

Evaluation of a patient-centered integrated care program for individuals with frequent hospital readmissions and multimorbidity

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Abstract

Managing patients with multimorbidity and frequent hospital readmissions is a challenge. Integrated care programs that consider their needs and allow for personalized care are necessary for their early identification and management. This work aims to describe these patients' clinical characteristics and evaluate a program designed to reducing readmissions. This prospective study analyzed all patients with ≥ 3 admissions to a medical department in the previous year who were included in the Internal Medicine Department chronic care program at the Lucus Augusti University Hospital (Lugo, Spain) between April 1, 2019 and April 30, 2021. A multidimensional assessment, personalized care plan, and proactive follow-up with a case manager nurse were provided via an advanced hospital system. Clinical and demographic variables and data on healthcare system use were analyzed at 6 and 12 months before and after inclusion. Descriptive and survival analyses were performed. One hundred sixty-one patients were included. Program participants were elderly (mean 81.4 (SD 11) years), had multimorbidity (10.2 (3) chronic diseases) and polypharmacy (10.6 (3.5) drugs), frequently used the healthcare system, and were highly complex. Most were included for heart failure. The program led to significant reductions in admissions and emergency department visits ($p = .0001$). A total of 44.7% patients died within 1 year. The PROFUND Index showed good predictive ability ($p = .013$), with high values associated with mortality (RR 1.15, $p = .001$). Patients with frequent hospital readmissions are

highly complex and need special care. A personalized integrated care program reduced admissions and allowed for individualized decision-making.

Keywords

Multimorbidity; Multiple chronic conditions; Hospital readmissions; Long-term care; Integrated health care systems; Case management

Introduction

Progressive population aging and an exponential increase in patients with multimorbidity has spurred substantial changes in traditional healthcare models [1,2,3]. Elderly, multimorbid patients are an extraordinary challenge for healthcare systems [3, 4] and, to that end, multiple strategies have been developed for outpatient monitoring and follow-up on them [5, 6]. These strategies generally focus on patients with a specific chronic disease [7]. Strategies vary widely [8] and can be difficult to implement in clinical practice [9]. Therefore, it is not easy to evaluate the real impact of their outcomes [4, 9]. In hospitals, polypathological patients have become a growing problem. This population has frequent readmissions which often occur within a short period of time [10,11,12]. Multiple hospitalizations are common among patients with significant healthcare needs who have a high degree of frailty and this consumes a large amount of healthcare resources [2, 12]. It seems reasonable to infer that they require a different type of care [13]. Consequently, it is necessary to identify these patients, define the scope of their healthcare needs, and determine if special early-detection programs guided by their characteristics are appropriate for their clinical management and lead to improvements in care [14]. To do so, other risk factors for readmission beyond the number of previous hospitalizations must be weighed [2, 15], such as the characteristics of their chronic diseases, degree of dependence, social support, medication reconciliation, or appropriate care transitions [13, 16, 17]. However, despite its importance, to date, few specific programs have been designed to address this issue, there are not enough long-term studies on patients with multimorbidity [7], and it is very difficult to identify those at high risk of readmission [11, 12].

The aim of this study is to describe the characteristics of patients with multimorbidity and frequent readmissions and to evaluate a specific program for integrated hospital care designed to reduce future readmissions.

Material and methods

This work is a prospective cohort study of all consecutive patients included in a comanagement program for chronic patients in the Medical Outpatient Department (HDDPRO, for its initials in Spanish) of the Lucus Augusti University Hospital (HULA, for its initials in Spanish) in Lugo, Spain, between April 1, 2019 and April 30, 2021. The HULA has 887 beds and serves a catchment area that includes 350,000 patients in Galicia (Northwestern Spain), with an average of 22,000 hospital admissions per year.

To be included, patients had to meet all of the following criteria:

Three or more admissions to a medical department in the last calendar year.

Belong to the HULA's reference healthcare district.

