A high number of diseases and consultations: a warning signal for GPs when following up a multimorbid patient

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Abstract

Background: the European General Practitioners Research Network (EGPRN) designed and validated a comprehensive definition of multimorbidity using a systematic literature review and qualitative research throughout Europe. Detecting risk factors for decompensation would be an interesting challenge for family physicians (FPs) in the management of multimorbid patients. The purpose of the survey was to assess which items belonging to the EGPRN multimorbidity definition could help to identify patients at risk of decompensation in a cohort pilot study over a 24-month follow-up among primary care outpatients. Method : 131 patients meeting the multimorbidity definition were included using two inclusion periods between 2014 and 2015. Over a 24-month follow-up, the « decompensation » or « nothing to report » status was collected. A logistic regression, following a Cox model, was then performed to identify risk factors for decompensation. Results : After 24 months of follow-up, 120 patients were analyzed. 3 clusters were identified. 44 patients, representing 36.6 % of the population, were still alive and had not been hospitalized for a period exceeding 6 days. Two variables were significantly linked to decompensation: the number of visits to the FP per year (HR 1.06, IC 95 %, 1,03-1,10, p-value <0,001) and the total number of diseases (HR 1,12, IC 95 %, 1,013-1,33, p-value = 0,039). Conclusion: FPs should be aware that a high number of consultations and a high total number of diseases are linked to severe outcomes such as death or unplanned hospitalization. A large-scale cohort in primary care seems feasible to confirm these results.

Background

Due to advances in medical care and public health policies, an aging population brings with it an increasing rate of chronic disorders that interfere with many other disorders. The consequences are an increase in the burden of disease (1) (2) and in health systems' expenditure (3).

Thus, in 1976, the concept of multimorbidity was published for the first time (4). According to the World Health Organization (WHO), multimorbidity is defined as « people being affected by two or more chronic health conditions » (5).

This definition was subject to several criticisms, mainly because of the word « condition » that led to several interpretations, and many attempts to refine that definition were ineffective (6) (7) (8). Peculiarly, this definition failed to determine which items were suitable for the prevention of severe issues or were useful for handling multimorbidity in primary care consultations (9) (10).

However, Family Physicians (FPs), who are the first port of call in the care of multimorbid patients, were very interested in this challenging concept as it is closely related to a global view of the patient which is a basic skill of Family Medicine (FM) (11) (12). This concept particularly fits the competences field of Family Medicine, as defined by the World Organization of National Colleges, Academies and Academic Associations of General Practitioners/Family Physicians (WONCA) (13). Adding another string to the bow

in investigating the complexity of patient conditions was an exciting project that could improve GPs' ability to detect a patient's frailty and to prevent severe outcomes such as hospitalization or death.

The concept of multimorbidity had stirred up some interest in the research agenda of the European General Practitioners Research Network (EGPRN)(14).

A research team which included 9 European countries, all involved in the European General Practitioners Research Network (EGPRN), aimed to clarify the concept of multimorbidity(15). In 2012, the EGPRN presented a comprehensive definition of multimorbidity in family medicine and long-term care.(16) It was the first attempt to define multimorbidity which benefited from the FP's pragmatic point of view (17). According to the EGPRN, multimorbidity is defined as « any combination of chronic disease with at least one other disease (acute or chronic) or psychosocial factor (associated or not) or somatic risk factor, any bio-psychosocial factor, any somatic risk factor, the social network, the burden of diseases, the health care consumption and the patient's coping strategies may function as modifiers (of the effects of Multimorbidity). Multimorbidity modifies the health outcomes and leads to increased disability or a decreased quality of life or frailty. » Thirteen themes have been outlined and then translated into ten European languages with the intention of inducing and standardizing further collaborative studies (18).

Nevertheless, that exhaustive definition covers too large a part of the population which renders it ineffective as it reduces the opportunity to pinpoint a patient at risk of severe outcomes. Since preventing acute hospitalization or death is a major concern of FM, (19) the EGPRN considered how to determine which variables within the concept would be effective in preventing those two events (20).

As FPs are very familiar with their patient's health status, (21) there could be some factors that might be neglected but which could help to avoid severe outcomes if they were noticed in time (22).

If the EGPRN could succeed in highlighting those variables, they could be integrated within the FPs' medical software and be a powerful tool in the care of multimorbid patients (23).

