Simposio

L'Anziano e le tecnologie avanzate: necessità o opportunità?

Strumenti informatici integrati predittivi di outcome nel processo decisionale clinico

Alberto Pilotto

Azienda ULSS 16 Padova

U.O.C. Geriatria, Ospedale S. Antonio, Padova, Italy

AZIENDA ULSS 16 PADOVA
UNITA' LOCALE SOCIO SANITARIA

The Central Role of Prognosis in Clinical Decision Making

JAMA®
The Journal of the American Medical Association

Because of competing chronic conditions and diminished life expectancy, careful consideration of prognosis is particularly important for clinical decision making in older patients.

Aligning the metric used to assess prognosis with recommendations in clinical guidelines would likely facilitate clinical decision making.

We need for validated indices that predict mortality for older persons rigorously assessed for generalizability, accuracy and potential bias.

Thomas M. Gill, JAMA 2012;307: 199-200

Intramural Research Program
National Institute on Aging
National Institutes of Health

Development and Validation of a CGA-based Multidimensional Prognostic Index (MPI)

- Activities of Daily Living (ADL)	6	items
- Instrumental Activities of Daily Living (IADL)	8	items
- Short Portable Mental Status Questionnaire (SPMSQ)	10	items
- Mini-Nutritional Assessment (MNA)	18	items
- Exton-Smith Scale	5	items
- Cumulative Illness Rating Scale_comorbility (CIRS)	14	items
- Number of drugs	1	
- Social index	1	
TOTAL	63	items

M. P. I.

	Mild	Moderate	Severe
SCORE	0.18±0.09	0.48±0.09	0.77±0.08
RANGE	0.00-0.33	0.34-0.66	0.67-1.0

Pilotto & Ferrucci, Rejuvenation Res 2008; 11: 151-61

Journals of Gerontology: MEDICAL SCIENCES
Cite journal as: J Gerontol A Biol Sci Med Sci
2008 Vol. 63A, No. 8, 880–887
doi:10.1093/gerona/63.8.880

© The Author 2008. Published by Oxford University Press on behalf of The Gerontological Society of America.
All rights reserved. For permissions, please e-mail: journals.permissions@oxfordjournals.org

Advance Access publication on April 8, 2008

The Multidimensional Prognostic Index Predicts Short- and Long-Term Mortality in Hospitalized Geriatric Patients With Pneumonia

Alberto Pilotto,[1] Filomena Addante,[1] Luigi Ferrucci,[2] Gioacchino Leandro,[3] Grazia D'Onofrio,[1] Michele Corritore,[1] Valeria Niro,[1] Carlo Scarcelli,[1] Bruno Dallapiccola,[4,5] and Marilisa Franceschi[1,6]

Journal of Alzheimer's Disease 18 (2009) 191–199
DOI 10.3233/JAD-2009-1139
IOS Press

The Multidimensional Prognostic Index (MPI), Based on a Comprehensive Geriatric Assessment, Predicts Short- and Long-Term Mortality in Hospitalized Older Patients with Dementia

Alberto Pilotto[a,*], Daniele Sancarlo[a], Francesco Panza[b], Francesco Paris[a], Grazia D'Onofrio[a], Leandro Cascavilla[a], Filomena Addante[a], Davide Seripa[a], Vincenzo Solfrizzi[b], Bruno Dallapiccola[c], Marilisa Franceschi[a] and Luigi Ferrucci[d]

JOURNAL OF GERIATRIC ONCOLOGY 4 (2013) 208–217

Does the Multidimensional Prognostic Index (MPI), based on a Comprehensive Geriatric Assessment (CGA), predict mortality in cancer patients? Results of a prospective observational trial

Valter Giantin[a], Elisabetta Valentini[a], Mario Iasevoli[a], Cristina Falci[b], Paola Siviero[c], Elisabetta De Luca[a,], Stefania Maggi[c], Bruno Martella[d], Graziella Orrù[a], Gaetano Crepaldi[c], Silvio Monfardini[e], Oreste Terranova[d], Enzo Manzato[a]*

A Multidimensional Prognostic Index (MPI) based on a comprehensive geriatric assessment predicts short- and long-term all-cause mortality in older hospitalized patients with transient ischemic attack

Daniele Sancarlo • Andrea Pilotto • Francesco Panza • Massimiliano Copetti • Maria Grazia Longo • Piero D'Ambrosio • Grazia D'Onofrio • Luigi Ferrucci • Alberto Pilotto

