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Psychosocial risk factors and admissions/readmissions in end stage renal disease patients

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ABSTRACT

Objectives: Patients with end-stage renal disease (ESRD) have the highest 30 days readmission rates of all patient populations supported by Medicare. **Methods:** To identify risk factors for early readmissions in ESRD patients, 61 patients with ESRD were recruited during hospitalization and putative causal factors were assessed, including demographics, depression, cognitive impairment (CI), history of substance abuse, history of psychiatric treatment and history of comorbid medical conditions. **Results:** Number of past year admissions yielded borderline significance for orientation ($P = 0.074$), History of central nervous system (CNS) disease ($P = 0.088$), history of congestive heart failure ($P = 0.065$) and an index of global CI ($P = 0.071$). The significant univariate correlates of 30 day readmission were health literacy (HL) ($P = 0.024$), male sex ($P = 0.056$) and a history of substance abuse ($P = 0.032$). Indices of CI were associated with a history of CNS disease, elevated age and elevated blood urea nitrogen. HL (rapid estimate of adult literacy in medicine-short form) was confounded with multiple other risk factors, including having: A history of substance abuse; failed orientation; and history of CNS disease; female sex; and fewer years of education. **Conclusions:** HL and substance abuse may be major determinants of the likelihood of 30 days readmission in ESRD patients, and CI may be a determinant of longer term readmission risk. Practitioners may need to have a high index of suspicion for health illiteracy, substance abuse and CI in the recurrently admitted ESRD patient.

KEY WORDS: End stage renal disease, readmissions, substance abuse

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INTRODUCTION

Healthcare cost control has become an urgent issue for the nation [1]. Hospital admissions are the single most expensive episodes in healthcare, and early readmission has been targeted as indicating a likely failure of appropriate care and/or discharge preparation. The end stage renal dialysis patient population has the highest rate of 30 days readmissions of all patients in the medicare/medicaid population, averaging over 30% across all hospitals [2].

With the exception of depression [3,4] and male sex [5], psychosocial factors have generally been ignored as possible correlates/causes of early readmission [6]. Since various behavioral factors can influence readmission in various ways, and carry different implications for intervention, it is important to understand which factors have the largest impact on readmission in which populations.

There are at least two additional psychosocial factors, which have recently been claimed to be of importance in affecting healthcare utilization, and hospital admissions – cognitive impairment (CI) and health literacy (HL). CI has been found to be related to poor self-care adherence [7], and to be a prospective predictor of readmission and mortality [8-10]. CI

may be the principle factor for early readmission in at least some populations, like congestive heart failure (CHF) [11]. Given the clustering of central nervous system (CNS)-pathogenic medical conditions (hypertension [HTN], diabetes, smoking, atherosclerosis, etc.) in chronically ill populations such as end-stage renal disease (ESRD) and CHF, it is hardly a surprise that CI has both a high prevalence and adverse impact in these patients.

Another psychosocial factor attracting much attention has been HL – the ability/inability of patients to understand the language used to educate regarding their conditions and the medications used to manage them [12]. Low HL has been associated with various adverse outcomes [13,14], including an increase in hospital admission/readmission rates [15-17]. In the case of patients with ESRD, increased mortality [18] has also been found to be associated with low HL. However, as clinical science has repeatedly proven “correlation does not prove causation” [19], and the possibility of a third factor confounding/mediating any observed association must be considered and controlled or eliminated.

The presumptive improvements assumed to occur with greater HL – better disease knowledge, healthier behaviors, more use of preventive care and compliance – could not account for the

relationship between HL and use of hospital services [20]. And while reading level was found to be related to knowledge of, and concern about, the health effects of smoking, there was no effect on cessation rates [21]. These results would seem to imply that the behavioral mechanisms relating HL to outcomes do not, in fact, seem to mediate the outcomes of interest [22], and potential confounders that could plausibly mediate the clinical outcomes (e.g. CI, substance abuse) have not been controlled in the published studies. Most important of all - HL has not passed the gold standard test of causality – a randomly-assigned, controlled clinical trial [19].

In the present investigation, it was anticipated that measures of CI, substance abuse and depression would be positively associated with both number of admissions over the past year, and thirty days readmissions. It was hypothesized that HL would not be associated with the admission/readmission data or that any primary effect would cease to be significant when confounding/mediating factors (CI and SA) were introduced.

METHODS

Patients

Sixty-one subjects with ESRD were recruited during a hospital stay on a nephrology unit. Patients were excluded for: Refusal of participation, persistent delirium, unavailability/discharge before recruitment and contact precautions. Seven patients were unable to complete the Rapid Estimate of Adult Literacy in Medicine-Short Form (REALM-SF) or Patient's Health Questionnaire 9 (PHQ9) because of vision impairment (glaucoma, retinopathy and/or cataracts), leaving a residual sample of 54 for analyses involving the REALM-SF.

