Heart and Vessels (2019) 34:452–461
https://doi.org/10.1007/s00380-018-1261-y

ORIGINAL ARTICLE

Possible associations between palliative care conferences and positive outcomes when performing palliative care for patients with end-stage heart failure: a nationwide cross-sectional questionnaire survey

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Received: 15 April 2018 / Accepted: 14 September 2018 / Published online: 20 September 2018

Abstract

Palliative care for end-stage heart failure should be provided by a multidisciplinary team. However, the influence of each occupational category on patients receiving palliative care for end-stage heart failure remains unclear. Thus, this study investigated the relationships between palliative care conferences and positive outcomes of palliative care for end-stage heart failure patients. We sent questionnaires to all cardiology training hospitals authorized by the Japanese Circulation Society ($n=1004$); of these, responses from the directors at 554 institutions were analyzed. We divided the responding institutions into two groups according to their implementation of palliative care conferences for patients with end-stage heart failure. The institutions that had held such conferences ($n=223$) had a larger number of hospital beds, beds in the cardiovascular department, and patients admitted to the cardiovascular department, compared with institutions that had not held these conferences ($n=321$). The usage rates of opioids, non-steroidal anti-inflammatory drugs, and sedatives were significantly higher in institutions that held these conferences. Multivariate analysis revealed that nutritionists and medical social workers had greater involvement in the improvement of mental symptoms and ensuring that patients could stay where they wished, respectively. The presence of palliative care physicians, physical therapists, or pharmacists was associated with multiple positive outcomes. This study indicated that there are possible associations between palliative care conferences and positive outcomes when performing palliative care for patients with end-stage heart failure.

Keywords Heart failure · Palliative care · Multidisciplinary team management · Nationwide survey

Introduction

Advancements in the pathophysiological and pharmacological understanding of heart failure have improved the prognosis of patients with heart failure [1]. The development of new drugs, surgical, and device-based therapies has all benefited patients with heart failure. Despite these advances, the mortality rate from heart failure remains high [2]. Once patients develop chronic symptomatic heart failure, it becomes difficult to completely control their disease. Furthermore, there is an obvious decline in the quality of life (QOL) of patients with advanced heart failure. These patients have been described as having "advanced heart failure," "end-stage heart failure," or "refractory heart failure," and were classified as having stage D heart failure in the American College of Cardiology Foundation /American Heart Association heart failure guideline [3].

Some clinical guidelines on the palliative care of patients with advanced cancer have proposed the use of specific treatments for its physical and psychological symptoms and have recommended that palliative care be provided by a multidisciplinary team [4–6]. Moreover, a previous study indicated that early palliative care had a life-prolonging effect in patients with metastatic lung cancer [7]. In Japan, multidisciplinary team management for patients with advanced cancer is widespread. The existing literature suggests that

Electronic supplementary material The online version of this article (https://doi.org/10.1007/s00380-018-1261-y) contains supplementary material, which is available to authorized users.

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nearly 99% of Japanese regional cancer centers have palliative consultation teams [8]. In contrast, multidisciplinary team management for heart failure is still inadequate in Japan [9]. Palliative care is as important for heart failure as for advanced cancer, given that patients with end-stage heart failure exhibit physical and psychological symptoms, such as breathlessness, pain, fatigue, and anxiety [10, 11]. Previous studies have assessed the efficacy of multidisciplinary palliative care for end-stage heart failure in improving QOL, symptom control, and healthcare costs [12–15]. Thus, for these patients, palliative care based on multidisciplinary team management should be implemented. This has also been recommended by some guidelines for heart failure [3, 16]. However, it remains unclear how each occupational category within the team influences the patients who are provided palliative care for end-stage heart failure.

To improve the quality of palliative care and provide more specialized palliative care for patients with end-stage heart failure within the limits of facilities' resources, it is necessary to determine the status of care and the factors that positively influence it. These issues have not yet been clarified in Japan. Therefore, we conducted a cross-sectional nationwide survey on palliative care for end-stage heart failure and reported the content of the questionnaires used [17]. In addition, we reported the results of the questionnaire survey [18]. The purpose of the present study was to investigate the relationships between palliative care conferences and positive outcomes of palliative care for patients with end-stage heart failure using the survey data.

Materials and methods

Definition of palliative care

In this study, palliative care was defined using the World Health Organization (WHO) definition [19]. The WHO defines palliative care as "an approach that improves the quality of life of patients and their families facing the problem associated with life-threatening illness, through the prevention and relief of suffering by means of early identification and impeccable assessment and treatment of pain and other problems, physical, psychosocial, and spiritual."

Data collection and analysis

The method used for the present survey was described in the previous report [conducted by the Palliative Care Study Group: https://shinfuzen-kanwa.jp/staff/index.html (in Japanese), study office: Hyogo Pref. Amagasaki General Medical Center] [17]. In this survey, pen-and-paper based questionnaires were mailed to the directors of the 1004 cardiology training hospitals authorized by the Japanese Circulation Society. Each director was responsible for the response to the questionnaire. The questionnaire was sent to institutions in August 2016. The response deadline was December 2016 and the investigators in the study office sent reminders to the directors at the 672 institutions from whom a response had not been received by September 2016. The investigators in the study office collected the survey data and statistical analysis was performed by MediStatLab Co. Ltd. (Tokyo Japan). The survey obtained data on the following: basic information about the facility and multidisciplinary team, the details of the palliative care for heart failure (such as need to treat patients' symptoms, implementation of palliative care conferences, members comprising conferences, and drug therapy), and positive patient outcomes.

