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Readmissions in Cancer Patients After Receiving Inpatient Palliative Care in Taiwan

A 9-Year Nationwide Population-Based Cohort Study

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Abstract: Few studies have reported on readmissions among cancer patients receiving inpatient palliative care (IPC). This study investigated readmissions in cancer patients after their first discharge from IPC in Taiwan from 2002 to 2010.

This study was a secondary data analysis using information from the National Health Insurance Database in Taiwan from 2002 to 2010. We included subjects ≥ 20 years old diagnosed with malignant neoplasms who were listed in the registry of catastrophic illness. Patients diagnosed with cancer before January 1, 2002 or who had ever been admitted to an inpatient hospice palliative care unit before the study period were excluded. Readmission was defined as hospital readmission at least once after discharge from first admission to IPC until mortality or the end of the study period.

A total of 42,022 patients who met the inclusion criteria were identified. The majority of these patients were male (60.4%). The mean age of cancer diagnosis was 64.0 ± 14.4 years for men and 64.5 ± 14.7 years for women. The mean age at first hospice ward admission was 65.2 ± 14.2 years for men and 65.9 ± 14.9 years for women. During their first admission to IPC, 59.2% patients died, and the median stay of first IPC admission was 8.0 days. Among those discharged alive from their first admission to IPC, 64.9% were readmitted, and 19.4% of these patients were readmitted on the same day of discharge. From first IPC discharge until mortality, 54.8% of patients were readmitted once, 23.9% were readmitted twice, 9.9% were readmitted 3 times, and 11.5% were readmitted 4 or more times. Being male, having a higher insurance premium level, having a longer length of stay during first IPC

admission, being admitted to a teaching hospital, or being admitted to a tertiary hospital increased the adjusted hazard ratio for readmission.

We found that terminal cancer patients in Taiwan received relatively late referrals for first admission to IPC and experienced a high rate of readmission after first discharge from IPC. Policies to improve hospice palliative care referrals and decrease readmissions should be considered.

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Abbreviations: CI = confidence interval, HR = hazard ratio, IPC = inpatient palliative care, IQR = interquartile range, NHI = National Health Insurance, NHIRD = National Health Insurance Research Database, NHRI = National Health Research Institute, NTD = New Taiwan Dollar, SD = standard deviation.

INTRODUCTION

In order to better respect the wishes of terminally ill patients about their medical treatment and to best protect their rights, the Taiwan government passed a piece of legislation titled the “Hospice Palliative Care Act” in 2000.¹ In the same year, the Taiwan National Health Insurance (NHI) program, which was created in 1995 and covers 99.6% of the national population, announced a new reimbursement regulation that provides coverage for inpatient palliative care (IPC). According to these regulations, terminal cancer patients have the autonomy to choose either hospice care or curative care after hospitalization.² Currently, the Taiwan NHI reimburses three kinds of hospice palliative care programs for terminal patients. In the first program, which began in 1996, hospice home care is provided for patients living in the community or in institutes for the terminally ill. The second program, which began in 2000, provides IPC for patients who need to be hospitalized and who are willing to be admitted to a hospice ward. The third program, also called hospice shared care, which began in 2005, provides care for patients who are admitted to a typical hospital ward and who are in need of hospice care. In Taiwan, before the launch of hospice shared care in 2005, IPC is the main type of hospice care, utilized by up to 80% of patients who had received hospice care.³ In recent years, about 25% of terminal cancer patients who ever received hospice care is IPC.⁴

A previous study by Enguidanos et al⁵ found that seriously ill older patients who received a consultation from an IPC team and then received hospice or home-based palliative care post-discharge experienced a significantly lower odds of hospital readmission. In a recent study by O’Connor et al,⁶ patients who received an inpatient palliative consultation had a lower 30-day readmission rate-adjusted odds ratio, and when the palliative team involved patients in discussions regarding their goals for care, patients experienced a lower readmission rate.

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Terminal cancer patients are admitted to IPC units for pain as well as physical, psychosocial, and spiritual problems. An important issue in the continuity of care revolves around where these patients are moved after their initial symptoms improve. Although a majority of these patients wish to return home, their vulnerable health status and fluctuating conditions might prevent these patients from returning home and puts them at risk for frequent readmissions at different hospitals. In addition, readmission is an indicator of quality of care and is related to healthcare costs. Therefore, the aim of this study was to investigate the characteristics surrounding readmission for cancer patients after their first IPC admission in Taiwan from 2002 to 2010 with the goal of informing future policy discussions.

