Utilization of Services Among Elderly Cancer Patients—Relationship to Age, Symptoms, Physical Functioning, Comorbidity, and Survival Status

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In this study we investigated predictors of utilization of primary care physician, hospital and emergency room services in a sample of 909 older patients during the first year following a diagnosis of cancer of the breast, colon, lung, or prostate.

Analysis of covariance models were implemented separately for the active treatment period (0–6 months) and the continuing care period (6–12 months) to determine how age, sex, comorbidity, length of survival, treatment status, stage of disease, cancer site, physical functioning, and symptom count were related to primary care physician visits, hospitalization, and emergency room use.

Decreased physical functioning was related to increased physician visits, hospital nights, and emergency room visits during the active treatment period, and to increased hospital nights and emergency room visits during the continuing care period. Patients with three or more comorbid conditions reported more physician visits than patients with no comorbid conditions during both periods. Patient age did not play a significant role in utilization of services.

The broad picture suggested by this study of elderly cancer patients is that their service utilization, particularly hospitalization and emergency room services, tends to peak in concert with a dramatic decrease in physical functioning as the patient nears the end of life. Use of primary care physicians' services may depend substantially on comorbid conditions. (*Ethn Dis.* 2005;15:[suppl 2]:S2-17–S2-22)

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Introduction

Historically, patient age has been thought to explain differences in the use of medical services among patients approaching death, and it was assumed that healthcare expenditures would increase as society ages.[1] While age and proximity to death are related, newer research indicates that the relatively greater number of persons who die in older age cohorts, not their age per se, explains the observed correlation between healthcare expenditure and age.[2] Felder[3] observed that the time remaining before death rather than calendar age is the decisive factor. His econometric analysis of healthcare expenditures during the terminal two years of life in a sample of decedents showed no effect of age on the demand for health care when controlling for the remaining lifetime. The results suggested that the cost of the terminal phase of life is independent of the age at which it occurs. Instead, it is the increase in the elderly's share of population that seems to shift the bulk of expenditures to higher age. A similar result was obtained by O'Neill et al in a study of nursing home patients.[4]

In 1990, 58% of all cancers were experienced by the elderly, and for individuals age ≥65 years, 2% were diagnosed with cancer annually, compared with 0.2% of those <65 years.[5–7] Healthcare expenditures for the treatment of cancer are substantial, and were estimated at $40 billion in 1994.[5] According to a 1992 survey, the elderly accounted for 54% of all hospital discharges for cancer.[8] Research on the impact of cancer on healthcare utilization by the elderly is sparse, inconclusive and presented most often in terms of healthcare cost analyses. Stafford and Cyr found that use of healthcare resources was higher among elderly patients with cancer than among those with other chronic conditions.[9] Another study that controlled for other chronic conditions suggested that cancer was not independently associated with increases in hospitalization, length of stay, or Medicare reimbursement.[10]

Most of the research on healthcare utilization by cancer patients concentrates on the last six months of life, excluding the important treatment period following diagnosis for patients who survive for an extended period. In this study, we focus on cancer patients' utilization of healthcare services during the year immediately following the cancer diagnosis, considering separately the period of generally more intensive treatment during the first six months, as well as the continuing care phase from six to twelve months. Thus, our point of view is to start at diagnosis and look forward, rather than starting at death and looking backward. In this process we provide a more comprehensive picture, as we can include also the numerous longer-term survivors, as well as those patients who died from their cancers. Specifically, of a sample of elderly patients newly diagnosed with cancer of the breast, colon, lung, or prostate, we investigated:

1. What factors predict the utilization of services during the active treatment period (0–6 months) following a diagnosis of cancer? For those patients who survive past 6 months, what factors predict their utilization of services during the continuing care period (6–12 months)?
2. Further, do physical functioning and symptomatology predict utilization of services during the first year fol-

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lowing a diagnosis of cancer, and are there differences according to cancer site, stage of disease, comorbidity, survivor or treatment status, age, and sex?