Meet the criteria for being considered a polypathological [18] or complex chronic patient (at least one chronic disease with progressive, limiting organ failure; polypharmacy (five or more drugs); and significant use of healthcare services) along with risk of frequent decompensation.

Have good family and social support.

Agree to be included in the program.

The exclusion criteria were meeting at least one of the following criteria:

Fewer than three admissions to a medical department in the last calendar year or multiple admissions to a surgical department.

Repeated scheduled admissions for diagnostic or therapeutic techniques (for example, cardiac catheterization, endoscopic retrograde cholangiopancreatography, band ligation of esophageal varices, etc.).

Not belonging to the HULA's reference healthcare district.

Death prior to possible inclusion.

Institutionalization in a residential nursing home.

Severe cognitive decline (8–10 errors on the Pfeiffer questionnaire).

Inclusion in other comanagement or specific hospital programs (palliative care, internal medicine unit for patients with heart failure, hemodialysis, peritoneal dialysis, liver or heart transplant unit).

Patient selection

Since the program's creation, the center's admissions department has sent a list of all patients admitted each day who had had three or more admissions to a medical department in the last 365 days. First, a case manager nurse who was trained for this task conducted a review of the electronic medical record of each candidate and selected those who met the inclusion criteria. Second, in a meeting between the case manager nurse and the internal medicine physician assigned to the program at that time, the medical records were reviewed again and patients were selected for inclusion in the program. Third, the case manager nurse identified and conducted an initial intervention during the hospitalization (or via telephone in the first 24–48 h after discharge for patients who were not able to be reached in the hospital). Patients were given an appointment within a maximum of 14 days from discharge for a comprehensive evaluation. In the first visit, a specific care plan was designed for each patient. It included a medical record, physical examination, and comprehensive individual evaluation which included demographic variables (age, sex, place of residence, social support), clinical variables (chronic diseases; high-risk and healthy habits; treatments; a nutritional, functional, cognitive, frailty, and geriatric syndrome evaluation; self-perception of health), and validated scales (Gijón Scale [19], Lawton-Brody Scale [20], EQ-5D-5L Questionnaire [21], Pfeiffer Questionnaire [22], PROFUND Index [18], PALIAR Index [23], Barthel Index [24], and Charlson Comorbidity Index [25]).

Then, a personalized follow-up plan was designed and appointments were scheduled. As part of this plan, the case manager nurse performed the following functions: proactive telephone contact; health education; evaluation of the patient's and caregivers' needs; review of treatment; training on self-management of their disease, including recognizing alarm signs and symptoms, hygiene and dietary education, and self-management of drug use (evaluation of bronchodilator technique, management of diuretics and insulin); contact with the primary care team from the time of inclusion, and contact with the Social Work Unit in cases in which it was necessary. Patients were given a folder with

recommendations, a contact telephone number, and information on the outpatient department healthcare process.

In addition, the program included the following tools: daily on-demand access via telephone in the event of alarm signs or symptoms for early intervention; scheduling of multiple appointment types through the department's manager (divided into emergency, scheduled, and telephone appointments) according to severity following an initial in-person or telephone evaluation; possibility of telemedicine with at-home telemonitoring if needed; and possibility of diagnostic and therapeutic techniques.

Study aims

Primary aims:

Describe the clinical characteristics of patients with multimorbidity and frequent readmissions.

Analyze whether a specific hospital-based integrated care program reduces readmissions and emergency department visits.

Secondary aims:

Determine the survival time of patients included in the program.

Evaluate if any of the prognostic indices included as part of the comprehensive evaluation was able to predict mortality risk.

Analysis of the variables

All clinical and demographic variables described in the previous section were analyzed. A comprehensive review of the medical record data from 6 and 12 months before and after inclusion in the program was conducted to determine use of healthcare resources, complications, and survival.

Ethical and legal aspects

The data were included in a registry approved by the Lucas Augusti University Hospital Clinical Research Ethics Committee. For this study, the following variables were collected: admitting department, date of entry into the program (inclusion date), and final

outcome on each of the evaluations. The sources of information included data from follow-up on each patient.

