



Original Article

Utilization of hospice and nonhospice care in patients with end-stage renal disease on dialysis

Shu-Chen Wang^{a,b*}, Kai-Chieh Hu^c, Wei-Chuan Chang^d, Chung-Y. Hsu^{e,f}

^aDepartment of Nursing, Hualien Tzu Chi Hospital, Buddhist Tzu Chi Medical Foundation, Hualien, Taiwan; ^bDepartment of Nursing, Tzu Chi University, Hualien, Taiwan; ^cManagement Office for Health Data, China Medical University Hospital, Taichung, Taiwan; ^dDepartment of Medical Research, Hualien Tzu Chi Hospital, Buddhist Tzu Chi Medical Foundation, Hualien, Taiwan; ^eCollege of Medicine, China Medical University, Taichung, Taiwan; ^fGraduate Institute of Clinical Medical Science, China Medical University, Taichung, Taiwan

Submission : 13-Jul-2021
 Revision : 30-Aug-2021
 Acceptance : 15-Sep-2021
 Web Publication : 09-Dec-2021

ABSTRACT

Objectives: The prevalence of end-stage renal disease (ESRD) and the number of patients undergoing dialysis in Taiwan are high. Since September 2009, the National Health Insurance has started to provide hospice care to patients with renal failure in Taiwan. Therefore, it is necessary to understand the use of hospice and nonhospice care in patients with ESRD on dialysis. We aim to understand trends in patients with ESRD receiving hospice and nonhospice care as well as medical care efforts during the last month of their lives (2009–2013). **Materials and Methods:** The cohort study was conducted using 1 million randomly selected samples from the Taiwan Health Insurance Research Database for millions of people in Taiwan in 2009–2013. Descriptive statistics were presented to summarize the characteristics of data. To compare differences between cohorts, Chi-square tests and Student's *t*-tests were used. Mann–Whitney *U*-tests were performed for nonnormally distributed data. Mantel–Haenszel test was test for trend. **Results:** We recruited 770 ESRD patients who underwent hemodialysis; among them, 154 patients received hospice care. Patients who received hospice care had a significantly longer survival time after removal of mechanical ventilator (20 vs. 0 days) and after discontinuation of dialysis (2 vs. 0 days) compared with those who did not receive hospice care. Patients who received hospice care had more pain control (61.04% vs. 17.37%, $P < 0.0001$) and other symptomatic control (55.84% vs. 43.18% with diuretics, $P < 0.05$; 64.29% and 48.21% with laxatives, $P = 0.0004$) medications than those who did not. Nevertheless, the overall medical cost in the hospice group was significantly lower (90 USD and 280 USD, $P < 0.0001$). **Conclusion:** Our results suggest that the addition of hospice care may permit patients a longer life-support-free survival time. In addition, despite a more frequent symptomatic controlling agent use, hospice care significantly reduced the overall medical expenditure.

KEYWORDS: *Dialysis, End-stage renal disease, Hospice*

INTRODUCTION

The prevalence of chronic kidney disease (CKD) in Taiwan is high, accounting for approximately 11.9% of the total population of Taiwan [1]. Overall, 87.5% of patients with end-stage renal disease (ESRD) receive hemodialysis, and 8.5% receive peritoneal dialysis [2]. Patients with ESRD aged >65 years have a mortality rate of 65% within 1 year after diagnosis, and the mortality rate increases with age [3].

Dialysis and comorbidity have a poor prognosis in the elderly, with a high probability of hospitalization, and are associated with a lengthy hospital stay because of the disease of comorbidities and treatment complications [4,5].

Approximately 20% of elderly patients undergoing hemodialysis are aged >75 years [6]. Patients aged >85 years with a Charlson Comorbidity Index (CCI) >10 or those aged >90 years with CCI 7–9 stay in hospital for half a year [7]. Patients aged >75 years with comorbidities receiving no benefit from hemodialysis have a 1-year mortality rate of approximately 59%–75% [8]. Regarding patients' subjective feelings about hemodialysis, 60% of Canadian patients have regretted receiving hemodialysis [8].

