

## Can This Patient Be Discharged Home? Factors Associated With At-Home Death Among Patients With Cancer

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### ABSTRACT

#### Purpose

The purpose of this study was to identify factors associated with at-home death among patients with advanced cancer and create a decision-making model for discharging patients from an acute-care hospital.

#### Patients and Methods

We conducted an observational cohort study to identify the association between place of death and the clinical and demographic characteristics of patients with advanced cancer who received care from a palliative home care team (PHCT) and of their primary caregivers. We used logistic regression analysis to identify the predictors of at-home death.

#### Results

We identified 380 patients who met the study inclusion criteria; of these, 245 patients (64%) died at home, 72 (19%) died in an acute-care hospital, 60 (16%) died in a palliative care unit, and three (1%) died in a nursing home. Median follow-up was 48 days. We included the 16 variables that were significant in univariate analysis in our decision-making model. Five variables predictive of at-home death were retained in the multivariate analysis: caregiver's preferred place of death, patients' preferred place of death, caregiver's perceived social support, number of hospital admission days, and number of PHCT visits. A subsequent reduced model including only those variables that were known at the time of discharge (caregivers' preferred place of death, patients' preferred place of death, and caregivers' perceived social support) had a sensitivity of 96% and a specificity of 81% in predicting place of death.

#### Conclusion

Asking a few simple patient- and family-centered questions may help to inform the decision regarding the best place for end-of-life care and death.

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### INTRODUCTION

Home discharge after an inpatient hospital admission is a major challenge for patients with advanced cancer, for their families, and for health care professionals. Hospital readmissions among these patients are frequent<sup>1-3</sup> and are associated with considerable patient and family suffering and costs to the health care system.<sup>4-11</sup>

Studies have found that most patients with advanced cancer prefer to receive care and die at home.<sup>12,13</sup> However, in developed countries, more than half of patients with advanced cancer ultimately die in the hospital.<sup>13-19</sup> The characteristics of health care resources appear to influence the place of death more than the stated preferences of the patient and his or her family.<sup>20,21</sup> To reduce the use of acute-care hospital resources—which can be expensive for the patient, their families, and the health care

system—and to improve the quality of life for terminally ill patients and their families, health care programs around the world have attempted to establish palliative care programs.<sup>22,23</sup> A few studies suggest that these palliative care programs might reduce the number of inpatient deaths and the overall rates of inpatient hospitalization.<sup>24-27</sup> However, their effectiveness is not clear,<sup>28</sup> and the factors associated with the ultimate place of death have not been studied extensively.

The purpose of this observational cohort study was to identify factors associated with at-home death among patients with advanced cancer who received care from a palliative home care team (PHCT). We postulated that, on the basis of the factors identified, we would be able to create a decision-making model for discharging patients from an acute-care hospital to the most appropriate setting.

## PATIENTS AND METHODS

### Study Location and PHCT

The city of Madrid and the surrounding region have a population of approximately 6 million and make up a largely urban setting. All residents have access to universal health care provided by the Spanish National Health System, including free and full access to outpatient, acute inpatient, and where available, home-care medical and nursing services.

This study was conducted in one of the Madrid region health areas. This area includes 350,000 inhabitants (250,000 from urban areas and 100,000 from rural areas, defined as towns/villages with fewer than 10,000 inhabitants). The PHCT conducts regular follow-up of patients who are referred by acute care hospitals, medical oncologists, or family physicians after being identified as having progressive incurable disease and high symptom distress. The team is comprised of two physicians, two advanced nurses, an assistant nurse, and an administrative clerk. The goal of the team is to help primary physicians assist patients at the end of life, sharing the assistance to enable physicians to cope with these patients.

According to the Madrid Regional Statistics Institute, the number of cancer deaths in the Madrid region was roughly 11,000 per year<sup>28a</sup> (approximately 75% occurring in the hospital and 17% at home [unpublished data]).

### Study Design

We conducted a prospective observational cohort study to identify the association between place of death and the clinical and demographic characteristics of patients with advanced cancer who received care from a PHCT as well as their primary caregivers. Patient and caregiver participation in the study began with patient enrollment onto the program and continued until the patient's death.

We included all patients with cancer who met the following inclusion criteria according to medical records: had progressive incurable cancer, as diagnosed by the patient's referring specialist; were 16 years of age or older; had been seen by the PHCT at least once; and died during the study period. We did not include patients without caregivers. The small number of such cases that appear in Spain are not usually referred to PHCT.

