Ability of the Comprehensive Geriatric Assessment to Predict Frailty in Older People Diagnosed with Cancer in a General Hospital

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Abstract

The field of oncogeriatrics considers the comprehensive geriatric assessment (CGA) as the main tool for distinguishing between patients who are frail and those who are not frail. The aim of our study was to determine the role of the CGA in predicting the risk of frailty in elderly patients. This prospective study was conducted at the Cancer in the Elderly Unit of the Medical Oncology Department at the Virgen de la Luz General Hospital in Cuenca, Spain. Demographic data and information about the CGA were collected. Using a bivariate logistic regression analysis, these factors were analysed and the factors that are associated with the risk of frailty were determined, as measured by the Barber questionnaire (BQ). We included 262 patients in the study with a mean age of 79 years (range 70–93 years). Seventy-four percent of the patients (n=194) had a risk of frailty as measured by the BQ. In the bivariate analysis, only age (odds ratio [OR] 1.064, 95 % confidence interval [CI] 1.000–1.133, p=0.051), being divorced, widowed or single (OR 0.450, 95 % CI 0.216–0.937, p=0.033) and being dependent in instrumental activities of daily living (IADL) (OR 3.003, 95 % CI 1.181–7.638, p=0.021) were associated with a higher risk of frailty. The risk of being frail in an elderly patient with cancer is higher in patients dependent in IADL and in patients who are not married. Age is another risk factor for frailty.

Keywords

Frailty, comprehensive geriatric assessment, Barber questionnaire, elderly patients with cancer

Disclosure: The authors have no conflicts of interest to declare.
Received: 1 December 2011 **Accepted:** 23 January 2012 **Citation:** *European Oncology & Haematology*, 2012;8(2):85–8 *DOI: 10.17925/EOH.2012.08.02.85*
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Understanding frailty has become the focus of numerous investigations but, for the moment, there is no universally accepted definition. The concept of frailty has been developing over the past two decades. From the first article that referred to this term, published in 1953,[1] to the first article that referred to 'frailty in the elderly', published in 1991,[2] the number of publications using this term has increased tenfold. The phenotype best known and most widely publicised is that discussed by Fried et al.[3,4] In Spanish populations, the prevalence of frailty in the elderly ranges between 21.0 and 27.5 % in patients older than 65 years,[5] is 10 % among individuals aged between 70 and 79 years[6] and 46 % among those aged over 85 years.[7] However, these values depend heavily on the criteria used in the definition of frailty and the type of community studied. In the Women's Health and Aging Study (WHAS), the prevalence was 11.3 %[8] and in the Cardiovascular Health Study (CHS), the prevalence was 11.6 %.[9]

As the term 'frailty' is problematic, an operational definition of frailty has been used in this article based on the Barber questionnaire (BQ). This is the most widely used questionnaire for identifying risk to the elderly in the outpatient setting.[10,11] In general, it integrates, in a first-stage screening process, global strategies intended to more fully assess and intervene in selected elderly patients at risk, helping to prevent the occurrence of adverse events (mortality, hospitalisation or institutionalisation) in the short to medium term.[10–12]

Our study's aim was to determine which components of the comprehensive geriatric assessment (CGA), patient demographics and tumours predict which elderly patients diagnosed with cancer have a risk of frailty and which do not. It also seeked to develop a predictive model based on such characteristics and determine its predictive power.

