Outpatient-Shopping Behavior and Survival Rates in Newly Diagnosed Cancer Patients

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Objectives: To evaluate the appropriateness of the definition of outpatient-shopping behavior in Taiwanese patients.

Study Design: Linked study of 3 databases (Taiwan Cancer Registry, National Health Insurance [NHI] claim database, and death registry database).

Methods: Outpatient shopping behavior was defined as making at least 4 or 5 physician visits to confirm a cancer diagnosis. We analyzed patient-related factors and the 5-year overall survival rate of the outpatient-shopping group compared with a nonshopping group. Using the household registration database and NHI database, we determined the proportion of outpatient shopping, characteristics of patients who did and did not shop for outpatient therapy, time between diagnosis and start of regular treatment, and medical service utilization in the shopping versus the nonshopping group.

Results: Patients with higher incomes were significantly more likely to shop for outpatient care. Patients with higher comorbidity scores were 1.4 times more likely to shop for outpatient care than patients with lower scores. Patients diagnosed with more advanced cancer were more likely to shop than those who were not. Patients might be more trusting of cancer diagnoses given at higher-level hospitals. The nonshopping groups had a longer duration of survival over 5 years.

Conclusions: Health authorities should consider charging additional fees after a specific outpatient-shopping threshold is reached to reduce this behavior. The government may need to reassess the function of the medical sources network by shrinking it from the original 4 levels to 2 levels, or by enhancing the referral function among different hospital levels.

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For author information and disclosures, see end of text.

With increasing life expectancy and an aging population, the focus of healthcare in Taiwan has changed from acute infectious diseases to chronic diseases such as diabetes, hypertension, and cancer. Since 1992, the incidence of cancer has increased annually. Additionally, cancer has become one of the leading causes of death,[1] accounting for nearly one-third of all deaths in Taiwan, according to an annual report by the Department of Health. Cancer is not a single disease, and a number of mysteries regarding its etiology remain.

For patients, cancer is a life-threatening disease with no cure. However, modern medicine can enhance patients' quality of life so long as patients follow the clinical protocol. Most patients can obtain a good quality of life, and survival rates are promising.[2] However, patients' behavior has a major influence on their survival rate. Generally, early diagnosis and treatment are fundamental. Therefore, understanding the relevant factors in patients' healthcare-seeking behavior can improve the subsequent treatment and prognosis.

Few studies have systematically investigated patients' psychological conditions to determine the factors influencing their healthcare-seeking behavior.[3] Patients, particularly those diagnosed with cancer, might want additional medical opinions (also known as doctor-shopping behavior) because of their perceptions of laboratory testing errors, incorrect diagnoses, or misunderstandings.[4-6] Thus, greater attention must be paid to patient behavior to develop useful support strategies, particularly for cancer patients.

Most studies have found a relationship between patients' healthcare-seeking behavior and utilization of medical services.[7,8] Appropriate behaviors can reduce waste and benefit society. By contrast, according to economic theory, a number of negative events (eg, moral failures) can result in excessive usage, especially of the national health insurance system, and are associated with shopping behavior. The various healthcare delivery systems in different countries have focused on different issues associated with doctor-shopping behavior.[9,10] In Taiwan, after the National Health Insurance (NHI) program was launched, some studies found that shopping behavior frequently occurred under this system because of the lack of restrictions, low costs, and reduction of barriers to access.[11] Most importantly, shopping behavior can increase medical expenses, reduce the quality of continuous care, and cause

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waste.[12,13] These unfavorable outcomes burden the already fragile healthcare financial system.

Patient and healthcare provider characteristics, as well as the scope of medical resources, all influence doctor-shopping behavior.[14] A number of studies found that people with low socioeconomic status do not benefit from cancer prevention therapies as much as people in higher socioeconomic status groups.[15,16] To date, few studies have systematically explored the relationship between the survival rates and shopping behaviors of cancer patients.[17,18]

Take-Away Points

Understanding the factors that influence patients to shop for outpatient care after a cancer diagnosis can aid in determining whether the definition of outpatient-shopping behavior is appropriate.

- Patients with higher individual incomes and higher comorbidity scores were more likely to shop for outpatient care.
- Patients with more advanced cancer tended to shop more frequently for outpatient care.
- Patients may be more trusting of cancer diagnoses given at higher-level hospitals.

Another complication is the lack of a conclusive definition of shopping behavior because of the various principles used by different healthcare systems. In addition, quantitative data that support a relationship between shopping behavior and use of healthcare services are limited, although it is obvious that the shopping behavior could induce wastefulness.