METHODS

Data Source

This study was a secondary data analysis using information from the National Health Insurance Database (NHIRD), which comprised anonymized secondary data derived from patient registries and claims data from the Taiwan NHI Program. The Taiwan NHI program, which began in 1995, covers more than 99% of the national population. The Taiwan National Health Research Institute (NHRI) collects and publishes the registry and claims data released by the NHI on an annual basis. The details of the NHIRD have been described in our previous studies.^{7–10}

Study Population

We identified all cancer patients who were added to the registry of catastrophic illness dataset from 1996 to 2010. We included subjects ≥ 20 years old with diagnoses of malignant neoplasm (ICD-9-CM code 140-209). Patients diagnosed with cancer before January 1, 2002 or who had ever been admitted to an inpatient hospice palliative care unit before the study period began were excluded. Terminally ill cancer patients who received IPC for the first time between 2002 and 2010 were included for analysis. Readmission was defined as hospital readmission at least once after discharge from first IPC admission until mortality or the end of this study. This study was approved by the institutional review board of Taipei Veterans General Hospital.

Study Outcomes and Covariates

The outcomes in this study included characteristics of patients during their first IPC admission and all subsequent readmissions. Covariates included subject income levels, urbanization of patient residence, comorbidities, and hospital level. Subject income levels were grouped into three categories according to the premium paid (NTD\$ $\geq 40,000$, 20,000–39,999, 1–19,999, and dependent). Patient residence was classified by urbanization and was divided into 7 levels. Level 1 was the “most urbanized” and level 7 was the “least urbanized.” We designated levels 1 and 2 as urban areas, levels 3 and 4 as suburban areas, and levels 4 and 7 as rural areas. Comorbidities were identified and classified by severity according to the Charlson Comorbidity Index as described in previous studies.^{8,9} Hospitals were classified by level, such as tertiary hospital, regional hospital, and local hospital. The teaching status of the hospital was also identified. Sex distributions, age at cancer diagnosis, age at first IPC admission, length of stay of first IPC admission, and survival days from first IPC discharge were also calculated.

Data Linkage and Statistical Analyses

Data linkage was performed with Microsoft SQL Server 2012 (Microsoft Corporation, Redmond, WA). Statistical

TABLE 1. Demographics and Clinical Characteristics of Patients' Received First Inpatient Palliative Care during 2002 and 2010 (n = 42,022)

Characteristics	n	%
Gender		
Men	25,359	60.4
Women	16,663	39.7
Age of cancer diagnosis (year, SD)		
Men	64.0	14.3
Women	64.5	14.7
Age of first IPC (year, SD)		
Men	65.2	14.2
Women	65.9	14.4
Insurance premium levels (NTD)		
Dependent	4797	11.4
1–19,999	11,556	27.5
20,000–39,999	20,423	48.6
$\geq 40,000$	5246	12.5
Residence urbanization		
Rural	5874	14.0
Suburban	11,437	27.2
Urban	24,711	58.8
Cancer types		
Lung	7719	18.4
Liver	7548	18.0
Colorectal	4952	11.8
Oral	3158	7.5
Stomach	2858	6.8
Pancreas	1841	4.4
Breast	1464	3.5
Esophageal	1359	3.2
Gallbladder	995	2.4
Prostate	946	2.3
Cervical	921	2.2
Hematological and lymphoma	760	1.8
Nasopharyngeal cancer	590	1.4
Ovarian cancer	547	1.3
More than 2 cancers	72	0.2
Others	6292	15.0
Charlson Comorbidity Index		
0–2	1606	3.8
3–4	2314	5.5
≥ 5	38,102	90.7
Mortality at first IPC	24,876	59.2
Cancer registry to first IPC (day)		
Median, IQR	268.0	79.0, 629.0
Length of stay at first IPC (day)		
Median, IQR	8.0	4.0, 16.0
Survival time after first IPC (day)		
Median, IQR	0.0	0.0, 16.0

IPC = inpatient palliative care, IQR = interquartile range, NTD = New Taiwan Dollar, SD = standard deviation.

analyses were performed with IBM SPSS Statistics 20.0 (IBM Corporation, Armonk, NY). Continuous variables were presented as the mean \pm standard deviation (SD) or as a median and range, and these were compared using the Student *t* test or the Mann–Whitney *U* test. Categorical variables were presented with a number and percentage, and these were compared using the Chi-squared test. We performed risk analyses for