Data were collected prospectively by the PHCT physicians and nurses. This study was approved by the institutional review board of the Madrid Primary Care Program.

### Variables

The primary outcome was the patient's place of death: home, hospital, in-patient hospice unit, or nursing home. Hospital deaths were further classified as deaths that occurred in the emergency room, in an oncology department, or in another hospital department. In addition, the following independent variables were assessed: patient demographic characteristics (age, sex, education level, place of residence, and length of time residing in current residence); patient clinical characteristics (tumor type, comorbidities, length of time between diagnosis and death, and performance status at baseline); primary caregiver demographic characteristics (age, sex, education level, employment status, relationship to patient, whether the patient resided with the caregiver, and household features); primary caregiver perceived support and burden (number of family members who participated in caregiving, private or public caregiver support, perceived social support, diagnosis of depression or anxiety, and caregiver burden by using Zarit's interview<sup>29</sup>); patient and primary caregiver preferred place of care and/or death (only patients who were informed about the prognosis were asked about their preferred place of death. These data were collected periodically to assess the changes in preferences between baseline and final measures); and health services used (number of days patient was observed by the PHCT, number of visits to an emergency room, number of hospital admissions, number of home visits by the PHCT and primary care team, and number of PHCT telephone consultations).

Further information about study variables available in the Appendix (online only).

### Data Analysis

First, we analyzed the categorical and ordinal data by using the  $\chi^2$  or Fisher's exact test. Univariate analyses were performed using the two-sample

parametric *t* test and the Mann-Whitney *U* test/Wilcoxon rank sum test for nonparametric ordinal data. Categorical data that fell under more than two categories were analyzed by using analyses of variance for parametric data and the Kruskal-Wallis exact test for nonparametric data. We used Pearson's correlation coefficient to examine the relationship between perceived caregiver burden (Zarit's interview) and perceived caregiver support (scale of 1 to 5).

To examine the relationship between the independent and dependent variables, we used logistic regression analysis to calculate the odds ratios (ORs) and 95% CIs. Independent variables that were found to be significant on univariate analysis were selected for inclusion in the multivariate model. Then we constructed a stepwise forward logistic regression model to identify the independent predictors of at-home death. Finally, on the basis of the multivariate results, we constructed a model to facilitate the decision-making and planning processes related to patient discharge.

For all analyses, significance was set at  $P < .05$  (two tailed). Data were analyzed using Statistical Package for the Social Sciences (SPSS) for Windows version 9.0 (SPSS, Chicago, IL).

## RESULTS

Between January 2004 and December 2006, 628 patients were referred to the PHCT. Of these, 380 met the inclusion criteria. We excluded 202 patients who had not received a cancer diagnosis, eight who had not received a home visit, four who were younger than 16 years of age, and 34 who had not died by study completion. No patients were lost to follow-up.

Among the 380 patients included, 245 patients (64%) died at home, 72 (19%) died in an acute-care hospital (35 [9%] in an oncology department, 28 [7%] in the emergency room, and nine [2%] in other hospital wards), 60 (16%) died in a palliative care unit, and three (1%) died in a nursing home.

Table 1 lists patient demographic and clinical characteristics. The median PHCT follow-up time was 48 days; 49 patients (13%) were observed for fewer than 7 days, and 74 patients (20%) were observed for more than 120 days. During the study, 182 patients (48%) accessed the emergency room or were admitted to the hospital at least once; 114 patients (30%) underwent one inpatient hospital admission; and 23 patients (6%) underwent two or more hospital admissions. The primary reason for hospital admission was symptom control in 57% of patients; whereas, for hospice admission, it was caregiver issues in 73% of patients.

Table 2 lists the sociodemographic and clinical characteristics of the patients' primary caregivers. Overall, 102 caregivers (27%) received private or public support. The median number of hours of support per day was 1.5 hours (range, 1 to 4 hours) for those who received publicly funded support and 8 hours (range, 4 to 24 hours) for those who hired private support ( $P < .001$ ). Among caregivers with a college degree or with a higher educational level, 25 (40%) hired private help; among caregivers with lower educational levels, 31 (13%) hired private help.

