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Predictors of the End of Life in Chronic Kidney Disease: A Pilot Study

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ABSTRACT

The aim of this pilot study was to describe indicators present at the end of life in persons with chronic kidney disease. Retrospective chart reviews of 10 randomly selected patients were conducted to describe demographic, physiological, and functional variables. Using a repeated measures ANOVA, The Palliative Performance Scale and the Braden Scale both showed significant differences during the death admission from previous admissions. These functional measures may provide useful insight in identifying the end of life in persons with chronic kidney disease.

Keywords: Chronic kidney disease; end of life; palliative care

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Introduction

Approximately 336,000 Americans have chronic kidney disease (CKD) requiring dialysis, and well over 84,000 dialysis patients died in 2004.[1] Patients with end stage renal disease (ESRD) must be kept alive with dialytic therapy and discontinuation usually results in death within eight days.[2] Many of these deaths are characterized by a diminished quality of life and medical futility.[3] More importantly, few ESRD patients receive hospice and palliative care.[4] The lack of end-of-life care may be related to the small time frame from discontinuation of dialysis until death or that the patients and families are not prepared to receive palliative care. Another reason these patients may not receive palliative care is that the identification of the dying trajectory in ESRD is unclear, thus preventing the nurse from initiating effective end-of-life planning. Mobilization of end-of-life resources is essential in facilitating a good death, which is often described as a spiritually meaningful, peaceful and pain-free end to one's life.[5]

Identifying the end of life, therefore, may facilitate a good death. Literature indicates that various functional and physiological indicators have been successful in identifying ESRD patients at risk for death. Functional indicators provide an assessment of the extent to which a person can perform activities of daily living, such as bathing and eating. Physiological indicators provide an objective assessment of physical health as determined by clinician assessment or other diagnostic test, such as blood pressure or hemoglobin level. None of the articles reviewed for this study comprehensively examined functional and physiological indicators together as predictors of end of life. [6-12] [13-17] Identifying these indicators are important in recognizing optimal times to offer palliative care to ESRD patients. Therefore, the specific aim of this pilot study was to describe functional and physiological indicators present at the end of life in those with CKD.

Methods

The researchers used a retrospective design to examine indicators of death. A retrospective medical chart review was conducted at a large community hospital in the southeastern United States and was deemed exempt by the hospital's Institutional Review Board. Ten medical record numbers, representing ten individual persons, were randomly selected from a list of all the persons with CKD who died at the hospital during 2005 (n= 15). Up to four medical documents were collected for each individual: the death record and up to three previous admissions' charts.

Demographic, physiological, and functional variables were extracted from the medical records at each admission and discharge (or death) using a researcher-designed data collection tool. Functional status was measured using the Palliative Performance Scale (PPS).[18] The PPS, a modification of the Karnofsky Performance Scale (KPS), measures the decline in function seen in terminal patients as they approach death. The index ranges from 100% (normal, no evidence of disease) to 0% (deceased). The scale progresses in 10% increments within these two anchors to describe overall level of function. Persons are classified against five categories: ambulation, activity/ evidence of disease, self-care, intake, and level of consciousness according to descriptors for each percentage from 0-100. Because the PPS was designed to predict death, evidence of construct validity has been supported by its prognostic capacity.[8,17,18] One study reported good interrater reliability with quadratically weighted kappa = 0.67 ($p < 0.001$).[8]

Physiological indicators included: mean arterial pressure (MAP), pulse, temperature, weight, serum albumin and prealbumin, serum hemoglobin, serum glucose and HgbA1c, mean arterial pressure during hemodialysis, dialysis transmembrane pressure (TMP), and score on the Braden Scale.[19]

The Braden Scale is a norm-referenced scale for measuring pressure ulcer risk. It has six distinct subscales that address known pressure ulcer risk factors or causes—mobility, activity, sensory perception, moisture, nutrition, and friction/ shear. All of the subscales have four statement choices, except for the friction/ shear subscale which has three. These statements are assigned a score from 1-4 (or 1-3 for the friction/ shear subscale) with lower values indicating higher risk for pressure ulcer development. The six subscales are summed to determine an overall risk assessment. The highest score attainable is 23, which indicates the lowest risk for pressure ulcer development; the lowest score attainable is 6, which indicates the highest risk. Reliability and validity of the Braden scale has remained strong over time.[20] Several studies have reported interrater correlation coefficients of 0.83 - 0.90.[19,21,22] Percent agreement has ranged from 95% to 100%.[23,24] Sensitivities have been reported at 100%,[25] while specificities range from 64% - 90%.[25]

Results

All data were analyzed using SPSS (version 13), and an alpha level of .05 was established for significance. Thirty-four charts representing 10 persons were reviewed. Five persons had reached stage 5 CKD requiring hemodialysis. The other five persons were in stage 3-4 CKD, and not yet on hemodialysis. No statistical differences were found between the patients with ESRD and those in stage 3-4 CKD. The majority of the sample was men (51%), White (54%), and the mean age was 73 (SD=17). Those on hemodialysis had been receiving this treatment for 1.17 (SD= 1.67) years. Sixty-nine percent of the persons had a central dialysis catheter, 25% had an arterio-venous fistula, and 6% had a graft.