TABLE 2. Characteristics of 30-Day Readmission and Nonreadmission Patients

Characteristics	Readmission, n	n = 9093, %	Nonreadmission, n	n = 6026, %	P
Sex					0.158
Men	5280	58.1	3429	43.1	
Women	3813	41.9	2597	40.5	
Age of cancer diagnosis (year, SD)	63.4	14.8	66.5	13.6	<0.001
Men	63.1	14.7	66.0	13.3	<0.001
Women	63.9	14.9	67.0	13.8	<0.001
Age of first IPC (year, SD)	64.8	14.6	67.7	13.3	<0.001
Men	64.4	14.5	67.2	13.2	<0.001
Women	65.3	14.6	68.3	13.4	<0.001
Insurance premium levels (NTD)					<0.001
Dependent	995	10.9	693	11.5	
1–19,999	2613	28.7	1955	32.4	
20,000–39,999	4350	47.8	2808	46.6	
≥40,000	1135	12.5	570	9.5	
Residence urbanization					<0.001
Rural	1351	14.9	1160	19.2	
Suburban	2426	26.7	2931	32.0	
Urban	5316	58.5	2935	48.7	
Cancer types					<0.001
Lung	1666	18.3	1104	18.3	
Liver	1270	14.0	1153	19.1	
Colorectal	1102	12.1	702	11.7	
Oral	899	9.9	347	5.8	
Stomach	592	6.5	437	7.3	
Pancreas	344	3.8	287	4.8	
Breast	326	3.6	201	3.3	
Esophageal	310	3.4	178	3.0	
Gallbladder	193	2.1	172	2.9	
Prostate	253	2.8	116	1.9	
Cervical	235	2.6	135	2.2	
Hematological and lymphoma	134	1.5	105	1.7	
Nasopharyngeal cancer	151	1.6	69	1.2	
Ovarian cancer	129	1.4	76	1.3	
More than 2 cancers	14	0.2	11	0.2	
Others	1475	16.2	933	15.5	
Charlson Comorbidity Index					0.042
0–2	408	4.5	222	3.7	
3–4	535	5.9	374	6.2	
≥5	8150	89.6	5430	90.1	
Length of stay at first IPC (day)					
Median, IQR	13.0	7.0, 20.0	8.0	4.0, 15.0	<0.001
Survival time after first IPC (day)					
Median, IQR	29.0	14.0, 59.0	6.0	1.0, 20.0	<0.001

IPC = inpatient palliative care, IQR = interquartile range, NTD = New Taiwan Dollar, SD = standard deviation.

readmission using the Cox proportional hazard method. Hazard ratios (HRs) were presented as crude ratios and adjusted ratios according to the covariates of sex, age at first IPC admission, insurance premium level, residence urbanization, age at diagnosis, Charlson Comorbidity Index, teaching status of admitting hospital, hospital level, and survival days from first IPC discharge until mortality. A 2-tailed *P*-value <0.05 was considered to be statistically significant.

RESULTS

There were 637,272 patients identified from the catastrophic illness registry who were older than age 20 and who were diagnosed with cancer between January 1, 2002 and

December 31, 2010. Among them, we identified 42,022 patients who were first admitted for IPC after being added to the catastrophic cancer registry. The majority of these patients were male (n = 25,359, 60.4%). The mean age at cancer diagnosis was 64.0 ± 14.4 years for males and 64.5 ± 14.7 years for females. The mean age at first hospice ward admission was 65.2 ± 14.2 years for males and 65.9 ± 14.9 years for females.

The majority (48.6%) of patients who received IPC had a middle insurance premium level between 20,000 and 39,999 NTD and lived in an urban area (58.8%). The top 5 diagnoses were lung cancer (18.4%), liver cancer (18.0%), colorectal cancer (11.8%), oral cancer (7.5%), and stomach cancer (6.8%). Most patients (n = 38,012, 90.7%) had a Charlson

TABLE 3. Characteristics of Readmissions From First Inpatient Palliative Care Discharge to Mortality (n = 11,129)

Characteristics	n	%
Days from first IPC discharge to first readmission		
0	2156	19.4
1–14	5005	45.0
15–30	1932	17.4
≥31	2036	18.3
Readmission frequency		
1	6093	54.8
2	2654	23.9
3	1105	9.9
≥4	1277	11.5
Hospital level		
Tertiary	4836	43.5
Regional	4645	41.7
Local	1643	14.8
Hospital teaching status		
Teaching hospital	9508	85.4
Nonteaching hospital	1621	14.6

IPC = inpatient palliative care.

comorbidity score of ≥ 5 . The median length of stay for first IPC admission was 8.0 days with an interquartile range (IQR) of 12 days, and 24,876 (59.2%) patients died during their first IPC admission (Table 1). The majority of patients were first admitted for IPC at a tertiary hospital (n = 22,855, 54.4%) and teaching hospital (n = 37,875, 90.1%).