3. Does age play a role in the utilization of services?

MATERIAL AND METHODS

Sample

Patients 65 years of age or older were recruited from 23 sites within a Midwestern state and enrolled into the study within six weeks of the patient's diagnosis of either breast, colon, lung, or prostate cancer. Recruitment sites included surgical units of hospitals as well as outpatient radiation and medical oncology units. Patients were approached in these settings by trained nurse recruiters who explained the research to them, provided them with a brochure summarizing the goals of the study and their role in completing four interviews and returning four self-administered questionnaires over the course of a year, and having their medical records audited. In order to insure that patients were at comparable points in the course of their treatments, they were interviewed initially (wave 1) between four to six weeks following their surgery or within two to four weeks following their initial radiation or chemotherapy treatment. Follow-up interviews, counting from wave 1, were conducted at 2–3 months (wave 2), 5–7 months (wave 3), and after one year (wave 4). Data on stage of disease and treatment dates were obtained from audits of patient medical records. Initially, 1200 patients indicated their willingness to participate in the study; 909 of these followed up by completing the wave 1 interview. These patients formed the sample for our study. Informed consent procedures for the study were approved by the appropriate university committee on research involving human subjects as well as the institutional review boards of the participating recruitment sites.

Measures

Data were collected on patient characteristics such as age and sex as well as cancer site, stage of disease, treatment (surgery, radiation, chemotherapy), symptomatology, comorbidity, physical functioning, and service utilization. Death dates for patients who died during the course of the study or soon thereafter were obtained from family members and verified through the Death Certificate Registry. Patients were divided into three survivor groups: those who died during the first six months, those who died between 6 and 12 months, and those who survived to the end of the study (one year). To test for age effects, patients were divided into two groups: up to 75 years of age, and ≥76 years.

Service utilization by patients was assessed in terms of patient recall of the number of nights spent in hospital, the number of visits to their primary care physician, and the number of emergency room visits. More precisely, at each interview the patients were asked how much time they had spent in the hospital during the previous four weeks, and how many times they visited their primary physician and emergency room. For each of these three types of service we constructed two measures of the rate of service utilization: one for the active treatment period (0–6 months) and one for the continuing care period (6 months to 1 year). For example, the active treatment period measure for nights in hospital was taken as the total nights spent in hospital during the past four weeks, as reported on the most recent interview available during the first six months. Thus, if a patient died between wave 2 and wave 3, the wave 2 data were used, or if death occurred between wave 3 and wave 4, the wave 3 data were used. Finally, if the patient survived at least one year, the wave 3 (six months) data were again used. The continuing care measure for nights in hospital was taken as the total nights in hospital during the past four weeks, as reported on the last interview in which the patient participated. This measure was computed only for patients who survived at least six months. Treatment period and continuing care period utilization rates for physician visits and emergency room visits were computed in a similar fashion.

Physical functioning was measured using the physical functioning subscale from the *Medical Outcomes Study (MOS) 36-Item Short Form Health Survey (SF-36).*[11] This subscale consists of 10 items (Cronbach's Alphas=0.907 at wave 1), including measures of the degree of limitation in various physical activities. The individual items capture both the presence and extent of physical limitations using a three-level response format to the question "Does your health now limit you in these activities? If yes, how much?" (1='yes, limited a lot,' 2='yes, limited a little,' 3='no, not limited at all'). The scores for this subscale were standardized in the usual way on a scale of 0–100, with higher scores indicating fewer limitations in physical functioning.

Patient symptomatology was measured with the *Symptom Experience Scale.*[12] This scale elicited information on 37 symptoms (nausea, pain, poor appetite, sleeping difficulty, fatigue, constipation, diarrhea, vomiting, etc) commonly associated with cancer and/or its treatment. The patients were presented with a symptom (eg, dry mouth) and were then asked whether they had experienced this symptom in the past two

weeks. The symptom score was computed as a count of the symptoms reported (potential range: 0–37; actual range in study sample: 0–22).

For both physical functioning and symptom count, separate measures were computed for the treatment period and the continuing care period in the same way as described earlier for the service utilization variables.