Our study focused on patients newly diagnosed with cancer in 2003 to explore the factors associated with their shopping behavior. We evaluated the definition of outpatient-shopping behavior (ie, making at least 4 or 5 physician visits to confirm a diagnosis of cancer), taking into consideration healthcare providers' characteristics. In addition, we analyzed patients' 5-year survival rate compared with that of nonshopping patients. These outcomes enabled us to determine the consequences of outpatient-shopping behavior and to develop feasible strategies to improve the quality of cancer care.

METHODS

Data Sources

This study linked 3 databases (the Taiwan Cancer Registry, the NHI claim database, and the death registry database) to explore factors associated with outpatient-shopping behavior and to conduct survival analysis. The Taiwan Cancer Registry collects basic information on newly diagnosed cancer patients from hospitals. All hospitals are required to report cancer records, and quality controls are conducted periodically to identify possible errors and inconsistencies.[1] The NHI, Taiwan's national health insurance program, was established in 1995 and covers 99% of the population in providing comprehensive services. The NHI database, a valuable population-based database, contains substantial information on people's use of medical services and a longitudinal time frame for cohort design. The Department of Health in Taiwan ensures the completeness and accuracy of the NHI database.[19] Therefore, we linked data from the 3 databases together using patients' identification numbers in compliance with privacy regulations. This study was approved by the Institutional Review Board of Asia University.

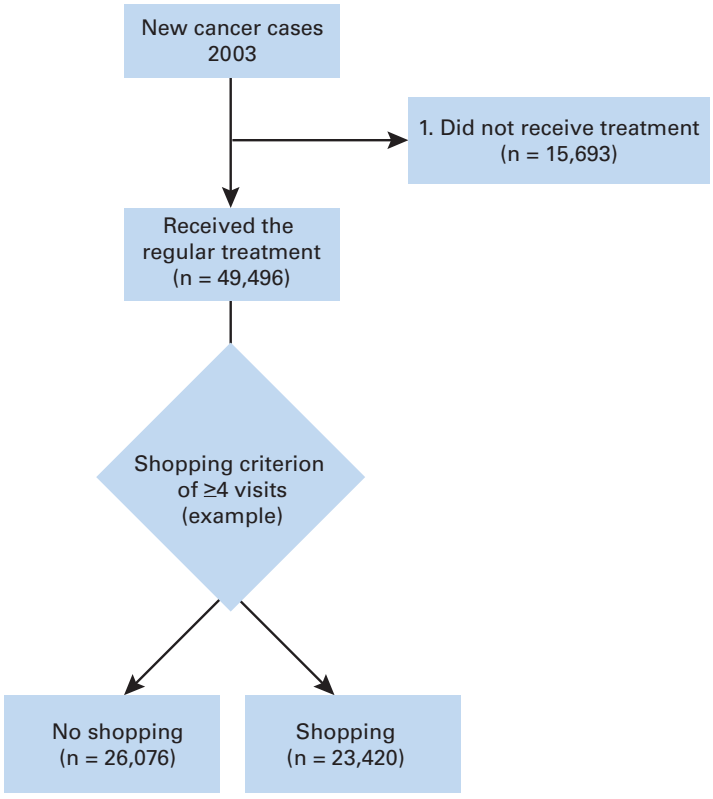
Study Design

Study Population and First-Time Diagnosis. This study focused on patients newly diagnosed with 1 of the 10 most common cancers, according to the cancer registry database (restricted to patients with their first diagnosis of cancer). The cancers were selected using *International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM)* A-codes as follows: liver cancer (155, A095), lung cancer (162, A101), colorectal cancer (153, 154, A093, A094), oral cancer (140, 141, 143-146, 148, 149, A08), stomach cancer (151, A091), esophageal cancer (150, A090), prostate cancer (185, A124), pancreatic cancer (157, A096), breast cancer (174, A113), cervical cancer (179, 180, A120, A122), and other cancers not in the above list. To measure the time from first diagnosis to initiation of regular treatment, as well as the effects of patient sex, age, and income variables, we selected only patients newly diagnosed with cancer in 2003 to analyze their 5-year survival rate.

Exclusions. This study excluded patients who did not have treatment records or who had died before receiving regular treatment. We also excluded patients who were younger than 20 years because their decisions might have been influenced by their parents. Additionally, based on NHI provisions, dependents of qualified beneficiaries do not report their income to the NHI service; therefore their income would have been 0 in the database and may have distorted the estimations in this study. Figure 1 shows the patient selection process used in this study.

Regular Treatment. In most situations, when patients accept the diagnosis of cancer, they typically undergo regularly scheduled treatment. According to NHI reimbursement schemes, 4 main forms of cancer treatment are used: surgery (*ICD_op_code* [NHI, Taiwan coding manual], varies for different types of cancer), radiotherapy (D1), chemotherapy (D2), and drugs (12). Undergoing 1 of these 4 types of treatment after a diagnosis of cancer is considered regular treatment.

