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Hospitalized Patients Frequently Unaware of Their Chronic Kidney Disease

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Abstract

Prior studies have found that outpatients are frequently unaware of their chronic kidney disease (CKD). Little is known about CKD awareness in hospitalized patients. We conducted a retrospective study of general medicine inpatients with CKD, ascertained through International Classification of Diseases, Ninth Revision codes for non–dialysis-dependent CKD (585.0–585.9) in their first 20 admission diagnoses (n = 590). Patient awareness of their CKD, defined as correct patient self-report of “kidney problems” was 32%. Of 161 patients with advanced CKD, 48% of patients with stage 4 (estimated glomerular filtration rate [eGFR] 15–29) and 63% with stage = (eGFR <15) reported having CKD. In multivariable analysis, factors significantly associated with patient self-report of CKD included advanced CKD stage, other race (nonwhite, non-African American), and increasing Mini-Mental State Exam score (all $P < 0.05$). CKD awareness increased, but remained low, in patients with advanced CKD who would benefit from referral to multidisciplinary nephrology care. Hospitalization provides an opportunity to educate patients with CKD and link them to care.

Chronic kidney disease (CKD) affects over 13% of the US population and is associated with increased morbidity, mortality, and healthcare costs.[1] However, only 10% of individuals with CKD are aware of their diagnoses.[2] Even in those with stage 5 CKD, only 60% of

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Additional Supporting Information may be found in the online version of this article.

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individuals are aware of their CKD.[3] To our knowledge, no work has examined CKD awareness in a hospitalized patient population.

Patient awareness of their CKD diagnosis is important because progression of kidney disease can be slowed by patient self-management of diabetes and hypertension.[4] Patient awareness of CKD may also increase acceptance of pre–end-stage renal disease (ESRD) patient education and nephrology referral, which have been shown to delay CKD progression and improve clinical status at dialysis initiation.[5] However, only 60% of patients with advanced CKD have visited a nephrologist in the past year or have seen a nephrologist prior to dialysis initiation.[1]

The hospital is an important site for patient education and linkage to outpatient care for patients with CKD.[6] The hospital serves high-risk patients who may not be well connected to outpatient care or who have less–well-controlled disease.[6,7] Thus, hospitalization represents an opportunity to identify existing CKD and to use a multidisciplinary approach to preventative care, patient education, and patient-provider planning for renal replacement therapy needs. In our cross-sectional study in an urban, minority-serving hospital, we sought to determine what patient factors were associated with hospitalized patients correctly self-identifying as having CKD.

METHODS

Subjects and Data

We used data from the University of Chicago Hospitalist Project, a study of hospitalized patient outcomes.[8] Within 48 hours of hospitalization, all general medicine patients or their proxies are approached to enroll. During one-on-one inpatient interviews, a trained research assistant obtains demographic, health status, and healthcare utilization information. Participants consent for study staff to review their medical records. More than 80% of general medicine patients enroll.

We obtained data on 1234 general medicine patients discharged between January 1, 2012 and March 31, 2013 with an International Classification of Diseases, Ninth Revision (ICD-9) code for chronic kidney disease (ICD-9 codes 585.0–585.5, 585.9) in their first 20 admission diagnoses. These codes are highly specific for CKD but have lower sensitivity.[9] We excluded all patients with a history of transplant (996.81, V42.0, n = 90) or ESRD (585.6, n = 416). We excluded repeat admissions during the study period (n = 138). Our final sample included 590 unique patients with ICD-9 diagnosis of CKD without ESRD.

Demographic, Clinical, and Health Service Utilization Characteristics

Our outcome was CKD awareness, the patient's correct self-report of kidney disease. Patients selected their chronic medical conditions from a list read to them and were specifically asked if they had "kidney problems." Demographic characteristics including age, gender, race/ethnicity, marital status, and education were also obtained. Healthcare utilization variables included how often the patient saw their primary medical care provider in the past year and whether patients had a prior hospitalization in the last year.