To assess patient comorbidity, the patients were asked to identify from a list of 11 frequently occurring physical and chronic co-morbid conditions (arthritis, hypertension, cardiovascular, emphysema, diabetes, etc) those that they currently experienced. This information was quantified as a grouped variable (0=no comorbid conditions, 1=one comorbid condition, 2=two comorbid conditions, 3=three or more comorbid conditions).

For this study, we employed the Tumor, Node, Metastasis (TNM) staging system promulgated by the American Joint Committee on Cancer (AJCC) in the United States. Determination of the stage involves consideration of a number of variables that are important for prognosis (eg, extent of the tumor, histological type, differentiation, metastasis, etc), and classifies tumors on a scale of 0–IV (0=localized, IV=distant metastasis).[13–15] To minimize the problem of small or empty cells in the analysis, stage was dichotomized into two groups: early (stages 0, I, II) and late (stages III, IV).

Treatment status was treated as a grouped variable (surgery; surgery plus radiation and/or chemotherapy; no surgery), as were age (up to 75 years vs. ≥76 years) and survivor status (less than six months; six months but less than 12 months; 12 months and beyond).

Analyses

As an initial step, basic descriptive statistics were computed for all study variables. Subsequently, two sets of analysis of covariance models were implemented. In the first stage, we tested for predictors of rates of service utilization (separately for physician visits, nights in hospital, and emergency room visits) during the active treatment period, while in the second set, we tested the same models for the continuing care period, restricting the sample to only those patients who survived at least six months. In each model the explanatory variables were age, sex, comorbidity, survivor group, treatment status, stage of disease, and cancer site, with physical functioning and symptom count as covariates. Simple contrasts were used to detect differences in means between subgroups.

RESULTS

Of the 909 patients in the sample, 53.5% were male and 46.5% were female, while 72.7% were <76 years of age and 27.3% were ≥76 years of age. Sixty-four patients died during the first six months, and another 58 died between six months and one year. Of the 122 patients who did not survive the year, two suffered from breast cancer, 19 from colon cancer, 94 from lung cancer, and seven from prostate cancer. Further demographic information is presented in Table 1.

Table 1. Frequencies for sex, age group, survivor group, cancer site, stage of disease, treatment status, and comorbid conditions (*N*=909)

	N	Percent
Sex		
Male	486	53.5
Female	423	46.5
Age group		
Less than 76 years	659	72.7
76 years and older	248	27.3
Survivor group		
Less than six months	64	7.0
Six months to one year	58	6.4
One year or more	786	86.6
Cancer site		
Breast	247	27.2
Colon	160	17.6
Lung	242	26.6
Prostate	260	28.6
Stage of disease		
Early	642	70.6
Late	267	29.4
Treatment status		
Surgery only	246	33.2
Surgery plus radiation and/or chemotherapy	277	37.4
No surgery	218	29.4
Comorbid conditions		
None	67	7.8
One	145	17.0
Two	217	25.4
Three or more	425	49.8

Tables 2 and 3 summarize the patients' utilization of primary care physicians and the reasons for this utilization, according to their survival status and the frequency of physician visits, during the active treatment period and the continuing care period, respectively. Also included are descriptive statistics for physical functioning, symptoms, nights in hospital, and emergency room visits. During the active treatment period those patients reporting more than one physician visit also reported worse physical functioning, somewhat higher symptom counts, and more nights in hospital. Similar results are evident for the continuing care period.

The analysis of covariance for the active treatment period (see Table 4) revealed that patients with worse physical functioning reported more primary care physician visits, more hospital nights, and more emergency room visits. Patients with three or more comorbid conditions reported more physician visits than patients with no comorbid conditions (P=.008), while colon cancer patients spent more nights in hospital than prostate cancer patients (P=.007). Men reported more frequent emergency room visits than women (P=.009). Patients surviving less than six months or 6–12 months reported more hospital nights (P=.000, P=.000) and more visits to the emergency room (P=.000, P=.017) than those surviving at least one year. In the analyses for hospital nights and emergency room visits, there was a significant interaction between

Table 2. Utilization of primary care physicians, plus descriptive statistics for symptomatology, physical functioning, nights in hospital, and emergency room visits, during the active treatment period (*N*=909)*

