Using Multidimensional Prognostic Indices to improve cost-effectiveness of interventions in multimorbid, frail older persons
The MPI_AGE project is a research project co-funded by the European Union through the Health 2007-2013 Programme that has explored ways to reduce unnecessary use of health care resources in older subjects by improving the quality of the medical interventions needed and adapting them to the individual needs of the subject.

Most of the work in this project is based on the use of a well-validated diagnostic and prognostic tool, named Multidimensional Prognostic Index (MPI). This tool gathers information obtained from a multidisciplinary assessment of each patient, called Comprehensive Geriatric Assessment (CGA). CGA has been shown to be very useful in improving the adaptation of health interventions to older people that suffer from many diseases and are especially complex.

WHAT ARE THE OBJECTIVES OF THIS RESEARCH?

The aims of the MPI_AGE project were to:

- identify the most cost-effective health interventions according to the expected survival of a given person;
- improve interactions and cooperation among health care professionals to prepare care plans that are adapted to the risk and needs of each person, defined by the MPI;
- develop adapted intervention programs based on the individual MPI-profile of each older person;
- explore ways to reduce health-related costs by reducing those that may be inappropriate, especially hospital admissions, time in hospital, need of nursing home and unnecessary prescription drug use.
The MPI_AGE project involves the following centers and organizations in twelve different countries.

ASSOCIATE PARTNERS

- **Italy**: AULSS16 - Azienda Unità Locale Socio Sanitaria nº 6 Euganea, Padova (Coordinating center)
- **Czech Republic**: Univerzita Karlova, Prague
- **France**: CHU, Poitiers
- **Germany**: Universitätsklinikum Köln, Cologne
- **Netherlands**: Erasmus Universitair Medisch Centrum, Rotterdam
- **Spain**: Fundación Para la Investigación Biomédica del Hospital Universitario Ramon y Cajal, Madrid
- **Sweden**: Karolinska Institute, Stockholm
- **Europe**: European Union Geriatric Medicine Society (EUGMS)

COLLABORATING PARTNERS

- **Australia**: Flinders University, Adelaide
- **Belgium**: EUREGHA; AGE platform Europe
- **Bulgaria**: Bulgaria Association on Ageing
- **Estonia**: Estonian Association of Gerontology
- **Italy**: Regione del Veneto - Servizio per le relazioni socio-sanitarie; Centro Regionale Management Progetti Europei – CREMPE; National Research Council – CNR; IRCCS Casa Sollievo della Sofferenza; Università degli Studi di Messina; E.O. Ospedali Galliera di Genova
- **Hungary**: Semmelweiss University, Budapest
- **United States of America**: National Institute on Aging; John Hopkins Bloomberg School of Public Health
WHAT IS THE MULTIDIMENSIONAL PROGNOSTIC INDEX (MPI)?

MPI is a diagnostic and prognostic tool based on the comprehensive assessment of older persons. We already know that MPI is good to predict survival and other problems (hospitalization, admission to nursing homes).

The original MPI includes information in 8 areas:
1. Activities of Daily Living (self-care)
2. Instrumental Activities of Daily Living (cooking, cleaning, caring of drugs and finances, etc.)
3. Mental status
4. Nutrition status
5. Risk of suffering bed sores
6. Number of diseases and their global burden
7. Number of drugs used
8. Living arrangements

A computer program (www.mpiage.eu) calculates the MPI score, which ranges from 0 (good health, low risk of dying) to 1 (bad health, high risk of dying).

HOW WAS THE MPI CREATED?

The MPI was developed in Italy, by using data from many patients to find what functional and health aspects were more powerful in measuring prognosis in complex patients. In these studies, the aggregated data included in MPI showed to be able to predict death on the short and long term in geriatric patients. It has also shown to be useful in persons suffering particular diseases, as gastrointestinal bleeding, pneumonia, heart failure, dementia, liver cirrhosis, chronic kidney disease and transient ischemic attacks.

The MPI has been studied in hospitals, in people living at home, and in care homes. It seems to be more accurate and reliable that other similar instruments.

WHAT DID WE LEARN DURING THE MPI_AGE STUDIES?

The MPI_AGE project, by including many partners, has been able to advance in the use of MPI in many different settings and groups of patients. These are some of the results of the studies performed:

1. Usually, MPI is performed in older people by a face-to-face assessment. However, it was not known if data from large medical databases could be used to calculate the MPI score. We were able to use databases from Sweden to extract the MPI, and showed that this version of the MPI was able to predict long-term survival (up to 12 years) and also the risk of hospitalization.

2. We also used an Italian database of people with dementia living in their homes, who applied to receive social services. In this population, MPI was again good in predicting mortality. We were also able to show that those individuals who were receiving anti-dementia drugs had a reduced mortality only if they were not in very poor health: those who had a high (bad) MPI did not benefit from drugs any more. This may be useful to know when drugs have to be stopped and a more palliative approach used in people suffering from severe dementia.
3. In another study, we analyzed a database from UK, with information gathered by general practitioners. Unfortunately, in this database we were unable to extract a complete MPI score, although we showed that some information that is part of the MPI (functional and cognitive measures) also predicted 1-year mortality.