The Zarit's interview was completed by 126 caregivers, 96 of whom (76%) were classified as burdened (Table 2). There was no relationship between caregiver burden and the receipt of private or public caregiver support. There was also no relationship between the caregivers' burden and their preferred place of death. However, higher burden score correlated with lower perceived support. Caregivers' burden score was significantly higher for caregivers who cared for patients who died in inpatient hospices than for caregivers who cared for patients who

Factors Associated With At-Home Death for Patients With Cancer

Table 1. Demographic and Clinical Characteristics of Patients With Advanced Cancer

Characteristic	No. of Patients (N = 380)	%	Median	Mean	Range	SD
Sex						
Male	230	60.5				
Female	150	39.5				
Age, years				66.76	16-94	13.4
Place of residence						
Urban	257	67.6				
Rural	123	32.4				
Time residing in current residence, years				19.48	0.76	15.5
Level of education						
No schooling	36	9.5				
Primary school	192	50.5				
Secondary school	58	15.3				
High school or higher	20	5.3				
Unknown	74	19.5				
Primary tumor site						
Lung	71	18.7				
GI	139	36.5				
Breast	29	7.6				
Genitourinary	43	11.4				
Head and neck	19	5.0				
Gynecologic	18	4.7				
CNS	17	4.5				
Hematologic	7	1.8				
Other	37	9.8				
Comorbidities present						
Yes	79	21.0				
No	301	79.0				
Karnofsky score at baseline			50	47.37	10-80	13.2
Time between diagnosis and death, months			13	21.88	0-168	26.3
Length of follow-up, days			48	75.46	1-553	87.7
No. of admissions during follow-up				0.45	0-5	0.7
No. of days admitted to hospital during follow-up				5.70	0-102	12.6
No. of emergency room visits				0.40	0-3	0.7
No. of PHCT visits				9.54	1-54	8.7
No. of PHCT telephone consultations				9.99	1-56	8.9
No. of primary physician visits				4.08	0-28	4.9

Abbreviations: SD, standard deviation; PHCT, palliative home care team.

died in the hospital or at home ( $64 \pm 16$  v  $55 \pm 13$  [ $\pm$  standard deviation];  $P = .018$ ).

We found that 329 (89%) of 368 patients preferred to receive care at home. Among patients who were aware of their prognosis ( $n = 228$ ; 60% of the overall population), at baseline, 182 (80%) preferred to die at home. Thirty-seven patients (10%) changed their preferred place of care from at-home care to hospital care. Of the caregivers, 248 (66%) preferred at-home death, and 114 (30%) preferred hospital death at baseline. The patients and caregivers had the same place of care and place of death preferences in 194 cases (85%). There was a significant association between preferred place of death and actual place of death (Tables 3 and 4).

Table 3 lists the relationships between the patients' demographic and clinical characteristics and whether the patients died at home. None of the demographic or clinical variables were significantly associated with at-home death. In contrast, all of the health care delivery variables were significantly associated with at-home death. The ORs for the days of PHCT follow-up were calculated for 30 days. Thus, for every 30 days of follow-up, the possibility of an at-home death de-

creased approximately 9%. For PHCT and family physician visits, the ORs are expressed for each visit. We found that each extra visit by the PHCT increased the chance of dying at home by approximately 11%. Finally, the ORs for the number of hospital admissions and the ORs for the length of hospital stay were calculated for each admission and each admission day, respectively.

Table 4 summarizes the relationships between caregivers' demographic characteristics and whether patients died at home. We found that most of the caregiver support and perceived burden variables were significantly associated with at-home death.

The stepwise logistic regression model included all variables that were significantly associated with at-home death on univariate analysis plus age and sex variables and functional status. Only five of the 19 variables included in the univariate analysis were retained in the multivariate model (Table 5). Three of these five variables can be identified by clinicians before home discharge. We constructed a decision-making model on the basis of these variables. Caregivers' place of death preferences were assigned a score of 3 for "at-home death" and a