Figure 1. Flow Chart for Patient Selection in This Study



Outpatient-Shopping Behavior. We selected assessment criteria and explored the characteristics of outpatient-shopping behavior using the frequency of outpatient visits. Previous studies considered seeking a second opinion on a diagnosis to be rational behavior. For this study, we defined outpatient-shopping behavior as ≥4 or ≥5 physician visits to confirm a diagnosis of cancer. Then we compared the difference between the 2 cutoff points.

Statistical Analyses. First, we determined the number of outpatient visits related to cancer from the first diagnosis until regular treatment. Then we used *t* tests and 1-way analysis of variance to investigate the influencing factors (age, sex, income, marriage, urbanization, Charlson Comorbidity Index score, cancer type, and severity) between the nonshopping and shopping groups. To determine differential cancer stages, we used the grading method of the Taiwan cancer registry database (well, moderate, poor, undifferentiated, and not determined), which is the method used by the *International Classification of Diseases for Oncology*. Additionally, logistic regression was performed to determine which factors might have been associated with outpatient-shopping behavior. Patient characteristics included age, sex, income, and cancer type; provider characteristics included the physician's age and sex, and the level of the hospital (medical center, regional hospital, district hospital, or clinic) where the initial diagnosis was made. For patient survival analysis, we calculated the overall patient survival rates and compared the shopping and nonshopping groups on the probability of surviving or being event-free in 5 years. We focused on the time between the first diagnosis and initiation of regular treatment and did not calculate the survival days for the specific cancers.

The Kaplan-Meier estimator was used in this study because of its simplistic step approach. The survival curve describes the relationship between the probability of survival and elapsed time**.** To deal with the outlier situation in outpatient shopping, we also performed a sensitivity analysis that excluded patients with more than 25 visits (5% of accumulated outpatient visits) to determine how that exclusion affected the results. We used SPSS 18.0 software to conduct analyses (SPSS Inc, Chicago, Illinois). A *P* value of .05 indicated a statistically significant result.

RESULTS

Table 1 shows the average number of physician visits among patients with the 10 most common cancer types. The total number of cases was 49,496, and the number of new cases ranged between 834 and 6910 for each cancer type. Although the number of physician visits varied among patients with different cancer types, the average number ranged from 5 to 8. The median for physician visits was from 2 to 4 and mode was 1 or 2, varied by different types of cancer. This result suggests that most patients do not shop for additional outpatient services to confirm their diagnosis; however, the extreme shopping behavior observed in this study and the patients' behaviors varied according to the different cancer types.

We defined outpatient-shopping behavior as ≥4 or ≥5 physician visits to confirm a diagnosis of cancer and compared the differences between these cutoff points. Table 2 shows the characteristics of the nonshopping group and the outpatient-shopping group with ≥4 visits. Although the distribution of variables was similar between the groups, most were significant except for sex and urbanization. Unsurprisingly, the shopping group had more visits (12 vs 2 visits), fewer survival days (485 vs 529 days), and longer time between initial diagnosis and first regular treatment (83 vs 11 days).

To determine the predictor effect, we applied the logistic regression model. We then combined the 2 models, setting the cutoff point as ≥4 or ≥5 visits (Table 3). The results of the 2 models were quite similar. Patients with higher income and higher comorbidity scores, and those who were diagnosed with more advanced cancer, had a significantly greater like-

Table 1. Physician Visits Among Patients With the 10 Most Common Cancer Types[a]

Cancer Type	No.	Mean	SD	Minimum	Maximum	Median	Mode
Liver	5887	7.56	11.563	1	160	4	2
Lung	5188	6.68	9.649	1	113	4	2
Colon	6910	4.14	6.906	1	160	2	1
Mouth	3781	5.56	9.216	1	179	3	1
Stomach	2519	5.79	10.297	1	304	3	1
Esophagus	1178	5.22	6.550	1	64	3	2
Prostate	1955	6.83	11.334	1	182	3	1
Pancreas	834	6.15	8.370	1	85	4	2
Breast	5538	4.43	5.774	1	122	3	1
Cervix	2144	6.55	9.585	1	185	4	1
Others	13,562	8.36	12.62	1	178	4	1
Total	**49,496**	**6.46**	**10.262**	—	—	—	—

SD indicates standard deviation.
[a]Visits were made between the time of first cancer diagnosis and the time when regularly scheduled treatment began.

lihood of engaging in shopping behavior, with odds ratios (ORs) around 1.49, 1.45, and 1.2, respectively (Table 3). In addition, patients diagnosed with cancer in a clinic had an increased likelihood of engaging in outpatient shopping (OR 1.23 and 1.28, 95% confidence interval 1.12-1.35 and 1.17-1.40, for ≥4 and ≥5 visits, respectively) compared with those who were diagnosed in the medical center. However, at other hospital levels (such as district or regional hospitals), patients were less likely to engage in outpatient-shopping behavior. Furthermore, the likelihood of patients engaging in shopping behavior varied for the different cancer types.