	No Visits		At Most One Visit		More Than One Visit	
	N	%	*N*	%	*N*	%
Survival group						
Less than 6 months	33	6.0	51	6.1	13	20.6
6–12 months	31	5.6	51	6.1	5	7.9
12 months or more	485	88.3	733	87.8	45	71.4
Reason for physician visit						
Cancer related			37	11.7	18	22.5
General care			163	51.8	21	26.3
Other			115	36.5	41	51.2
	Mean	**SD**	**Mean**	**SD**	**Mean**	**SD**
Physical functioning	72.28	28.21	69.96	28.81	54.37	29.96
Symptom count	6.45	4.58	6.64	4.54	8.76	4.39
Nights in hospital	0.77	2.80	0.87	3.28	2.70	5.22
Emergency room visits	0.08	0.039	0.08	0.37	0.17	0.42

* Median number of visits for those making visits = 1.

physical functioning and survival group. A more-detailed analysis revealed that patients surviving at least one year had much better physical functioning than patients in the other two survival groups. Similarly, a modest interaction of symptoms and survival group was seen for emergency room visits. Again, the one-year survivors reported fewer symptoms than the shorter-term survivors, accounting for the interaction.

During the continuing care period (see Table 5) physical functioning had a similar relation to hospital nights and emergency room visits, and patients with three or more comorbid conditions reported more physician visits than patients with no comorbid conditions (P=.006), one comorbid condition (P=.010) or two comorbid conditions (P=.007).

No differences in rates of utilization of services were observed for any of the three types of service, for either the active treatment period or the continuing care period.

DISCUSSION

The most persistent theme appearing in the analyses was the relationship of decreased physical functioning to greater utilization of services. This relationship was present for primary care physician visits, hospital nights, and

Table 3. Utilization of primary care physicians, plus descriptive statistics for symptomatology, physical functioning, nights in hospital, and emergency room visits, during the continuing care period (*N*=844)*

	No Visits		At Most One Visit		More Than One Visit	
	N	%	*N*	%	*N*	%
Survival group						
6–12 months	32	9.1	52	7.4	4	3.0
12 months or more	318	90.9	647	92.6	131	97.0
Reason for physician visit						
Cancer related			31	8.0	23	14.1
General care			221	57.1	60	36.8
Other			135	34.9	80	49.1
	Mean	**SD**	**Mean**	**SD**	**Mean**	**SD**
Physical functioning	70.98	30.06	71.76	28.17	59.76	28.74
Symptom count	5.88	4.65	5.91	4.47	7.56	4.84
Nights in hospital	1.19	4.92	0.88	3.81	2.64	6.74
Emergency room visits	0.11	0.41	0.08	0.34	0.25	0.59

* Excludes patients who died during the first six months.

Table 4. Analysis of covariance for physician visits, hospital nights, and emergency room visits during the active treatment period (*N*=909)

	Physician Visits			Hospital Nights			Emergency Room Visits		
	SS	F	Sig	SS	F	Sig	SS	F	Sig
Survival group	0.773	0.600	0.549	291.80	12.645	0.000	2.756	10.427	0.000
Stage of disease	0.311	0.482	0.488	0.12	0.011	0.917	0.040	0.300	0.584
Sex	0.060	0.092	0.761	12.47	1.081	0.299	0.916	6.934	0.009
Cancer site	0.149	0.077	0.972	131.59	3.802	0.010	0.649	1.637	0.179
Age group	0.178	0.276	0.599	17.55	1.521	0.218	0.015	0.114	0.736
Comorbidity	5.662	2.928	0.033	47.19	1.363	0.253	0.361	0.911	0.435
Treatment status	0.445	0.345	0.708	11.78	0.510	0.601	0.052	0.196	0.822
Symptom count	0.189	0.293	0.589	13.96	1.210	0.272	0.007	0.049	0.824
Physical functioning	3.882	6.022	0.014	494.35	42.845	0.000	4.053	30.677	0.000
	0.143								
Symptom count × survivor group	2.956	0.111	0.895	51.64	2.238	0.107	0.860	3.253	0.039
Physical functioning × survivor group	0.078	2.014	0.134	228.01	9.881	0.000	2.623	9.927	0.000
R-squared	0.078			0.184			0.132		