Consequently, a feasibility pilot cohort study was started in 2014 which included patients who met the EGPRN multimorbidity definition (24). Data were analysed every three months.

The main objective of this study was to assess which criteria, within the EGPRN concept of multimorbidity, could identify multimorbid patients at risk of decompensation in a primary care cohort in France over a 24-month follow-up.

Methods

Ethic statement

The study was approved by the ethics committee of the « Université de Bretagne Occidentale » Faculty of Medicine, Brest. The participants had to sign a written informed consent to participate in the study. The Family Physicians involved provided a verbal consent.

Participant selection

The recruitment was handled by 31 FPs in western Brittany, France, who agreed to participate in the study after being contacted at their office. All were chosen from the Clinical Teacher list of Brest University.

All patients met the EGPRN definition of multimorbidity. 96 patients were included by 19 FPs between July and December 2014. 12 other FPs enrolled 35 new patients from September to November 2015 to increase the study's power.

Inclusion criteria were: having a chronic disease, with at least one other disease (acute or chronic) or a biopsychosocial factor (associated or not) or a somatic risk factor.

Biopsychosocial risk, including all psychological risk factors, psychosocial risk factors, lifestyle, demographic data (age, gender), psychological distress, socio-demographic characteristics, aging, beliefs and expectations of patients, physiology and pathophysiology were taken into account.

Each patient was monitored over time and had to sign an informed consent.

Exclusion criteria: patients not meeting the criteria of the multimorbidity definition, patients living in a nursing home, patients who were unable to follow the study over time, patients under legal protection, and patients whose condition was already life-threatening or whose life expectancy was estimated at less than three months.

Data collection

Each FP had to follow a plan: at the first stage, the multimorbid patient was given full information on the study by the FP and asked to give his/her consent.

Then, the FPs had to fill in a questionnaire to explore the potential decompensation risk factors within themes and subthemes of multimorbidity. (Table 1)

The questionnaire was designed by the research group with reference to the definition of multimorbidity. There were 52 questions, covering every item of the definition and based on a clinical and anamnestic approach by the FP. First, there were 7 questions about the patient's diseases. Then, there were 8 questions to evaluate the somatic risks factors. Questions 16 to 19 focused on the psychosocial factors, social network and coping strategies (defined as: diet and lifestyle, planning, instrumental support, social support, expression of feelings, positive reinstatement, acceptance, denying, blaming, sense of humor, religion, leisure activities, substance use). From Question 20 to Question 37, the FPs were asked about burden of diseases and health care consumption. There were then 4 questions about prevention vaccination and screening. The last questions pondered the core competencies of the FP and his/her relationship with his/her patient.

The questionnaire is fully available (Appendix 1) as it was given to the FPs (in the French language).

From the first pilot study, some irrelevant variables were deleted for different reasons:

- Chronic condition redundancy with chronic disease or psychological risk factor)
- Cost of care (impossible to estimate given the time and resources dedicated to the study)
- Disability (disability / impairment, quality of life and health outcomes (consequences rather than the characteristics of the multimorbidity)
- frailty (absence of consensual definition, criterion assessed by study, methodologically impossible to assess at the beginning of the study)
- physiology (too broad a notion, impossible to evaluate)
- disease and assessment (present in the theoretical definition but missing from the coding book and not found in the transcripts)
- demography and aging (redundant with sociodemographic characteristics)

Somatic risks were evaluated as cardiovascular risk factor, risk of falling factors (calculated with the CETAF score) (25), an assessment of hygiene, nutrition and physical activity at the discretion of the FP.

This questionnaire was accepted by the scientific committee of the research team and tested with FPs and medical students.

Thanks to the comments made during the first pilot study, a revised questionnaire was used for those patients included from September to November 2015. The question order was actually rearranged to ease and shorten the time needed to complete it. No question could be asked before the previous one had been answered in order to avoid omitting data. The FP was only asked question number 40 if he/she had answered « yes » to organized or individual screening in question number 39 to avoid errors in completion identified in previous studies.

Data were saved using Microsoft Excel and computed by the online survey software EVA-LANDGO ®.

24 months after inclusion, FPs were contacted by email or phone (INSERER APPENDIX 5) to collect patient status information. Two types of status were defined after a consensus had been reached in a peer group gathering on multimorbidity made up of physicians, residential students and researchers in family practice: « decompensation » (D) and « Nothing to Report » (NTR). Decompensation was understood as the occurrence of hospitalization of at least 7 days duration, or death, during the 24 months of follow-up, as the mean duration for hospitalization in the European Union is 6.7 days (26).