Health status variables such as mental status, diabetes, hypertension, and CKD stage were also assessed. Mental status was quantified using the telephone version of the Mini-Mental State Examination (MMSE), scored from 1 to 22.[10] We defined diabetes as ICD-9 codes 250.0–250.00, and hypertension as ICD-9 codes 401.0, 401.9, 403, 405.09, 405.19, 405.91, 405.99, or by patient self-report. CKD stage was based on the estimated glomerular filtration rate (eGFR) from the medical record using Kidney Disease Outcomes Quality Initiative guidelines.[11] We used the mode of the eGFR to calculate the appropriate CKD stage for those with more than 1 eGFR value from the hospitalization (576/590, 98%). The eGFR was calculated by the modified Modification of Diet in Renal Disease equation: (GFR (mL/min/1.73 m^2) = 175 × $(S_{creatinine})^{-1.154}$ × $(Age)^{-0.203}$ × (0.742 if female) × (1.212 if African American)) recommended by the National Kidney Disease Education Program.[12]

Analysis

We used logistic regression to analyze the influence of the demographic, clinical, and healthcare utilization covariates on the likelihood of a patient reporting kidney problems. For the multivariate analysis, we sequentially added variables in a step-wise fashion. We adjusted for (1) demographic factors: gender, race, ethnicity, marital status, and education; (2) eGFR-calculated CKD stage and comorbidities: diabetes, hypertension, and mental status; and (3) healthcare utilization in the last 12 months: any hospitalizations and the number of visits to a health provider.

RESULTS

Patient Characteristics and Bivariable Association With Patient CKD Self-Report

Table 1 shows demographic, clinical, and health service use characteristics for 590 patients with ICD-9 coded CKD. In the bivariable model in Table 1, age, race, marital status and comorbidities, were associated with patient self-report of CKD. Patients older than 80 years with physician-identified CKD through ICD-9 coding had 57% lower odds of reporting CKD than their younger counterparts. Patients of other races (nonwhite, non-African American), married patients, and those with CKD stages 4 and 5 were much more likely to correctly self-report CKD. Patients with higher MMSE score, diabetes, or hypertension had greater odds of CKD self-report (all $P < 0.05$).

Multivariable Associations With Patient CKD Self-Report

Age, race, and CKD stage remained consistently associated with CKD self-report, although the magnitude of the effects (odds ratios [ORs]) varied across models (Table 1). Across all the models, patients older than 80 years were still significantly less likely than younger patients to self-report CKD (ORs ranging from 0.32 to 0.42, all $P < 0.05$). Patients classified as being of “other” race were found to have a 5.29 to 11.63 greater odds of CKD self-report than African American patients (all $P < 0.05$).

Patients with CKD stage 4 and 5 were more likely to self-report than patients with CKD stage 3 (ORs ranging from 2.69–3.07 for stage 4 and 3.94–5.16 for stage 5, $P < 0.05$). In the final model, every unit increase in MMSE score increased the odds of CKD self-report by 22%. In addition, patients who saw their health provider 4 or more times per year were 62%

less likely to self-report CKD than patients who saw their provider 1 or fewer times per year (OR: 0.38, $P < 0.05$).

A large proportion of patients (68.6%) were CKD "unspecified" by ICD-9 codes, and only 27% of the unspecified group reported having CKD (Table 2). Examining the eGFR CKD stage of the CKD unspecified group showed that 22.8% were eGFR-determined CKD stage 1 to 2, 57.1% were CKD stage 3, 14.8% were CKD stage 4, and 5.3% were CKD stage 5. Patients had 2 to 3 times greater odds of correct CKD self-report if physicians had correctly identified their CKD stage (bivariable OR: 2.42, 95% confidence interval [CI]: 1.57–3.72, multivariable OR: 3.22, 95% CI: 0.99–10.46) (analysis not shown).

DISCUSSION

Although prior work has examined CKD awareness in the general population and in high-risk cohorts,[2,3,13] this is the first study examining CKD awareness in an urban, underserved hospitalized population. We found that overall patients' CKD awareness was low (32%), but increased as high as 63% for CKD stage 5, even after controlling for patient demographic, clinical characteristics, and healthcare use. Our overall rate of CKD awareness was higher than prior studies overall and at lower CKD stages.[2,3,13] Our work is consistent with prior literature that shows increasing CKD awareness with advancing CKD stage.[2,3,13]

Older patients (>80 years) had lower awareness of CKD. Older patients are more likely to have a near normal creatinine, despite a markedly reduced eGFR, so their CKD may go unnoticed.[14] Even with appropriate recognition, providers may also feel like their CKD is unlikely to progress to ESRD, given its stability and/or their competing risk of death.[15] Finally, older hospitalized patients may also be less likely to report a CKD diagnosis due to difficulty in recall due to denial, dementia, or delirium.

One limitation is that our case-finding for CKD was physician ICD-9 coding, which is highly specific but not sensitive.[9] The majority of patients with physician-identified CKD were "CKD unspecified," perhaps due to poor coding, physician underdocumentation, or physician under-recognition of CKD stage. Although only 27% of the "CKD unspecified" group correctly self-identified as having CKD, over 75% were found to be CKD stage 3 or higher, which should trigger additional monitoring or care based on guidelines.[10] In addition, despite statistical significance, we may not be able to make meaningful inferences about our small "other" group (nonwhite, non-African American). Our sample was from 1 hospital—an urban, academic, tertiary care center with a large proportion of African American patients—which may limit generalizability. The multivariable model will need to be tested in other populations for reproducibility.