Figure 2 and Figure 3 show a comparison of the number of survival days between the shopping group and the nonshopping group at different cutoff points (≥4 and ≥5 visits). Not surprisingly, as determined from the Kaplan-Meier curves, the nonshopping groups had longer survival times during the 5-year period (mean of 534 and 529 days for cutoff points of ≥4 and ≥5 visits, respectively); the shopping group's survival time was a mean of 46.3 days less (median 29-61 days).

DISCUSSION

Previous studies related to shopping behavior are either out of date or focus on specific conditions such as drug abuse. The high occurrence of outpatient-shopping behavior in Asian countries such as Japan, Hong Kong, and Taiwan[11,20,21] may be associated with the local culture or healthcare insurance system.

Some studies reported that male patients and patients diagnosed at the local hospital level were more likely to engage in shopping behavior.[22] However, other studies have found that vulnerable populations, such as children or the elderly, are more likely to exhibit outpatient-shopping behavior; this probability is also greater in areas with abundant medical resources or longer waiting times.[23] Patients in poor overall health also tend to visit physicians more frequently.[11,24]

The results of this study indicated that patients with severe conditions (assessed using their Charlson Comorbidity Index score and cancer differential stage) had an increased likelihood of engaging in shopping behavior. That may be because patients in poor health request additional procedures and tests to confirm a catastrophic diagnosis such as cancer. Although some studies have indicated that low socioeconomic status groups are more likely to seek additional medical care in safety-net situations[25] or when they have poor health status, we found that patients with higher income were more likely to engage in shopping behavior. This finding implies that patients in the high-income group invest more in their healthcare in exchange for better outcomes, which may contribute to their outpatient-shopping behavior.

Significantly, patients who received a diagnosis of cancer for the first time in clinics had a greater tendency to shop for additional physicians or outpatient services. These patients may visit another medical center to confirm their diagnosis of cancer. A previous study reported that patients have more confidence in diagnoses received at higher-level hospitals.[26] Therefore, health officials should inform patients that the differences between hospital levels do not influence diagnosis or promote quality measures for cancer diagnosis. Furthermore, the time from first diagnosis to the start of regular treatment varied for different cancer types. This finding requires further investigation to provide guidance and to understand patients' behavior. Although the characteristics between 2 groups were statistically significant, there were differences, despite urbanization and gender. However, if we observed the table, those differences were very small despite the severity of conditions.

Although shopping behavior wastes healthcare resources,[27] few quantitative descriptions have been presented using evi-

Table 2. Patient Characteristics (n = 49,496)

