

Original Article

Association of a home-based nursing service during chemotherapy with the transfer to home care immediately after the last chemotherapy treatment in patients with advanced cancer

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Abstract

Background: The appropriate timing of introducing the home-based nursing service to patients with advanced cancer has not been clarified. This study conducted a retrospective cohort study to investigate the associations of the early utilization of the home-based nursing service during chemotherapy with the place of care immediately after the last chemotherapy treatment in patients with advanced cancer.

Methods: Among the patients referred to the palliative care team of the University of Tsukuba Hospital between January 2018 and December 2019, patients with advanced cancer undergoing chemotherapy or before the start of chemotherapy at referral were included. The study patients who utilized the home-based nursing service during chemotherapy were classified into the early utilization group. The primary endpoint was the place of care immediately after the last chemotherapy treatment.

Results: Of the 1154 patients referred to the palliative care team during the study period, 261 were eligible for this study. Of these patients, 15.3% of patients ($n = 40$) received the home-based nursing service during chemotherapy. The proportion of patients transferred to home care after the last chemotherapy treatment was 17.5% in the early utilization group and 7.2% in the control group. The multivariate analysis revealed that the early utilization of the home-based nursing service during chemotherapy was significantly associated with the transfer to home care (odds ratio = 3.077; 95% confidence interval, 1.113–8.502).

Conclusion: The early utilization of the home-based nursing service during chemotherapy might be associated with the transfer to home care immediately after the last chemotherapy treatment.

Key words: home nursing, health services, neoplasms, palliative care, terminal care

Introduction

In Japan, the majority of the population would like to be cared for at the end of life at home as in some other developed countries (1,2), and ~40% of cancer patients chose home as the preferred place of care (3). However, more patients with cancer who decided home as their preferred place of care chose hospice or hospital over home as their preferred place of death (3). According to the 2019 Ministry of Health, Labor and Welfare vital statistics, the proportion of patients with cancer who died at home in Japan was 12.3%, whereas that of those who died in hospital was 81.3% (4). Although the proportion of home death in patients with cancer has increased annually, it has been lower than those in European countries (5). Japanese patients with cancer are reported to be concerned about family burden and being unable to adequately respond to sudden changes out of hospital working hours (3).

A home-based nursing service plays significant roles in home care at the end of life for patients with advanced cancer (6–9). It provides hands-on nursing care, psychological support for patient-perceived burden and 24-h support at home (6,9). In addition, the home care nurses are expected to support in how to address problems at home and arrange regional resources to reduce actual family burden (3). Caregivers have highlighted home nursing as the essential service component of home care (7). Moreover, existing literature suggested the potential effects of home-based end-of-life nursing services in reducing the demand for acute hospital care in patients at the end of life (9).

So far, few studies have investigated the influence of the timing of the first contact with the home-based nursing service on the place of care at the end of life. In a case control study, patients with cancer who began their home nursing early were less likely to die at home than those who began such care late (10).

The purpose of this study was to investigate associations between the early utilization of the home-based nursing service during chemotherapy and the place of care immediately after the last chemotherapy treatment in patients with advanced cancer. Especially, this study examined whether the early utilization of the home-based nursing service during chemotherapy is associated with the transfer from the hospital for anticancer treatment to home care after the last chemotherapy treatment. In addition, this study examined the association between the early utilization of the home-based nursing service and in-hospital death without transfer.

Subjects and Methods

Study design and patients

This was a retrospective cohort study conducted at the University of Tsukuba Hospital, which is a designated cancer hospital and plays central roles in cancer care in the prefecture. The hospital has a palliative care team but no palliative care unit. Of the patients referred to the palliative care team between 1 January 2018 and 31 December 2019, those eligible were aged ≥ 20 years and were referred during chemotherapy or before the start of chemotherapy. The exclusion criteria were (i) patients who received no chemotherapy after referral, (ii) patients referred to another hospital for follow-up without recurrence or new cancer treatment and (iii) patients alive as of 31 December 2020.

Measurement

All data were obtained retrospectively from the medical records and the order of the home-based nursing service. Data at

referral included sex, birthdate, date of referral to the palliative care team, primary sites, marital status (single, married/remarried and widowed/divorce), the presence or absence of family members living together (spouse and children) and the hospitalization at referral (yes and no). The post-referral data included the presence or absence of chemotherapy after referral, the utilization of the home-based nursing service, the date of order of the home-based nursing service and the date of the end of chemotherapy, which was the date both medical doctors and patients agreed to discontinue chemotherapy. The primary endpoint was the place where the patients received care immediately after the last chemotherapy treatment at the hospital for anticancer treatment. It did not mean place of death or place of care close to end-of-life. It included home, specialized palliative care (outpatient or hospitalized patient), hospital/clinic/nursing home (outpatient or hospitalized patient) and in-hospital death without transfer.