J Neurol 2012; 259 (4): 670-678

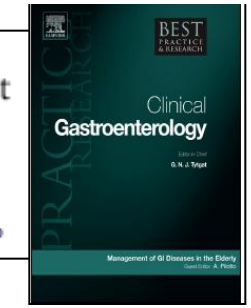
Digestive Diseases
Dig Dis 2007;25:124–128
DOI: 10.1159/000099476

Usefulness of the Comprehensive Geriatric Assessment in Older Patients with Upper Gastrointestinal Bleeding: A Two-Year Follow-Up Study

Alberto Pilotto[a] Luigi Ferrucci[a] Carlo Scarcelli[a] Valeria Niro[a] Francesco Di Mario[c] Davide Seripa[a] Angelo Andriulli[b] Gioacchino Leandro[d] Marilisa Franceschi[a, c]

The Comprehensive Geriatric Assessment and the multidimensional approach. A new look at the older patient with gastroenterological disorders

Alberto Pilotto, MD, Head of Department[a,*], Filomena Addante, MD, Assistant Physician[a], Grazia D'Onofrio, PsyD, Research Fellow[a], Daniele Sancarlo, MD, Research Fellow[a], Luigi Ferrucci, MD, PhD, Director[b]



The Multidimensional Approach to the Older Patient with Chronic Kidney Disease

Alberto Pilotto, Daniele Sancarlo, Marilisa Franceschi, Massimiliano Copetti, Piero D'Ambrosio, Carlo Scarcelli, Luigi Ferrucci

Circulation
Heart Failure
JOURNAL OF THE AMERICAN HEART ASSOCIATION

American Heart Association
Learn and Live

Multidimensional Prognostic Index Based on a Comprehensive Geriatric Assessment Predicts Short-Term Mortality in Older Patients With Heart Failure

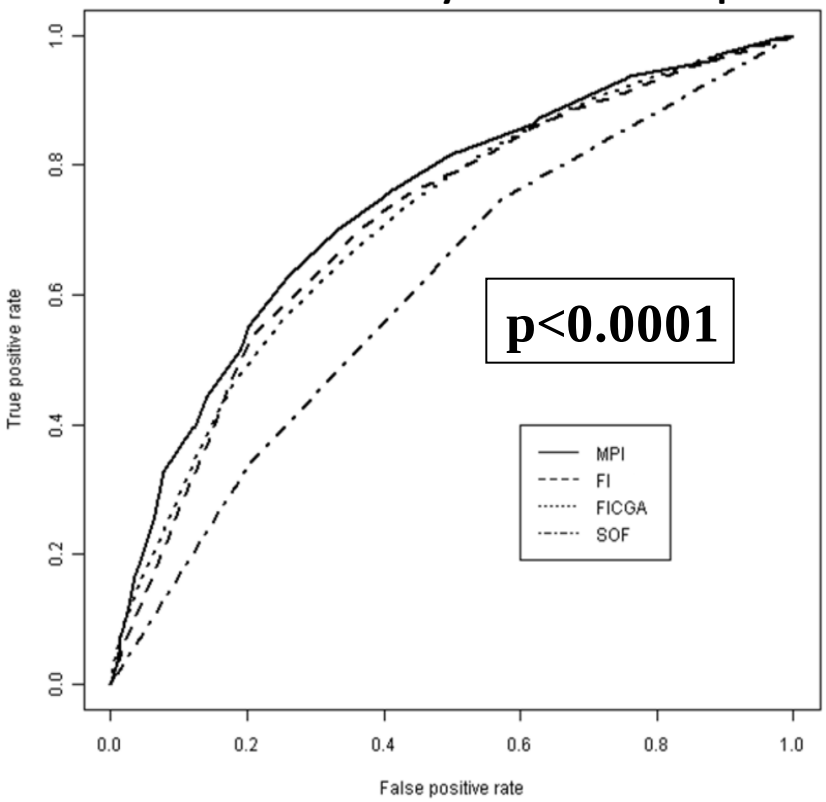
Alberto Pilotto, Filomena Addante, Marilisa Franceschi, Gioacchino Leandro, Giuseppe Rengo, Piero D'Ambrosio, Maria Grazia Longo, Franco Rengo, Fabio Pellegrini, Bruno Dallapiccola and Luigi Ferrucci

Circ Heart Fail 2010; 3: 14-20

Comparing the Prognostic Accuracy for All-Cause Mortality of Frailty Instruments: A Multicentre 1-Year Follow-Up in Hospitalized Older Patients