Characteristic	No.	Nonshopping Group (n = 26,076)	Shopping Group Who Made ≥4 Visits (n = 23,420)	χ^2 / *t*
Sex, n (%)				0.569
Male	22,483	11,644 (52.86)	10,839 (53.22)	
Female	19,913	10,386 (47.14)	9527 (46.78)	
Age, n (%), y				58.985[a]
≤39	5184	2563 (11.63)	2621 (12.87)	
40-49	7952	4279 (19.42)	3673 (18.03)	
50-59	8029	4056 (18.41)	3973 (19.51)	
60-69	9589	4842 (21.98)	4747 (23.31)	
≥70	11,642	6290 (28.55)	5352 (26.28)	
Income level, n (%), NT$[b]				19.505[c]
>60,000	1100	517 (02.35)	583 (02.86)	
30,001-60,000	3795	1920 (08.72)	1875 (09.21)	
15,841-30,000	18,095	9423 (42.77)	8672 (42.58)	
≤15,840	7685	4097 (18.60)	3588 (17.62)	
0 (dependent)[d]	11,721	6073 (27.57)	5648 (27.73)	
Marriage, n (%)				14.419[c]
Married	14,530	7066 (70.34)	7464 (72.14)	
Single	1441	692 (06.89)	749 (07.24)	
Divorced	809	410 (04.08)	399 (03.86)	
Widowed	3612	1877 (18.69)	1735 (16.77)	
Urbanization, n (%)				2.763
High	27,920	14,589 (66.22)	13,331 (65.46)	
Low	14,476	7441 (33.78)	7035 (34.54)	
Charlson Comorbidity Index score, n (%)				17.466[a]
0	46,940	24,793 (95.08)	22,147 (94.56)	
1	1224	573 (02.20)	651 (02.78)	
2+	1332	710 (02.72)	622 (02.66)	
Cancer type, n (%)				1351.989[a]
Liver	5887	2934 (11.25)	2953 (12.61)	
Lung	5188	2572 (09.86)	2616 (11.17)	
Colon	6910	4797 (18.40)	2113 (09.02)	
Mouth	3781	2145 (08.23)	1636 (06.99)	
Stomach	2519	1369 (05.25)	1150 (04.91)	
Esophagus	1178	633 (02.43)	545 (02.33)	
Prostate	1955	1062 (04.07)	893 (03.81)	
Pancreas	834	407 (01.56)	427 (01.82)	
Breast	5538	3199 (12.27)	2339 (09.99)	
Cervix	2144	970 (03.72)	1174 (05.01)	
Others	13,562	5988 (22.96)	7574 (32.34)	
Differential stage, n (%)				377.409[a]
Well differentiated	3428	1947 (08.98)	1481 (07.44)	
Moderately differentiated	12,179	7116 (32.83)	5063 (25.43)	
Poorly differentiated	5832	2943 (13.58)	2889 (14.51)	
Undifferentiated	1149	500 (02.31)	649 (03.26)	
Not determined	18,996	9170 (42.30)	9826 (49.36)	
Frequency of visits, mean ± SD		1.88 ± 0.795	11.57 ± 13.130	−118.932[a]
Survival, mean ± SD, d		528.91 ± 515.836	484.75 ± 484.623	7.291[a]
Duration, mean ± SD, d[e]		11.25 ± 23.046	83.08 ± 111.845	−101.335[a]

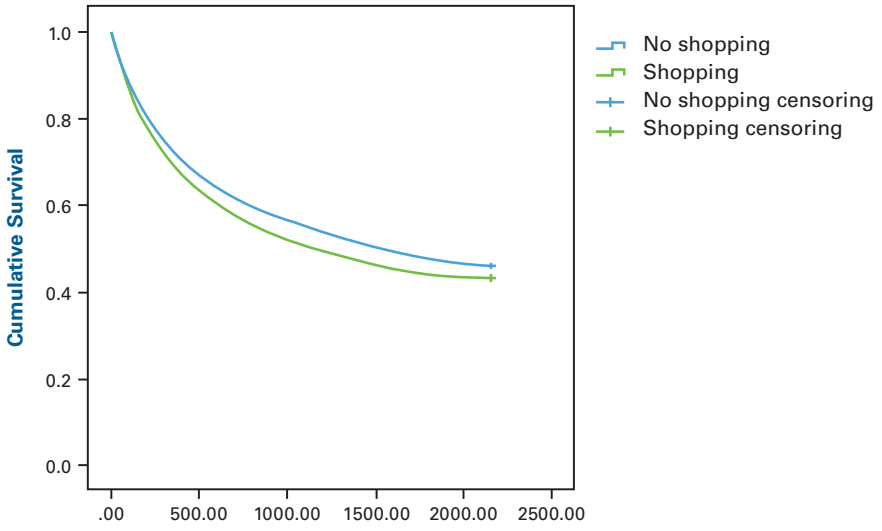
SD indicates standard deviation.
[a] $P < .001$.
[b] Premium-based monthly salary.
[c] $P < .01$.
[d] The salary in the dependent group was defined as 0.
[e] Duration refers to the time between first diagnosis and the time when regular treatment began.

Table 3. Logistic Regression of Outpatient Shopping Behavior (n = 49,496)