4. Frail older subjects are usually excluded from clinical trials of new drugs, which puts them at risk by using drugs that were never researched in them. We used the MPI to find out what was happening in real life with two drugs frequently used in older people but not without risk: statins (drugs to reduce cholesterol) and anticoagulants (used to reduce the risk of stroke in patients with a common cardiac arrhythmia – atrial fibrillation).

   a. In a large database from Italy, we looked at subjects with diabetes (who have higher cardiovascular risk than non-diabetics) and showed that using statins to lower cholesterol was effective in reducing mortality in all groups, from the healthiest to the more complex or disabled patients. This was confirmed in a second group who had already heart problems (coronary artery disease). We also found that the frailest were less likely to be treated with statins.

   b. We looked at older people with atrial fibrillation who were using anticoagulants and found that anticoagulants were useful to reduce mortality regardless of poor health and functional conditions. This reinforces the safety of the use of anticoagulants in older complex patients.

5. Sometimes older patients are excluded from innovative techniques or interventions due to old age, not considering the actual health and functional status of a given individual. Decisions based only on age are usually discriminatory, they are called ageism. We studied the use of MPI to help deciding who benefits of a given intervention by prospectively measuring MPI in patients aged ≥75 years who had a severe age-related heart valve problem (aortic stenosis) and were treated with a modern – yet expensive - technique that skips the need of surgery (transcatheter aortic valve implantation, TAVI). We showed that MPI is good in predicting mortality depending on baseline status, so MPI may help patients and doctors decide whether this technique is appropriate for them.

6. Finally, the main contribution of MPI_AGE was a major international study exploring if MPI was useful in predicting what happens during hospital admission and one year after admission in very frail complex patients (named geriatric patients) hospitalized in geriatric wards. In this large effort (the MPI_AGE multicenter trial) we were able to enroll 1,148 patients in 9 international centers across Europe and Australia. They were very old (mean age was 84 years), complex and acutely ill. They were classified according to their MPI score at hospital admission and discharge, and followed for one year. We obtained very important results from this study, in summary:

   a. We showed that the MPI score obtained at hospital admission was a very reliable predictor of mortality. We classified patients in three levels: those in the second level had 3 times the risk of dying in hospital, those in the third level had more than 10 times the risk of dying. MPI also predicted how long patients stayed in the hospital. This information may be useful for patients and their health care providers to make decisions on the care needs. If fact, MPI was associated with different profiles of use of diagnostic tests during admission.

   b. We also showed that the MPI score obtained at hospital discharge predicted well the risk of mortality in the year after discharge. MPI also predicted patients that had a higher risk to be readmitted to the hospital along that year, and those in need of home services or admission to nursing homes.

   c. MPI changed from admission to discharge in most patients, roughly improving in one out of three and worsening in one out of four. Those who improved had reduced mortality after discharge, those who deteriorated had an increased need of home services after discharge.
Health interventions should be adapted to the individual needs of older people, especially for those who are very sick, have multiple health problems or are physically or mentally impaired.

Healthcare professionals should assess the needs of each individual in an objective, reproducible way. Assessment has to consider every aspect of health and function that are relevant to each person.

Objective assessment of needs may avoid discrimination of older people (ageism) in health care.

The Multidimensional Prognostic Index (MPI) has proved to be an excellent objective assessment instrument in various healthcare settings (community, hospital, nursing homes) and across a wide range of diseases and conditions.

MPI also identifies problems in several domains that may benefit from specialist comprehensive geriatric care.

Tailored healthcare interventions have the potential to reduce the inappropriate and potentially harmful use of resources (hospitalizations, drugs, invasive procedures) and to allow well-established treatments and interventions to be used in older people who can benefit from them.

Tailored healthcare interventions have the potential to reduce inappropriate health-related costs.

MPI can be used to find out whether different treatments or interventions work in different older people.

In older people who are hospitalized MPI identifies those at higher or lower risk of mortality or hospitalization for excessively long periods.

MPI can also predict who will have a more/less favourable outcome and who will need social support (home-care services) or nursing-home care after hospitalisation.
REFERENCES


Bureau ML, Liu E, Christaens L et al. on behalf of the MPI_AGE Project Investigators. Using a multidimensional prognostic index (MPI) based on comprehensive geriatric assessment (CGA) to predict mortality in elderly undergoing transcatheter aortic valve implantation. J Cardiol. 2017 Jun 1; 236: 381-386.


LEAD PARTNER
AULSS 6 Euganea Padova
Via E. degli Scrovegni, 14 • 35131 Padova • Italy
Website: www.aulss6.veneto.it
E-mail: geriatria.osa@aulss6.veneto.it

COMMUNICATION LEADER
EUGMS - European Geriatric Medicine Society
Secretariat Vienna - Laudongasse, 21/10 • 1080 Vienna • Austria
E-mail: secretariat@eugms.org

PROJECT LEADER
Dr. Alberto Pilotto - E.O. Galliera Hospital
Mura delle Cappuccine, 14 • 16128 Genova • Italy
E-mail: alberto.pilotto@galliera.it

WEB & MEDIA

www.mpiage.eu
www.facebook.com/MPIAGE
@MPI_AGE