2033 hospitalized patients, M=874, F=1159, aged ≥ 65 years mean age=79.8 7.8 years, recruited in 20 Italian Geriatric Units

ROC curves at 1-year of follow-up



Age/sex adjusted 1 Month-Mortality	AUC	95% CI
FI-SOF (Fried mod, 3 items)	0.685	0.64-0.73
FI-CD (Kulminski, 32 items)	0.738	0.69-0.78
FI-CGA (Rockwood, 10 domains)	0.724	0.68-0.77
MPI (Pilotto, 8 domains)	0.765	0.72-0.80

Age/sex adjusted 1 Year-Mortality	AUC	95% CI
FI-SOF (Fried mod, 3 items)	0.694	0.67-0.72
FI-CD (Kulminski, 32 items)	0.729	0.70-0.76
FI-CGA (Rockwood, 10 domains)	0.727	0.70-0.75
MPI (Pilotto, 8 domains)	0.750	0.72-0.78

MPI vs FI-SOF p<0.0001; vs FI-CD p<0.0005, <0.0001; vs FI-CGA p<0.0001

Pilotto et al, PLoS ONE 2012, January 2012 | Volume 7 | Issue 1 | e29090

Table 1. AUC Values of Predictive Tools Examined in More Than 1 Assessment

Predictive Tool, No.	AUC	Median	Range
AMIS model 2	0.86	(0.84-0.87)	0.84-0.87
APACHE II 19	0.77	(0.71-0.81)	0.69-0.94
BCLC score 2	0.85	(0.84-0.86)	0.84-0.86
BISAP score 2	0.82	(NA)	0.82-0.82
BNP 3	0.66		
CLIP score 5			
CRIB II 2			
			0.95
		(0.73-0.82)	0.51-0.85
	0.74	(0.71-0.84)	0.71-0.84
score 9	0.84	(0.75-0.85)	0.71-0.93
Simple risk index 2	0.80	(0.78-0.82)	0.78-0.82
TIMI risk score 5	0.73	(0.72-0.75)	0.68-0.84
TIMI risk score laboratory	0.77	(0.76-0.78)	0.76-0.78
TNM 2	0.80	(NA)	0.80-0.80
TRISS 2	0.75	(0.64-0.85)	0.64-0.85
Tokyo score 2	0.87	(0.86-0.87)	0.86-0.87

Only 40% (15) of the AUC values were higher than 0.80 (very good discrimination), and only 10% (3) were higher than 0.90 (excellent discrimination).

JAMA®
The Journal of the American Medical Association

Table 3. Summary of 16 Validated General Prognostic Indices for Older Adults (continued)

		Generalizability[a]		Accuracy		
					Calibration[c]	
Source	Index	Development Cohort	Validation Cohort	Discrimination (95% CI)[b]	Predicted Mortality (95% CI), %[b]	Observed Mortality (95% CI), %[b]
			Hospital Patients			
Teno et al,[57] 2000	1-y index on admission	n = 1266 Median age 85 y 25% Cancer 9% Congestive heart failure 61% Female 40% 1-y Mortality	Validation performed using resampling from development cohort	Derivation *C* = 0.73 Validation *C* = 0.74	22 58 66 82 86 93	26 57 72 80 89 95
Pilotto et al,[42] 2008	1-y index on admission	n = 838 Mean age 79 y 55% Female Mean 4/6 functional ADL Mean 3 errors on SPMSQ Mean 4 medications 18% 1-y Mortality	n = 857 Mean age 78 y 53% Female Mean 4/6 functional ADL Mean 3 errors on SPMSQ Mean 4 medications 17% 1-y Mortality	Development *C* = 0.75 (0.71-0.80)	8 21 43	6 23 45

Yourman et al, JAMA 2012, January 11, 2012 ; 307: 182-192

JAMDA

journal homepage: www.jamda.com

Original Study

Development and Validation of a Multidimensional Prognostic Index for Mortality Based on a Standardized Multidimensional Assessment Schedule (MPI-SVaMA) in Community-Dwelling Older Subjects

12.020 community-dwelling subjects, F=7876 (63.3%), mean age=81.8 7.9 years who underwent a SVaMA evaluation 2005-2010 Padova District, Veneto, Italy

1. Nursing Care Needs (VIP)	11 items
2. Exton-Smith Scale (V_PIA)	5 items
3. Activities of Daily Living (V_ADL)	6 items
4. Barthel Index (V_MOB)	10 items
5. SPMSQ (V_COG)	10 items
6. Social Index (V_SOC)	3 items
Totale	45 items

+ AGE + SEX + MAIN DIAGNOSIS

(dementia, neoplasia, bone fracture, stroke, CV, Resp., Neurol Dis., hypocinetic s.)