	≥4 Physician Visits		≥5 Physician Visits	
Variable	**Exp(B)**	**95% CI of Exp(B)**	**Exp(B)**	**95% CI of Exp(B)**
Constant	1.558		0.974	
Sex				
Male (reference)				
Female	1.027	0.956-1.104	1.020	0.948-1.097
Age, y				
≤39 (reference)				
40-49	0.950	0.825-1.093	0.971	0.841-1.120
50-59	1.070	0.933-1.228	1.056	0.919-1.214
60-69	1.082	0.945-1.239	1.107	0.965-1.271
≥70	0.926	0.808-1.060	0.973	0.848-1.117
Income, NT$				
>60,000 (reference)				
30,001-60,000	0.698[a]	0.536-0.908	0.815	0.628-1.058
15,841-30,000	0.739[b]	0.579-0.943	0.859	0.675-1.093
≤15,840	0.657[a]	0.512-0.844	0.760[b]	0.593-0.974
0 (dependent)	0.672[a]	0.524-0.860	0.781[b]	0.611-0.997
Marriage				
Married (reference)				
Single	1.033	0.910-1.173	0.983	0.864-1.118
Divorced	0.907	0.775-1.062	0.934	0.795-1.097
Widowed	0.941	0.865-1.024	0.936	0.858-1.020
Urbanization				
High (reference)				
Low	1.017	0.53-1.085	1.029	0.963-1.099
Charlson Comorbidity Index score				
0 (reference)				
1	1.448[c]	1.229-1.705	1.445[c]	1.228-1.700
2+	1.051	0.894-1.234	1.011	0.859-1.191
Cancer type				
Liver (reference)				
Lung	1.007	0.909-1.116	0.960	0.866-1.064
Colon	0.458[c]	0.408-0.514	0.415[c]	0.367-0.469
Mouth	0.846[b]	0.740-0.967	0.812[a]	0.709-0.930
Stomach	0.819[a]	0.711-0.943	0.707[c]	0.611-0.818
Esophagus	0.842[b]	0.710-0.999	0.815[b]	0.684-0.971
Prostate	0.808[b]	0.684-0.954	0.831[b]	0.701-0.986
Pancreas	0.875	0.719-1.066	0.869	0.712-1.061
Breast	0.626[c]	0.533-0.736	0.577[c]	0.487-0.684
Cervix	1.288[a]	1.065-1.558	1.192	0.988-1.439
Others	1.380[c]	1.249-1.524	1.367[c]	1.238-1.508
Cancer differential stage				
Well differentiated (reference)				
Moderately differentiated	1.056	0.919-1.215	0.968	0.838-1.118
Poorly differentiated	1.211[b]	1.042-1.408	1.103	0.945-1.287
Undifferentiated	1.138	0.907-1.427	1.093	0.871-1.372
Not determined	1.288[c]	1.125-1.475	1.230[a]	1.071-1.414
Hospital level for diagnosis				
Medical center (reference)				
Region	0.588[c]	0.549-0.629	0.573[c]	0.535-0.615
Local	0.823[c]	0.744-0.910	0.829[c]	0.748-0.918
Clinic	1.229[c]	1.122-1.346	1.277[c]	1.167-1.398
Diagnosing provider's sex				
Male (reference)				
Female	1.094	0.958-1.249	1.091	0.955-1.247

[a] $P < .01$
[b] $P < .05$.
[c] $P < .001$.

Figure 2. Kaplan-Meier Curves for Nonshopping Group and Shopping Group With 4 or More Visits



Log Rank Test at Cut Point of 4 or More Visits

			Survival Days				
Group	**No.**	**Events**	**Mean**	**SD**	**Median**	**SD**	**Log Rank Test**
Nonshopping	26,076	13,989	534.017	4.485	366	4.771	83.697[a]
Shopping	23,420	13,379	487.713	4.269	305	4.436	
Total	49,496	27,368	511.534	3.106	321	3.250	

SD indicates standard deviation.
[a] $P < .001$.

dence from the population database. Significant differences between the nonshopping and shopping groups for average number of visits (2 vs 12), mean number survival days (529 vs 485), and hospitalizations (11 vs 83) demonstrate that shopping behavior leads to consumption of more medical resources. These figures not only provide a foundation for scientists to estimate the economic impact of healthcare, but also support the need for additional data on outpatient behavior. Health authorities could assess the scale of outpatient-shopping behavior and develop useful strategies to control or reduce this behavior. However, to provide more details, future studies should focus on patients' behavioral patterns instead of the utilization perspective.