Home-based nursing service

Patients received the home-based nursing service in their own homes after medical doctors gave the order of it. The home-based nursing service provides 24-h support. Patients can be subsidized by medical or long-term care insurance when using the home-based nursing service. The home-based nursing service is available even for patients who visit the hospital for anticancer treatment.

Statistical analysis

The study patients were classified into the early utilization group when the date of order of the home-based nursing service was earlier than the date of the end of chemotherapy. The control group included patients who did not utilize the home-based nursing service or those who utilized the home-based nursing service after the end of chemotherapy. Categorical variables were compared using the Pearson's Chi-square test or the Fisher's exact test, and continuous variables, by the Student's *t*-test. A multivariate logistic regression analysis was performed to examine the associations of the early utilization of the home-based nursing service during chemotherapy with the place of care immediately after the last chemotherapy treatment. Covariates were selected using backward stepwise selection among sex, age at referral, primary sites, marital status, the presence or absence of family members living together, hospitalization at referral and the number of days from referral to the end of chemotherapy. A two-tailed *P* value < 0.05 was considered significant. All the analyses were conducted using STATA version 16.0 (Stata Corp., College Station, TX, USA).

Results

Of 1154 patients referred to the palliative care team during the 2-year enrollment period, those aged < 20 years ($n = 16$), those without cancer ($n = 75$), those who underwent treatment for lymphedema only ($n = 19$) and those referred after the end of chemotherapy ($n = 420$) were ineligible. Among the remaining 624 patients, 363 were excluded from the analysis, as follows: (a) those who received no chemotherapy after referral ($n = 154$), (b) patients referred to another hospital for follow-up without recurrence ($n = 19$) or new cancer treatment ($n = 34$) and (c) those who survived as of 31 December 2020 ($n = 156$). Finally, 261 patients were analyzed in this study (Table 1).

Table 1. Characteristics data of study patients

	Total (<i>n</i> = 261)	Home-based nursing service during chemotherapy		<i>P</i>
		Absence (<i>n</i> = 221)	Presence (<i>n</i> = 40)	
Age, year	63.66 (13.18)	63.41 (13.25)	65.03 (12.87)	0.477
Female	123 (47.1)	99 (44.8)	24 (60.0)	0.076
Primary sites				
Esophagus/gastric/colon/rectal	50 (19.2)	42 (19.0)	8 (20.0)	0.103
Liver/gall bladder/pancreas	38 (14.6)	35 (15.8)	3 (7.5)	
Lung	31 (11.9)	28 (12.7)	3 (7.5)	
Breast	27 (10.3)	19 (8.6)	8 (20.0)	
Uterus/ovary	26 (10.0)	19 (8.6)	7 (17.5)	
Kidney/urinary tract/bladder/prostate	25 (9.6)	24 (10.9)	1 (2.5)	
Blood	19 (7.3)	17 (7.7)	2 (5.0)	
Others	45 (17.2)	37 (16.7)	8 (20.0)	
Marital status				
Single	25 (9.6)	21 (9.5)	4 (10.0)	0.885
Married/remarried	188 (72.0)	160 (72.4)	28 (70.0)	
Widowed/divorced	48 (18.4)	40 (18.1)	8 (20.0)	
Living				
With spouse	90 (34.5)	76 (34.4)	14 (35.0)	0.997
With spouse and children	95 (36.4)	81 (36.7)	14 (35.0)	
With children	39 (14.9)	33 (14.9)	6 (15.0)	
Alone/others	37 (14.2)	31 (14.0)	6 (15.0)	
Hospitalization at referral				
154 (59.0)	128 (57.9)	26 (65.0)	0.402	
Referral-the end of chemotherapy interval				
≤60 days	73 (28.0)	69 (31.2)	4 (10.0)	0.011
60–180 days	95 (36.4)	75 (33.9)	20 (50.0)	
>180 days	93 (35.6)	77 (34.8)	16 (40.0)	

Of the 261 patients, 15.3% of patients (*n* = 40) were included in the early utilization group. A comparison between the two groups showed that the number of days from referral to the end of chemotherapy was longer in the early utilization group than in the control group (*P* = 0.011). Also, the number of female patients was slightly higher in the early utilization group, although the difference was not significant (*P* = 0.076).