Outcome assessment

We grouped institutions from which we received responses to our questionnaire according to whether they had held palliative care conferences for patients with end-stage heart failure ("implementation" group) or not ("non-implementation" group). The institutions from which we did not receive a response to the question about the number of patients with heart failure that they had targeted for their palliative care conferences were grouped into the non-implementation group. After that, we investigated the difference between the groups.

The implementation group was found to have a positive outcome. Palliative care not only addresses the patients' physiological and psychological symptoms, but also their social and spiritual needs [20–22]. Therefore, we investigated factors associated with six positive outcomes of palliative care: "improvements in physical symptoms," "improvements in mental symptoms," "patients were able to end their life with dignity," "patients could stay where they wished," "respect of the patients' wishes," and "respect of the families' wishes." "Life prognosis improved" was not analyzed, because it was only selected on the questionnaires from 10 institutions (Table S1).

Statistical analysis

The comparison of order and binominal variables between the institutions holding and not holding the conference was evaluated using the Wilcoxon rank sum test and Fisher's exact test, respectively. The analyses of "positive outcome of the palliative care" were performed using logistic regression with each individual outcome ("yes" 1; not "yes" 0) as the dependent variable and the basic setting of the institution (with number of beds being more than 400 in the entire hospital and more than 60 in the cardiovascular department alone), setting of the conference (being held regularly or occasionally and targeting more than 10 patients per year),

and members of the conference as independent variables (model 1). After that, the basic setting of the institution and the factors with $p < 0.2$ in model 1 were evaluated in model 2. The two-sided $p < 0.05$ was defined as being statistically significant. All analyses were performed using R 3.3.3 (R Foundation for Statistical Computing, Vienna, Austria).

Results

Characteristics of institutions

Of the 1004 institutions to which the questionnaire was mailed, the directors at 544 institutions (54.2%) responded. We then divided these institutions into two groups according to their implementation of palliative care conferences for patients with end-stage heart failure. Of the 544 institutions from which we received a response, 223 (41.0%) had held palliative care conferences for patients with end-stage heart failure, while 321 (59.0%) had not. The characteristics of the institutions are summarized in Table 1. Institutions that had held palliative care conferences had a larger number of hospital beds and beds in the cardiovascular departments, compared with institutions that had not held the conferences. Furthermore, the institutions that had held the palliative care conferences had a significantly higher registration rate for certified chronic heart failure care nurses; by contrast, the registration rate for certified palliative care nurses did not significantly differ between the two groups.

Table 1 Characteristics of institutions

	Palliative care conference for patients with end-stage heart failure				
	Implementation		Non-implementation		*p*
	NA	*n* = 223	NA	*n* = 321	
Number of beds	1	*n* (%)	4		
Hospital					
≤ 200		26 (11.7)		47 (14.3)	
201–400		68 (30.6)		120 (37.9)	0.0034*
401–600		66 (29.7)		98 (30.9)	
≥ 601		62 (27.9)		52 (16.4)	
Cardiovascular Department	3		6		
≤ 20		9 (4.1)		20 (6.3)	
21–40		111 (50.5)		193 (61.3)	
41–60		72 (32.7)		80 (25.4)	0.0010*
61–80		13 (5.9)		13 (4.1)	
≥ 81		15 (6.8)		9 (2.9)	
Certified chronic heart failure care nurse belong to institution (+)	2	79 (35.7)	5	67 (21.2)	0.0003†
Certified palliative care nurse belong to institution (+)	4	159 (72.6)	13	207 (67.2)	0.2123†

NA not available

*Wilcoxon rank sum test

†Fisher's exact test

Drug therapy as palliative care for end-stage heart failure

Analgesics or sedatives were used in palliative care for end-stage heart failure in 403 (74.1%) institutions (Table 2). Additionally, 194 (87.4%) of the institutions that had held palliative care conferences used drug therapy for palliative care. Of the 223 institutions that had held palliative care conferences, 179 (80.3%) used opioids and 111 (49.8%) used sedatives. Conversely, the usage rates of opioids, non-steroidal anti-inflammatory drugs, and sedatives were lower in institutions that had not held palliative care conferences. The number of drugs used in palliative care was, overall, larger in institutions that had held palliative care conferences.

Implementation status of palliative care conferences for end-stage heart failure

Table 3 shows the implementation status of palliative care conferences for end-stage heart failure. Only 20 (9.0%) of the institutions held regular conferences on palliative care for end-stage heart failure, while 134 (60.1%) of the institutions rarely held these conferences. In 176 (78.9%) institutions, the number of patients per year targeted for the conference was 10 or less, while 19 (8.5%) institutions targeted 21 or more patients per year. The percentage of institutions that included physicians and/or nurses as conference members was high. The physicians who attended the conferences, in addition to cardiologists, included psychiatrists, palliative care physicians, and others. In some institutions, two or more types of physicians other than cardiologists participated in the palliative care conferences.