Statistical analysis

A descriptive analysis was conducted on the characteristics of the patients included. The chi-square test was used to compare qualitative variables (with the Yates correction when required). The two-tailed Student's *t*-test was used to compare quantitative variables and the ANOVA test was used for multiple comparisons. In cases in which normality was not demonstrated, the nonparametric Mann–Whitney *U* test and the Kruskal–Wallis test were used, respectively. The probability of survival was estimated in a univariate manner using the Kaplan–Meier method. Confidence intervals were calculated using standard methods. To calculate the difference between probabilities of survival, the log-rank test was used. On the Cox analysis, a level of significance of less than 5% was required on the univariate analysis for variables to be included. However, it was decided to include non-significant sociodemographic and clinical variables on the maximum likelihood model because they could modify the final outcome of the analysis. Prior to adjusting the model, possible collinearity among the candidate variables was evaluated. The proportionality of hazards was evaluated by graphic means. Based on the maximum likelihood model, we used a backward strategy as the modeling procedure. The interaction terms were first jointly analyzed, but they were not included in the final model as they were not significant. To remove a variable, we used the habitual criteria for the Wald test values and the maximum verisimilitude equation. All analyses were two-tailed and values of $p < 0.05$ were considered significant. The analysis was conducted using the SPSS 25.0 program [26].

Results

Patients' baseline characteristics

During the study's inclusion period, 329 patients with 3 or more admissions in the hospital's medical departments were detected. Of them, 168 (51.1%) were not included in the program: 94 (56%) for being in active monitoring by other departments, 69 (41%)

for not meeting the inclusion criteria, and 5 (3%) for declining to participate. In the end, 161 (48.9%) of patients were included.

The main clinical characteristics of patients categorized by sex are shown in Table 1. As a whole, the patients were elderly (mean: 81.4 (SD 11) years); had a high number of chronic diseases (mean: 10.2 (SD 3)); high comorbidity and prognostic index scores (PROFUND index: 8 (SD 4.3) and Charlson Comorbidity Index: 6.8 (SD 3)), and received a high number of drugs (mean: 10.6 (SD 3.5)). A total of 82.6% had some degree of dependence, mostly mild (38.2%). Among males, toxic habits, peripheral artery disease, and vision disorders were significantly more frequent. Among women, hypertension, obesity, thyroid disease, psychiatric disorders, and chronic bone and joint disease were significantly more frequent. The causes of hospital admission, categorized by sex, are indicated in Table 2. Whereas problems related to chronic obstructive pulmonary disease (COPD) were most common among men, problems associated with heart failure (HF) were most common among women.

Follow-up

During the follow-up period, five (3.1%) patients dropped out of the program (two due to a change of address, two due to a change in program, and one due to repeated noncompliance). Among the 156 patients who remained in the program, the mean number of in-person visits with the medical team was 3.1 (SD 3.3) at 6 months and 4.0 (SD 4.9) at 12 months. The mean number of in-person visits to the case manager nurse was 2.5 (SD 2.4) and 3.3 (SD 4.0) at 6 and 12 months, respectively. The mean number of telephone visits was 6.6 (SD 5.4) and 9.9 (SD 9.1) at 6 and 12 months, respectively.

Use of healthcare system resources

Table 3 shows emergency department visits and hospital admissions in the year before and the year after inclusion in the program. A significant reduction in both emergency department visits and hospital admissions was found. This finding was observed in patients who died as well as patients who remained in the program ($p = 0.0001$).

Survival analysis

The median survival time was 582 (SD 92.2) days. In the first 6 months, 42 (26%) of patients died and in the first year, 72 (44.7%) of patients died. Of them, 35 (48.6%) died in the hospital and 37 (51.4%) died at home.