**Table 2.** Demographic Characteristics and Perceived Burden of the Patients' Primary Caregivers

Characteristic	No. of Caregivers (N = 380)	%	Median	Mean	Range	SD
<b>Sex</b>						
Male	68	17.9				
Female	312	82.1				
Age, years				54.32	19-86	14.4
<b>Level of education</b>						
No schooling	22	5.8				
Primary school	156	41.1				
Secondary school	61	16.1				
High school or higher	63	16.6				
Unknown	78	20.5				
<b>Relationship to patient</b>						
Spouse	203	53.4				
Son/daughter	132	34.7				
Sibling	14	3.7				
Other family member	29	7.7				
Non-family member	2	0.5				
<b>Resides with patient</b>						
Yes	333	88.3				
No	44	11.7				
<b>Employment status</b>						
Retired	39	10.3				
Unemployed	132	34.7				
Quit working to care for family member	45	11.8				
Employed part time	59	15.5				
Employed full time	44	11.6				
Unknown	61	16.1				
No. of people residing in patient's home			3	3.21	0-3	1.32
No. of co-caregivers in the family			2	1.95	0-8	1.20
Perceived social support, scale of 1-5 (range)			4	3.69	1-5	1.32
<b>Formal private support</b>						
Yes	66	17.4				
No	314	82.6				
<b>Formal public support</b>						
Yes	36	9.5				
No	344	90.5				
<b>Prior experience caring for end-of-life patients</b>						
Yes	71	18.7				
No	309	81.3				
<b>Depression diagnosis<sup>30</sup></b>						
Yes	56	14.7				
No	324	85.3				
<b>Anxiety diagnosis<sup>30</sup></b>						
Yes	55	14.5				
No	325	85.5				
Time patient fully dependent on primary caregiver, months			4	6.01	1-240	13.0
<b>Caregiver burden (Zarit's interview; n = 126)</b>						
No burden	30	23.8		56.47		14.2
Low burden	28	22.2				
High burden	68	54.0				

NOTE. Ratio of caregivers to patients was 1:1.  
Abbreviation: SD, standard deviation.

score of 0 for "unsure" or "other." Patients' place of death preferences were assigned a score of 3.5 for "at-home death," 2 for "unsure" or nonresponders, and 0 for "other." Perceived caregiver social support was assigned a score of 4 if the caregivers' perceived social support had been ranked as a 5 on a scale of 1 to 5; 3 if previously ranked as a 4;

2 if previously ranked as a 2 or a 3; and 0 if previously ranked as a 1. Thus, the final scores ranged between 0 and 10.5, and the cutoff point for home discharge was a score of 6. Figure 1 shows the receiver operating characteristics of our model. The model constructed with the cutoff point of 6 resulted in a sensitivity of 96% and a specificity of 81%.

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Table 3. Patient Demographic and Clinical Characteristics and Associations With At-Home Deaths

Characteristic	Place of Death				Univariate Analysis		P
	Home (n = 248)		Other (n = 132)		OR*	95% CI	
	No. of Patients	%	No. of Patients	%			
Sex							.152
Female	91	60.7	59	39.3	1.00	—	
Male	157	68.3	73	31.7	1.4	0.91 to 2.14	
Age, years							.142
< 65	95	60.9	61	39.1	1.00	—	
65-80	115	66.1	59	33.9	1.25	0.8 to 1.96	
> 80	38	76.0	12	24.0	2.03	0.98 to 4.19	
Place of residence							.188
Urban	162	63.0	95	37.0	1.00	—	
Rural	86	69.9	37	30.1	1.36	0.86 to 2.16	
Time residing in current residency, years							.074
Median		18.19		21.74			
SD		15.67		15.11			
Level of education							.320
No schooling	21	58.3	15	41.7	1.00	—	
Primary school	124	64.6	68	35.4	1.30	0.63 to 2.69	
Secondary school	27	62.8	16	37.2	1.21	0.49 to 2.98	
High school or higher	24	53.3	11	46.7	1.56	0.59 to 4.13	
Primary tumor							.831
Lung	41	57.7	30	42.3	1.00	—	
GI	94	67.6	45	32.4	1.25	0.70 to 2.23	
Breast	16	55.2	13	44.8	0.90	0.38 to 2.15	
Genitourinary	31	72.1	12	27.9	1.89	0.84 to 4.27	
Head and neck	12	63.2	7	36.8	1.25	0.44 to 3.56	
Gynecologic	12	66.7	6	33.3	1.46	0.49 to 4.34	
Brain	11	64.7	6	35.3	1.34	0.45 to 4.03	
Hematologic	5	71.4	2	28.6	1.83	0.33 to 10.08	
Other	26	70.3	11	29.7	1.73	0.74 to 4.04	
Comorbidities present							.111
Yes	58	73.4	21	26.6	1.61	0.93 to 2.8	
No	190	63.1	111	36.9	1.00	—	
Length of follow-up, days					0.91	0.86 to 0.97	< .001
Median		66.1		93.05			
SD		77.9		101.6			
No. of PHCT visits ×100					1.11	1.08 to 1.15	< .001
Median		25		13			
SD		18.2		7.8			
No. of primary physician visits ×100					1.08	1.04 to 1.11	< .001
Median		13.6		5.7			
SD		19.0		6.0			
No. of admissions ÷ days of follow-up ×100					0.22	0.15 to 0.32	< .001
Median		0.16		3.1			
SD		0.9		4.5			
No. of days admitted to hospital ÷ days of follow-up, ×100					0.80	0.76 to 0.84	< .001
Median		1.1		22.9			
SD		4.7		25.2			
Patient preferred place of care							< .001
Home	230	69.9	99	30.1	7.80	3.58 to 17.04	
Other	9	23.1	30	76.9	1.00	—	
Patient preferred place of death							< .001
Home	161	88.5	21	11.5	80.50	26.22 to 247.17†	
Other	4	8.7	42	91.3	1.00	—	