Table 2 shows the characteristics of patients according to 30-day readmission and nonreadmission status. There were no significant differences in sex distribution between the 2 groups. Ages at cancer diagnosis and at first IPC admission were significantly younger in the readmission patients (both $P < 0.001$). According to distribution by insurance premium

level, readmission patients had a significantly higher premium level when compared to nonreadmission patients ($P < 0.001$). In regards to cancer diagnosis, more readmission patients had been diagnosed with lung, colorectal, oral, esophageal, prostate, cervical, nasopharyngeal, and ovarian cancer. Readmission patients had a significantly higher Charlson Comorbidity Index score than nonreadmission patients ($P < 0.001$).

In Table 3, we further analyzed the characteristics of patients who were readmitted after their first IPC discharge until mortality. Two thousand one hundred fifty-six (19.4%) patients were readmitted on the same day of their first IPC discharge, 5005 (45.0%) patients were readmitted between days 1 and 14 of their first IPC discharge, and 1932 (17.4%) patients were readmitted between days 15 and 30 of their first IPC discharge. In terms of readmission frequency, most patients were readmitted once (n = 6093, 94.8%), 2654 (23.9%) patients were readmitted 2 times, 1105 (9.9%) were readmitted 3 times, and 1277 (11.5%) were readmitted ≥ 4 times. The majority of patients were readmitted to tertiary hospitals and teaching hospitals.

Table 4 shows risk factors for 30-day readmission after first discharge from an IPC stay. After adjusting for covariates, statistically significant risk factors for 30-day readmission included being male (adjusted hazard ratio [adjusted HR] = 1.087; 95% confidence interval [CI], 1.036–1.140, $P = 0.001$), higher insurance premium level (adjusted HR = 1.107, 95% CI, 1.015–1.208, $P = 0.022$), length of stay during first IPC admission (adjusted HR = 1.006, 95% CI, 1.005–1.008, $P < 0.001$), being admitted to a teaching hospital (adjusted HR = 1.105, 95% CI, 1.003–1.218, $P = 0.044$), and being admitted to a tertiary hospital (adjusted HR = 1.113, 95% CI, 1.006–1.232, $P = 0.038$). Patients who were older at first IPC admission were less likely to be readmitted (adjusted HR = 0.996, 95% CI, 0.994–0.997, $P < 0.001$).

DISCUSSION

There are very few studies focused on readmissions of cancer patients after discharge from IPC, but it is an important

TABLE 4. Risk Factors for 30-Day Readmission After First Inpatient Palliative Care Discharge

Characteristics	Crude HR	95% CI	P	Adjusted HR	95% CI	P
Sex						
Women	1.000	Reference		1.000	Reference	
Men	1.096	1.051–1.142	<0.001	1.084	1.033–1.137	0.001
Age at first inpatient palliative care (year)	0.995	0.994–0.996	<0.001	0.996	0.994–0.997	<0.001
Insurance premium levels (NTD)						
Dependent	1.000	Reference		1.000	Reference	
1–19,999	1.109	1.031–1.193	0.006	1.095	1.016–1.180	0.018
20,000–39,999	1.093	1.020–1.271	0.012	1.069	0.996–1.147	0.065
≥40,000	1.170	1.074–1.274	<0.001	1.107	1.015–1.208	0.022
Stay at first inpatient palliative care (day)	1.007	1.005–1.009	<0.001	1.006	1.005–1.008	<0.001
Hospital teaching status						
Nonteaching hospital	1.000	Reference		1.000	Reference	
Teaching hospital	0.993	0.930–1.061	0.838	1.105	1.003–1.218	0.044
Hospital level						
Local hospital	1.000	Reference		1.000	Reference	
Regional hospital	0.935	0.895–0.977	0.003	0.947	0.905–0.990	0.017
Tertiary hospital	1.043	0.972–1.119	0.243	1.113	1.006–1.232	0.038

CI = confidence interval; HR = hazard ratio; NTD = New Taiwan Dollar.

issue when considering continuity of care, healthcare utilization, and healthcare resource allocation. In this study, we found that lung cancer, liver cancer, and colorectal cancer were the most common diagnoses. The majority of these patients died during their first admission for IPC, and the median length of stay for first IPC admission was 8 days. The median survival after discharge from first IPC stay was 0 day. Our results showed that 19.4% were readmitted on the same day of discharge, 45.0% were readmitted within 14 days, and 81.7% were readmitted within 30 days. Males, patients with a higher insurance premium level, patients with a longer length of stay during first IPC admission, admission to a teaching hospital, and admission to a tertiary hospital all increased the adjusted HR for readmission.