Table 4 indicates the main characteristics of the patients who died and the patients who remained in the program. No statistically significant differences were found among the chronic diseases categorized by survival. The ROC curve for predicting mortality according to the PROFUND Index showed an area under the curve of 0.638 (95% CI 0.545–0.718) (Fig. 1). The PROFUND Index, measured at the start of follow-up, showed an adequate predictive capacity (Fig. 2) ($p = 0.013$). On the Cox univariate analysis, only the PROFUND Index classification was significantly associated with mortality (Wald 8.21; RR 1.15, 95% CI 1.09–1.21; $p = 0.001$).

Discussion

This study shows that the selection of patients with multiple hospital admissions adequately identifies a subgroup with multimorbidity and significant healthcare needs and that an integrated healthcare program of personalized, proactive follow-up reduces readmissions. In addition, it was observed that the PROFUND Index correctly predicts risk of mortality, which allows for tailoring care over time.

There are numerous studies on hospital monitoring programs for patients with specific pathologies and multiple admissions [10, 27, 28]. These works have demonstrated that early, planned continuity of care upon discharge is essential for reducing readmissions [29, 30]. These works have some limitations, such as the habitual analysis of readmissions within a very short period of time (30 days) [12, 31] or focusing mainly on financial impacts [32]. However, the reality of hospitalized patients with repeated admissions is very different: they have numerous concomitant diseases and one is not always clearly predominant, their readmissions are difficult to prevent, and their progress is unpredictable [2, 33]. For all of these reasons, it seems appropriate to pay special attention to them and provide follow-up for a longer period of time [16, 33]. Our program focuses on this type of highly complex patient, who are in fact quite simple to select [2]. Though the exact number of readmissions necessary for inclusion in the program is debatable, in

this study, we chose three admissions to a medical department for pragmatic reasons. This cut-off point can be revised in the future if needed.

Our program is similar to other existing models. It includes multidisciplinary teams [4, 8], healthcare personnel with specific training [7, 9], a nurse acting as a case manager [34], and telemedicine [35] as essential tools. Previous studies have indicated that the inclusion of all these tools prevents fragmentation of care [9, 34], allows for an early assessment of health status, and trains the team so they can provide a rapid response to specific problems, which leads to a reduction in the frequency of medical care and healthcare costs [3, 9, 35] as well as an improvement in patients' quality of life [3, 9, 34]. Our study demonstrates that this type of program used in patients selected according to the number of admissions to medical departments significantly reduces admissions and emergency department visits; this suggests an improvement in the patients' quality of life. The reasons underlying this program's success include the personalization of the program to each individual and their care needs which, in addition, change over time. This adaptation and the fact that it prevented overload or excessive effort expended on the patient's care are factors that should be taken into account in the design of future programs in similar populations.

These outcomes were achieved despite the fact that the patients selected were more complex than those included in other, more typical studies on this issue. Compared to patients from similar cohorts, our patients were older [8, 16], had a greater number of chronic diseases, had higher scores on prognostic indices, and used the healthcare system more frequently [16, 18, 36]. These differences were found both when we compared our patients with very similar populations in Mediterranean countries [16, 32, 36] and countries in the Americas [31, 33]. Nevertheless, the association between diseases and risk of readmission varies according to sex and age [17, 32] and there are important differences between healthcare systems due to sociocultural and demographic factors [17, 32, 37]. With patients who are complex and diverse and who have frequent hospital admissions, a patient-centered, multidisciplinary approach is more important than an approach that focuses on specific pathologies when it comes to reducing the readmission rate [31].

Lastly, though the programs described seem to increase survival time [9], the clinical characteristics of this subgroup of patients nevertheless entails a high mortality rate

during follow-up period [8, 15, 33]. Indeed, the probability of survival at 1 year was 60% in this study. Once patients have reached this state of health, decisions must be made that balance clinical care and life expectancy with the patient's needs and wishes [38]. Having an appropriate estimation of survival is key for achieving realistic objectives according to how advanced their chronic diseases are [4, 18]. In our study, the PROFUND Index was useful as a predictor of death at 1 year, with the data showing that intermediate-high risk and high-risk patients had a significant reduction in survival (Fig. 2). This approach could serve for deciding on diagnostic or therapeutic strategies for these groups of patients. Said strategies would probably be less invasive, more targeted at symptoms, and aimed at improving quality of life.