Pilotto A et al, J Am Med Dir Assoc. 2013; 14: 287-292

Accuracy and calibration of the MPI-SVaMA

Mortality 1 month	C-Index	C-Lower	C-Upper
Development Cohort	0,827	0,817	0,837
Validation Cohort	0,832	0,818	0,845
Mortality 1 year	**C-Index**	**C-Lower**	**C-Upper**
Development Cohort	0,791	0,784	0,798
Validation Cohort	0,792	0,783	0,801

Table 3
Observed and Predicted Mortality Rate for Each Quintile of the Predicted Probabilities, for MPI-SVaMA Indices at 1-Month and 1-Year Mortality Prediction, in the Development Cohort (n = 7876) and in the Validation Cohort (n = 4144)

MPI-SVaMA	Quintile	Development Cohort			Validation Cohort		
		Observed Mortality, %	Predicted Mortality, %	Difference, %	Observed Mortality, %	Predicted Mortality, %	Difference, %
MPI-SVaMA at 1 month	1	1.03	2.07	1.04	0.61	1.97	1.36
	2	2.69	4.82	2.13	3.30	4.68	1.38
	3	8.40	8.80	0.40	7.19	8.85	1.66
	4	20.20	15.62	4.58	20.60	15.92	4.68
	5	48.48	48.60	0.12	50.72	50.29	0.43
MPI-SVaMA at 1 year	1	11.87	14.57	2.70	9.60	14.62	5.02
	2	21.20	24.96	3.76	22.94	25.24	2.29
	3	36.35	37.69	1.34	40.43	38.38	2.05
	4	66.44	58.18	8.26	64.41	59.44	4.97
	5	90.21	91.93	1.71	91.45	92.75	1.30

MPI-SVaMA, Multidimensional Prognostic Index based on the Standardized Multidimensional Assessment Schedule (Scheda per la Valutazione Multidimensionale delle persone adulte e Anziane).

Pilotto A et al, J Am Med Dir Assoc. 2013; 14: 287-292

Contenuti:

- Reparti e Servizi
- Prenotazioni e disdette
- Ritiro referti e Documentazione clinica
- Servizi Amministrativi
- Altri Servizi
- Mappa ospedale

Accessi diretti:

- Emergenze
- U.R.P.
- Prenotazioni
- Servizi on-line
- Farmacie
- Rubrica telefonica

MULTIDIMENSIONAL PROGNOSTIC INDEX MPI

Back

The Multidimensional Prognostic Index (MPI) is a prognostic tool based on a standard Comprehensive Geriatric Assessment (CGA) that predicts short- and long-term mortality in elderly subjects

What Multidimensional Prognostic Index is?

The Multidimensional Prognostic Index (MPI) is a prognostic tool based on a standard Comprehensive Geriatric Assessment (CGA) that predicts short- and long-term mortality in elderly subjects. The MPI includes 63 items distributed in 8 domains of CGA as follows:

1.Activities of Daily Living (ADL): 6 items
2.Instrumental Activities of Daily Living (IADL): 8 items
3.Short Portable Mental Status Questionnaire (SPMSQ): 10 items
4.Mini Nutritional Assessement (MNA): 18 items
5.Exton-Smith Scale (ESS): 5 items
6.Cumulative Index Rating Scale – Comorbidity Index (CIRS-CI): 14 items
7.Number of drugs used: 1 item
8.Co-habitation status: 1 item

What Multidimensional Prognostic Index is for?

On the basis of MPI values, it is possible to calculate the short- and long-term mortality risk of the older subjects and to define the severity grade of mortality risk: low, moderate and severe. Several studies showed that the prognostic accuracy of the aggregated MPI was significantly greater than the prognostic accuracy of its individual components considered singularly. Thus the multidimensional approach can be successfully used in elderly patients for both clinical and administrative purposes.

Utilization of Calculate-MPI

Through the following link is possible to download the program Calculate-MPI to calculate the Multidimensional Prognostic Index. The program is an .exe file and allows to run out the tests to obtain the numeric value of the single domain (ADL, IADL, SPMSQ, CIRS, MNA, ESS, drugs, co-habitation). Tests are available also in PDF format printable from this page. The program allows to print the final MPI result.