*Address for correspondence: Prof. Shu-Chen Wang, Department of Nursing, Hualien Tzu Chi Hospital, Buddhist Tzu Chi Medical Foundation, 707, Section 3, Chung-Yang Road, Hualien, Taiwan. E-mail: wangsc@tzuchi.com.tw

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

For reprints contact: WKHLRPMedknow_reprints@wolterskluwer.com

How to cite this article: Wang SC, Hu KC, Chang WC, Hsu CY. Utilization of hospice and nonhospice care in patients with end-stage renal disease on dialysis. Tzu Chi Med J 2022;34(2):232-8.

Access this article online

Quick Response Code:



Website: www.tcmjmed.com

DOI: 10.4103/tcmj.tcmj_207_21

Data from the Health Insurance Database reveal that health insurance costs for Taiwanese citizens are highest in the last 3 months of their lives [9]. Patients undergoing hemodialysis have higher rates of admission to hospital and intensive care units (ICUs) in the last month of life than those with cancer and heart disease but have lower rates of hospice care [10,11]. Another study surveyed the Health Insurance Database in 2006–2011, revealing that a total of 1177 patients had died from chronic dialysis; in the last month of life, 66.9% of them still received cardiopulmonary resuscitation (CPR), 51% were admitted to the ICU, and 65% died in hospital, of which only 1.6% ($n = 19$) received hospice care [12]. The top second and third leading causes of ESRD deaths in the United States and Australia, respectively, are terminations of hemodialysis, and approximately 40% of patients receive hospice care after dialysis termination. Patients with end-stage cancer and renal failure who were hospitalized in a university-affiliated hospital had a higher rate of discontinuing hemodialysis [13].

Taiwan has had health-care subsidies for hospice care for patients with end-stage organ failure since September 1, 2009, including patients with acute and chronic renal failure. When patients with renal disease reach the end of life, they are faced with the choice of continuing to undergo hemodialysis or receiving hospice care.

If the patients with ESRD receive hospice care, then they will receive more symptom management and less medical costs than nonhospice care. The purpose of this study was to understand the trends of receiving hospice and nonhospice care in patients with ESRD during the last month of their lives, in 2009–2013, as well as the rate of medical care use.

MATERIALS AND METHODS

Data source

Data were obtained from the National Health Insurance Research Database (NHIRD) established in 1995, with over 99% of Taiwan residents participating in the government-run single-payer National Health Insurance (NHI) program. The cohort study was conducted using 1 million randomly selected samples from the NHIRD, i.e., the Longitudinal Health Insurance Database 2000. The database includes health and medical information on the insured, and the death records were derived from the inpatient files and the registry files for catastrophic illness patients between 1996 and 2013. Data anonymization was performed before the data analysis. International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM) codes were adopted for diagnoses and procedures in the database.

Ethical approval

This study was approved by the Institutional Review Board (IRB) of China Medical University and Hospital (CMUH) Research Ethics Committee (REC) (IRB permit number: CMUH-104-REC2-115(CR4)).

Study population

Patients with CKD had at least one inpatient hospitalization or at least two outpatient clinic visits. The study excluded patients younger than 20 years or patients diagnosed with

CKD during hospice care. Decedents with CKD (ICD-9-CM: 585–586) and receiving hospice care (order code: 05602A, 05603B, 05601K, P4402B, P4401B, and P4403B) from January 1, 2009, to December 31, 2013, were included in the case cohort, and the latest dates of hospice enrollment before death were used. Decedents with CKD but not receiving hospice care were included in the comparison cohort. The case cohort and the comparison cohort were matched using 1:4 propensity score matching on age and gender. The index date for both cohorts was the end date of follow-up. Moreover, the index date for the case cohort was also the date on which decedents were discharged from hospice care. The end of follow-up was the date on which patients died or withdrew from NHIRD or on December 31, 2013. Moreover, the withdrawal date was defined as the latest date of withdrawal/suspension from the NHI, immigration, prison sentence, etc., at the end of the study.

Comorbidities and prescriptions

Baseline comorbidities according to ICD-9CM were hypertension (401–405), diabetes mellitus (250), chronic obstructive pulmonary disease (491, 492, and 496), congestive heart failure (428), cancer (140–208), hyperlipidemia (272), and dementia (290 and 331.0). Diagnoses of comorbidities were confirmed with at least one inpatient hospitalization or at least two outpatient clinic visits before death. There were also recorded the Do-not-resuscitate (DNR) orders (V49.80) and advance directives (V68.89) decision-making before death.