Regarding the place of care immediately after the last chemotherapy treatment, 8.8% of all the study patients were transferred to home care (Table 2). In comparing the groups, the proportion of home was higher in the early utilization group (17.5%) than in the control group (7.2%). In a multivariate logistic regression analysis that examined the association of the early utilization of the home-based nursing service during chemotherapy with the transfer to home care, gastrointestinal cancer, hepatobiliary and pancreatic cancer, lung cancer, and hospitalization at referral were identified as covariates by backward stepwise selection. The analysis revealed that the early utilization of the home-based nursing service during chemotherapy was a factor with a significant positive association with the transfer to home care (Table 3, odds ratio = 3.077; 95% confidence interval, 1.113–8.502). In addition, similar results were obtained when limited to patients who were unable to visit the hospital immediately after the last chemotherapy treatment (Supplemental Table 1, odds ratio = 3.056; 95% confidence interval, 1.065–8.773).

Another multivariate logistic regression analysis showed the significant associations of in-hospital death with age, blood cancer, hospitalization at referral and longer referral-the end of chemotherapy interval, but not the early utilization of the home-based nursing service during chemotherapy (Table 4, odds ratio = 1.880; 95% confidence interval, 0.869–4.067).

Discussion

This is the first study to suggest that the early utilization of the home-based nursing service during chemotherapy might be associated with the place of care after the last chemotherapy treatment. The most important finding of this study is that the early utilization of the home-based nursing service during chemotherapy was significantly associated with the transfer to home care after the last chemotherapy treatment. In the study patients, the number of days from referral to the end of chemotherapy was significantly different between the early utilization group and the control group, but it could not be confounded with this finding because it was not significantly associated with the transfer to home care after the last chemotherapy treatment.

A systematic review concluded that the quality and availability of health-care service and programs were one of the most important factors for determining the place of the end of life care (11). However, it is challenging for home care nurses to establish a trusting relationship with patients and their families during the short life expectancy

Table 2. Place of care immediately after the last chemotherapy treatment

	Total (<i>n</i> = 261)	Home-based nursing service during chemotherapy	
		Absence (<i>n</i> = 221)	Presence (<i>n</i> = 40)
Home	23 (8.8)	16 (7.2)	7 (17.5)
Specialist palliative care			
Outpatient	59 (22.6)	50 (22.6)	9 (22.5)
Hospitalized patient	38 (14.6)	34 (15.4)	4 (10.0)
Hospital/clinic/nursing home			
Outpatient	23 (8.8)	21 (9.5)	2 (5.0)
Hospitalized patient	38 (14.6)	35 (15.8)	3 (7.5)
In-hospital death	80 (30.7)	65 (29.4)	15 (37.5)

Table 3. OR and 95% CI of home-based nursing service during chemotherapy for the transfer to home care after the last chemotherapy treatment

	Univariate			Multivariate		
	OR	95% CI	<i>P</i>	OR	95% CI	<i>P</i>
Home-based nursing service during chemotherapy	2.718	1.039–7.107	0.041	3.077	1.113–8.502	0.030
Age	1.003	0.971–1.037	0.857			
Sex						
Male	Ref					
Female	0.851	0.359–2.016	0.714			
Primary sites						
Esophagus/gastric/colon/rectal	8.381	1.005–69.922	0.050	4.413	1.454–13.388	0.009
Liver/gall bladder/pancreas	5.176	0.553–48.456	0.150	3.434	0.889–13.257	0.073
Lung	6.519	0.692–61.419	0.101	2.928	0.770–11.131	0.115
Breast	3.520	0.304–40.796	0.314			
Uterus/ovary	3.667	0.316–42.552	0.299			
Kidney/urinary tract/bladder/prostate	1.833	0.110–30.637	0.673			
Blood	2.444	0.145–41.238	0.535			
Others	Ref					
Living						
With spouse	Ref					
With spouse and children	1.553	0.574–4.200	0.386			
With children	0.988	0.242–4.039	0.987			
Alone/others	0.678	0.134–3.425	0.638			
Hospitalization at referral	2.089	0.795–5.486	0.135	2.384	0.854–6.661	0.097
Referral-the end of chemotherapy interval						
≤60 days	Ref					
60–180 days	0.888	0.285–2.766	0.838			
>180 days	1.345	0.465–3.891	0.584			

OR, odds ratio; CI, confidence interval.

of patients with advanced cancer. A qualitative study in Iran reported distrust in home care services as a barrier to home-based palliative care for patients with cancer (12). In that regard, the early utilization of the home-based nursing service during chemotherapy may provide enough time to achieve a close and trusting collaboration with the patients and their families and lead to their participation in decisions related to the place of care after the last chemotherapy treatment. Moreover, it may enable good collaboration with the hospital for anticancer treatment by sharing the daily life of patients with advanced cancer at home. In a previous qualitative study, the collaboration between home care nurses and the hospital for

anticancer treatment was emphasized as a critical factor to prepare for home palliative care following discharge from the hospital (13).