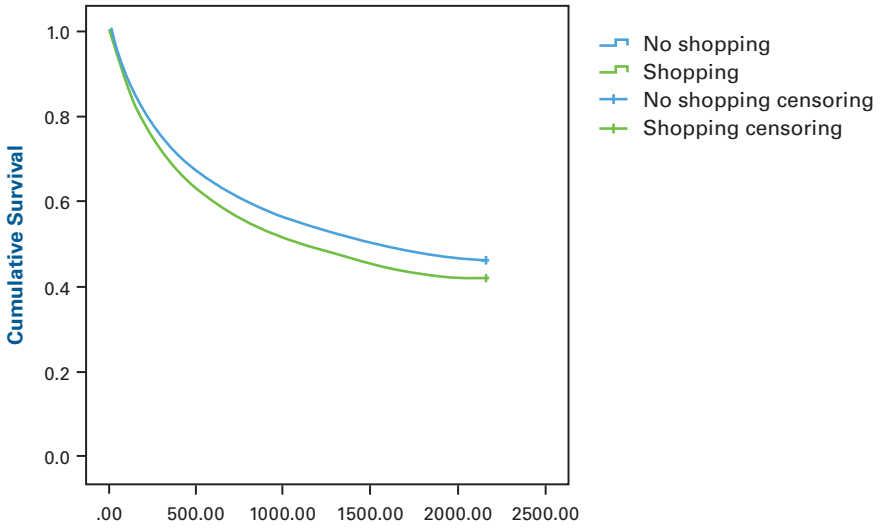
The cancer survival rate in Taiwan is lower than that in the United States. This may be related to a lower screening rate or because the survival rate varies for each type of cancer.[28,29] The survival rates are different for the low-income group and the higher income group, attributable to low-income patients having more advanced stages of cancer and not receiving aggressive therapy.[30] The 5-year survival time of the outpatient-shopping group differed significantly from that of the nonshopping group. Although the difference was not marked, the nonshopping group survived approximately 46 days longer than the outpatient-shopping group, depending on the various definitions of outpatient-shopping behavior. Future studies should examine and differentiate patient behavior according to the various cancer types.

Kasteler and colleagues define shopping behavior as consulting physicians for the same syndrome without referrals.[31] Demers defined shopping as numerous visits (>20) to healthcare providers.[13] Another study defined shopping behavior as the frequent switching of healthcare providers for the same syndrome.[32] Subsequently, Sato and colleagues defined shopping as the use of more than 3 providers.[33] Although no conclusive definition for shopping behavior exists, the concept is consistent despite the varying measurement. Most studies contended that shopping behavior leads to adverse outcomes and increases resource consumption.[34,35] However, few studies have presented quantitative data on these outcomes.

In this study, outpatient-shopping behavior in Taiwan was defined as at least 4 or 5 physician visits and that definition was compared with others. The appropriateness and the determining factors of that definition were similar to the criteria adopted by other researchers.[13,31-33] Health authorities should devote greater attention to preventing patients from engaging in outpatient-shopping behavior rather than to establishing a definition of the term.

In this study we not only identify the factors related to outpatient-shopping behavior, but also provide a number of

Figure 3. Kaplan-Meier Curves for Nonshopping Group and Shopping Group With 5 or More Visits



Log Rank Test at Cut Point of 5 or More Visits

			Survival Days				
Group	No.	Events	Mean	SD	Median	SD	Log Rank Test
Nonshopping	31,052	16,688	529.499	4.088	333	4.316	107.200[a]
Shopping	18,444	10,680	483.183	4.729	304	4.926	
Total	49,496	27,368	511.534	3.106	321	3.250	

SD indicates standard deviation.
[a] $P < .001$.

feasible strategies for improving the quality of cancer care. Patients with greater access to healthcare resources have a higher likelihood of engaging in shopping behavior. Therefore, health authorities should first educate patients and then consider charging additional fees after a specific threshold (such as more than 5 visits) to reduce the probability of outpatient shopping occurring. In addition, patients whose cancer is more severe tend to engage more in shopping. Thus, promotion of integrated cancer services should be considered to enhance the healthcare services currently available. Additionally, because patients tend to have greater trust in a diagnosis of cancer from higher-level hospitals, the government should reassess the function of the medical sources network and reduce it from its original 4 levels to 2 levels, or enhance the referral function between different hospital levels.

This study had several limitations. First, we did not have information on patient care preferences, doctor-patient relationships, or the available support systems, all of which can affect the time from first diagnosis to regularly scheduled treatment. Second, patients might have consulted physicians not registered in the database for a second opinion. Thus, the time from first diagnosis to regular treatment might have been underestimated. Third, some patients had extremely high numbers of visits (see the skew distribution in Table 2). Most of these patients were elderly and in the veterans system, and may have had an extraordinary number of visits (>100) between diagnosis and treatment (>365 to 730 days). We did not exclude these cases from the sample because we wanted to provide accurate and realistic results. In addition, when we ran the sensitivity analysis to define the outliers as patients with more than 25 visits, the findings did not change (see **eAppendices A** and **B**, available at **www.ajmc.com**). Fourth, even though we defined new cases from the Taiwan cancer registry, a patient who had cancer in different primary sites before 2003 still could have been included in this study. In addition, patients with more than 1 cancer type might have delayed their regular treatment.

Future research should examine this skewed distribution and include additional cancer types. For the survival analysis, future researchers should consider using the Cox proportional hazard model to control for other variables in the association between survival and shopping behavior. Income as reported in the database was our sole source for individual salary; this variable would be different if information on total income were available. Taiwan provides free screening tests for oral cancer, colorectal cancer, cervical cancer, and breast cancer to people in various age groups, which may also influence when diseases are diagnosed. Health education is another factor influencing the time from the initial diagnosis to regular treat-

ment, but no information on health education is provided in the database. Finally, although the scope of this study did not include the relationship between patients' outpatient-shopping behavior and type of cancer, we discovered a number of significant differences between cancer types.