NOTE. At-home death is defined as deaths that occurred at home (n = 245) or in a nursing home (n = 3).

Abbreviations: OR, odds ratio; SD, standard deviation; PHCT, palliative home care team.

\*ORs for the days of PHCT follow-up were calculated for 30 days; for PHCT and family physician visits, the ORs are expressed for each visit. ORs for the number of hospital admissions and for the length of hospital stay were calculated for each admission and each admission day, respectively.

†The extremely wide confidence interval results from the few patients who expressed "Other place of death" preference different than "home" but who finally died at home.

**Table 4.** Caregiver Demographic Characteristics and Associations With Patient Home Deaths

Characteristic	Place of Death				Univariate Analysis		P
	Home (n = 245)		Other (n = 132)		OR	95% CI	
	No. of Patients	%	No. of Patients	%			
Sex							
Female	207	66.8	103	33.2	1.53	0.89 to 2.63	.123
Male	38	56.7	29	43.3	1.00	—	
Age, years							.935
< 65	182	65.5	96	34.5			
65-80	59	63.4	34	36.6			
> 80	4	66.7	3	33.3			
Level of education							
No schooling	13	59.1	9	40.9	1.00	—	
Primary school	96	61.5	60	38.5	1.11	0.45 to 2.75	.825
Secondary school	38	62.3	23	37.7	1.14	0.42 to 3.09	.791
High school or higher	49	77.8	14	22.2	2.42	0.86 to 6.83	.094
Relationship to patient							
Spouse	133	66.2	68	33.8	1.01	0.64 to 1.61	.303
Son/daughter	87	66.4	44	33.6	0.38	0.13 to 1.15	
Sibling	6	42.9	8	57.1	0.72	0.33 to 1.60	
Other family member	17	58.6	12	41.4	1.00	—	
Non-family member	2	100	0	0	—	—	
Resides with patient?							
Yes	224	67.3	109	32.7	2.25	1.19 to 4.24	.012
No	21	47.7	23	52.3	1.00	—	
Employment status							
Retired	24	61.5	15	38.5			
Unemployed	87	65.9	45	34.1			
Retired and unemployed					1.85	0.95 to 3.6	.072
Quit working to care for family member	35	77.8	10	22.2			
Employed part time	44	74.6	15	25.4			
Quit working and employed part time					3.16	1.5 to 6.64	.002
Employed full time	22	50.0	22	50.0	1.00	—	
Formal private support							
Yes	49	74.2	17	25.8	1.69	0.93 to 3.08	.085
No	196	63.0	115	37.0	1.00	—	
Formal public support							
Yes	20	55.6	16	44.4	0.64	0.32 to 1.29	.215
No	225	66.0	116	34.0	1.00	—	
Prior experience caring for end-of-life patients							
Yes	52	73.2	19	26.8	1.57	0.88 to 2.8	.160
No	173	63.6	99	36.4	1.00	—	
Children < 18 years old reside in household							
Yes	41	61.2	26	38.8	1.00	—	.474
No	204	65.8	106	34.2	1.22	0.71 to 2.10	
Disabled person resides in household							
Yes	10	47.6	11	52.4	0.47	0.19 to 1.13	.101
No	235	66.0	121	34.0	1.00	—	
No. of co-caregivers in the family					1.80	1.48 to 2.29	< .001
Median	2.21		1.47				
SD	1.1		1.3				
Perceived social support, scale of 1-5					3.21	2.55 to 4.06	< .001
Median	4.27		2.61				
SD	0.9		1.3				
Caregiver burden (Zarit interview)					0.97	0.95 to 1.00	.055
Median	54.85		60.21				
SD	12.6		17.0				
No. of months patient fully dependent on primary caregiver	3.0		4.0		1.01	0.98 to 1.03	.653
Depression diagnosis <sup>30</sup>							
Yes	27	48.2	29	51.8	1.00	—	.005
No	217	67.8	103	32.2	2.26	1.27 to 4.02	
Anxiety diagnosis <sup>30</sup>							
Yes	18	32.7	37	67.3	1.00	—	< .001
No	226	70.4	95	29.6	4.89	2.65 to 9.02	
Caregiver preferred place of death							
Home	223	89.9	25	10.1	42.60	22.94 to 78.99	< .001
Other	25	19.5	103	80.5	1.00	—	