Mather

To calculat
individual don
were estimate
models, one f
respectively (T

Each weig
a range that v
the observed
by the observ
1-month MPI
tracting the

difference by

SVaMA, the
minimum val

$5.476\left(\text{ie},\frac{(R-$

The RECurs
was used to

A Indices for 1-Month

for MA th	Weights for MPI-SVaMA at 1 Year
1	0.01351
	0
4	0.3413
	0
3	1.99569
2	−0.54763
8	0.0099
5	0.30945
4	0.2596
9	−0.10899
2	0.21911
1	0.34769
1	0.02771
2	0.00799
4	0.02858
8	0.00662
7	0.01645
367	0.0000994

Standardized Multi-
e Multidimensionale
ing; VCOG, cognitive
sure sores risk; VSOC,

iMPI

New Application for iPhone and iPad

portable tool

easy to use

always available

Home Page

- patient informations
- calculate MPI
- visualize results
- the archive
- about MPI

Calculate MPI

input the cumulative domain values

Calculate MPI

or input the single items

MPI value

Grade of severity of mortality risk:

mild

moderate

severe

pdf report

- cumulative values
- or detailed for each domain
- send the results by e-mail

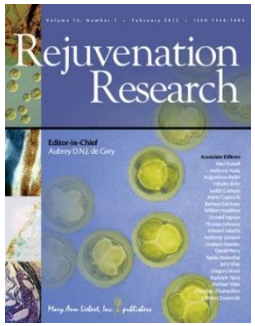
Frailty in elderly people

Andrew Clegg, John Young, Steve Iliffe, Marcel Olde Rikkert, Kenneth Rockwood

~~We need to develop more~~ (*..We have developed and validated an..*) efficient model~~s~~ to detect ~~frailty~~ (*..subjects at different mortality risk..*) and measure its severity in routine clinical practice.

Such progress would greatly inform the appropriate selection of elderly people for invasive procedures or drug treatments and would be the basis for a shift in the care of frail elderly people towards more appropriate goal-directed care.