The target population in this study included terminal cancer patients with limited life expectancy. In addition, in clinical practice we found that the majority of patients who received IPC were very vulnerable and in a relatively unexpected condition. Patients with a longer stay during their first IPC admission, admitted to a teaching or tertiary hospital might indicate a relatively unstable or severe condition of these patients that may attribute to increased risk for readmission. A previous study in Hong Kong reported that progression of previous condition is one of the factors related to readmission.¹¹

A previous study on rehospitalization of gynecological oncology patients examined the possible factors related to readmissions, including planned treatments, symptom management, and end-of-life care.¹² A previous study by Jencks et al reported a 19.6% readmission rate within 30 days of initial hospitalization among Medicare beneficiaries; they also found that rehospitalization was costly. The authors reported that poor communication with patients, insufficient outpatient follow-up, and a lack of care coordination may be related to this phenomenon.¹³ Ranganathan et al¹⁴ reported that palliative home care may help patients to remain at home and avoid 30-day rehospitalizations.

In Taiwan, hospice palliative home care has been provided for terminal patients since 1996, but in a study by Hu et al¹⁵ regarding the beliefs of healthcare professionals about why Taiwanese hospice patients prefer staying in the hospital, the main concerns included an inability to manage emergent medical conditions, better quality of care in hospitals, and an insufficient number of caregivers. Furthermore, our results revealed that 2156 (19.4%) patients were readmitted on the same day of discharge. In our clinical practice experience, some patients whose family cannot take them back home will ask for transferring to another hospital for continual hospitalization. Most of these patients will be transferred to another hospital on the same day. This might be one of the reasons for this high rate of readmission on the same day of hospital discharge; however, further study is needed. Besides, although studies in Taiwan have reported that the preferred place of death for terminal cancer patients is at home, there were discrepancies regarding this preference between patients, their caregivers, and even physicians.^{16–19} Chiu et al²⁰ reported that the location of care was one of the prevailing ethical dilemmas surrounding the provision of terminal care for cancer patients. In regards to the readmission phenomenon found in our study, it may indicate a need for improved continuity of care and increased support for caregivers, and may be associated with the unstable nature of the patient's underlying diseases and comorbidities.

A previous study evaluated the effects of IPC consultation on subsequent hospice use and place of death in patients with advanced gastrointestinal cancers and found that receiving a

palliative care consult during admission increased the odds of home death and decreased the odds of hospital death, but had no effect on hospital readmission. The live discharge rates were 95% and 89% for curative care and palliative care, respectively, and the hospital readmission rates 6 months after discharge were 68% and 67% for curative care and palliative care, respectively.²¹ In our study, 59.2% patients died during their first IPC admission, with a median length of stay of 8 days. The results of our study reflect a problem with late referrals to hospice palliative care, as other studies in Taiwan have also found.^{3,22} The Hospice Palliative Care Act of 2000 and its recent amendments in 2013 are intended to better protect terminal patients' right to choose hospice palliative care.¹ However, further studies are needed to better understand the effects of the law and its amendment on hospice palliative care utilization.

This study is a secondary data analysis and, as such, it has several limitations. First, the claim database did not contain information about cancer stage; therefore, we could not know how terminal these patients were. To mitigate this issue, we used the Charlson Comorbidity Index to measure the severity of comorbid conditions among these patients. Second, the claim database did not contain information about education level, marital status, and actual income. To address this problem, we assessed insurance premium level, which has been widely used in many studies as a surrogate for income level. Despite the aforementioned limitations, this study was a nationwide population-based cohort study that included all terminal cancer patients admitted for IPC with limited selection bias and good representativeness.

In conclusion, our study found that 59.2% of patients died during their first IPC admission and that the median stay of first IPC was 8 days. Among those discharged alive after first IPC admission, 64.9% were readmitted and 19.4% of them were readmitted on the same day of discharge. From first IPC discharge to mortality, 54.8% were readmitted once, 23.9% were readmitted twice, 9.9% were readmitted 3 times, and 11.5% were readmitted 4 or more times. The results may help inform policy discussions to improve the relatively late referral rate to IPC and to reduce the high readmission rate among terminal cancer patients in Taiwan.

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