Positive outcomes after performing palliative care for end-stage heart failure

Table S1 indicates the positive outcomes which were obtained from 223 institutions that had implemented palliative care conferences when performing palliative care for end-stage heart failure. Physical and mental symptomatic relief was most frequently reported. However, it was rare to have the opinion that life expectancy was improved. Using the responses from 217 institutions (after excluding six incomplete responses), we analyzed the factors related to each positive outcome (Table 4).

Table 2 Drug therapy as palliative care for end-stage heart failure

	Palliative care conference for patients with end-stage heart failure		
	Implementation ($n=223$)	Non-implementation ($n=321$)	p
Use of analgesics or sedatives as part of palliative care	194 (87.0)	209 (65.1)	<0.0001
Number of drugs used in palliative care[a]	2.0 (1.0–4.0)	1.0 (0–2.0)	<0.0001
Type of drug			
Opioid	179 (80.3)	191 (59.5)	<0.0001
Morphine	169 (75.8)	185 (57.6)	<0.0001
Fentanyl	67 (30.0)	45 (14.0)	<0.0001
Codeine phosphate	26 (11.7)	14 (4.4)	0.0023
Non-opioid analgesics	81 (36.3)	49 (15.3)	<0.0001
Acetaminophen	68 (30.5)	31 (9.7)	<0.0001
NSAIDs	49 (22.0)	39 (12.1)	0.0030
Sedatives	111 (49.8)	93 (29.0)	<0.0001
Midazolam	67 (30.0)	49 (15.3)	<0.0001
Propofol	51 (22.9)	29 (9.0)	<0.0001
Dexmedetomidine	70 (31.4)	64 (19.9)	0.0033

Values are number of institutions (%)

NSAIDs non-steroidal anti-inflammatory drugs

[a]Sum of individual drugs and category of NSAIDs [median (interquartile range), Wilcoxon rank sum test]

Improvements in physical symptoms

"Improvements in physical symptoms" was more frequently selected in institutions that included physical therapists or palliative care physicians in the palliative care conferences for patients with end-stage heart failure (odds ratio [OR]: 2.1 [1.0–4.1, $p=0.0412$]; OR 4.5 [1.6–12.7, $p=0.0043$], respectively). It was also more frequently selected in institutions with more than 400 beds but did not significantly differ according to the number of occupational categories involved in the palliative care conferences.

Improvements in mental symptoms

Institutions in which nutritionists or palliative care physicians participated in the palliative care conferences were more likely to select "improvements in mental symptoms" as positive outcomes (OR 2.2, [1.0–4.5, $p=0.0366$]; OR 5.1 [1.8–14.5, $p=0.0021$], respectively). This positive outcome also had greater odds of being selected in institutions where four or more occupational categories were involved in the palliative care conferences.

Patients were able to end their life with dignity

Institutions in which pharmacists or palliative care physicians participated in the palliative care conferences were more likely to select "patients were able to end their life with dignity" as a positive outcome (OR 2.7, [1.4–5.0, $p=0.0023$]; OR 2.2, [1.1–4.5, $p=0.0313$]).

Patients could stay where they wished

"Patients could stay where they wished" had greater odds of being selected as a positive outcome in institutions where medical social workers (MSWs) participated in the palliative care conferences (OR 2.5, [1.2–5.1, $p=0.0130$]). Conversely, in institutions where palliative care physicians participated in the conference, this positive outcome had lower odds of being selected.

Respect of the patients' wishes

The responses from institutions where physical therapists participated in the palliative care conferences were more likely to include "respect of the patients' wishes" as a positive outcome (OR 2.0, [1.1–3.5, $p=0.0169$]). This positive outcome also had greater odds of being selected in institutions where palliative care conferences were regularly or occasionally held (OR 2.7, [1.5–4.8, $p=0.0008$]).

Respect of the families' wishes

Responses from institutions where pharmacists participated in palliative care conferences were more likely to include "respect of the families' wishes" as positive outcomes (OR

Table 3 The implementation status of palliative care conference for end-stage heart failure

Frequency of palliative care conference	
Regularly	20 (9.0)
Occasionally	69 (30.9)
Rarely	134 (60.1)
Number of patients per year became targeted for palliative care	
≤ 10	176 (78.9)
11–20	28 (12.6)
21–30	8 (3.6)
31–40	3 (1.3)
≥ 41	8 (3.6)
Members composing conference[a]	
Cardiologist	202 (91.8)
Nurse	214 (97.3)
Pharmacist	129 (58.6)
Nutritionist	103 (46.8)
Physical therapist	126 (57.3)
Medical social worker	88 (40.0)
Psychology professional	29 (13.2)
Other occupation	7 (3.2)
Physician other than cardiologist	60 (27.3)
Psychiatry	17 (7.7)
Palliative Care Physician	46 (20.9)
Other	7 (3.2)
Number of occupational categories[a]	
1	7 (3.2)
2	35 (15.9)
3	30 (13.6)
4	38 (17.3)
5	45 (20.5)
6	35 (15.9)
7	19 (8.6)
8	8 (3.6)
≥ 9	3 (1.4)

Number of institution (%)

[a]Insufficient data in 3 institutions

2.1, [1.2–3.8, $p = 0.0138$]). This positive outcome also had greater odds of being selected in institutions where palliative care conferences were regularly or occasionally held (OR 2.0, [1.1–3.7, $p = 0.0270$]).

