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

Shu-Chen Wang, Kai-Chieh Hu, Wei-Chuan Chang, Chung-Y. Hsu

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].
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 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].

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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 (Q1 and Q3) 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 Q1 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 Q1 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 the case cohort, respectively, and 2,694.00 TWD in the comparison cohort, 2,486.00 TWD in the case cohort. The median and Q1 of medical daily cost were 2,694.00 TWD in the comparison cohort and 2,486.00 TWD in the case cohort. The median of frequency of mechanical ventilation was 2.71 times per week in the comparison cohort and 2.38 times per week in the case cohort. The median of frequency of 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.

**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 hospice care.

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

| Year | Nonhospice, n/N (%) | Hospice, n/N (%) |
|------|---------------------|------------------|
| 2009 | 93/97 (95.88)       | 4/97 (4.12)      |
| 2010 | 132/148 (89.19)     | 16/148 (10.81)   |
| 2011 | 135/160 (84.38)     | 25/160 (15.63)   |
| 2012 | 117/162 (72.22)     | 45/162 (27.78)   |
| 2013 | 139/203 (68.47)     | 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                              | Total (n=770) | Nonhospice (n=616) | Hospice (n=154) | P     |
|---------------------------------------|---------------|--------------------|-----------------|-------|
|                                       | n/mean±SD     |                    |                 |       |
| Age (year)*                           |               |                    |                 |       |
| 20-64                                 | 215           | 171 (27.76)        | 44 (28.57)      | 0.8074|
| 65-74                                 | 157           | 122 (19.81)        | 35 (22.73)      |       |
| 75-84                                 | 261           | 213 (34.58)        | 48 (31.17)      |       |
| ≥85                                   | 137           | 110 (17.66)        | 27 (17.53)      |       |
| Mean±SD                               | 72.87±13.30   | 72.88±13.40        | 72.83±12.91     | 0.9685|
| Gender*                               |               |                    |                 |       |
| Female                                | 247           | 196 (31.82)        | 51 (33.12)      | 0.7575|
| Male                                  | 523           | 420 (68.18)        | 103 (66.88)     |       |
| Insurance premium levels (TWD)*       |               |                    |                 |       |
| Dependent (0)                         | 184           | 148 (24.03)        | 36 (23.38)      | 0.6471|
| 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*                                  |               |                    |                 |       |
| ≤1                                    | 43            | 39 (6.33)          | 4 (2.60)        | 0.1091|
| 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                               | 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              |       |
| Advance directive*                   |               |                    |                 |       |
| No                                    | 767           | 615 (99.84)        | 152 (98.70)     | 0.0429|
| 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*                        |               |                    |                 |       |
| Medical center                        | NA            | NA                 | 82 (53.25)      |       |
| Regional hospital                     | NA            | NA                 | 65 (42.21)      |       |
| Local hospital                        | NA            | NA                 | 7 (4.55)        |       |

*Chi-square test, *Student’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

| Variable | Nonhospice (n=616), n/median (Q1-Q3) | Hospice (n=154), n/median (Q1-Q3) | P
|----------|-------------------------------------|-----------------------------------|---
| 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

*Mann-Whitney U-test. Q: First quartile; Q: 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)* | 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; *Mann-Whitney U-test. CPR: Cardiopulmonary resuscitation, ECMO: Extracorporeal membrane oxygenation, IABP: Intra-aortic balloon pumping, NA: Not available, Q: First quartile, Q: 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 without hospice 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 whom 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.

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Conflicts of interest

There are no conflicts of interest.

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