Prescription drugs with ATC code included solution for parenteral nutrition (B05BA), vasopressors (C01CA03), adrenergic and dopaminergic agents (C01CA), opioids (N02AA), meperidine (N02AB02), fentanyl (N02AB03), Lasix (C03CA), sedation (N05CA, N05CD, and N05BA), contact laxatives (A06AB), antibiotics (J04AB), and antidepressant (N06A).

Prescribing procedures by order code included CPR (47029C), intra-aortic balloon pumping (IABP) (47063B), defibrillation (47028C), invasive mechanical ventilation (57001B), noninvasive mechanical ventilation (57002B–57023B), extracorporeal membrane oxygenation (ECMO) (47089B), dialysis (58001C, 58019C–58025C, and 58029C), nasogastric tube (47018C–47019C), gastrostomy (72022C), total parenteral nutrition (39015B), blood transfusion (94001C), physical restraint (47093B), and feeding through ostomy (47066B).

The latest records for procedures within 30 days before death were used for discussing the proportions of usage and costs of procedures. However, the latest records before death were used when discussing the time intervals for procedures until death.

Statistical analysis

Counts and percentages were used to describe the essential features of categorical data; means and standard deviations or medians and upper and lower quartiles (Q_1 and Q_3) were used to describe the basic characteristics of continuous variables. To address hypothesis tests for differences between cohorts, Chi-square tests and Student's *t*-tests were used for categorical

data and continuous data, respectively. When data were skewed, Mann–Whitney *U*-tests were used instead. Normal Q-Q plots were used to check the skewness visually for all the continuous variables in the study. In these plots, the reference lines were plotted by connecting the 25th and 75th percentiles of the data and extending to the ends of the data. A Mantel–Haenszel test for trend was used to assess whether there was a monotonically increasing or decreasing trend in a contingency table. $P < 0.05$ was statistically significant. All data were analyzed using SAS 9.4 software (SAS Institute Inc., Cary, NC, USA).

RESULTS

Table 1 shows the distributions of decedents with ESRD in nonhospice care and hospice care in Taiwan during 2009–2013. In the comparison cohort, the percentage of patients was 95.88% in 2009, 89.19% in 2010, 84.38% in 2011, 72.22% in 2012, and 68.47% in 2013. In the case cohort, the percentage of patients was 4.12% in 2009, 10.81% in 2010, 15.63% in 2011, 27.78% in 2012, and 31.53% in 2013. There was a statistically significant difference ($P < 0.0001$) between proportions of the two cohorts across the years, that is, patients with ESRD and receiving hospice care had increased from 2009 to 2013.

Table 2 shows the demographics and comorbidities of decedents with ESRD in nonhospice care and hospice care in Taiwan during 2009–2013. The average age was 72.88 years in the comparison cohort and 72.83 years in the case cohort. There were 31.82% of females in the comparison cohort and 33.12% of females in the case cohort. The percentage of beneficiaries at the dependent level of insurance premium in the comparison cohort and the case cohort was 24.03% and 23.38%. There were statistically significant differences ($P < 0.05$) between comorbidities of the two cohorts except for hyperlipidemia and dementia. In the case cohort, 83.12% of patients had cancer, which was highly significantly different ($P < 0.0001$) compared to 33.12% in the comparison cohort. The mean scores of CCI in the comparison cohort and the case cohort were 4.75 and 4.66, respectively. The percentage of patients making advance directive was 0.16% in the comparison cohort and 1.30% in the case cohort, and they were statistically different ($P = 0.0429$). The percentage of hemodialysis patients was 48.05% in the comparison cohort and 34.42% in the case cohort. They were significantly different ($P = 0.0024$). In the case cohort, 53.25% of patients received hospice care in medical centers followed by 42.21% in regional hospitals and 4.55% in local hospitals.

Table 3 shows the comparison of hemodialysis decedents with ESRD in nonhospice care and hospice care in Taiwan during 2009–2013. A total of 349 patients received dialysis in the study. Among them, 270 patients received mechanical

ventilation. The median of length of hemodialysis was 12.65 months in the comparison cohort and 9.76 months in the case cohort. The median of frequency of hemodialysis was 2.71 times per week in the comparison cohort and 2.38 times per week in the case cohort. The median and Q_3 of time from hemodialysis withdrawal to death were 0.00 and 0.00 in the comparison cohort, respectively, and 2.00 and 17.00 in the case cohort, respectively. The median and Q_3 of time from mechanical ventilation withdrawal to death were 0.00 and 0.00 in the comparison cohort, respectively, and 20.00 and 248.00 in the case cohort, respectively. There were statistically significant differences ($P < 0.0001$) between the two cohorts in time from dialysis withdrawal to death and time from mechanical ventilation withdrawal to death.