Discussion

This study is, to our knowledge, the first nationwide survey to report possible associations between palliative care conferences and positive outcomes when performing palliative care for patients with heart failure. Our data indicated the possibility that effects of palliative care for end-stage heart failure differed depending on which occupational categories were involved in the palliative care conferences. Moreover, it was an important finding that the institutions that had held palliative care conferences tended to use significantly more types of drugs compared with those that had not held such conferences. Some previous studies have indicated that multidisciplinary team treatment for chronic heart failure was effective [21, 23, 24, 14]. The recent Palliative Care in Heart Failure trial demonstrated that multidimensional palliative care intervention improved patient QOL and spiritual well-being but not mortality or hospitalization rates [25]. However, the influence of each occupational category on patients receiving palliative care for end-stage heart failure remains unclear. Our results might help to optimally coordinate palliative care. The second important finding is that we reaffirmed that palliative care based on multidisciplinary team management was uncommon for patients with end-stage heart failure in Japan. In a Japanese regional cancer center, 99% of institutions had a palliative care consultation team and 90% had defined palliative care consultation request methods [8]. This study indicated that only 223 (41%) of 544 institutions had held palliative care conferences for end-stage heart failure. This suggests that palliative care involving a multidisciplinary team for heart failure is not as widespread as that for advanced cancer.

In Japan, factors of medical scale (such as number of items or budget) are based on the number of beds. Previous reports on palliative care consultation teams for cancer patients indicated that the number of beds was associated with a conference with or communication by, a physician and a nurse on the palliative care consultation teams, direct care for a patient by palliative care consultation teams, and presence and use of a pain measurement scale [8]. Our data also indicated that institutions holding palliative care conferences had a larger number of hospital beds and beds in the cardiovascular departments, compared with institutions not holding the conferences. These results suggest that palliative care structure and process is influenced by the number of beds in the hospital.

According to the multivariate analyses, physical therapists contributed to the responses from the institutions including "improvements in physical symptoms" as a positive outcome. Previous reports have indicated that the combination of massage and exercises can reduce pain and improve mood in patients with terminal cancer [26]. Our results similarly suggest that interventions by physical therapists can reduce physical pain.

Nutritionists interview patients about the content of their meals, their appetite, and feelings of nausea, as well as provide appropriate meals. Nutritional interventions have been shown to be effective in the prevention and reduction of malnutrition in cancer patients [27]. Loss of appetite is a common symptom of heart failure, especially among patients with end-stage heart failure. Nutritionists were found to