The second significant result was that the proportion of in-hospital death showed no significant difference between the two groups. The quality of life and the quality of care at the end of life for patients with cancer tend to be worse when they die in a hospital compared with when they die elsewhere (14–16). Previous studies identified age, deprivation, treatment in the last month of life, treatment started in the last month of life, elective and emergency admissions, encounter for palliative care in the last year and availability of palliative home care as factors associated with in-hospital

Table 4. OR and 95% CI of home-based nursing service during chemotherapy for in-hospital death

	Univariate			Multivariate		
	OR	95% CI	P	OR	95% CI	P
Home-based nursing service during chemotherapy	1.440	0.713–2.907	0.309	1.880	0.869–4.067	0.109
Age	0.971	0.951–0.990	0.004	0.968	0.945–0.990	0.006
Sex						
Male	Ref					
Female	1.181	0.697–2.000	0.537			
Primary sites						
Esophagus/gastric/colon/rectal	0.465	0.189–1.143	0.095			
Liver/gall bladder/pancreas	0.511	0.196–1.336	0.171			
Lung	0.573	0.210–1.565	0.277			
Breast	0.576	0.202–1.649	0.304			
Uterus/ovary	0.872	0.318–2.389	0.790			
Kidney/urinary tract/bladder/prostate	0.412	0.130–1.301	0.131			
Blood	0.461	1.409–15.093	0.012	5.592	1.831–17.082	0.003
Others	Ref					
Living						
With spouse	Ref					
With spouse and children	1.142	0.605–2.156	0.681			
With children	1.456	0.654–3.242	0.358			
Alone/others	1.248	0.545–2.858	0.600	0.479	0.193–1.185	0.111
Hospitalization at referral	2.777	1.548–4.979	0.001	2.130	1.147–3.955	0.017
Referral-the end of chemotherapy interval						
≤60 days	Ref					
60–180 days	0.432	0.222–0.841	0.014	0.469	0.225–0.982	0.044
>180 days	0.617	0.325–1.175	0.142	0.529	0.257–1.089	0.084

OR, odds ratio; CI, confidence interval.

death for patients with cancer (14,17–20). However, few studies have investigated the association between the proportion of in-hospital death and the early utilization of the home-based health care services during chemotherapy. A previous qualitative study mentioned that the home care nurses who are involved with patients during cancer treatment needed to explain the treatment in understandable terms (13). Moreover, a recent study has suggested that palliative home care reduces chemotherapy at the end of life and in-hospital death (21). From these studies, it was hypothesized that the early utilization of the home-based nursing service during chemotherapy might lead to the reduction of in-hospital death by avoiding chemotherapy near the end of life, but this study did not demonstrate the hypothesis. On the other hand, this result may be due to the lack of statistical power and should be verified with an appropriate sample size.

The strength of this study is that it was not biased toward specific cancer and targeted patients with a wide range of carcinomas, and a few patients were transferred to another hospital for new cancer treatment. However, this study has several limitations. First, this study was retrospective at a single site and had a small sample size. Moreover, this study was conducted at a hospital without a palliative care unit. If palliative care unit admission was one of the patients' options, more patients might have preferred to continue to be admitted to the hospital where they received chemotherapy. Second, this study had not fully evaluated confounding factors for the early utilization of home-based nursing services during chemotherapy. Above all, performance status and/or activities of daily living may have a great impact when considering the utilization of the home-based health care services and the place of care after the last chemotherapy treatment. Furthermore, no data were obtained

on patient preferences regarding the place of care after the last chemotherapy treatment, which was one of the important determinants related to home care for patients with advanced cancer (11). These factors may be confounded with the significant association between the early utilization of the home-based nursing service during chemotherapy and the transfer to home care immediately after the last chemotherapy treatment. Therefore, this finding should be interpreted with caution along with these factors. Third, patients who were using the home-based nursing service under the order by other hospitals might have been overlooked. Finally, the outcome of the patients transferred to other institutions was unclear. Some patients might eventually have been discharged home after transferring to other institutions. However, at least these results would be considered valuable in the patients with advanced cancer who would like to be cared for at home immediately after the last chemotherapy treatment.

In conclusion, the early utilization of the home-based nursing service during chemotherapy for patients with advanced cancer might be associated with the transfer from the hospital for anticancer treatment to home care immediately after the last chemotherapy treatment. This might help bridge the gap between their preferred place of care and their actual place of care after the last chemotherapy treatment. Furthermore, a prospective cohort study that verifies this association is desirable.

Declaration of conflicting interests

The authors declare no potential conflicts of interest with respect to the research, authorship, or publication of this article.

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