Groups labelled « frail » or « not frail » in the feasibility study were changed at the six-month follow-up as confusion between « frail » and « frailty » might occur and this would include a definition which was not

consensual (27).

Data analysis

Data cleaning was performed to harmonize data for analysis. The ICD 10 was used to standardize the mentioned chronic diseases. 102 chronic diseases were reported.

Missing data were spotted during descriptive statistics analysis. They were replaced by the median value to be incorporated into the statistical analysis.

Each modification and the reasons for it were compiled in the « dictionary » available on demand from the corresponding author.

A description of the population was the first step. Both types of status « decompensation » and « nothing to Report » were compared using a bi-dimensional analysis for each variable.

Quantitative variables were compared using a Fischer's exact test or a chi-2 test with an alpha level set at 5 %. Qualitative variables were compared using a Student's test when it followed a normal distribution to compare the means of the two groups from a normal population, and a Shapiro-Wilk's test when it did not follow a normal distribution, to compare the medians of the two groups.

Patients with the same characteristics, regardless of status « Decompensation » or « Nothing to Report », were grouped together using a multidimensional analysis. Non-discriminating and non-descriptive variables were removed. Then, a clustering represented in a dendrogram and a multiple correspondence analysis (MCA) were performed to identify discriminating variables for each group and the resulting information was combined using the technique of hierarchical clustering on principal components (HCPC).

The second step comprised a statistical analysis of the follow-up. A logistic regression was used for the six and nine-month follow-up as the dependent variable was binary (D versus NTR), regardless of follow-up time. A Cox model was chosen to complete the analysis from the twelve-month study, making it possible to apply different durations of follow-up time to support each patient. The aim was to find the best subgroup of variables for predicting and explaining the patient's status at 24 months.

At first, the overall survival of the two populations for each variable were compared using a non-parametric estimator by Kaplan-Meier, with a Wilcoxon test of alpha-risk at 5%. Then, the team estimated the survival function using semi-parametric models. A Hazard Ratio (HR) was first obtained by a univariate analysis using Cox's Model. Then, an adjusted HR was obtained with a multivariate analysis using Cox's model, representing the association between a variable and the decompensation risk factor.

Results

Sample participants

137 patients were included by 31 FPs. Out of the 137 patients, 6 were excluded for failing to complete questionnaires or for duplicate questionnaires. The status at 24 months was collected for all 131 patients. 11 were lost in follow-up because of a change of FP or because the FP ceased working. (Figure 1)

Data cleaning and recoding

Some variables were removed from data analysis because they were:

- not discriminating: divorce, use of pharmacological treatment, neglect of the patient, patient victim of iatrogeny, nursing home, lack of entourage
- of no use: identification number, inclusion date, date of birth (expressed as age)
- Irrelevant for the objective (referring to FPs feelings): variables related to quality of care, detection of multimorbidity and doctor self-assessment, detailed and/or complex medical history.

The recoding data work was transcribed in a dictionary (available on demand from the corresponding author).

Characteristics of the patients included

A cluster dendrogram was summarized from a hierarchical ascending classification (FIGURE 2). Inertia gain determined the number of clusters and, thanks to the clustering quality index, three groups were retained. The MCA factor map projected those three groups in two dimensions.

A comparison of the proportion within the group (PwG), and within the study population (PwP), was carried out for each variable for the purpose of characterizing all three groups. (Figure 3)

CLUSTER 1: This was the largest cluster. A large majority of the patients did not suffer from psychosomatic disease (PwG: 95.1 % vs PwP: 63.4 %), had no daily use of psychotropic medication (PwG: 85.2% vs PwP: 56.5 %) and no reaction due to stress (PwG: 86.9 % vs PwP: 63.4 %). They used coping strategies (PwG: 88.5 % vs PwP: 66.4%) and had a low risk of falls (PwG: 77.0 % vs PwP: 49.6 %). Very few suffered from osteo-articular disease (PwG: 65.6 % vs PwP: 44.3 %).