Table 4 The factors that contributed to positive outcome

Factor	Improvements in physical symptoms				Improvements in mental symptoms			
	Model 1		Model 2		Model 1		Model 2	
	OR [95% C.I.]	*p*	OR [95% C.I.]	*p*	OR [95% C.I.]	*p*	OR [95% C.I.]	*p*
Number of hospital beds								
> 400	1.8 [0.9–3.4]	0.1040	1.8 [0.9–3.5]	0.0718	1.2 [0.6–2.3]	0.6737	1.1 [0.6–2.2]	0.7099
Number of beds at the cardiovascular department								
> 60	1.0 [0.5–1.9]	0.9493	1.0 [0.5–2.0]	0.9196	1.6 [0.8–3.2]	0.1682	1.6 [0.8–3.1]	0.1582
Palliative care conference for end–stage heart failure								
Holding regularly or occasionally	1.2 [0.6–2.5]	0.5695			1.8 [0.8–3.7]	0.1303	2.0 [1.0–3.9]	0.0398
Number of patients per year targeted > 10	1.3 [0.6–3.1]	0.5313			1.4 [0.6–3.5]	0.4467		
Members who comprise conference								
Cardiologist	1.0				1.0			
Nurse	3.2 [0.5–19.8]	0.2200			1.0 [0.2–6.3]	0.9984		
Pharmacist	1.0 [0.4–2.3]	0.9881			1.3 [0.6–2.9]	0.5038		
Nutritionist	1.0 [0.5–2.4]	0.9165			1.9 [0.9–4.3]	0.1131	2.2 [1.0–4.5]	0.0366
Physical therapist	1.8 [0.8–4.0]	0.1415	2.1 [1.0–4.1]	0.0412	1.8 [0.9–3.9]	0.1213	2.0 [1.0–3.9]	0.0596
Medical social worker	0.3 [0.1–0.6]	0.0005	0.3 [0.1–0.6]	0.0006	1.1 [0.5–2.2]	0.8640		
Psychology professional	1.1 [0.4–3.1]	0.8170			1.0 [0.3–2.8]	0.9359		
Psychiatry	0.7 [0.2–2.6]	0.6396			0.8 [0.2–3.0]	0.6875		
Palliative care physician	4.4 [1.5–12.7]	0.0065	4.5 [1.6–12.7]	0.0043	5.0 [1.7–14.6]	0.0029	5.1 [1.8–14.5]	0.0021
Factor	Patients were able to end their life with dignity				Patients could stay where they wished			
	Model 1		Model 2		Model 1		Model 2	
	OR [95% C.I.]	*p*	OR [95% C.I.]	*p*	OR [95% C.I.]	*p*	OR [95% C.I.]	*p*
Number of hospital beds								
> 400	0.8 [0.4–1.6]	0.5383	0.8 [0.4–1.5]	0.5058	1.0 [0.5–2.1]	0.9355	1.1 [0.5–2.2]	0.7738
Number of beds at the cardiovascular department								
> 60	1.1 [0.6–2.1]	0.7328	1.1 [0.6–2.0]	0.7366	0.8 [0.4–1.7]	0.5883	0.8 [0.4–1.6]	0.5616
Palliative care conference for end–stage heart failure								
Holding regularly or occasionally	1.0 [0.5–1.9]	0.9496			2.3 [1.1–5.0]	0.0296	2.2 [1.1–4.4]	0.0181
Number of patients per year targeted>10	1.1 [0.5–2.4]	0.8117			0.8 [0.3–1.8]	0.5562		
Members who comprise conference								
Cardiologist	1.0				1.0			
Nurse	1.2 [0.1–11.3]	0.8910			0.2 [0.0–1.7]	0.1482	0.3 [0.0–1.7]	0.1594
Pharmacist	2.7 [1.2–5.9]	0.0140	2.7 [1.4–5.0]	0.0023	1.1 [0.4–2.6]	0.9118		
Nutritionist	0.8 [0.4–1.7]	0.5895			1.0 [0.4–2.2]	0.9419		
Physical therapist	1.5 [0.7–3.0]	0.2809			1.8 [0.8–4.2]	0.1868	1.8 [0.8–3.9]	0.1320
Medical social worker	0.7 [0.4–1.4]	0.3090			2.5 [1.2–5.1]	0.0145	2.5 [1.2–5.1]	0.0130
Psychology professional	1.4 [0.6–3.4]	0.4371			1.4 [0.6–3.6]	0.4623		
Psychiatry	1.1 [0.4–3.5]	0.8476			2.3 [0.7–7.6]	0.1596	2.5 [0.8–8.2]	0.1189
Palliative care physician	2.2 [1.1–4.7]	0.0338	2.2 [1.1–4.5]	0.0313	0.4 [0.2–1.2]	0.1043	0.4 [0.2–1.2]	0.0981
Factor	Respect of the patients' wishes				Respect of the families' wishes			
	Model 1		Model 2		Model 1		Model 2	
	OR [95% C.I.]	*p*	OR [95% C.I.]	*p*	OR [95% C.I.]	*p*	OR [95% C.I.]	*p*
Number of hospital beds								
> 400	1.1 [0.6–2.1]	0.6682	1.2 [0.7–2.2]	0.4786	0.7 [0.4–1.3]	0.2744	0.7 [0.4–1.3]	0.2564
Number of beds at the cardiovascular department								
> 60	1.1 [0.6–1.9]	0.8320	1.1 [0.6–2.0]	0.7204	1.4 [0.7–2.5]	0.3259	1.3 [0.7–2.4]	0.3672

Table 4 (continued)

Factor	Respect of the patients' wishes				Respect of the families' wishes			
	Model 1		Model 2		Model 1		Model 2	
	OR [95% C.I.]	*p*	OR [95% C.I.]	*p*	OR [95% C.I.]	*p*	OR [95% C.I.]	*p*
Palliative care conference for end-stage heart failure								
Holding regularly or occasionally	2.7 [1.4–5.2]	0.0034	2.7 [1.5–4.8]	0.0008	2.2 [1.1–4.3]	0.0284	2.0 [1.1–3.7]	0.0270
Number of patients per year targeted > 10	0.9 [0.4–2.0]	0.8243			0.8 [0.4–1.8]	0.6278		
Members who comprise conference								
Cardiologist	1.0				1.0			
Nurse	2.8 [0.3–26.9]	0.3713			4.4 [0.5–41.9]	0.1985	4.5 [0.5–41.1]	0.1815
Pharmacist	1.0 [0.5–2.2]	0.9111			2.2 [1.0–4.6]	0.0429	2.1 [1.2–3.8]	0.0138
Nutritionist	1.2 [0.6–2.4]	0.6623			0.8 [0.3–1.6]	0.4743		
Physical therapist	1.7 [0.9–3.4]	0.1151	2.0 [1.1–3.5]	0.0169	1.5 [0.8–3.0]	0.2398		
Medical social worker	1.1 [0.6–2.0]	0.8087			0.8 [0.4–1.6]	0.5953		
Psychology professional	0.7 [0.3–1.8]	0.5209			1.0 [0.4–2.5]	0.9525		
Psychiatry	1.6 [0.5–5.5]	0.4521			1.7 [0.5–6.3]	0.4310		
Palliative care physician	1.2 [0.6–2.5]	0.6517			1.1 [0.5–2.3]	0.8589		

model 1: all target factors were included; model 2: baseline characteristics of institutions and factors with $p < 0.2$ in model 1 were included

OR odds ratio,*CI* confidence interval

be significantly associated with the selection of "improvements in mental symptoms" in this study. This suggests that nutritional interventions, which include appetite assessment, adjustment of meals, and prevention of malnutrition, likely influence the mental health of patients with end-stage heart failure.