SS=sum of squares; F=statistic; Sig=significance.

emergency room visits during the active treatment period, and for hospital nights and emergency room visits during the continuing care period. To further investigate this relationship between physical functioning and service utilization, we analyzed the average service utilization levels for different levels of physical functioning (0–10, 11–20, . . ., 91–100). We discovered that, during the continuing care period, utilization levels remained roughly constant until physical functioning worsened to the level of 0–10. At this level the average number of hospital nights more than doubled, and to a lesser degree, a similar picture was seen for emergency room visits. A similar phenomenon occurred during the active treatment period. To summarize, utilization of services by these elderly patients seems to peak only at very low levels of physical functioning.

Patients with three or more comorbid conditions (roughly 50% of the sample) visited their primary care physicians more frequently than those with no comorbid conditions, both during the active treatment and continuing care periods. As shown in Tables 2 and 3, the reasons for physician visits were predominantly not cancer-related, thus likely were related to the comorbid conditions themselves. With respect to the observed relationship of reduced physical functioning to increased utilization of services, we are unable to determine the degree to which the cancer itself, as opposed to the other comorbid conditions, was responsible for the reduced physical functioning and the subsequent increased utilization of services. Stafford

Table 5. Analysis of covariance for physician visits, hospital nights, and emergency room visits during the continuing care period (*N*=844)

	Physician Visits			Hospital Nights			Emergency Room Visits		
	SS	F	Sig	SS	F	Sig	SS	F	Sig
Survival group	1.408	1.224	0.269	17.817	0.820	0.365	0.042	0.302	0.583
Stage of disease	0.000	0.000	0.988	20.264	0.933	0.334	0.094	0.671	0.413
Sex	0.120	0.104	0.747	26.012	1.198	0.274	0.098	0.701	0.403
Cancer site	3.894	1.128	0.337	9.228	0.142	0.935	0.291	0.693	0.557
Age group	0.049	0.042	0.837	59.941	2.760	0.097	0.471	3.366	0.067
Comorbidity	16.443	4.762	0.003	17.431	0.268	0.849	0.641	1.527	0.206
Treatment status	3.608	1.567	0.209	63.611	1.465	0.232	0.189	0.674	0.510
Symptom count	0.009	0.008	0.928	1.172	0.054	0.816	0.222	1.590	0.208
Physical functioning	0.697	0.606	0.437	249.81	11.503	0.001	1.577	11.270	0.001
Symptom count × survivor group	0.454	0.394	0.530	3.585	0.165	0.685	0.181	1.291	0.256
Physical functioning × survivor group	1.082	0.940	0.333	4.634	0.213	0.644	0.494	3.534	0.061
R-squared	0.087			0.093			0.080		

SS=sum of squares; F=statistic; Sig=significance.

To summarize, utilization of services by these elderly patients seems to peak only at very low levels of physical functioning.

and Cyr,[9] for example, found that other serious chronic conditions had a greater impact on physical functioning than cancer.

As expected, patients who survived less than six months reported more hospitalization and emergency room services during the active treatment period than those who survived the full year. This is entirely consistent with the fact that, in general, service utilization tends to be higher in the end-of-life period.[16,17]

Our analyses did not reveal age to be a significant factor in any of the areas of service utilization. It is possible that our sample did not contain enough age diversity (all patients were ≥65 years) to show such effects, or perhaps it is the case, as others contend, that age, per se, is not as important as nearness to death.[3] The latter interpretation seems more plausible in view of the results concerning the increased hospital and emergency room utilization by shorter term survivors.

In conclusion, the broad picture suggested by this study of elderly cancer patients is that their service utilization, particularly hospitalization and emergency room services, tends to peak in concert with a dramatic decrease in physical functioning as the patient nears the end of life. It also appears that multiple comorbid conditions may be responsible for substantial utilization of services provided by primary care physicians in both the active treatment and continuing care periods. Further research needs to be undertaken to better differentiate utilization of services that are cancer-related from those related to comorbid conditions.

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