Table 4 shows intensive and supportive procedures for decedents with ESRD during the last month of their lives in nonhospice care and hospice care in Taiwan during 2009–2013. The percentages of patients with the procedures in the comparison cohort and the case cohort were listed as follows: 21.10% and 1.30% with CPR ($P < 0.0001$), 1.30% and 0.00% with IABP, 5.68% and 0.65% with defibrillation ($P = 0.0081$), 38.96% and 7.14% with invasive mechanical ventilation ($P < 0.0001$), 10.55% and 5.84% with noninvasive mechanical ventilation, 0.49% and 0.00% with ECMO, 30.03% and 16.88% with hemodialysis ($P = 0.0011$), 47.40% and 36.36% with nasogastric tube ($P = 0.0138$), 3.73% and 1.30% with total parenteral nutrition, 60.55% and 52.60% with solutions for parenteral nutrition, 50.49% and 48.70% with blood transfusion, 28.25% and 10.39% with vasopressors ($P < 0.0001$), 63.15% and 20.78% with adrenergic and dopaminergic agents ($P < 0.0001$), 17.37% and 61.04% with opioids ($P < 0.0001$), 9.42% and 11.04% with pethidine, 4.38% and 17.53% with fentanyl ($P < 0.0001$), 43.18% and 55.84% with Lasix ($P = 0.0048$), 42.05% and 48.70% with sedation, 48.21% and 64.29% with contact laxatives ($P = 0.0004$), 0.97% and 0.00% with antibiotics, 7.79% and 8.44% with antidepressants, 6.33% and 7.79% with physical restraint, and 0.65% and 0.00% with feeding through ostomy. The median of medical daily cost was 8,360.00 TWD in the comparison cohort and 2,694.00 TWD in the case cohort. There was a statistically significant difference (<0.0001) between the two cohorts in medical cost.

DISCUSSION

The aim of this study was to examine the trends of receiving hospice and nonhospice care in patients with ESRD during the last month of their lives. The results clearly demonstrate that the number of patients with ESRD receiving hospice care increased year by year from 2009 to the end of 2013. Our results reveal that nonhospice care had more invasive procedures and less symptom management than

Table 1: Distributions of decedents with end-stage renal disease in nonhospice care and hospice care

	2009, n/N (%)	2010, n/N (%)	2011, n/N (%)	2012, n/N (%)	2013, n/N (%)	<i>P</i> [#]
Nonhospice	93/97 (95.88)	132/148 (89.19)	135/160 (84.38)	117/162 (72.22)	139/203 (68.47)	<0.0001
Hospice	4/97 (4.12)	16/148 (10.81)	25/160 (15.63)	45/162 (27.78)	64/203 (31.53)	

[#]Mantel-Haenszel test for trend

Table 2: Demographics and comorbidities of decedents with end-stage renal disease in nonhospice care and hospice care

