated for the MPI score for the participants in the study which was (0.43) with standard deviation (0.20) where the MPI-I was 31.9% of the participants and MPI-II was 45.6% and the MPI-III was 22.5%. The mean length of hospital stay was 6.17 days with standard deviation 2.66.

The most common causes of hospitalization in the participants of the study was found to be respiratory causes(26.6%) followed by gastrological and hepatic (21.9%) causes then followed by cardiovascular (14.4%) and neurological (14.4%) followed by renal causes (12.5%), hematology (11.3%) and endocrinal (4.4%)

Table 1: Most common causes of hospitalization in different MPI groups

Cause of admission	MPI-I		MPI-II		MPI-III	
	No.	%	No.	%	No.	%
Cardiovascular	7	13.7%	11	15.1%	5	13.9%
Endocrine	3	5.9%	3	4.1%	1	2.8%
Hematology	7	13.7%	7	9.6%	4	11.1%
Hepatic	10	19.6%	18	24.7%	7	19.4%
Neurological	7	13.7%	11	15.1%	5	13.9%
Renal	7	13.7%	9	12.3%	4	11.1%
Respiratory	10	19.6%	14	19.2%	10	27.8%

P=0.977

The most common cause for admission among the three groups was found to be respiratory causes then hepatic causes followed by cardiovascular causes. The mean length of hospital stay (los) was 4.71days for MPI-I , 7.41 days for MPI-II and MPI-III was 8.14 days and the p value was highly significant (< 0.001) where the MPI increasing values for the participants were also

found to highly indicative for prolonged hospital stay. The mean MPI at admission was (0.43) and at discharge (0.41).

Table (2): Mean length of hospital stay at different MPI groups

LOS	MPI-I No. = 51	MPI-II No. = 73	MPI-III No. = 36	P-value
Mean±	4.71 ±	7.41 ±	8.14 ±	0.000
SD	1.99	2.47	2.23	
Range	2 – 10	3 – 13	4 – 14	

Table (3): correlation between MPI score and LOS among the three groups of MPI

	LOS (days)		95% Confidence Interval	
	Median	SE	Lower Bound	Upper Bound
MPI-I	6.63	0.47 7	5.694	7.563
MPI-II	7.87	0.31 3	7.259	8.486
MPI-III	8.51	0.40 8	7.709	9.308

Kaplan Mayer Analysis
P=0.015

Figure (2): The MPI as predictive tool for length of hospital stay.

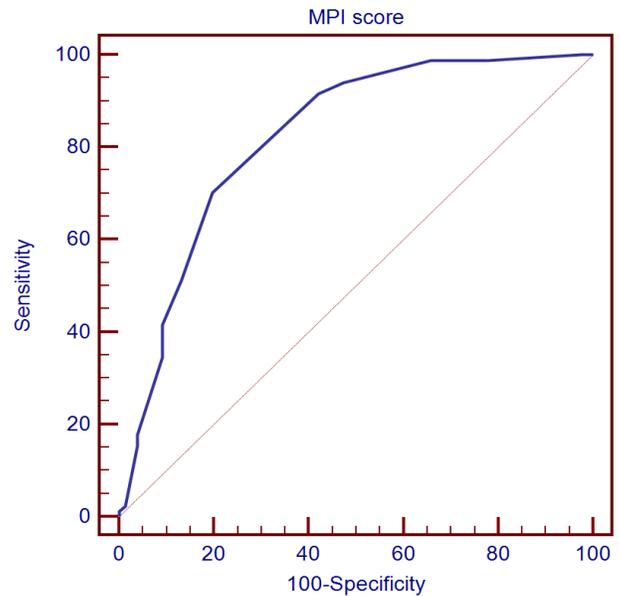
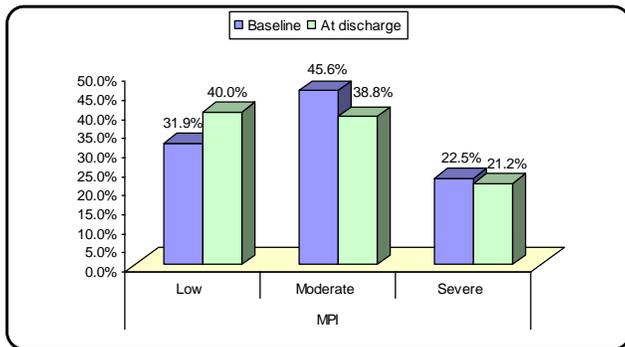


Table (5): Receiver operating characteristic curve (ROC) for MPI as a predictor for the length of hospital stay

Cut off point	AUC	Sensitivity	Specificity	+PV	-PV
>0.38	0.82	70.24	80.26	79.7	70.9

Figure (1): Mean value of MPI in different categories at admission and at discharge.



MPI-I group at discharge was 40% with increase around 10% increases. MPI-II group show decrease 6.8% at discharge. MPI-III shows decrease 1.3% at discharge.

Table (4): Mortality among different MPI groups

Mortality	MPI-I		MPI-II		MPI-III	
	N	%	N.	%	N	%
Positive	1	2.0	2	2.7	7	19.4
Negative	50	98.0	71	97.3	29	80.6

P-value=0.001

The previous ROC curve shows that the best cut off point for MPI to predict length of hospital stay was found > 0.38 with sensitivity of 70.24%, specificity of 80.26 and area under curve of 82.2%

Discussion

In this study 160 patients were included from the medical wards in Ain Shams university hospitals in the study followed up during their hospital admission where the multi-dimensional prognostic tool were applied to them at admission and at discharge , our aim was to prove whether the multidimensional prognostic index was an effective tool in predicting the length of hospital stay and mortality.