Clinical/demographic characteristics for the sample are contained in Table 1. 30 day readmissions occurred in 36.1% of the sample and the average number of admissions over the preceding year was 2.5. The average age was 63.5 and the average number of years of education was 12.4. A little over half the patients (52.4%) were male, and 82% failed at least one of the cognitive tests. Sample characteristics are summarized in Table 1.

The study was initially run as a quality improvement project and was reviewed and approved by the hospital IRB.

Measurements

To quantify HL, we used the REALM-SF [23].

Depression was assessed using the PHQ9 [24]. CI was determined by conducting a version of the Mini-Cog [25,26] that included: Immediate memory ("Repeat these three items Apple...Car... Pen"); orientation ("Name the current Month, Year and Building we are in."); Short Term Memory (after a 3-5 min delay during which the patient was distracted – "What were those three items I gave you?"); and executive function (after being given a full sheet of paper with a large circle

Table 1: Baseline demographic/clinical characteristics of the sample (N=61)

Characteristics	Percent
Male sex	52.4
Caucasian	18.0
Lives with family	68
Psych Hx	60.7
Passive suicidal ideation	19.7
Lonely	23.0
Cry easily or for no reason	31.1
Active smoker	14.8
Substance abuse	32.8
History of:	
DM	60.7
CAD	37.7
COPD	16.4
CNS	60.7
CHF	26.2
HTN	90.2
CI	82.0
30 day readmission	36.1
	Mean (SD)
N=61	
Age	63.5 (13.1)
Years of education	12.4 (2.1)
Number of past-year admissions	2.5 (2.7)
Pack-years of smoking	16.4 (25.8)
Glucose	153.5 (72.4)
HGN	9.4 (1.3)
WBC	8.1 (3.9)
BUN	37.9 (16.5)
Na	137.7 (3.2)
N=54	
REALM-SF	6.9 (2.0)
PHQ9	6.0 (4.6)

DM: Diabetes mellitus, CAD: Coronary artery disease, COPD: Chronic obstructive pulmonary disease, CNS: Central nervous system, CHF: Congestive heart failure, HTN: Hypertension, HGN: Hepatic gluconeogenic, WBC: White blood cell, BUN: Blood urea nitrogen, Na: Sodium, REALM-SF: Rapid estimate of adult literacy in medicine-short form, PHQ9: Patient's health questionnaire 9, SD: Standard deviation, CI: Cognitive impairment

drawn on it) - "Draw me a clock, put all the numbers on it and make it say 10:15." (PDF version available upon request with provision of an email address). In addition, a history of CNS disease or findings (Alzheimer's, Cerebrovascular Accident, Subdural Hematoma, Sub Arachnoid Hemorrhage, Closed Head Injury, Cardiac/Respiratory Arrest, Lupus Cerebritis, Multiple Sclerosis, Chronic Seizures, Normal Pressure Hydrocephalus, Fronto-Temporal Dementia or Atrophy/Ischemic Changes/Encephalomalacia on head scan) was assumed to be an indicator of likely CI.

History was initially quantified using a semi-structured interview for demographic factors (Age, Educational Attainment), comorbid medical conditions (Coronary Artery Disease [CAD], HTN, Diabetes, Chronic Obstructive Pulmonary Disease and CHF), Living Circumstances, Psychiatric History and Substance Abuse History. Stigmatized matter (history of psych treatment, dementia, positive tox screens) and cognitively relevant lab findings (white blood cell [WBC] count, sodium [Na] level, blood urea nitrogen [BUN], etc.) were checked against the

patient's electronic health record. Number of admissions over the preceding year, and readmission within 30 days of discharge, were also abstracted from the record.

Procedures

Patients were identified as having ESRD by Nurse Administrative Manager if they were on permanent dialysis. All patients were seen and evaluated by a licensed and boarded clinical psychologist. Charts were reviewed prior to approaching patients to make sure he/she had had at least two dialysis sessions since arriving. Patients were approached during their hospital stay, and the study explained as an attempt to figure out if there was anything else we could be doing to keep patients healthy and able to stay out of the hospital. Verbal assent to participate and to examine the patient's records was obtained. Two patients refused participation, eighteen were delirious on initial and subsequent contacts, and discharged before the survey could be completed, nine were on contact precautions.

If patients displayed symptoms of delirium (excessive somnolence, difficulties awakening, wax/waning of arousal/attention, hallucinations, acute confusion or family indicating the patient "was not him/herself"), the interview was delayed until the delirium had cleared, or the patient was lost to discharge. No current tox screens were run on any patient in this sample.

Patients were given a semi-structured interview to determine: Living Circumstances, Ethnicity, History of Psychiatric Treatment, History of Substance Abuse, Loneliness, Worry, Passive Suicidal Ideation and Comorbid Medical Conditions – including HTN, Diabetes, CAD, CHF, Chronic Obstructive Pulmonary Disease, Obstructive Sleep Apnea, Dementia and CNS Illness. The latter included: Alzheimer's, Fronto-Temporal Dementia, Cerebrovascular Accidents, Subdural Hematomas, Subarachnoid Hemorrhage, Periventricular White Matter Changes, Atrophy, Closed Head Injury, Chronic/Poorly Controlled Seizures, Multiple Sclerosis, Lupus Cerebritis and Anoxic Injury. The patient's electronic records were then reviewed for comorbid medical conditions, indications of acute lab values relevant to cognitive status (Na, WBC count, hemoglobin, glucose, BUN, serum glutamic oxaloacetic transaminase), stigmatized conditions (psychiatric treatment, positive tox screens, dementia) and number of admissions over the preceding year.