Euthanasia is illegal in Japan. As such, palliative sedation therapy is generally used to reduce symptoms such as pain, dyspnea, and fatigue, thereby providing patients with a dignified end-of-life. This perhaps relates to why pharmacists contributed to the selection of "patients were able to end their life with dignity" as a positive outcome. Previous studies have also reported that significantly more drug-related problems were identified among patients who were interviewed by pharmacists compared to patients who underwent the usual examination [28]. This suggests that pharmacists influence appropriate drug therapy in palliative care.

In Japan, MSWs are involved in meeting patients' social, environmental, financial, and support needs, and interface with the other members of the healthcare team. Additionally, in hospital settings, MSWs tend to have an important role in coordinating patients' discharge planning, assisting patients and families in accessing in-home health care services, arranging for in-home medical equipment, and coordinating follow-up treatments. As such, it is readily apparent why the presence of MSWs in our study was significantly associated with the selection of "patients could stay where they wished" as a positive outcome.

Notably, the presence of palliative care physicians contributed to the selection of three positive outcomes: "improvements in physical symptoms," "improvements in mental symptoms," and "patients were able to end their life with dignity." This result suggests that it is important for palliative care physicians to participate in the treatment of patients with end-stage heart failure. Some reports have also shown that palliative care tends to be provided by a multidisciplinary team that includes palliative care professionals [20, 29, 30].

Responses from institutions where palliative care conferences were regularly or occasionally held were more likely to include "respect of the patients' wishes" and "respect of the families' wishes." Additionally, the number of patients per year did not have a significant association with selection of these positive outcomes. These results probably indicated that the frequency of holding palliative care conferences was important in order to honor the wishes of patients and their families.

In this study, 403 (74.1%) of the 544 institutions used analgesics or sedatives as part of palliative care for heart failure, and morphine was most often selected for drug therapy. In a previous study, morphine led to a reduction in the median breathlessness score in patients with heart failure [31]. Two previous studies have also indicated that opioids were effective for improving exercise tolerance in patients with chronic heart failure [32, 33]. In contrast, one study showed that oral opioids were no more effective than a placebo for relieving breathlessness in patients with chronic heart failure [4]. More studies are required to confirm the effectiveness of morphine for heart failure. The most used sedative in palliative care was dexmedetomidine

in this study, which is a relatively new drug. This is an α2-adrenoreceptor agonist with sedative and analgesic properties but without respiratory depressant effects. Previous studies have reported that dexmedetomidine is beneficial in the palliative care of children and adolescents at the end of life [35]. Furthermore, dexmedetomidine is expected to have a large effect on the palliative care of adult patients with heart failure. In this study, institutions that had held palliative care conferences tended to use significantly more types of drugs compared with those that had not held such conferences. These results probably suggest that the former institutions implemented palliative care that was more suitable for end-stage heart failure compared with the latter institutions. Future studies should further examine the effect of drug therapy in palliative care for patients with end-stage heart failure.

This study has some limitations. First, the survey was conducted only in cardiology training hospitals authorized by the Japanese Circulation Society. There are other institutions that implement palliative care for heart failure in Japan. Moreover, only approximately half of the surveyed hospitals responded. The low response rate may reflect the institutions' policies such as innovative care for patients and/or scale. Therefore, our results include some bias of positive response for palliative care. Second, the respondents to the questionnaires were medical practitioners and not patients; furthermore, the responses were based on these practitioners' subjective opinions. However, we are unable to accurately interview patients who are close to death about their symptoms, wishes, and dignity. Third, this survey's subjects were at institutions having a relatively high level of expertise in cardiology. Thus, it was possible that responders were at institutions working aggressively to increase palliative care for heart failure. In this study, of the 544 responding institutions, 527 (98%) answered that palliative care was necessary for patients with heart failure [18]. It is likely that these institutions had the opinion that the current status of palliative care for heart failure was inadequate and the quality of palliative care should be improved. These factors probably influenced the generalizability of this study. Fourth, the definitions of multidisciplinary team, palliative care conference, or end-stage heart failure might have differed for each responder. This last difference in definition may make it difficult to determine what constitutes the terminal stage for patients with heart failure.

Conclusion

This study revealed that there are possible associations between palliative care conferences and positive outcomes when performing palliative care for patients with end-stage heart failure. Moreover, the institutions that had held palliative care conferences tended to use significantly more types of drugs compared with those that had not held such conferences. Our data indicated the possibility that the effects of palliative care for end-stage heart failure differed depending on which occupational categories were involved in the palliative care conferences. Specifically, the presence of palliative care physicians was associated with multiple positive outcomes. These results indicate that multidisciplinary team management is beneficial for palliative care for end-stage heart failure and might help optimally coordinate palliative care. For both end-stage heart failure and advanced cancer, palliative care should be provided by a multidisciplinary team that includes palliative care professionals. More studies are required to determine optimal treatment strategies for patients with end-stage heart failure.

Acknowledgements The authors would like to acknowledge the directors and staff of the 1004 cardiology training hospitals authorized by the Japanese Circulation Society for their cooperation with this survey. The authors thank Koji Shimamoto, MS (MediStatLab Co., Ltd., Tokyo, Japan, https://www.medistatlab.com/) for assistance with statistical methods.