This study must be interpreted taking into account its strengths and limitations. Its main strengths are its homogeneity in data collection, the small number of losses, and a much longer follow-up period than what is common in similar studies [9, 12, 31]. However, some limitations must be considered when interpreting the findings. First, it is a single-center study. Though this means that the data are highly homogeneous, it must be reproduced in other centers in order to determine its true significance. Second, it can be claimed that it includes a very limited number of patients. The underlying reason for the sample size is that the results were both clinically and statistically significant on an intermediate analysis and, given that there are few studies on this subgroup of patients, we proceeded with analyzing the outcomes as these data would perhaps support the conduct of other studies and could be extrapolated to populations in other settings. Lastly, more studies are needed to specifically evaluate the effects of each of the program's components and their possible beneficial impact on quality of life.

Conclusions

In conclusion, this study found that patients with multiple admissions are very complex and need care adapted to their needs. Our data suggest that a personalized integrated follow-up and monitoring program reduces the number of future admissions and emergency department visits. In addition, it allows for individualized decision-making and better management of the burden of disease by the patient. Additional studies are needed to verify these findings.

Availability of data and materials

This material is the authors' own original work, which has not been previously published elsewhere. The paper is not currently being considered for publication elsewhere. The paper reflects the authors' own research and analysis in a truthful and complete manner. The results are appropriately placed in the context of prior and existing research. All sources used are properly disclosed (correct citation).

Code availability

Not applicable.

Conflict of interests

The authors declare that they have no conflicts of interest.

Ethics approval

The data were included in a registry approved by the center's Clinical Research Ethics Committee.

Consent to participate

Not applicable.

Consent for publication

All authors have been personally and actively involved in substantial work leading to the paper, and will take public responsibility for its content.

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Table 1 Main baseline clinical and demographic characteristics, categorized by sex

	Total (161 patients)	Women (81 patients (50.3%))	Men (80 patients (49.7%))	<i>p</i> value
Age	81.4 (11) Median = 84	82.8 (9.3)	80.0 (12.4)	.098
No. of chronic diseases	10.2 (3)	10.2 (3)	10.3 (3)	.805
No. of drugs	10.6 (3.5)	10.6 (3.2)	10.5 (3.8)	.874
Polypharmacy (> 5 drugs)	156 (96.9%)	79 (97.5%)	77 (96.3%)	.639
PROFUND index	8 (4.3)	7.8 (4)	8.4 (4.5)	.384
PALIAR index	5.6 (3.4)	5.7 (3.2)	5.5 (3.5)	.694
Barthel index	56.4 (35.3)	53.2 (34.9)	59.5 (36.3)	.287
Charlson comorbidity index	6.8 (3)	6.5 (2.7)	7.0 (3.3)	.322
Comorbidity (Charlson comorbidity index > 3)	137 (85.1%)	69 (85.2%)	68 (85%)	.974
Pfeiffer questionnaire	1.9 (2.6)	2.0 (2.6)	1.8 (2.7)	.699
Lawton-brody scale	2.6 (3.1)	2.3 (2.8)	2.9 (3.4)	.333
Social support	138 (89.6%)	70 (93.3%)	68 (86.1%)	.140
Social risk (Gijón Scale)	33 (21.4%)	12 (15.8%)	21 (26.9%)	.092
Chronic diseases				
Tobacco use	60 (37.3%)	4.0 (4.9%)	56 (70%)	.0001
Alcohol use disorder	42 (26.1%)	10 (12.3%)	32 (40%)	.0001
Hypertension	126 (78.3%)	69 (85.2%)	57 (71.3%)	.032
Diabetes	62 (38.5%)	32 (39.5%)	30 (37.5%)	.794
Dyslipidemia	72 (44.7%)	34 (42%)	38 (47.5%)	.481