CLUSTER 2: For the most part, they had osteo-articular disease (PwG: 85.4 % vs PwP: 55.7 %), psychosomatic disease (PwG: 65.8 % vs PwP: 36.6%), reaction due to severe stress (PwG: 75.6% vs PwP: 36.6%), postural instability (PwG: 75.6 % vs PwP: 55.7 %) and had a medium risk of falls (PwG: 63.4% vs PwP: 38.9%). Women were a large part of the group (PwG: 78.0% vs PwP: 53.4%). Most of them had a healthy diet (PwG: 75.7 % vs PwP: 51.9%).

CLUSTER 3: this group included Patients who, in most cases, lacked proper hygiene (PwG: 79.3 % vs PwG: 23.7 %) or physical activity (PwG: 96.5% vs PwG: 63.4%). None of them had a healthy diet (PwG: 100% vs PwG: 48.1%). Most suffered from psychosomatic disease (PwG: 62.0% vs PwG:36.6 %) and used psychotropic drugs on a daily basis (PwG: 79.3% vs PwG: 43.5%). Some of them were socially vulnerable (PwG: 41.4% vs PwG: 14.5%) and had addictions (PwG: 34.5 % vs PwG: 13.7 %) as a psychological factor. They frequently failed to comply with screening (PwG: 55.2% vs PwG: 29.8%) and did not adopt coping strategies (PwG: 62.0% vs PwG: 33.6%).

Status at 24 months

44 patients (36.6 % of the cohort) belong to the D group and 76 (63.4 %) to the NTR group.

Variables of each group are reported in TABLE 2.

The analysis highlighted several characteristics for the patients belonging to the D group:

- they were more likely to suffer from postural instability (73% vs 49%, p-value = 0.018)
- They were more likely to be single or widowed (52% vs 30%, p-value = 0.028)
- Equipment at home was more readily available (39% vs 13%, p-value = 0.003)
- More human help was available at home (52% vs 26%, p-value = 0,008)
- Their medical history was detailed and more complex (93% vs 68%, p-value = 0.004).

Among the quantitative variables, six were significant with an alpha-risk at 5%:

- the patients in the D-group were older (80 years old vs 69 yo, p-value <0.001)
- They had more diseases, taking into account both chronic and acute conditions (7 vs 6, p-value = 0,016)
- They visited their FPs more often (12 vs 4, p-value = 0.010)
- They took more medication per day (8 vs 7, p-value = 0.003)

Survival analysis

The overall survival for each variable and between the D and NTR groups was compared using the non-parametric estimation of Kaplan-Meier.

The probability of no decompensation at 24 months was 63.3 % (95% IC, (55.3%–72.6%). Two variables had a significant protective effect: excess weight (Log-rank test, p-value = 0.038) and not being single or widowed (Log-rank test, p-value = 0.015). On the other hand, four were significantly linked to decompensation: detailed and complex medical history (Log-rank test, p-value = 0.003), human help at

home (Log-rank test, p-value: 0.002), equipment to help at home (Log-rank test, p-value < 0.001) and multiple complaints patient (Log-rank test, p-value = 0.03). (Figure 4)

Twenty-five variables appeared to be linked to the risk of decompensation according to a uni-variate analysis by Cox regression. They are referred in TABLE 3. Sixteen of them were statistically significant with an alpha risk at 5% (in bold in TABLE 3). Four of them had a protective effect (in italics in TABLE 3) whereas twelve were predictive of decompensation.

Among those sixteen variables, an expert consensus chose four of them (number of FP consultation per year, total number of diseases, CETAF score, multiple complaints) and integrated them into the multivariate analysis.

Due to the adjusted HR, it appeared that a high number of FP consultation per year was significantly associated with decompensation (HR 1.06, IC 95% [1.03; 1.10], p-value <0.001). Patients in the D group had a mean of 12.52 consultations per year compared with 9.08 in the NTR group. Also, a higher total number of diseases seemed to be significantly associated with decompensation (HR 1.12, IC95% [1.01; 1.25], p-value = 0.039), as patients in the D group had an average of 7.32 diseases compared with 6.11 in the NTR group. (Table 4)

Discussion

Main results

The purpose of this survey was to assess which FP criteria in the EGPRN definition of multi morbidity were the most accurate for identifying patients at risk of decompensation. Over 24 months of follow-up, this study highlighted 2 variables associated with decompensation: « number of visits to FPs » and « total number of diseases ». Those two variables are sub themes of « health care consumption » in the definition of multimorbidity, according to the EGPRN.