Patients were asked to complete the PHQ9, but this was administered verbally if the patient had visual difficulties (glasses not available, cataracts, retinopathy, etc.). Seven patients were unable to complete the REALM-SF because of visual difficulties. The Mini-Cog was administered by the examiner.

Thirty days after discharge, the patient's record was again examined for readmission within that time period.

Analyses

Because the literature is sparse and the sample size was limited, and therefore a risk for a false negative result [27,28], significant

($P < 0.05$) and borderline significant ($P < 0.10$) are reported for primary analyses. We believe these findings may have heuristic value for future investigators. One-tailed tests were used because previous studies or review/theoretical publications had suggested one or more of these factors as possible causes of admissions/readmission.

Univariate tests (Pearson product-moment correlation coefficients, Chi-square and Student's *t*-test for means comparisons) were used to examine the association of the psychosocial, and medical, factors with a number of past year admissions and 30 days readmissions.

Univariate tests were also run to test for correlates of CI and HL. Because two potentially modifiable/manageable variables (healthy literacy and substance abuse) yielded univariate significance for 30 day readmissions, these were entered in a forward stepwise logistic regression (P in < 0.05 , P out > 0.10).

RESULTS

Number of admissions over the past year demonstrated only borderline significance for: Orientation ($r = -0.185$, $P = 0.074$); history of CNS disease ($t = -1.37$, $P = 0.088$); History of CHF ($t = -1.59$, $P = 0.065$); and global CI indicated by defined failure on one or more of the cognitive tests ($t = 1.49$, $P = 0.071$).

Readmission within 30 days of the index admission was more likely in males ($\chi = 3.41$, $P = 0.056$), those with a history of substance abuse ($\chi = 4.63$, $P = 0.032$) and those with low HL ($t = 2.038$, $P = 0.026$). 40% of males were readmitted within 30 days whereas only 24% of females were. 55% of substance abusers were readmitted within 30 days whereas only 27% of non-users were.

In the logistic regression, only the substance abuse \times REALM-SF interaction survived entry to the model (Wald = 5.87, $P = 0.015$). Correlates of one or another test of CI included: Older age ($r = 0.268$, $P = 0.019$), history of CNS disease ($t = 2.25$, $P = 0.014$) and elevated BUN ($r = 0.194$, $P = 0.067$). HL was positively associated with: Orientation ($r = 0.271$, $P = 0.024$); years of education ($r = 0.481$, $P < 0.001$); and female sex ($t = 2.65$, $P = 0.006$). HL was negatively associated with: History of substance abuse ($t = 2.17$, $P = 0.018$); history of CNS disease ($t = 1.84$, $P = 0.036$).

DISCUSSION AND CONCLUSIONS

CI may be a consistent correlate of the number of admissions over the past year. Disorientation, failure on one or more of our cognitive tests (orientation, immediate memory, short term memory and executive function) and CNS disease were all borderline correlates of number of admissions. While these results need replication in a larger sample, research efforts need to better elucidate both the nature of the cognitive lesions [29], the behavioral mechanisms involved and the potential management solutions for this problem.

Present results implicate male sex, health illiteracy and a history of substance abuse as correlates, and therefore plausible causes,

of early readmission to hospital in patients with ESRD. The most parsimonious explanation for these results is an inability to engage in appropriate self-care as a result of illiteracy or continued abuse of substances. Other variables that may adversely affect the need for hospitalization include: CNS disease, CHF and CI. The relationship of CNS disease and CI may represent a single factor – an inability to cope reliably and consistently with the complex medical regimens imposed by ESRD. Future work in this area should include these variables.

Present results imply that “HL” carries additional variance in association with substance abuse in predicting early readmissions, and therefore may be a causal factor. The confounding of HL with both substance abuse and CI deserves much further investigation in understanding causal pathways mediating reported epidemiological associations.

In addition, the fact that HL covarys so strongly with years of education may imply that assessing it is redundant with the information gained by simply knowing how many years of education the patient has experienced.

The present study may be limited by using data only from our health system. In order for our data to provide systematically skewed results, however, admissions occurring outside of our system would have to systematically resulted in undercounting events only amongst females, non-substance abusers or the cognitively impaired. We can discern no reason why this should be so, and thus consider this source of bias improbable. None-the-less, future research might try to capture such data.

Interventions to reduce the impact of substance abuse, health illiteracy and perhaps CI, on admission/readmission rates are warranted. Not only might such interventions be reduce the cost of care in this population, but they simultaneously offer the possibility of improving care by avoiding recurrent medical crises, at least some of which may contribute to mortality.

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