Obesity	41 (25.5%)	28 (34.6%)	13 (16.3%)	.008
Atrial fibrillation	88 (54.7%)	48 (59.3%)	40 (50%)	.238
Ischemic heart disease	51 (31.7%)	22 (27.2%)	29 (36.3%)	.215
Valvular heart disease	51 (31.7%)	29 (35.8%)	22 (27.5%)	.258
Heart failure	121 (75.2%)	64 (79%)	57 (71.3%)	.254
Chronic obstructive pulmonary disease	70 (43.5%)	30 (37%)	40 (50%)	.097
Chronic respiratory failure	47 (29.2%)	27 (33.3%)	20 (25%)	.245
Stroke	33 (20.5%)	16 (19.8%)	17 (21.3%)	.814
Chronic kidney disease	83 (51.6%)	47 (58%)	36 (45%)	.098
Peripheral artery disease	29 (18%)	9 (11.1%)	20 (25%)	.022
Thyroid disease	25 (15.5%)	20 (24.7%)	5 (6.3%)	.001
Chronic anemia (hemoglobin < 10 g/dL)	69 (42.9%)	33 (40.7%)	36 (45%)	.585
Neoplasm (solid or hematologic)	31 (19.3%)	11 (13.6%)	20 (25%)	.066
Dementia	51 (31.7%)	27 (33.3%)	24 (30%)	.649
Psychiatric disorder	51 (31.7%)	36 (44.4%)	15 (18.8%)	.0001
Vision disorder	72 (44.7%)	30 (37%)	42 (52.5%)	.048
Hypoacusia	62 (38.5%)	29 (35.8%)	33 (41.3%)	.478
Urinary incontinence	83 (51.6%)	47 (58%)	36 (45%)	.098
Chronic bone and joint disease	62 (38.5%)	43 (53.1%)	19 (23.8%)	.0001

Values are expressed as means (standard deviation, range) and absolute values (percentage)

Table 2 Causes for hospital admission, categorized by sex

	Total	Women	Men
HF	71 (44.1%)	42 (51.9%)	29 (36.3%)
HF/COPD	28 (17.4%)	11 (13.6%)	17 (21.3%)
Other	25 (15.5%)	11 (13.6%)	14 (17.3%)
COPD	18 (11.2%)	7 (8.6%)	11 (13.8%)
Infections	11 (6.8%)	4 (4.9%)	7 (8.8%)
Anemia	8 (5%)	6 (7.4%)	2 (2.5%)

Acronyms: heart failure (HF), chronic obstructive pulmonary disease (COPD)

Table 3 Change in the number of emergency department visits and hospital admissions at 6 and 12 months before and after inclusion in the program

Type of care	Follow-up time	Total (143 patients)	<i>p</i> value	Survivors (76 patients (53.1%))	<i>p</i> value	Nonsurvivors (67 patients (46.9%))	<i>p</i> value
Hospital emergency department visits	6 months before inclusion	3.1 (2)	.0001	3.0 (1.5)	.0001	3.4 (2.4)	.0001
	6 months after inclusion	1.0 (1.2)		0.8 (1.1)		1.2 (1.4)	
	12 months before inclusion	4.6 (2.7)	.0001	4.5 (2.4)	.0001	4.7 (3)	.0001
	12 months after inclusion	1.4 (1.6)		1.3 (1.6)		1.5 (1.7)	
Hospital admissions	6 months before inclusion	2.4 (1.4)	.0001	2.2 (1.1)	.0001	2.7 (1.8)	.0001
	6 months after inclusion	0.8 (1.1)		0.5 (0.8)		1.2 (1.3)	
	12 months before inclusion	3.4 (1.7)	.0001	3.1 (1.2)	.0001	3.6 (2.2)	.0001
	12 months after inclusion	1.1 (1.5)		0.8 (1.4)		1.4 (1.5)	

Values expressed as means (standard deviation)

Table 4 Main baseline clinical and demographic characteristics, categorized by survivors and nonsurvivors