Materials and Methods

Between March 2010 and October 2011, the Cancer in the Elderly Unit of the Medical Oncology Department at the Virgen de la Luz General Hospital in Cuenca, Spain, conducted a prospective study that included all patients over 70 years of age who had a diagnosis of cancer and who had been assessed at the unit. Patients signed a consent form to participate in this study. The study involved the systematic application of a specific model of the CGA and the application of the BQ, a test used routinely in our unit to assess the risk of frailty. The results from applying the questionnaire are variable. When considering the results of Spanish studies[13,14] and taking into account the original study by Barber,[10] the percentage of patients who complete the questionnaire is generally between 73 and 81 %. The sensitivity of the questionnaire to identify elderly patients at risk is approximately 94–95 %, the specificity is between 68 and 81 % and the positive predictive value (PPV) is between 91 and 94 %.[10,13,14]

The CGA model used was specifically designed by the authors of this article and represents the first model created for the elderly Spanish

Table 1: Population Characteristics

Variable	Percentage (n)
Sex	Male – 57.6 % (n=151) Female – 42.4 % (n=111)
Eastern Cooperative Oncology Group index	1- 48.3 % (n=117) 0- 34.3 % (n=83) 2- 12.8 % (n=31) 3- 4.1 % (n=10) 4- 0.4 % (n=1)
Marital status	Not married – 65 % (n=169) Married – 35 % (n=91)
Level of education	Can read and write – 60.7 % (n=156) Completed primary school – 25.3 % (n=65) Completed secondary school – 7.4 % (n=19) Can neither read nor write – 6.6 % (n=17)
Self-perception of health	Good – 61.9 % (n=153) Average – 30.8 % (n=76) Bad – 7.3 % (n=18)
Self-perception of health compared with their contemporaries	Better than or equal to their contemporaries – 88.2 % (n=216) Worse than their contemporaries – 11.8 % (n=29)
Type of tumour	Digestive tumour – 41.3 % (n=107) Breast and gynaecological tumours – 26.6 % (n=69) Urological and prostate cancer – 13.5 % (n=35) Lung cancer – 9.7 % (n=25) Others – 8.9 % (n=23)
Tumour stage	Not metastatic – 69 % (n=171) Metastatic – 31 % (n=77)

Table 2: Results of the Comprehensive Geriatric Assessment and the Barber Questionnaire

Variable	Percentage of Deficits	Mean/Range
Barber questionnaire	Risk of frailty (Barber>0): 74 % (n=194)	1.35/0–6
Barthel index	Dependence in ADL: 5.7 % (n=15)	89.27/0–100
Lawton–Brody index	Dependence in IADL: 22.8 % (n=57)	6.924/0–26
Pfeiffer test	Cognitive impairment: 6.6 % (n=17)	0.84/0–10
Charlson index	Severe co-morbidity (Charlson index ≥3): 7.6 % (n=19)	0.99/0–6
Nutritional status (Nutrition Screening Initiative)	Moderate to high nutritional risk (≥3): 52.5 % (n=136)	3.02/0–13
Social evaluation (Gijón scale)	Social risk (>14): 0 %	3.930/0–12
Consumption of medications	High daily consumption of drugs (≥5): 42.3 % (n=110)	4.31/0–15

ADL = activities of daily living; IADL = instrumental activities of daily living.

population diagnosed with cancer.[15] Additionally, we collected other data derived from individual patient histories or obtained by direct patient interview (age, sex, baseline status measured by Eastern Cooperative Oncology Group (ECOG) index, tumour type, tumour stage, marital status, educational level and self-perceived health status). We codified the variable 'BQ' into two groups: score 0 implies no risk of frailty and score ≥1 implies risk of frailty. Subsequently, we applied a univariate and, afterwards, a bivariate logistic regression model to analyse which of these factors, including the various scales of the CGA, were associated with the risk of frailty, as measured by the dichotomised variable BQ. In the model of logistic regression, the reference groups for the different variables were: independence or low dependence in activities of daily living (ADL); independence in instrumental activities of daily living (IADL); absence of cognitive impairment; Charlson index between 0 and 2; Nutrition Screening Initiative (NSI) score of 0–2 points; female sex; being married; non-metastatic tumour; and number of medications (between 0 and 4).

Additionally, using a receiver operating characteristic (ROC) curve, we determined the area under the curve (AUC) and the predictive ability of the model. We used the Statistical Package for the Social Sciences (SPSS) 19.0 for the statistical analysis.