Variable	n/mean±SD			P
	Total (n=770)	Nonhospice (n=616)	Hospice (n=154)	
Age (year)*				0.8074
20-64	215	171 (27.76)	44 (28.57)	
65-74	157	122 (19.81)	35 (22.73)	
75-84	261	213 (34.58)	48 (31.17)	
≥85	137	110 (17.86)	27 (17.53)	
Mean±SD ^a	72.87±13.30	72.88±13.40	72.83±12.91	0.9685
Gender*				0.7575
Female	247	196 (31.82)	51 (33.12)	
Male	523	420 (68.18)	103 (66.88)	
Insurance premium levels (TWD)*				0.6471
Dependent (0)	184	148 (24.03)	36 (23.38)	
Low (1-19,999)	357	290 (47.08)	67 (43.51)	
Moderate (20,000-39,999)	179	141 (22.89)	38 (24.68)	
High (≥40,000)	50	37 (6.01)	13 (8.44)	
CCI*				0.1091
≤1	43	39 (6.33)	4 (2.60)	
2-3	209	160 (25.97)	49 (31.82)	
4-5	255	200 (32.47)	55 (35.71)	
≥6	263	217 (35.23)	46 (29.87)	
Mean±SD ^a	4.73±2.33	4.75±2.32	4.66±2.35	0.6933
Comorbidities*				
Hypertension				0.0050
No	82	56 (9.09)	26 (16.88)	
Yes	688	560 (90.91)	128 (83.12)	
Diabetes mellitus				0.0390
No	304	232 (37.66)	72 (46.75)	
Yes	466	384 (62.34)	82 (53.25)	
COPD				0.0173
No	399	306 (49.68)	93 (60.39)	
Yes	371	310 (50.32)	61 (39.61)	
CHF				0.0357
No	422	326 (52.92)	96 (62.34)	
Yes	348	290 (47.08)	58 (37.66)	
Cancer				<0.0001
No	438	412 (66.88)	26 (16.88)	
Yes	332	204 (33.12)	128 (83.12)	
Hyperlipidemia				0.9135
No	348	279 (45.29)	69 (44.81)	
Yes	422	337 (54.71)	85 (55.19)	
Dementia				0.1802
No	626	495 (80.36)	131 (85.06)	
Yes	144	121 (19.64)	23 (14.94)	
DNR	NA	NA	NA	NA
Advance directive*				0.0429
No	767	615 (99.84)	152 (98.70)	
Yes	3	1 (0.16)	2 (1.30)	
Hemodialysis*				0.0024
No	421	320 (51.95)	101 (65.58)	
Yes	349	296 (48.05)	53 (34.42)	
Accreditation*				NA
Medical center	NA	NA	82 (53.25)	
Regional hospital	NA	NA	65 (42.21)	
Local hospital	NA	NA	7 (4.55)	

*Chi-square test, ^aStudent's *t*-test. SD: Standard deviation, CCI: Charlson Comorbidity Index, CHF: Congestive heart failure, COPD: Chronic obstructive pulmonary disease, DNR: Do not resuscitate, NA: Not available

Table 3: Comparison of hemodialysis decedents with chronic kidney disease in nonhospice care and hospice care

	Nonhospice Median (Q ₁ -Q ₃) (n)	Hospice Median (Q ₁ -Q ₃) (n)	P ^a
Length of hemodialysis (month)	12.65 (1.38-55.34) (296)	9.76 (1.05-37.29) (53)	0.2257
Frequency of hemodialysis (time/week)	2.71 (1.40-2.99) (296)	2.38 (1.64-2.98) (53)	0.4603
Time from hemodialysis withdrawal to death (day)	0.00 (0.00-0.00) (296)	2.00 (0.00-17.00) (53)	<0.0001
Time from mechanical ventilation withdrawal to death (day)	0.00 (0.00-0.00) (245)	20.00 (0.00-248.00) (25)	<0.0001

^aMann-Whitney U-test. Q₁: First quartile; Q₃: Third quartile

Table 4: Intensive and supportive procedures for decedents with end-stage renal disease during the last month of their lives in nonhospice care and hospice care

Variable	Total (n=770), n/median (Q1-Q3)	Nonhospice (n=616), n/median (Q1-Q3)	Hospice (n=154), n/median (Q1-Q3)	P
CPR*	132	130 (21.10)	2 (1.30)	<0.0001
IABP*	8	8 (1.30)	0	0.1551
Defibrillation*	36	35 (5.68)	1 (0.65)	0.0081
Invasive mechanical ventilation*	251	240 (38.96)	11 (7.14)	<0.0001
Noninvasive mechanical ventilation*	74	65 (10.55)	9 (5.84)	0.0762
ECMO*	3	3 (0.49)	0	0.3855
Hemodialysis*	211	185 (30.03)	26 (16.88)	0.0011
Nasogastric tube	348	292 (47.40)	56 (36.36)	0.0138
Gastrostomy*	NA	NA	NA	NA
Total parenteral nutrition*	25	23 (3.73)	2 (1.30)	0.1273
Solutions for parenteral nutrition*	454	373 (60.55)	81 (52.60)	0.0727
Blood transfusion*	386	311 (50.49)	75 (48.70)	0.6918
Vasopressors*	190	174 (28.25)	16 (10.39)	<0.0001
Adrenergic and dopaminergic agents*	421	389 (63.15)	32 (20.78)	<0.0001
Opioids*	201	107 (17.37)	94 (61.04)	<0.0001
Pethidine*	75	58 (9.42)	17 (11.04)	0.5434
Fentanyl*	54	27 (4.38)	27 (17.53)	<0.0001
Lasix*	352	266 (43.18)	86 (55.84)	0.0048
Sedation*	334	259 (42.05)	75 (48.70)	0.1360
Contact laxatives*	396	297 (48.21)	99 (64.29)	0.0004
Antibiotics*	6	6 (0.97)	0	0.2189
Antidepressants*	61	48 (7.79)	13 (8.44)	0.7896
Physical restraint*	51	39 (6.33)	12 (7.79)	0.5143
Feeding through ostomy*	4	4 (0.65)	0	0.3161
Medical cost (TWD) ^a	6374.00 (612.00-29,215.00)	8360.00 (750.50-33,498.50)	2694.00 (353.00-9445.00)	<0.0001