Funding This study received no grant from any funding agency in the public, commercial, or not-for-profit sectors.

Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

Informed consent For this type of study, formal consent is not required.

References

1. Jessup M, Brozena S (2003) Heart failure. N Engl J Med 348:2007–2018
2. Krum H, Teerlink JR (2011) Medical therapy for chronic heart failure. Lancet 378:713–721
3. Yancy CW, Jessup M, Bozkurt B, Butler J, Casey DE Jr, Drazner MH, Fonarow GC, Geraci SA, Horwich T, Januzzi JL, Johnson MR, Kasper EK, Levy WC, Masoudi FA, McBride PE, McMurray JJ, Mitchell JE, Peterson PN, Riegel B, Sam F, Stevenson LW, Tang WH, Tsai EJ, Wilkoff BL, American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines (2013). 2013 ACCF/AHA guideline for the management of heart failure. Circulation 128:e240–e327
4. Levy M, Smith T, Alvarez-Perez A, Back A, Baker JN, Beck AC, Block S, Dalal S, Dans M, Fitch TR, Kapo J, Kutner JS, Kvale E, Misra S, Mitchell W, Portman DG, Sauer TM, Spiegel D, Sutton L, Szmuilowicz E, Taylor RM, Temel J, Tickoo R, Urba SG, Weinstein E, Zachariah F, Bergman MA, Scavone JL (2016) Palliative care version 1.2016. Clinical practice guidelines in oncology. J Natl Compr Canc Netw 14:82–113
5. Ferrell BR, Temel JS, Temin S, Alesi ER, Balboni TA, Basch EM, Firn JI, Paice JA, Peppercorn JM, Phillips T, Stovall EL, Zimmermann C, Smith TJ (2017) Integration of palliative care into