Results

The study included a total of 262 patients over 70 years of age who had been diagnosed with cancer. The patient characteristics and the specific neoplasias of the patients are shown in *Table 1*. The mean patient age was 79 years (range 70–93 years).

Regarding the application of the BQ, 37.0 % (n=97) of patients scored 1; 21.0 % (n=55) scored 2; 10.7 % (n=28) had 3 points; 3.1 % (n=8) had 4 points; 1.5 % (n=4) had 5 points; and 0.8 % (n=2) had 6 points. The results of applying the BQ and the CGA are shown in *Table 2*.

By applying a univariate regression analysis to evaluate which demographic characteristics, tumour factors or CGA components influenced the risk of frailty as determined by the BQ, it was observed that the following markers reached statistical significance: dependence in IADL as measured by the Lawton–Brody index (odds ratio [OR] 3.145, 95 % confidence interval [CI] 1.347–7.345, p=0.008), risk of malnutrition as measured by the NSI index (OR 1.859, 95 % CI 1.060–3.259, p=0.030), heavy medication use (OR 1.769, 95 % CI 0.989–3.166, p=0.055), having an unmarried status (widowed, divorced, single) (OR 0.307, 95 % CI 0.154–0.609, p=0.001) and age (OR 1.093, 95 % CI 1.032–1.158, p=0.002).

Subsequently, after including all these variables in a bivariate regression analysis, the following were statistically significant predictors of the risk of frailty: unmarried status (OR 0.450, 95 % CI 0.216–0.937, p=0.033), dependence in IADL (OR 3.003, 95 % CI 1.181–7.638, p=0.021) and age (OR 1.064, 95 % CI 1.000–1.133, p=0.051). The Nagelkerke R-square parameter was 0.159, the Cox and Snell R-square was 0.110 and the Hosmer–Lemeshow test showed a value of p=0.751.

The AUC of the model comprising the significant variables of the bivariate regression analysis was 0.732, with a 95 % CI of 0.653–0.811 (see *Figure 1*).

For a cut-off of 0.78, the sensitivity of the model is 87.3 % with a specificity of 43.8 %. For a cut-off of 0.70, the same sensitivity for detecting the risk of frailty is 72.7 % with a specificity of 64.1 %. For a cut-off of 0.50, the sensitivity of the model for predicting the risk of frailty is 96.5 %, but it has a specificity of 21.5 % and the validity for correctly classifying patients is 76.1%.

Discussion

It is increasingly common for studies to try to determine which factors influence frailty in the elderly and to diagnose frailty before

its onset. In the field of oncogeriatrics, distinguishing the frail elderly may influence subsequent decision-making.[16–19]

This work was carried out to identify which demographic factors and/or which elements of the CGA allowed prediction of the risk of frailty as measured by the BQ. The only factors that have been found to act as predictors of the risk of frailty are age, marital status (unmarried) and dependence in IADL.

Traditionally, age has been associated with frailty and has been included as one of the main diagnostic criteria.[20] According to this study, the risk of being frail among the elderly with cancer is 1.064 times greater than the risk for a cancer patient a year younger, which coincides with the widespread idea that frailty is associated with advanced age. However, it must be noted that the significance of this parameter was limited (p=0.051).