*Chi-square test; ^aMann-Whitney U-test. CPR: Cardiopulmonary resuscitation, ECMO: Extracorporeal membrane oxygenation, IABP: Intra-aortic balloon pumping, NA: Not available, Q₁: First quartile, Q₃: Third quartile

hospice care. We found that patients receiving hospice care had significantly better life expectancy after withdrawing hemodialysis and after removing mechanical ventilation than those without hospice care. Moreover, the medical cost of ESRD patients receiving hospice care last month was lower than those receiving non-hospice care.

In the present study, the increasing trend of hospice care loading from 2009 to the end of 2013. One explanation for this trend is that patients with end-stage cancer still had a higher rate of hospice care than patients with ESRD. Most patients with ESRD were referred to hospice care because of cancer. We found that 83.12% of the patients with ESRD receiving hospice care were those with cancer, whereas only 33.12% of them had cancer in the comparison cohort. The rate of cancer patients receiving hospice care in the last month of their lives had increased year by year from 2008 to 2013. To compare with Shao *et al.* survey [14], 41.9% of cancer had

received hospice care in 2013 and Chiang *et al.* study [12], 11.4% of dialysis patients with cancer received hospice care in 2011. The results present that the national policies to promote hospice care are practical and beneficial.

Instead of prolonging life, the goal of hospice care is to support the quality of life and provide comfort care during the end of life. The present study surveyed patients receiving end-of-life care who received medical care 1 month before death; patients receiving hospice care had higher rates of nasogastric tubes and blood transfusion than those without hospice care. Opioids, fentanyl, Lasix, and laxatives were more frequently prescribed for patients with hospice care than those with nonhospice care. We found that after receiving hospice treatment, the hospice care was still actively dealing with the physiological condition of the patients with renal disease. Murtagh surveyed patients with Stage 5 CKD who did not undergo dialysis during the last month of life; the

most common symptoms included lack of energy, followed by itching, drowsiness, dyspnea, poor concentration, pain, poor appetite, swelling arms/legs, dry mouth, and constipation [15]. Chan *et al.* had evaluated patients with CKD on a Numerical Rating Scale and found that 47.7% had moderate pain and 10.2% had severe pain [16]. After receiving hospice care, their pain decreased from 5.8 (1.9) to 2.9 (2.5), and 42.1% expected the clinician's care to relieve their pain and symptoms [16].

In the present study, days from dialysis withdrawal to death and days from ventilation withdrawal to death were significant differences between the case and comparison cohorts. We found that patients with ESRD receiving nonhospice care still continued hemodialysis after removal of the ventilator, yet nothing was helpful. We found that patients receiving hospice care had a significantly better life expectancy after discontinuing hemodialysis (2 vs. 0 days, $P < 0.001$) and after removing mechanical ventilation (20 vs. 0 days, $P < 0.001$) compared with those without hospice care. Our results suggest that the addition of hospice care may permit patients a longer life-support-free survival time. This outcome could be explained by a survey of patients with Stage 4–5 CKD, 69% of who had reported that physicians had never mentioned palliative care, 49.5% did not know about hospice care, and more than 90% of physicians did not discuss terminal care with patients [17]. In addition, Lai *et al.* had suggested that some physicians considering termination of dialysis as a medical failure are not proficient in discussing hospice care with patients or family members or are uncomfortable discussing these issues [18].