standard oncology care: American Society of Clinical Oncology clinical practice guideline update. J Clin Oncol 35:96–112
6. Caraceni A, Hanks G, Kaasa S, Bennett MI, Brunelli C, Cherny N, Dale O, De Conno F, Fallon M, Hanna M, Haugen DF, Juhl G, King S, Klepstad P, Laugsand EA, Maltoni M, Mercadante S, Nabal M, Pigni A, Radbruch L, Reid C, Sjogren P, Stone PC, Tassinari D, Zeppetella G, European Palliative Care Research Collaborative (EPCRC); European Association for Palliative Care (EAPC) (2012). Use of opioid analgesics in the treatment of cancer pain: evidence-based recommendations from the EAPC. Lancet Oncol 13:e58–68
7. Temel JS, Greer JA, Muzikansky A, Gallagher ER, Admane S, Jackson VA, Dahlin CM, Blinderman CD, Jacobsen J, Pirl WF, Billings JA, Lynch TJ (2010) Early palliative care for patients with metastatic non-small-cell lung cancer. N Engl J Med 363:733–742
8. Nakazawa Y, Miyashita M, Morita T, Misawa T, Tsuneto S, Shima Y (2012) The current status and issues regarding hospital-based specialized palliative care service in Japanese regional cancer centers: A nationwide questionnaire survey. Jpn J Clin Oncol 42:432–441
9. Sato Y (2015) Multidisciplinary management of heart failure just beginning in Japan. J Cardiol 66:181–188
10. Nordgren L, Sörensen S (2003) Symptoms experienced in the last six months of life in patients with end-stage heart failure. Eur J Cardiovasc Nurs 2:213–217
11. Riley JP, Beattie JM (2017) Palliative care in heart failure: facts and numbers. ESC Heart Fail 4:81–87
12. Brännström M, Boman K (2014) Effects of person-centered and integrated chronic heart failure and palliative home care. PREFER: a randomized controlled study. Eur J Heart Fail 16:1142–1151
13. Schwarz ER, Baraghoush A, Morrissey RP, Shah AB, Shinde AM, Phan A, Bharadwaj P (2012) Pilot study of palliative care consultation in patients with advanced heart failure referred for cardiac transplantation. J Palliat Med 15:12–15
14. Lorenz KA, Lynn J, Dy SM, Shugarman LR, Wilkinson A, Mularski RA, Morton SC, Hughes RG, Hilton LK, Maglione M, Rhodes SL, Rolon C, Sun VC, Shekelle PG (2008) Evidence for improving palliative care at the end of life: a systematic review. Ann Intern Med 148:147–59
15. Diop MS, Rudolph JL, Zimmerman KM, Richter MA, Skarf LM (2017) Palliative care interventions for patients with heart failure: a systematic review and meta-analysis. J Palliat Med 20:84–92
16. Ponikowski P, Voors AA, Anker SD, Bueno H, Cleland JG, Coats AJ, Falk V, González-Juanatey JR, Harjola VP, Jankowska EA, Jessup M, Linde C, Nihoyannopoulos P, Parissis JT, Pieske B, Riley JP, Rosano GM, Ruilope LM, Ruschitzka F, Rutten FH, van der Meer P, Authors/Task Force Members (2016) 2016 ESC guidelines for the diagnosis and treatment of acute and chronic heart failure. Eur Heart J 37:2129–2200
17. Kurozumi Y, Oishi S, Sugano Y, Sakashita A, Kotooka N, Suzuki M, Higo T, Yumino D, Takada Y, Maeda S, Yamabe S, Washida K, Takahashi T, Ohtani T, Sakata Y, Sato Y (2018) Design of a nationwide survey on palliative care for end-stage heart failure in Japan. J Cardiol 71:202–211
18. Kuragaichi T, Kurozumi Y, Oishi S, Sugano Y, Sakashita A, Kotooka N, Suzuki M, Higo T, Yumino D, Takada Y, Maeda S, Yamabe S, Washida K, Takahashi T, Ohtani T, Sakata Y, Sato Y (2018) Nationwide survey of palliative care for patients with heart failure in Japan. Circ J 82:1336–1343
19. World Health Organization. WHO Definition of Palliative Care. Available at http://www.who.int/cancer/palliative/definition/en/. Accessed April 8, 2018
20. Jaarsma T, Beattie JM, Ryder M, Rutten FH, McDonagh T, Mohacsi P, Murray SA, Grodzicki T, Bergh I, Metra M, Ekman I, Angermann C, Leventhal M, Pitsis A, Anker SD, Gavazzi A, Ponikowski P, Dickstein K, Delacretaz E, Blue L, Strasser F, McMurray J, Advanced Heart Failure Study Group of the HFA of the ESC (2009). Palliative care in heart failure: a position statement from the palliative care workshop of the Heart Failure Association of the European Society of Cardiology. Eur J Heart Fail 11:433–443
21. Adler ED, Goldfinger JZ, Kalman J, Park ME, Meier DE (2009) Palliative care in the treatment of advanced heart failure. Circulation 120:2597–2606
22. Goodlin SJ (2009) Palliative care in congestive heart failure. J Am Coll Cardiol 54:386–396
23. McAlister FA, Stewart S, Ferrua S, McMurray JJ (2004) Multidisciplinary strategies for the management of heart failure patients at high risk for admission: a systematic review of randomized trials. J Am Coll Cardiol 44:810–819
24. Fonarow GC, Albert NM, Curtis AB, Stough WG, Gheorghiade M, Heywood JT, McBride ML, Inge PJ, Mehra MR, O'Connor CM, Reynolds D, Walsh MN, Yancy CW (2010) Improving evidence-based care for heart failure in outpatient cardiology practices: primary results of the Registry to Improve the Use of Evidence-Based Heart Failure Therapies in the Outpatient Setting (IMPROVE HF). Circulation 122:585–596
25. Rogers JG, Patel CB, Mentz RJ, Granger BB, Steinhauser KE, Fiuzat M, Adams PA, Speck A, Johnson KS, Krishnamoorthy A, Yang H, Anstrom KJ, Dodson GC, Taylor DH Jr, Kirchner JL, Mark DB, O'Connor CM, Tulsky JA (2017) Palliative care in heart failure. J Am Coll Cardiol 70:331–341
26. López-Sendín N, Alburquerque-Sendín F, Cleland JA, Fernández-de-las-Peñas C (2012) Effects of physical therapy on pain and mood in patients with terminal cancer: a pilot randomized clinical trial. J Altern Complement Med 18:480–486
27. Lee JL, Leong LP, Lim SL (2016) Nutrition intervention approaches to reduce malnutrition in oncology patients: a systematic review. Support Care Cancer 24:469–480
28. Viktil KK, Blix HS, Moger TA, Reikvam A (2006) Interview of patients by pharmacists contributes significantly to the identification of drug-related problems (DRPs). Pharmacoepidemiol Drug Saf 15:667–674
29. McIlvennan CK, Allen LA (2016) Palliative care in patients with heart failure. BMJ 353:i1010
30. Gelfman LP, Kavalieratos D, Teuteberg WG, Lala A, Goldstein NE (2017) Primary palliative care for heart failure: what is it? How do we implement it? Heart Fail Rev 22(5):611–620
31. Johnson MJ, McDonagh TA, Harkness A, McKay SE, Johnson Dargie HJ, MJ1, McDonagh TA, Harkness A, McKay SE, Dargie HJ, (2002) Morphine for the relief of breathlessness in patients with chronic heart failure—a pilot study. Eur J Heart Fail 4:753–756
32. Williams SG, Wright DJ, Marshall P, Reese A, Tzeng BH, Coats AJ, Tan LB (2003) Safety and potential benefits of low dose diamorphine during exercise in patients with chronic heart failure. Heart 89:1085–1086
33. Chua TP, Harrington D, Ponikowski P, Webb-Peploe K, Poole-Wilson PA, Coats AJ (1997) Effects of dihydrocodeine on chemosensitivity and exercise tolerance in patients with chronic heart failure. J Am Coll Cardiol 29:147–152
34. Oxberry SG, Torgerson DJ, Bland JM, Clark AL, Cleland JG, Johnson MJ (2011) Short-term opioids for breathlessness in stable chronic heart failure: a randomized controlled trial. Eur J Heart Fail 13:1006–1012
35. Burns J, Jackson K, Sheehy KA, Finkel JC, Quezado ZM (2017) the use of dexmedetomidine in pediatric palliative care: a preliminary study. J Palliat Med 20(7):779–783

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