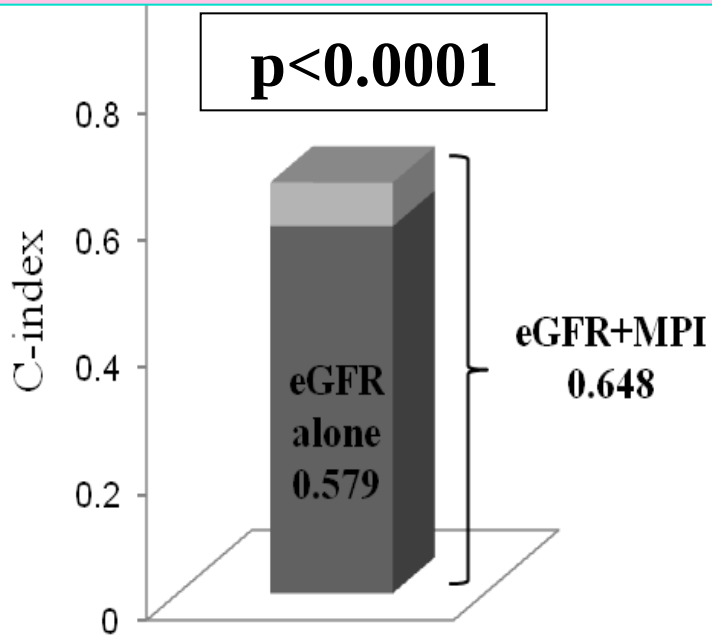
Clegg et al, Lancet 2013; 381:752-62



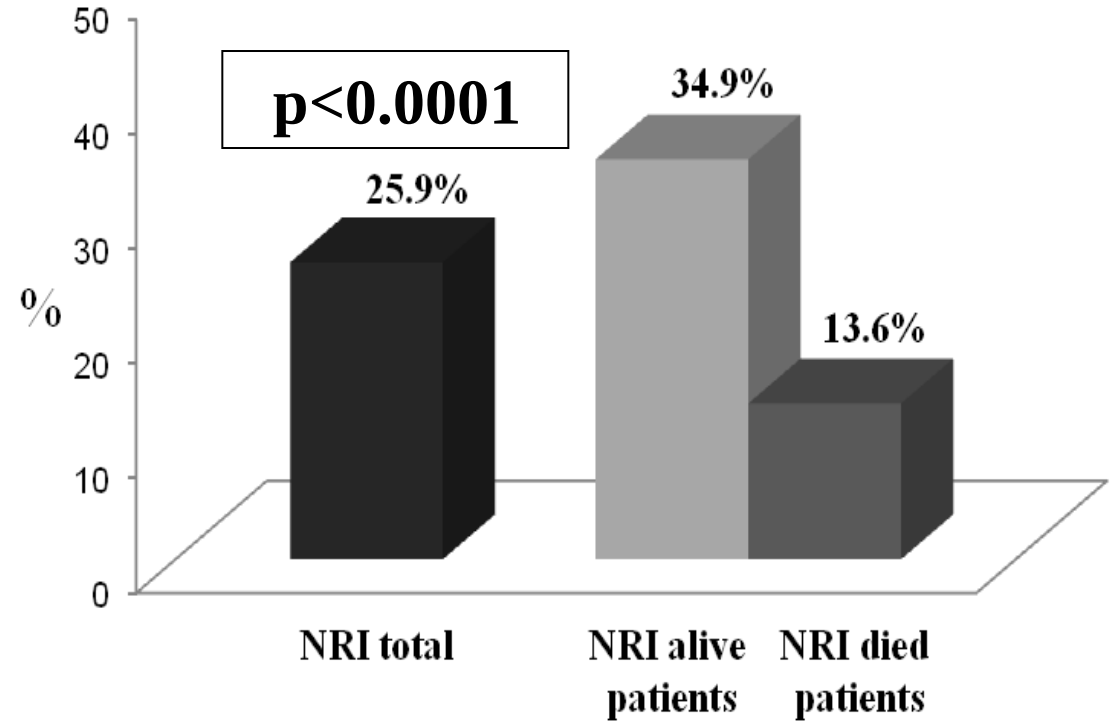
Addition of the Multidimensional Prognostic Index to the Estimated Glomerular Filtration Rate Improves Prediction of Long-Term All-Cause Mortality in Older Patients with Chronic Kidney Disease

1198 pts, M=44.5%, mean age=80.5 6.8, e-GFR<60 ml/min/1.73m^2, follow-up 2.1 yrs

Survival C-index by adding MPI to eGFR to predict mortality



Net Reclassification Improvement (NRI) by adding MPI to e-GFR



Pilotto et al. Rejuvenation Res 2012, 15: 82-88

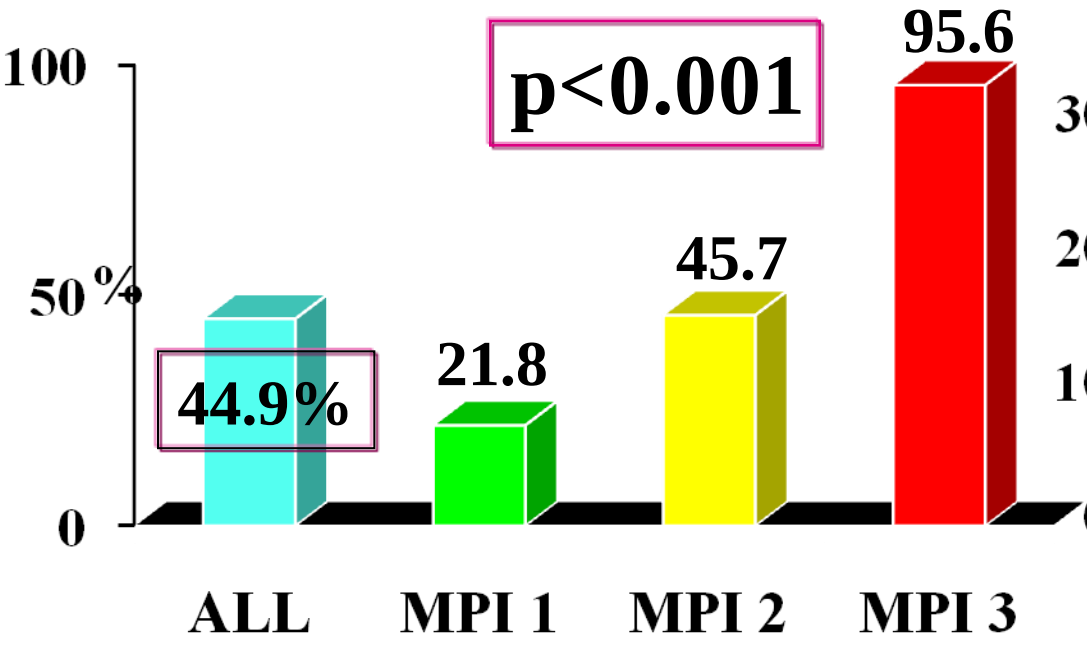
Usefulness of the MPI in evaluating the efficacy of warfarin in older patients with AF