The participants were divided into three groups according to their MPI score. the MPI-III with the highest score was associated with increased length of hospital stay and increased rates of mortality.

Results of the study showed significant relationship between polypharmacy, cohabitational status, number of drugs, comprehensive geriatric tools, simple basic laboratory data including hemoglobin levels, hematocrit and sodium levels. Age , sex, and cause of admission was found to irrelevant to functional decline and length of hospital stay and multidimensional prognostic index score

Depression and cognitive impairment were closely associated with higher MPI scores, prolonged length of hospital stay and increased incidence of mortality. Multidimensional prognostic index was found to be highly related to the outcome of hospitalized elderly patients.

Cause of admission in elderly patients recruited in the study is thought to be important when laying down the management plan for treatment and discharge. In this study it was found to be non-significant all multidimensional prognostic index categories.

The results mentioned was found to be consistent with the study by Vetrano et al., 2016 where cause of admission for 1123 was regarded also non-significant to length of hospital stay and mortality in most of the diagnoses of the acutely ill elderly patients gathered through ICD-9 system except for cardiovascular and neurological causes of admission (Vetrano et al., 2016).

the relation between the MPI score and the length of hospital stay was evident where the higher the MPI the longer the hospital stay where the mean hospital stay for MPI-I was 4.71 + 1.99, MPI-II was 7.41 + 2.47 and MPI-III was 8.14 + 2.23 with P-value <0.001 which highly significant for relevance, this results was consistent with the results by Pilotto et al. (2016) where it showed at admission, 23.6% subjects had a MPI-1 score, 33.8% had a MPI-2 score, and 42.6% had a MPI-3 score. Subjects with higher MPI score at admission were older (p <.001), more frequently women (p <.001) and had higher prevalence of common chronic conditions. After adjustment for age, gender, and diseases, patients included in the MPI-2 and MPI-3 groups had a significantly higher risk for intra-hospital mortality than patients included in the MPI-1 group, respectively. In multivariable model, length of stay significantly increased across the three MPI groups (11.29 [0.5], 13.73 [1.3], and 15.30 [1.4] days, respectively [p <.0001] (Volpato et al., 2015).

Conclusion:

In the study, Multidimensional prognostic index showed excellent specificity and sensitivity. so, In the future the multidimensional prognostic index application should be implemented on wider scale as it shown high sensitivity and specificity. The results of the current study emerge the importance of studying MPI as a prognostic tool among the elderly patients in different setting, on larger number of the participants.

Conflict of Interests

The author has no conflict of interests to declare regarding the publication of this paper.

References

1- El-Okli MA, El Banouby MH, El Etrebi A (2002): Prevalence of Alzheimer dementia and other causes of dementia in Egyptian elderly. MD thesis, Faculty of Medicine, Ain Shams University.

2- Folestien MF, Folstein SE, McHugh PR (1975): Minimal state: a practical method for grading the cognitive state of patients for the clinician. *Journal of Psychiatric Research*; 12(3):189-98.

3- Pilotto A, Franceschi M, Di Bari M et al. (2011): The ability of the all patient refined (APR) and centres for medicare (CMS) diagnosis related groups (DRG) systems to evaluate clinical and functional outcomes of hospitalized elderly patients: a multicentre, prospective study. *J Pub Health Epidemiol*; 3: 248–53.

4- Pilotto A, Panza F, Ferrucci L (2012): A Multidimensional Prognostic Index in common conditions leading to death in older patients. *Arch Intern Med*; 172: 594–5.

5- Podsiadlo D, Richardson S (1991): The timed "Up & Go": a test of basic functional mobility for frail elderly persons. *Journal of the American geriatrics Society*; 39(2):142-8.

6- Shehata AM, El-Banouby MH, Mortagy AK, Ghanem M (1998): Prevalence of depression among Egyptian geriatric community. Faculty of Medicine, Ain Shams University.

7- Sheikh JI, Yesavage JA (1986): Geriatric Depression Scale (GDS): recent evidence and development of a shorter version. *Clinical Gerontologist: The Journal of Aging and Mental Health*. 1986.

8- Vellas B, Villars H, Abellan G, Soto ME, Rolland Y, Guigoz Y, Morley JE, Chumlea W, Salva A, Rubenstein LZ, Garry P (2006): Overview of the MNA®-Its history and challenges. *Journal of Nutrition Health and Aging*.; 10(6):456.

9- Vetrano D, Landi F, De Buyser S, Carfi A, Zuccalà G, Petrovic M, et al. (2014): Predictors of length of hospital stay among older adults admitted to acute care wards: a multicentre observational study. *European Journal Of Internal Medicine*, 25(1): 56-62.

10- Volpato S, Bazzano S, Fontana A, Ferrucci L, Pilotto A (2015): Multidimensional Prognostic Index Predicts Mortality and Length of Stay During Hospitalization in the Older Patients: A Multicenter Prospective Study. *The Journals of Gerontology Series A: Biological Sciences and Medical Sciences*; 70(3):323-329.