Strengths and limitations of the study

Selections bias. FPs who selected multimorbid patients were aware of the study's aim. They may have selected patients with a high risk of decompensation although this bias was minimized by the exclusion criteria « estimated survival less than 3 months ». For the most part, FP recruiters were clinical teachers. It is a well-known fact that clinical teaching FPs undertake work which differs from that of non-teaching FPs (28) (29). Therefore, results with a more general population might be different.

Information bias. To avoid missing data, the questionnaire was modified after the first inclusion period: moving to the next question was impossible without answering the previous one. As this move has effectively avoided omitting data and increased the response rate to some questions, it may have significant impact on the results of the statistical analysis.

Some data were missing and others were inconsistent. The origin of that issue may be due to some unclear and/or laborious questions and to the length of the questionnaire. Missing data were removed in the statistical analysis to reduce information bias.

Exhaustion after 24 months of follow-up and lack of time to find the answer to some questions may have caused some errors or omitted data.

The 102 chronic diseases reported by the FPs during the study were clustered in a single category, and others were moved into the acute disease or risk factor category. To limit information bias, the clustering was decided by the scientific committee using the ICD 10.

Although the CETAF score was not validated for the under 65-year-olds, the team assumed that it would not be high for people under 65 years old and would have no impact on the statistical analysis result. Therefore, the CETAF score was calculated for every patient (30).

Data transcription from the Evalongo software which was used to complete each questionnaire as an Excel file, in order to ease the analysis, may result in some transcription errors.

Confounding bias

With regard to the questionnaire, themes and sub themes of the English EGPRN definition of multi morbidity had to be translated into French, and some errors of translation could have occurred. Between the two inclusion periods, some quantitative concepts were transformed into qualitative variables, which may have led to errors of transformation.

Given the small number of patients, there was a large number of variables that might have hampered the analysis. With the intention of reducing those difficulties, the decision was made to reduce the number of variables, following expert advice. The variables removed were those which were redundant or not statistically relevant according to the peer group.

Lastly, and despite the fact that it has the virtue of being objective, clinical and valid in literature, the judgment criterion for « decompensation » defined as hospitalization for at least seven days, or death, could be a subject for discussion. However, this choice avoided confounding bias.

Key points

At the 24-month follow-up, the number of visits to the FPs and total number of diseases were the most useful variables of the EGPRN definition of multimorbidity to predict decompensation. Contrary to the follow-up at 6 months, family problems were not found to be significant.

Every study before that cohort has failed to assess the meaning or the intensity of the relationship between multimorbidity and health outcomes (31) (32). These two variables will help to clarify the

concept of multimorbidity when the subject in question is specifically the decompensation outcome. In addition, it will ease the burden for FPs in their clinical practice as they work to identify patients who are at risk of decompensation, and to prevent this outcome.

The number of FP consultation per year was also found to be a risk factor for decompensation in the previous studies at 6, 9, 12, 15 and 18 months (24).

Earlier studies had found an association between multimorbidity and the number of FP visits (18) (33) (34).

The follow up at 6 months found that « age », « number of visits to FPs » and « family problems » were linked to the risk of decompensation. As « age » is a non-modifiable factor, only « family problems » and « number of visits to FPs » could help to prevent decompensation. At 24 months, « age » was significantly linked to decompensation in the univariate analysis but the expert group didn't integrate it into the multivariate analysis.

As regards « family problems », belonging to the psychosocial risk factor theme, the univariate analysis at 24 months did not find a link with a risk of decompensation, contrary to the previous studies.

These differences may be explained by the fact that more patients were included than previously which can lead to some changes in the characteristics of the population, as could the fact that eleven were lost to follow-up. Finally, the amendments made to the questionnaire may have interfered with the results of the statistical analysis.

Implications for practice, teaching and future research

In everyday practice, FPs should keep in mind that a multimorbid patient who frequently visits them is at risk of decompensation. This point is easy to deal with and costs nothing to monitor in primary care.

Trainees in family medicine should be aware of this risk factor.

This study is included in an EGPRN project and is destined to be reproduced as a large-scale European study. It is apparent that a clear understanding of the concept of multimorbidity and of the risk factors for decompensation should have a major impact on managing multimorbid patients and on health system expenditure.

It could be interesting that some variables originated from patients, even though this contribution may be considered subjective.

A new, simpler and less demanding questionnaire, should be proposed in further studies in order to avoid errors or data omission due to recruiters being short of time.