Abbreviations: OR, odds ratio; SD, standard deviation.



**Table 5.** Multivariate Logistic Regression Model of the Factors Associated With Death at Home

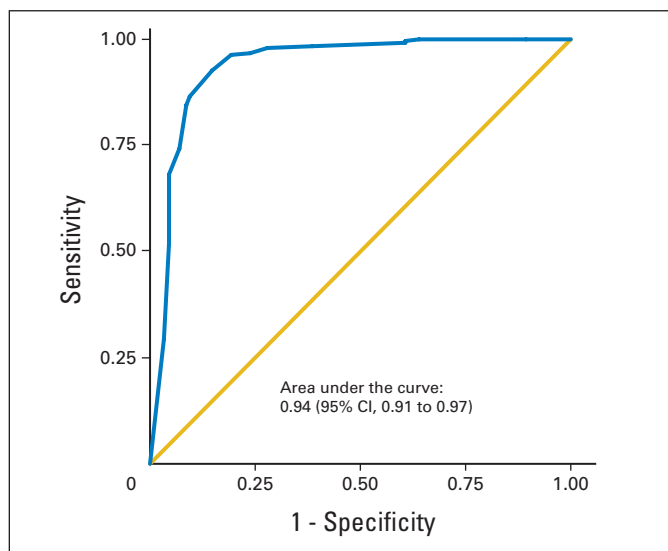
Factor	OR	95% CI	P
No. of PHCT visits ÷ days of follow-up ×100	1.09	1.02 to 1.16	.007
No. of days admitted to hospital ÷ days of follow up ×100	0.89	0.83 to 0.95	< .001
Social support for the primary caregiver	2.19	1.45 to 3.29	< .001
Patient place of death preference (home v other)	28.55	3.08 to 264.53	.003
Caregiver place of death preference (home v other)	5.94	2.20 to 16.10	< .001

NOTE. Only predictors with a P value of < .05 are shown. Abbreviation: OR, odds ratio.

**DISCUSSION**

In this study, we identified 16 variables associated with at-home death on univariate analysis, and five of these variables remained independently associated with at-home death on multivariate analysis. Only three of them can be identified by clinicians before discharging the patients from a hospital setting. The decision-making model created with these variables predicts with high sensitivity and specificity the chance of an at-home death in this patient cohort. We believe that these variables will help identify patients who are able to die at home and will better assist the patient, family, and health care team in the delivery of care and communication. More research is needed to prospectively validate this model.

Several studies have identified factors associated with place of death<sup>31</sup>; however, to our knowledge, there are currently no predictive models for place of death in the literature. Gomes and Higginson<sup>31</sup> conducted a systematic review of studies on factors associated with place of death in patients with cancer. They identified several factors linked to dying at home: poor performance status, patients' preferences, the stresses and intensities associated with home care, living



**Fig 1.** Receiver operating characteristic curve for multivariate logistic regression model with three predictors.

arrangements, and extended family support. These factors are similar to those found in our study.