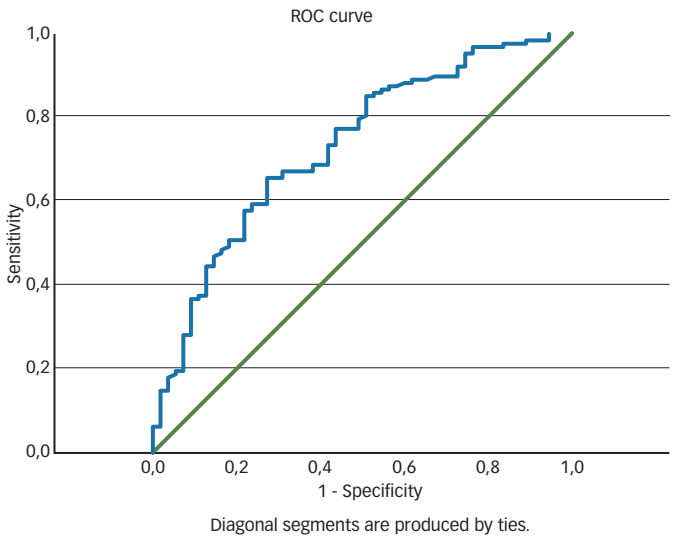
Marital status (specifically 'unmarried') is associated with an increased risk of frailty. Other studies have shown that an unmarried marital status is associated with an increased risk of frailty, although this statistic is from general geriatric population studies. Even in the initial definitions of frailty, a patient's unmarried status was considered a risk factor.[12,21] We do not have a possible explanation for the fact that being unmarried is a predictive factor for frailty, but there is no universal criterion for defining frailty.

The study concluded that the risk of frailty among elderly cancer patients is approximately three times higher if the patient is dependent in IADL. These results agree with previous studies in the scientific literature, which show that patients dependent on others for at least one IADL are more frail because they have more associated problems, poorer cognitive function and have more falls.[22] Although there is no unanimity in this respect at the moment, some authors have included disability and functional decline as components of frailty.[23–25] Diagnosis of a non-skin cancer was associated with increased levels of having disability, having geriatric syndromes and meeting criteria for vulnerability and frailty.[26] There is an interrelationship between frailty and disability, although they are not synonymous.[27]

Given the consistency of our results with the results of other studies, it can be stated that the proposed model is closely correlated with the reality of the risk of frailty among elderly cancer patients.

However, one aspect that should be improved in this study is that the BQ was used as a measure of the risk of frailty, even though, according to a previous study, the predictive ability of the BQ to detect the risk of frailty is moderate, according to the value of the AUC.[28] At present, studies comparing the various frailty screening scales usually only refer to two or three specific questionnaires.[28–32] However, there are no studies that compare all of them side by side, nor are there studies that consider the G-8 questionnaire as a detection method for the risk of frailty, despite the fact that it was developed specifically for the cancer population and has proven to be a very promising survey in this area.[33] Thus far, most publications include the Vulnerable Elders Survey-13 (VES-13) questionnaire as the main detector of frailty risk, but future studies will have to show a more complete response to this question. We routinely apply the BQ to the elderly at the cancer unit in our hospital because we are investigating and clarifying its role in the field of oncogeriatrics.

Figure 1: Receiver Operating Characteristic Curve of the Model



ROC = receiver operating characteristic.

The model generated by the regression analysis has its limitations. Firstly, the model has a moderate predictive ability (AUC 0.732), with a sensitivity of 72.7 % and a specificity of 64.1 % for a cut-off of 0.70. Secondly, the proportion of the variability in the risk of frailty that can be explained by this model is only between 11.0 % (Cox and Snell R-square) and 15.9 % (Nagelkerke R-square), which is not considered good. There is, therefore, a significant influence on the risk of frailty among the elderly over 70 years of age with cancer that does not depend on the variables analysed. A more complete model that initially analyses many more variables would therefore be necessary. Finally, the model is acceptable because there is no reason to believe that the predicted results are different from those observed (Hosmer–Lemeshow test), but its discriminatory power to predict the risk of frailty and its validity in correctly classifying individuals as frail are low to moderate, as indicated by the AUC.[34]

Perhaps the best way to evaluate the role of the CGA as a predictor of frailty would be to analyse its ability to predict death, institutionalisation or the onset of dementia in the elderly with cancer, but not by analysing which of these components relate significantly to the risk of frailty as detected by the BQ. However, to date, there is no study examining the ability of the CGA to predict future adverse events, and our study may indicate a possible approach to one of the most concerning issues in the field of oncogeriatrics. ■

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