	Total (161 patients)	Nonsurvivors (72 (44.7%))	Survivors (89 (55.3%))	<i>p</i> value
Age	81.4 (11) Median = 84	82 (10.5)	81 (11.5)	.515
Sex				.698
Female	81 (50.3%)	35 (48.6%)	46 (51.7%)	
Men	80 (49.7%)	37 (51.4%)	43 (48.3%)	
No. of chronic diseases	10.2 (3)	10.1 (3)	10.4 (3.3)	.472
No. of drugs	10.6 (3.5)	10.8 (3.8)	10.4 (3.2)	.476
Polypharmacy (> 5 drugs)	156 (96.9%)	69 (95.8%)	87 (97.8%)	.485
PROFUND index	8 (4.3)	9.3 (4.2)	7.1 (4)	.001
Low risk (0–2 points)	10 (6.2%)	3 (4.2%)	7 (7.9%)	.013
Low-intermediate risk (3–6 points)	52 (32.3%)	18 (25%)	34 (38.2%)	
Intermediate-high risk (7–10 points)	56 (34.8%)	23 (31.9%)	33 (37%)	
High risk (\geq 11 points)	41 (26.7%)	28 (38.9%)	15 (16.9%)	
PALIAR index	5.6 (3.4)	6.3 (3)	5.1 (3.6)	.021
Barthel index	56.4 (35.3)	49.4 (35.8)	61.5 (34.2)	.045
Charlson comorbidity index	6.8 (3)	6.7 (3)	6.8 (3.1)	.878
Comorbidity (Charlson comorbidity index > 3)	137 (85.1%)	63 (87.5%)	74 (83.1%)	.441
Pfeiffer questionnaire	1.9 (2.6)	2.5 (3.2)	1.5 (2.1)	.060
Lawton-brody scale	2.6 (3.1)	1.8 (2.8)	3.1 (3.2)	.033
Social support	138 (89.6%)	63 (91.3%)	75 (88.2%)	.535
Social risk (Gijón Scale)	33 (21.4%)	14 (20.3%)	19 (22.4%)	.756

Values are expressed as means (standard deviation) and absolute values (percentage)