17.018 community-dwelling older subjects ≥ 65 years Jan 2005-Dec 2011

1284 older patients with AF, F=63.1%, mean age=84.2 7.18

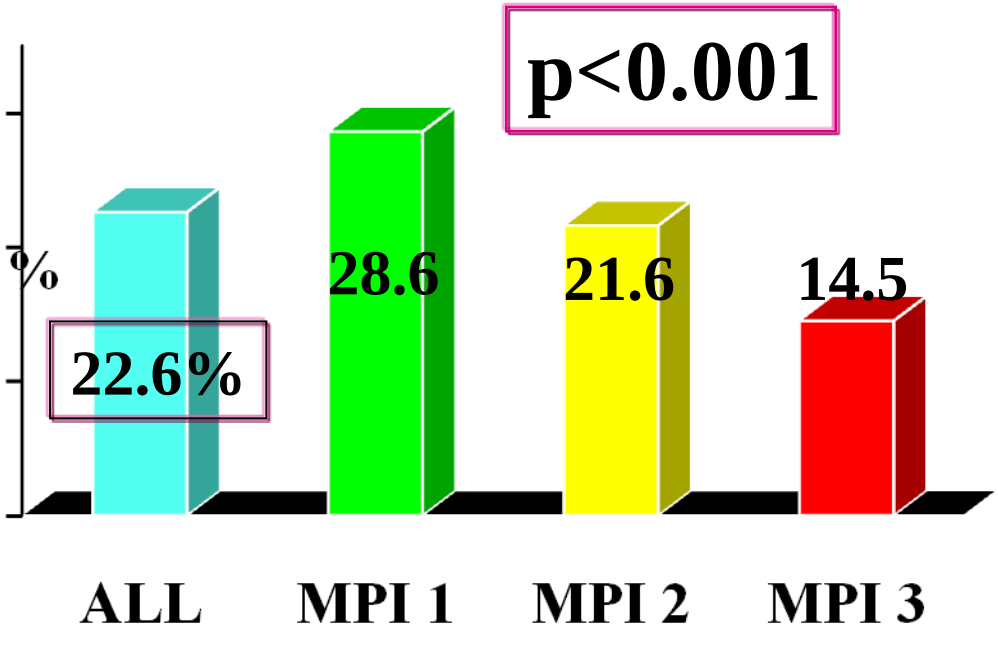
One-year Mortality

Events/per 100 person-year



Warfarin

Medications per month



Pilotto et al, EGM 2012

Mortality risk in post-matching model (propensity score)*: treated *vs* not-treated with warfarin

MPI grade	1-Year Mortality(*)	
	HR [95% CI]	p
ALL Patients	0.39 0.27-0.55	<0.001
MPI 1 Low risk	0.57 0.31-1.03	0.062
MPI 2 Moderate risk	0.33 0.17-0.63	0.001
MPI 3 Severe risk	0.34 0.19-0.59	<0.001

MPI grade	3-Year Mortality(*)	
	HR [95% CI]	p
ALL Patients	0.62 0.49-0.77	<0.001
MPI 1 Low risk	0.71 0.49-1.03	0.070
MPI 2 Moderate risk	0.63 0.42-0.93	0.022
MPI 3 Severe risk	0.55 0.37-0.83	<0.004

•Adjusted for age, sex, main diagnosis, all MPI-SVaMA domains and past prescription rate (tertiles) (PS 1:1 matching models)

Pilotto et al, EGM 2012

Journal of Clinical Epidemiology

New technology–based functional assessment tools should avoid the weaknesses and proliferation of manual functional assessments

Shane A. Lowe[a,b,*], Alejandro Rodríguez-Molinero[a,c], Liam Glynn[d], Paul P. Breen[a,b,e], Paul M.A. Baker[f], Jon Sanford[g], Brian D. Jones[h], Gearóid ÓLaighin[a,b,i]