As the total number of diseases was not found to be a risk factor at the previous follow-up, a future study should be run in order to establish a standardized disease classification that could help to identify multimorbidity and its risks of decompensation.

Conclusions

Once again, the number of FP consultation is found to be a risk factor for decompensation among multimorbid patients in this 24 months of follow-up study. For the first time in this cohort, the total number of diseases was shown to be a risk factor for decompensation. Meanwhile family problems are no longer considered a risk factor. A large-scale study should complete and confirm these outcomes which would, in turn, facilitate research and clinical practice on the concept of Multimorbidity, an key topic of the EGPRN.

Abbreviations

EGPRN: European General Practitioners Research Network

WHO: World Health Organization

WONCA: World Organization of National Colleges, Academies and Academic Associations of General Practitioners/Family Physicians

FP: family physician FM: family medicine

HR: hazard ratio

MCA: multiple correspondence analysis

HCPC: hierarchical clustering on principal components

NTR: nothing to report

D: decompensation

Declarations

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Ethics approval and consent to participate:

The study was approved by the ethics committee of the « Université de Bretagne Occidentale » Faculty of Medicine, Brest. The participants had to sign a written informed consent to participate in the study.

Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

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Consent for publication

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The authors declare that they have no competing interests.

Author contributions

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Methodology: AP, NP, LS, LGD, DJ, VJ, FJ, GF, LRJY

Project administration: LRJY

Resources: LRJY

Supervision: LRJY

Validation: LRJY

All Authors read and approved the final version of the manuscript.

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Tables

Table 1: Themes and subthemes of the multimorbidity

THEMES	SUBTHEMES
Chronic disease	Chronic condition Chronic diseases Complexity characteristics of chronic disease Psychosomatic disease
Acute disease	Acute condition Acute disease Complexity characteristics of acute disease Reaction to severe stress and acute disorders
Biopsychosocial factors and somatic risk factors	Demographic risk factor Lifestyle Patients beliefs/expectations Physiopathology Psychological risk factors Psychosocial risk factors Sociodemographic characteristics Somatic risk factors
Coping	Patient's coping strategies
Burden of diseases	Disease morbidity Disease complication
Health care consumption	Use of carers Disease management Health system Health care policy Health care Health care services Malpractice

	Assessment Medical history Medical procedure Pain Polypharmacy Prevention Symptoms/signs/complaints Treatment or medication Cost of care
Disability	Handicap Functional impairments
Quality of life	Health status Impairment Morbidity implication Quality of life
Frailty	Frailty
Social network	Dependence on social network Family's coping strategies Social isolation Social network Support from social network
Health outcomes	Outcomes Medical research epidemiology Mortality
Core competencies of FP	Holistic approach Practical experience of general practitioners with patients

	<p>General practitioner, as a sole expert in multimorbidity</p> <p>Expertise of the general practitioner</p> <p>"Gut feeling"/Intuition</p> <p>Person-centred care</p> <p>Primary care management</p> <p>Specific problem-solving skills</p>
Relationship between FP and patient	<p>Communication challenge</p> <p>FP's and patient's experience</p>

Table 2 : characteristics of D group and NTR group for each variable as described by FPs

		Study Population N=120 (100%)		Decompensation (D) N= 44 (36,6%)		Nothing to Report (NTR) N= 76 (63,4%)		p-value
Qualitative variables		N	%	N	%	N	%	Chi ² /Fisher
Men		57	48 %	22	50%	35	46%	0,820
Women		63	52%	22	50%	41	54%	
<i>Somatic risk factors and disease</i>								
Osteoarticular disease		66	55%	29	66%	37	49%	0,102
Hypertension		76	63%	32	73%	44	58%	0,153
Hypercholesterolemia		52	43%	20	45%	32	42%	0,868
Diabetes		31	26%	10	23%	21	28%	0,708
Psychosomatic disease		43	36%	14	32%	29	38%	0,617
Complexity of chronic disease		61	51%	27	61%	34	45%	0,117
Complication of acute disease		12	10%	4	9%	8	11%	1,000
Reaction to severe stress		44	37%	19	43%	24	33%	0,352
Cardiovascular family history		27	23%	6	14%	21	28%	0,123
Overweight		47	39%	12	27%	35	46%	0,066
Immunosuppression		15	13%	6	14%	9	12%	1,000
Postural instability		69	58%	32	73%	37	49%	0,018
Falls in year		25	21%	12	27%	13	17%	0,276
Number of falls in year	0	95	79%	32	73%	63	83%	0,253
	1	16	13%	6	14%	10	13%	
	2	6	5%	4	9%	2	3%	
	3 or more	3	3%	2	5%	1	1%	