Despite those limitations, our findings could help other countries as they work to improve primary care function, promote screening services, and provide a quality assurance mechanism for cancer diagnosis in different types of hospitals. These improvements could reduce the likelihood of outpatient shopping as well as future disease burden.

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■ **eAppendix A.** Physician Visits Among Patients With the 10 Most Common Cancer Types, Excluding 5% of Outpatient Visiting as Outliers

Cancer Type	No.	Mean	SD	Minimum	Maximum	Median	Mode
Liver	5478	5.02	4.86	1	24	3	2
Lung	4947	4.98	4.61	1	24	3	2
Colon	6758	3.32	3.40	1	24	2	1
Mouth	3662	4.32	4.19	1	24	3	1
Stomach	2432	4.42	4.18	1	24	3	1
Esophagus	1149	4.43	3.96	1	24	3	2
Prostate	1841	4.64	4.63	1	24	3	1
Pancreas	798	4.71	4.13	1	24	3	2
Breast	5462	3.93	3.41	1	24	3	1
Cervix	2056	5.06	4.48	1	24	4	1
Others	12,530	5.42	4.93	1	24	4	1
Total	**47,113**	**4.63**	**4.33**	—	—	—	—

SD indicates standard deviation.

eAppendix B. Logistic Regression of Outpatient Shopping Behavior, Excluding 5% of Outpatient Visiting as Outliers (n = 47,113)

	≥4 Physician Visits		≥5 Physician Visits	
Variable	**Exp(B)**	**Exp(B)[a]**	**Exp(B)**	**Exp(B)[a]**
Constant	1.558	1.345	0.974	0.815
Sex				
Male (reference)				
Female	1.027	1.000	1.020	0.984
Age, y				
≤39 (reference)				
40-49	0.950	0.909	0.971	0.917
50-59	1.070	1.011	1.056	0.981
60-69	1.082	1.001	1.107	1.004
≥70	0.926	0.846[a]	0.973	0.869
Income, NT$				
>60,000 (reference)				
30,001-60,000	0.698[b]	0.681[b]	0.815	0.794
15,841-30,000	0.739[a]	0.715[b]	0.859	0.829
≤15,840	0.657[b]	0.640[b]	0.760[a]	0.738[a]
0 (dependent)	0.672[b]	0.658[b]	0.781[a]	0.763[a]
Marriage				
Married (reference)				
Single	1.033	1.032	0.983	0.977
Divorced	0.907	0.924	0.934	0.956
Widowed	0.941	0.935	0.936	0.927
Urbanization				
High (reference)				
Low	1.017	1.026	1.029	1.043
Charlson Comorbidity Index score				
0 (reference)				
1	1.448[c]	1.441[c]	1.445[c]	1.445[c]
2+	1.051	1.033	1.011	0.985
Cancer type				
Liver (reference)				
Lung	1.007	1.106	0.960	1.074
Colon	0.458[c]	0.503[c]	0.415[c]	0.458[c]
Mouth	0.846[a]	0.913	0.812[b]	0.887
Stomach	0.819[b]	0.896	0.707[c]	0.778[b]
Esophagus	0.842[a]	0.943	0.815[a]	0.935
Prostate	0.808[a]	0.822[a]	0.831[a]	0.848
Pancreas	0.875	0.963	0.869	0.975
Breast	0.626[c]	0.708[c]	0.577[c]	0.668[c]
Cervix	1.288[b]	1.425[c]	1.192	1.350[b]
Others	1.380[c]	1.370[c]	1.367[c]	1.360[c]
Cancer differential stage				
Well differentiated (reference)				
Moderately differentiated	1.056	1.115	0.968	1.030
Poorly differentiated	1.211[a]	1.284[b]	1.103	1.183[a]
Undifferentiated	1.138	1.238	1.093	1.213
Not determined	1.288[c]	1.314[c]	1.230[b]	1.264[b]
Hospital level for diagnosis				
Medical center (reference)				
Region	0.588[c]	0.616[c]	0.573[c]	0.603[c]
Local	0.823[c]	0.839[b]	0.829[c]	0.847[b]
Clinic	1.229[c]	1.204[c]	1.277[c]	1.255[c]
Diagnosing provider's sex				
Male (reference)				
Female	1.094	1.121	1.091	1.129

[a] $P < .05$.
[b] $P < .01$
[c] $P < .001$.