Our findings have practical implications. Agreement between patients and caregivers on their preferred place of death is a crucial requirement for an at-home death. In a prospective study, Grande and Ewing<sup>32</sup> also found that this agreement resulted in a high likelihood of the patient dying in his/her preferred location. This likelihood decreased dramatically when there was no agreement between them. It is, therefore, important to assess both patient and caregiver wishes before formulating the care plan. In our study, congruence between patients and caregivers was higher than that reported in other studies.<sup>33</sup> However, only approximately 60% of patients expressed a preference regarding place of death.

Several studies have shown that preference regarding place of death is not stable over time,<sup>34-36</sup> and the PHCT needs to be aware of possible changes in these preferences. It is also important to differentiate between preferences regarding place of care and place of death.<sup>36</sup> From the planning perspective, it is better to ask about patients' and caregivers' preferred place of death.<sup>36</sup> However, in many clinical situations, asking patients this question directly might be difficult because some patients may not be aware of their prognosis. We should assess not only patient and caregiver preference regarding place of care and place of death but also the reasons for such preferences. Occasionally, the patient and/or caregiver might modify his or her preference once the reasons for the preferences are identified and addressed.<sup>34,37,38</sup>

We found no differences regarding patients' demographic data, although there was a tendency toward more at-home deaths among older patients and more educated patients. Other studies have shown similar findings.<sup>15,31,39-42</sup>

The possibility of keeping terminally ill patients at home depends primarily on caregivers.<sup>31,43,44</sup> The amount of support that caregivers receive and the caregiver's perceived burden are central issues. Patients with cancer are more likely to die at home if the caregiver has access to more intensive social support.<sup>43-50</sup> In our study, the Zarit's interview was not highly predictive of place of death; however, the subjective perception of support was highly predictive of place of death. Thus, in clinical practice, it may be easier to ask caregivers about their perceived burden and level of support than to conduct a lengthy interview. More prospective studies are needed to better characterize the usefulness of simple global questions about caregivers' perceptions of support.

Few studies have assessed the intensity of palliative home care delivery in the last months of a patient's life. In our study, the PHCT conducted a visit every 5 days. This number included visits conducted by any member of the team. In addition, the family physician visited approximately once every 10 days. We found that home care delivery was significantly associated with at-home death.

In our study, the PHCT's median follow-up was 48 days. This number is similar to those reported by other PHCTs,<sup>26,51,52</sup> although some studies have reported longer follow-up times.<sup>46,53-55</sup> However, patients' and caregivers' burdens increased in the last two months of life, and therefore, extending PHCT support for longer periods may considerably increase the cost and complexity of palliative care programs and be less likely to result in a major change in the ultimate place of death.

Finally, we found that patients who died at home were admitted to the hospital approximately 0.2 times for every 100 days of follow-up compared with 3.1 times for patients who died in the hospital (P < .001). Patients who died at home spent a median of 1 day

admitted to the hospital for every 100 days of follow-up compared with 23 days for those who did not die at home ( $P < .001$ ). It is likely that, as inpatient admissions become more frequent and prolonged, the patient and caregiver may lose confidence in the patient's ability to remain comfortable and safe at home.

Several limitations can be stated. First, the likelihood of at-home death in our study group is higher than in the general population, primarily because of the absence of patients who lack a caregiver. Second, some patient groups may be infrarepresented. For instance, only 2% of patients in our sample had hematologic malignancies, in contrast with a higher percentage of approximately 10% in the Madrid area. These findings are consistent with previous studies.<sup>14,16,18,19,39,41</sup>

Third, only one of three caregivers completed Zarit's interview. Time restrictions and understanding problems were reported as the primary reasons for not completing them. However, there were no differences in the subjective perception of support between patients who completed Zarit's interview and those who did not. Finally, our model is specific to a palliative home care program and must be tested in different palliative care delivery systems.

In conclusion, a few simple patient- and family-centered questions may help guide the decision regarding the best place for end-of-life care and death. These questions could be as simple as where does the patient prefer to spend the remainder of his/her life, where does the patient's caregiver prefer for the patient to spend the rest of his/her life, and does the patient's caregiver feel he/she is receiving adequate support to cope with the patient's end-of-life care. Our findings invite

further prospective studies to confirm the usefulness of this model in other contexts.

#### AUTHORS' DISCLOSURES OF POTENTIAL CONFLICTS OF INTEREST

The author(s) indicated no potential conflicts of interest.

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