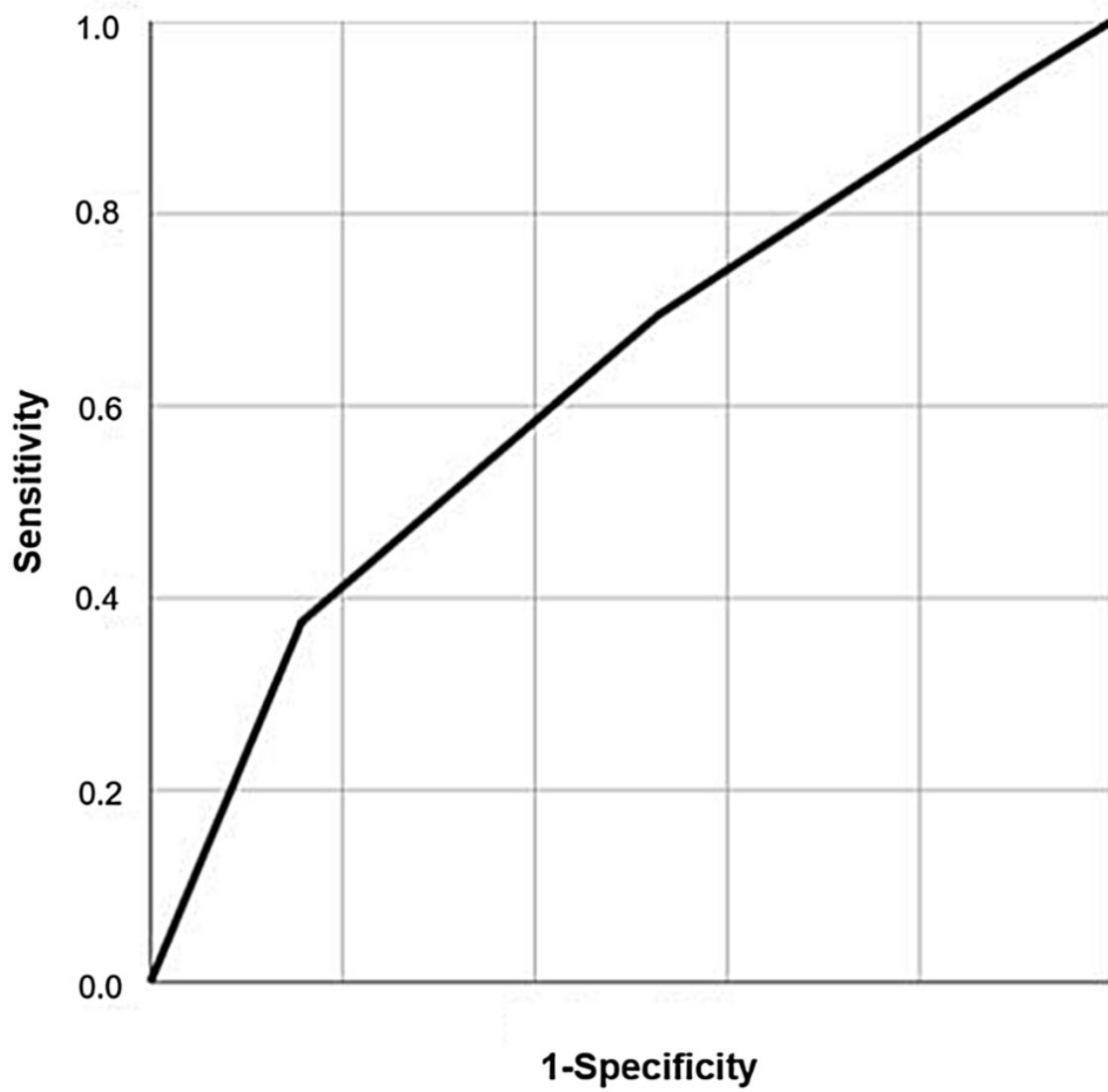


Fig 1 ROC curve for predicting mortality according to the PROFUND Index

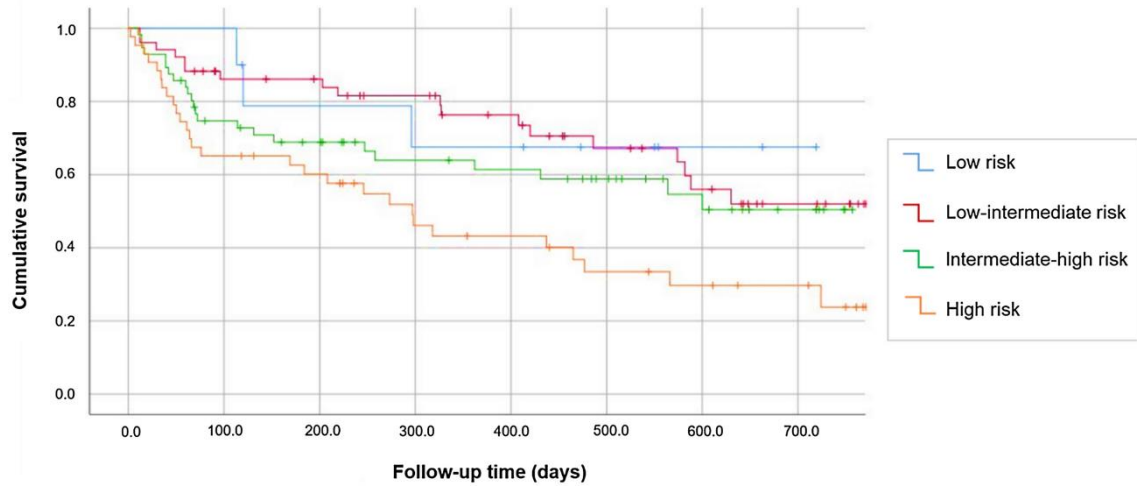


Fig 2 Kaplan–Meier survival curve at 2 years according to PROFUND Index risk groups