CETAF Score	Great risk	12	10%	6	14%	6	8%	0,315
	Medium risk	62	52%	19	43%	43	57%	
	Small risk	46	38%	19	43%	27	36%	
Psychological risk factor								
Risk behaviour		3	2,5%	0	0%	3	4%	0,297
Suicide risk		5	4%	3	7%	2	3%	0,355
Addiction		14	12%	2	5%	12	16%	0,120
No psychological risk factor		102	85%	41	93%	61	80%	0,100
Psychosocial risk factor								
Unemployment		3	2,5%	0	0%	3	4%	0,297
Marital problems		9	8%	4	9%	5	7%	0,886
Stress at work		9	8%	3	7%	6	8%	1,000
Family problems		20	17%	10	23%	10	13%	0,271
Financial and social vulnerability		13	11%	2	5%	11	14%	0,167
Death of one or more loved ones		21	18%	10	23%	11	14%	0,370
Divorce		2	2%	0	0%	2	3%	0,532
Lifestyle								
Good hygiene		92	77%	34	77%	58	76%	1,000
Physical activity		45	38%	16	36%	29	38%	1,000
Healthy diet		63	50%	26	59%	37	49%	0,363
No positive answer		21	18%	6	14%	15	20%	0,550
Socio professional category (SPC)								
	Farmer	15	13%	5	12%	10	13%	0,743
	Artisan	17	14%	8	19%	9	12%	
	Executive	7	6%	1	2%	6	8%	

	Intermediate profession	19	16%	8	19%	11	14%	
	Employee	18	15%	7	16%	11	14%	
	Worker	18	15%	7	16%	11	14%	
	Unemployed	25	21%	7	16%	18	24%	
<i>Family situation</i>								
	In a relationship	74	62%	21	48%	53	70%	0,028
	Single or widowed	46	38%	23	52%	23	30%	0,028
	Having children	31	26%	11	25%	20	26%	1,000
<i>Entourage characteristics</i>								
	Absence of entourage	17	14%	8	18%	9	12%	0,491
	Supporting entourage	66	55%	23	52%	43	57%	0,790
	Dependency of entourage	22	18%	12	27%	10	13%	0,093
	Coping strategies	24	20%	13	30%	11	14%	0,080
<i>Health care</i>								
	Pharmacological treatment	120	100%	44	100%	76	100%	NI
	Treatment at risk	43	36%	18	41%	25	33%	0,493
	Daily use of psychotropic medication	50	42%	16	36%	43	45%	0,481
	Coordination procedures	63	53%	24	55%	39	51%	0,879
	Good communication between other carers	107	89%	37	84%	70	92%	0,291
	Neglect of the patient	6	5%	2	5%	4	5%	1,000
	Patient victim of iatrogeny	14	12%	3	7%	11	14%	0,335
	Equipment for patient at home	27	23%	17	39%	10	13%	0,003

Human help at home	43	36%	23	52%	20	26%	0,008
Lack of time and remuneration	34	28%	15	34%	19	25%	0,393
Detailed and complex medical history	93	78%	41	93%	52	68%	0,004
Vaccination97 recommended	97	81%	36	82%	61	80%	1,000
Screening proposed	70	58%	24	55%	46	61%	0,654
Screening accepted	78	70%	30	73%	48	68%	0,686
Therapeutic education proposed	22	18%	8	18%	14	18%	1,000
Patient in pain	54	45%	24	55%	30	39%	0,159
Residing in nursing home	3	2,5%	2	5%	1	1%	0,553
Multiple complaints	38	32%	19	43%	19	25%	0,063
Good knowledge of health care system	106	88%	40	91%	66	87%	0,709
Used to solving complex problems	116	97%	42	95%	74	97%	0,623
Global vision of patient's diseases	119	99%	43	98%	76	100%	0,367
Cares focused on needs and expectations	118	98%	43	98%	75	99%	1,000
Long term relationship	119	99%	43	98%	76	100%	0,367
Feeling that something bad had happened	78	65%	32	73%	61	46%	0,249
Good quality communication	119	99%	43	98%	76	100%	0,367
Impact on the quality of follow-up	96	80%	37	84%	59	78%	0,538
	Study		Decompensation		Nothing to		P value