The trajectories of physiological and functional indicators are displayed in Table 1. Prealbumin and HgbA1c were not measured in any of the 34 charts reviewed and were dropped from the analyses. Only three variables showed a declining trajectory: MAP, Braden Scale, and serum albumin. The PPS noted a declining trajectory between the first admission and the final (death) admission. The middle two admissions' PPS scores were not statistically different.

All variables were compared across the four admission times using a repeated measures ANOVA. The MAP, Braden Scale score, and the PPS were all significant (see Table 2). Independent *t* tests for differences between patients already on hemodialysis and those not yet on hemodialysis were not significant for these three variables.

In examining the admission just prior to the death admission, the mean number of days until death was 68.44 (SD= 68.50). The mean PPS during the admission just prior to the death admission was 60.6 (SD= 10.2), and fell to 40.0 (SD= 20) on the day of admission for the final hospitalization. The mean Braden Scale score during the admission just prior to the death admission was 16.4 (SD= 3.0), and fell to 11.2 (SD= 1.8) at death. The MAP during the admission just prior to the death admission was 89.9 (SD= 22.3), and fell to 80.8 (SD= 22.9) during the final admission.

Discussion

While the MAP was significantly different during some of the admissions, there was not a difference between the death admission and the admission just prior to death. The PPS and the Braden Scale both showed significant differences during the death admission from the previous three admissions. Both the PPS and the Braden Scale have functional indicators within the scales. Therefore, functional measures may provide greater predictive indication of impending death than other physiological indicators.

This study provides early evidence that determination and quantification of functional health status for hospitalized persons with CKD may be important to document. This documentation will allowing trending changes over time and may assist nurses in determining the dying trajectory in patients with CKD. Braden Scale scores approaching 11, and PPS scores approaching 40, when factored in to the total assessment, may signal that death is near. Palliative care clinicians may provide needed support during this critical time. Further research is needed to validate the predictive impact of functional status on end of life and the effect of early palliative and hospice options on the achievement of good deaths within the ESRD population.

This was a small pilot study to explore some possible indicators present at the end of life in persons with CKD. Because the sample was from one hospital, external validity is limited. In addition, due to the small sample size, results

should be interpreted with caution. However, this study may help inform future larger studies exploring indicators present at the end of life in persons with CKD. The ultimate goal is to assist persons with CKD experience a good death.

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Table 1

Mean Values of Physiological and Functional Indicators during Final Hospital Admissions

	Third Admission	Second Admission	Admission Prior to Death	Death Admission

	Prior to Death	Prior to Death		
MAP	105.13 ± 24.45	94.29 ± 14.96	89.89 ± 22.28	80.75 ± 22.92
Pulse	85.44 ± 18.26	92.93 ± 20.00	82.83 ± 22.17	85.55 ± 20.31
Temp	98.11 ± 0.83	97.41 ± 1.07	97.81 ± 0.70	97.93 ± 1.08
Weight	104.93 ± 41.57	92.98 ± 30.69	79.04 ± 21.32	101.93 ± 41.51
Braden Scale	17.29 ± 2.38	16.43 ± 1.57	16.43 ± 3.03	11.27 ± 1.77
Albumin	3.09 ± 0.60	2.87 ± 0.33	2.71 ± 0.60	2.66 ± 0.67
Hemoglobin	11.91 ± 1.28	11.89 ± 1.10	11.08 ± 1.94	12.10 ± 1.56
Glucose	127.07 ± 25.64	119.57 ± 29.42	102.93 ± 48.53	190.35 ± 217.07
MAP*	54.63 ± 37.89	87.04 ± 20.96	73.38 ± 23.63	61.90 ± 13.49
TMP*	42.50 ± 28.72	78.75 ± 26.58	50.00 ± 18.26	81.00 ± 35.78
PPS	68.57 ± 10.69	57.86 ± 10.75	60.63 ± 10.16	20.00 ± 10.00

*These measurements taken during hemodialysis

Table 2

Significant Results of Physiological and Functional Indicators across Admissions Using Repeated Measures ANOVA

	F statistic	Degrees of Freedom	Significance level	Differences Between Admissions* #

Mean Arterial Pressure (MAP)	9.580	3, 21	*p*< 0.001	Death and 3 Death and 4 2 and 4
Braden Scale	8.263	3, 17	*p*= 0.001	Death and 2 Death and 3 Death and 4
Palliative Performance Scale (PPS)	78.918	3, 18	*p*< 0.001	Death and 2 Death and 3 Death and 4 3 and 4

*Death= death admission, 2= admission just prior to death, 3= second admission prior to death, 4= third admission prior to death# Post hoc analysis using a Bonferroni adjustment was used to determine which admissions were different.