Table 5. Instrument performance properties

	BADL			IADL			Global health				Combination			Performance		
Assessment tool	Katz index	Barthel index	PSMS	Lawton IADL scale	FAI	Neadl	HAQ	SIP	SMAF	SF-36	Spector	FIM	GARS	PPT	PPB	TUG
Reliability																
Interrater	4	4	4	4	3	—	—	4	4	—	—	4	—	4	—	4
Test–retest	—	4	—	—	2	4	4	4	4	4	4	4	—	4	4	4
Internal	4	—	4	—	4	4	3	4	—	4	2	3	4	4	—	—
Validity																
Concurrent	—	3	3	3	3	2	4	3	4	4	—	4	4	3	3	2
Predictive	3	3	—	—	—	—	4	—	—	4	4	4	4	—	2	1
Responsiveness	—	2	—	—	1	1	3	2	2	4	—	2	2	—	3	2
Time taken to administer (min)	5	5–20	5	10–15	5	10	20–30	30–60	20	6–30	—	30–60	15	10	12	2

Abbreviations: BADL, basic activities of daily living; IADL, instrumental activities of daily living; PSMS, physical self-maintenance scale; FAI, Frenchay Activities Index; NEADL, nottingham extended activities of daily living; HAQ, health assessment questionnaire; SIP, sickness impact profile; SMAF, functional autonomy measurement system; SF-36, Short Form 36; FIM, functional independence measure; GARS, Groningen Activity Restriction Scale; PPT, physical performance test; PPB, *physical performance battery*; TUG, timed up and go test.

Conclusions: With the advancement of technology has come the possibility to perform assessments in new ways.

Lowe et al, 2013; 66:619-32

Arch Intern Med. 2012;172(7):594-595

A Multidimensional Prognostic Index in Common Conditions Leading to Death in Older Patients

Alberto Pilotto, MD, Francesco Panza, MD,PhD , Luigi Ferrucci, MD, PhD

Considering multidimensional aggregate information may be very important for predicting mortality in older patients with the most common conditions leading to death.

Circulation Heart Failure
Journal of the American Heart Association
American Heart Association
Learn and Live

Editorial

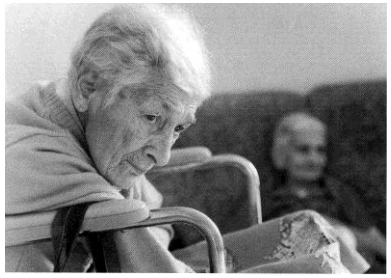
Prognosis of Heart Failure in the Elderly Not an Affair of the Heart?

Douglas D. Schocken, MD

What is the practical utility of this new instrument?

…Weighting the risk according to the MPI would be very helpful in setting the direction of the clinical plans toward comfort care and compassionate end-of-life plans or more aggressive care …

Schocken, *Circulation Heart Fail 2010: 3: 2-3*



Take Home Messages

1. Crucial role of Prognosis in the "clinical decision making"
2. CGA-based tools are important to predict mortality in the older patients
3. The Multidimensional Prognostic Index (MPI):
   - accurate and well calibrated predictive tool for mortality
   - validated in most common conditions leading to death
   - higher accuracy than other frailty intruments
   - meta-analyses confirmed data and suggested its use in CP
4. ICT-based tools to calculate MPI: PC-software/portable applications
5. The role of ICT-based MPI to:

a) identify subgroups of patients candidate to different therapeutical approaches (i.e. invasive vs not invasive procedures)

b) evaluate efficacy of interventions in patients with different mortality risk

Prospective studies are needed

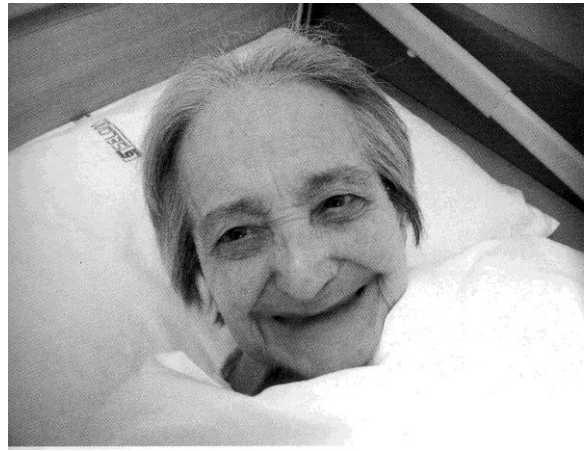
Download "MPI-calculate" "MPI-SVaMA" software

http://www.ulss16.padova.it/geriatria/

available "for free"

iMPI© application for iPhone and iPad

on AppStore



Grazie per l'attenzione