	Population N=120 (100%)		(D) 44 (36,6%) N=		Report (NTR) N= 76 (63,4%)		
Quantitative variables	Median	(Q1-Q3)	Median	(Q1-Q3)	Median	(Q1-Q3)	Wilcoxon/ Mann-Whitney
Average age	73,0	(52-30)	80,5	(73-85)	69,0	(61-78)	<0,001
Total number of diseases	6,0	(5-8)	7,0	(6-8)	6,0	(5-8)	0,016
Number of chronic diseases	6,0	(4-8)	6,0	(5-8)	5,0	(4-7)	0,019
Number of Acute diseases	0,0	(0-1)	0,0	(0-1)	0,5	(0-1)	0,643
Number of treatments	7,0	(5-9)	8,0	(6-10)	7,0	(4-8)	0,003
Number of FP consultation per year	10,0	(6-12)	12,0	(7-14)	8,0	(6-12)	0,021
Number of specialist consultation per year	3,0	(2-5)	3,0	(2-5)	3,0	(2-5)	0,755
Number of times health paramedics used per year	6,0	(2-30)	12,0	(4-43)	4,0	(2-20)	0,010
Number of biological tests performed per year	1,0	(1-2)	2,0	(2-3)	1,0	(1-2)	0,447
Number of medical imaging tests per year	1,0	(0-2)	1,0	(1-2)	1,5	(0-2)	0,734
CETAF score	3,0	(2-5)	4,0	(2-5)	3,0	(2-4)	0,075

NI : not interpretable Bold : significantly results

Table 3: Univariate analysis

	HR	IC95%	p
Joint or bone diseases	1,80	[0,93 ; 3,54]	0,083
Chronic disease complication	1,68	[0,91 ; 3,08]	0,095
Family history of cardiovascular disorders	0,46	[0,19 ; 1,08]	0,075
<i>Excess weight</i>	0,51	[0,26 ; 0,98]	<i>0,044</i>
Postural instability	2,28	[1,17 ; 4,43]	0,015
Family problems	1,84	[0,91 ; 3,73]	0,090
<i>In a relationship</i>	0,49	[0,27 ; 0,89]	<i>0,019</i>
Coping strategies	1,85	[0,97 ; 3,54]	0,062
Equipment for patient at home	2,80	[1,52 ; 5,15]	0,001
Human help at home	2,48	[1,37 ; 4,49]	0,003
Detailed and complex medical history	4,97	[1,54 ; 16,06]	0,007
Multiple complaints	1,93	[1,06 ; 3,51]	0,031
Dependency of entourage	1,94	[1,00 ; 3,77]	0,051
<i>Global vision of patient's diseases</i>	0,05	[0,01 ; 0,43]	<i>0,006</i>
<i>Long term relationship</i>	0,05	[0,01 ; 0,43]	<i>0,006</i>
<i>Good quality of communication</i>	0,05	[0,01 ; 0,43]	<i>0,006</i>
Number of times health paramedics used per year	1,00	[1,00 ; 1,00]	0,006
Age	1,07	[1,03 ; 1,11]	<0,001
Number of FP consultation per year	1,07	[1,03 ; 1,11]	<0,001
Number of treatments	1,14	[1,05 ; 1,25]	0,003
Number of chronic diseases	1,15	[1,03 ; 1,28]	0,012
CETAF score	1,17	[1,03 ; 1,34]	0,015
No psychological risk factor	2,70	[0,84 ; 8,74]	0,096
Total number of diseases	1,15	[1,03 ; 1,28]	0,012
Number of biological tests per year	1,12	[0,99 ; 1,27]	0,060

In Bold : significant results in Italics : protective effect

Table 4: Adjusted Hazard Ratio after multivariate analysis:

	HR	IC95%	p
Number of FP consultation per year	1,06	[1,03 ; 1,10]	<0,001
Total number of diseases	1,12	[1,01 ; 1,25]	0,039

Figures

Figure 1 : Flow Chart

Figure 1

Flow Chart

Figure 2

A cluster dendrogram summarized from a hierarchical ascending classification

Figure 3

HCPC – factor map

Figure 4

Overall survival curve of the cohort

Supplementary Files

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