According to a survey in Taiwan from 2007 to 2010, 19.7% of end-stage cancer patients were associated with renal failure. However, even after receiving hospice care, 81.8% of them must continue to receive hemodialysis. Therefore, the cost of hospice care was higher, and the length of hospital stay was 8 days longer than patients without hemodialysis (14.3 vs. 6.2) [13]. Withdrawing hemodialysis can understandably be a major challenge for the medical staff and a complex medical decision for patients and their families [18]. Therefore, patients continue to receive pointless medical treatment.

Patients with the end stage of renal disease who had stopped dialysis and received hospice care died in 7.4 days (0–40 days). The survival time of patients with renal disease was longer than that of those with the nonrenal disease after the termination of dialysis [19]. In Japan, 55%–82% of patients with the renal disease with the dementia or cancer sign a DNR and stop hemodialysis [20]. According to Murray *et al.* study, 64.0% of dialysis patients received dialysis for <3 years; the main reason for dialysis termination is transplant failure, followed by medical complications. Patients who could move or could be referred to a dialysis team were more willing to receive hospice care [21]. Without improvements in quality of life during end-of-life care, these limited changes in survival days might be insignificant.

In terminal patients with renal disease, the medical cost of patients receiving hospice care in their last month was lower than that of receiving nonhospice care. Patients

receiving hospice care in Taiwan must sign a DNR. In the present study, 1.3% of patients receiving hospice care received CPR and 0.65% received defibrillation, indicating that these patients were transferred to hospice care after CPR. Chiang *et al.*'s survey, 47% of the dialysis patients with cancer received CPR, and 69.8% of dialysis patients without cancer received hospice care and received CPR [12]. Lin *et al.* had found that older patients with dialysis and more comorbidities had higher medical costs but lower survival rates [7].

The present study found that the CCI of patients with ESRD receiving hospice care was higher compared with those without hospice care. Patients with dialysis having a CCI of 4–6 had a mortality rate 1.39 times higher than patients having a CCI of <3.00 [7]. Of patients with the renal disease at the end of disease, 74.8% were older than 65 years [18], and approximately 1 in 5 dialysis patients in Taiwan were older than 75 years [22]. The challenge has increased for choice of dialysis decision in the elderly population [5]. We suggest that patients with dialysis and a greater CCI should be referred to hospice care earlier. Taken together, we suggest that although many uses of intensive and supportive procedures were invalid, many were still important. Yet, increased medical costs need to be addressed; particularly, a care plan is needed to address the decision-making of patients receiving hospice care.

A limitation of this study was that the reasons for referrals to hospice care were unknown. Although changes in health-care policies have allowed patients on dialysis to choose hospice care and stop receiving dialysis, this study could not determine from the annual increase in hospice care patients whether it was due to the patient's decision or other factors.

CONCLUSION

Most patients with ESRD on dialysis receiving hospice care were those with cancer and the elderly with comorbidities. Although they had more medication for controlling pain and symptoms, the average medical cost per person was lower than those in nonhospice care; thus, hospice care for these patients can yet be augmented. The number of these patients has increased year by year; therefore, it is important to improve the referral of patients with ESRD to hospice care. This improvement requires the joint effort of the medical team to initiate an advanced care plan immediately after patients receive hemodialysis or peritoneal dialysis, allowing patients/families to make informed medical decisions.

Financial support and sponsorship

This study was supported in part by Taiwan Ministry of Health and Welfare Clinical Trial Center (MOHW108-TDU-B-212-133004), China Medical University Hospital, Academia Sinica Stroke Biosignature Project (BM10701010021), MOST Clinical Trial Consortium for Stroke (MOST 108-2321-B-039-003-), Tseng-Lien Lin Foundation, Taichung, Taiwan, and Katsuzo and Kiyo Aoshima Memorial Funds, Japan.

Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. Wen CP, Cheng TY, Tsai MK, Chang YC, Chan HT, Tsai SP, et al. All-cause mortality attributable to chronic kidney disease: A prospective cohort study based on 462293 adults in Taiwan. *Lancet* 2008;371:2173-82.
2. Wu MY, Wu MS. Taiwan renal care system: A learning health-care system. *Nephrology* 2018;23(Suppl 4):112-5.
3. Saeed F, Arrigain S, Schold JD, Nally JV Jr., Navaneethan SD. What are the risk factors for one-year mortality in older patients with chronic kidney disease? An analysis of the Cleveland clinic CKD Registry. *Nephron* 2019;141:98-104.
4. Rosansky SJ, Schell J, Shega J, Scherer J, Jacobs L, Couchoud C, et al. Treatment decisions for older adults with advanced chronic kidney disease. *BMC Nephrol* 2017;18:200.
5. Berger JR, Hedayati SS. Renal replacement therapy in the elderly population. *Clin J Am Soc Nephrol* 2012;7:1039-46.
6. Munshi SK, Vijayakumar N, Taub NA, Bhullar H, Lo TC, Warwick G. Outcome of renal replacement therapy in the very elderly. *Nephrol Dial Transplant* 2001;16:128-33.
7. Lin YT, Wu PH, Kuo MC, Lin MY, Lee TC, Chiu YW, et al. High cost and low survival rate in high comorbidity incident elderly hemodialysis patients. *PLoS One* 2013;8:e75318.
8. Kan WC, Wang JJ, Wang SY, Sun YM, Hung CY, Chu CC, et al. The new comorbidity index for predicting survival in elderly dialysis patients: A long-term population-based study. *PLoS One* 2013;8:e68748.
9. Liu CN, Yang MC. National health insurance expenditure for adult beneficiaries in Taiwan in their last year of life. *J Formos Med Assoc* 2002;101:552-9.
10. Wong SP, Kreuter W, O'Hare AM. Treatment intensity at the end of life in older adults receiving long-term dialysis. *Arch Intern Med* 2012;172:661-3.
11. Grubbs V, Moss AH, Cohen LM, Fischer MJ, Germain MJ, Jassal SV, et al. A palliative approach to dialysis care: A patient-centered transition to the end of life. *Clin J Am Soc Nephrol* 2014;9:2203-9.
12. Chiang JK, Chen JS, Kao YH. Comparison of medical outcomes and health care costs at the end of life between dialysis patients with and without cancer: A national population-based study. *BMC Nephrol* 2019;20:265.
13. Kang SC, Lin CC, Chen YC, Wang WS. The impact of hemodialysis on terminal cancer patients in hospices: A nationwide retrospective study in Taiwan. *J Palliat Med* 2019;22:188-92.
14. Shao YY, Hsiue EH, Hsu CH, Yao CA, Chen HM, Lai MS, et al. National policies fostering hospice care increased hospice utilization and reduced the invasiveness of end-of-life care for cancer patients. *Oncologist* 2017;22:843-9.
15. Murtagh FE, Addington-Hall J, Edmonds P, Donohoe P, Carey I, Jenkins K, et al. Symptoms in the month before death for stage 5 chronic kidney disease patients managed without dialysis. *J Pain Symptom Manage* 2010;40:342-52.
16. Chan KY, Yap DY, Yip T, Sham MK, Lui SL, Chan TM. Palliative care consultation in advanced chronic kidney disease with pain. *J Palliat Med* 2018;6:809-14.
17. Davison SN. End-of-life care preferences and needs: Perceptions of patients with chronic kidney disease. *Clin J Am Soc Nephrol* 2010;5:195-204.
18. Lai CF, Tsai HB, Hsu SH, Chiang CK, Huang JW, Huang SJ. Withdrawal from long-term hemodialysis in patients with end-stage renal disease in Taiwan. *J Formos Med Assoc* 2013;112:589-99.
19. O'Connor NR, Dougherty M, Harris PS, Casarett DJ. Survival after dialysis discontinuation and hospice enrollment for ESRD. *Clin J Am Soc Nephrol* 2013;8:2117-22.
20. Miura Y, Asai A, Nagata S, Ohnishi M, Shimbo T, Hosoya T, et al. Dialysis patients' preferences regarding cardiopulmonary resuscitation and withdrawal of dialysis in Japan. *Am J Kidney Dis* 2001;37:1216-22.
21. Murray AM, Arko C, Chen SC, Gilbertson DT, Moss AH. Use of hospice in the United States dialysis population. *Clin J Am Soc Nephrol* 2006;1:1248-55.
22. Wu MS, Wu IW, Shih CP, Hsu KH. Establishing a platform for battling end-stage renal disease and continuing quality improvement in dialysis therapy in Taiwan – Taiwan renal registry data system (TWRDS). *Acta Nephrol* 2011;25:148-53.