Our study significantly contributes to the literature by examining patient awareness of CKD in a high-risk, urban, hospitalized minority population. Other study strengths include use of basic demographic information, as well as survey and laboratory data for a richer examination of the associations between patient factors and CKD awareness.

CONCLUSION

Hospitalized patients with CKD have a low CKD awareness. Patient awareness of their CKD is increased with physician documentation of CKD severity. Patient awareness of their CKD must be coupled with provider awareness and CKD documentation to link patients to multidisciplinary CKD education and care to slow CKD progression and reduce associated cardiovascular and metabolic complications. Further work is needed across hospitals to determine—and improve—CKD awareness among both patients and providers.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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TABLE 1

Overall Patient Characteristics and Patient Factors Associated With Patient Chronic Kidney Disease Self-Report

			Multivariable With Stepwise Addition (95% CI)		
	Total, N = 590	**Bivariable Odds Ratio (95% CI)**	**Model 1, Demographic Factors**	**Model 2, Plus CKD and Other Comorbidities**	**Stage Model 3, Plus Health Service Use**
Female	312 (52.98%)	1.21 (0.85–1.70)	1.64 (1.09–2.47)*	1.28 (0.79–2.06)	1.36 (0.75–2.48)
Age, y					
Below 54	138 (23.4%)	REF	REF	REF	REF
54–66	150 (24.4%)	0.96 (0.59–1.54)	0.95 (0.56–1.59)	1.01 (0.56–1.81)	0.83 (0.41–1.68)
67–79	161 (27.3%)	0.77 (0.48–1.23)	0.67 (0.39–1.15)	0.66 (0.35–1.23)	0.72(0.34–1.52)
Above 80	141 (23.9%)	0.43 (0.26–0.74)†	0.32 (0.17–0.60)‡	0.42 (0.20–0.91)*	0.37 (0.15–0.93)*
Race					
African American	449 (82.1%)	REF	REF	REF	REF
White	75 (13.7%)	1.47 (0.89–2.42)	1.53 (0.86–2.71)	1.56 (0.78–3.12)	1.08 (0.47–2.49)
Other§	23 (4.2%)	3.62 (1.53–8.54)†	5.29 (1.78–15.73)†	6.19 (1.72–22.29)†	11.63 (1.80–75.21)*
Ethnicity (Hispanic is reference group)	21 (4.0%)	0.97 (0.38–2.44)	0.43 (0.13–1.45)	0.71 (0.16–3.09)	0.46 (0.06–3.57)
Married	171 (32.6%)	1.49 (1.03–2.18)*	1.32 (0.85–2.04)	1.20 (0.73–1.98)	1.77 (0.94–3.33)
Education					
Less than high school	128 (25.2%)	REF	REF	REF	REF
High school grad/some college	296 (58.2%)	1.05 (0.68–1.63)	0.93 (0.58–1.49)	0.95 (0.54–1.67)	0.85 (0.42–1.72)
College grad or higher	85 (16.7%)	1.13 (0.64–2.01)	0.96 (0.51–1.78)	1.07 (0.51–2.23)	0.69 (0.27–1.77)
CKD stage (eGFR calculated, mode)					
1–2	115 (20.0%)	0.55 (0.32–0.95)*		0.52 (0.27–1.01)	0.28 (0.11–0.69)†
3	300 (52.1%)	REF		REF	REF
4	112 (19.4%)	2.43 (1.55–3.81)‡		2.69 (1.52–4.76)†	3.07 (1.56–6.07)†
5	49 (8.5%)	4.50 (2.39–8.48)‡		3.94 (1.81–8.56)†	5.16 (1.85–14.41)†
Diabetes (ICD-9 coded or self-report)|	292 (49.5%)	1.52 (1.07–2.15)*		1.54 (0.97–2.45)	1.26 (0.71–2.26)
Hypertension (ICD-9 coded or self-report)	436 (73.9%)	3.36 (2.09–5.41)‡		1.53 (0.80–2.90)	1.26 (0.57–2.81)
Mini-Mental State Exam score#	19.7 (2.5)	1.13 (1.03–1.23)†		1.09 (0.98–1.22)	1.22 (1.06–1.42)†
Hospitalized in last 12 months	253 (46.9%)	1.50 (1.05–2.13)*			1.12 (0.65–1.95)

			Multivariable With Stepwise Addition (95% CI)		
	Total, N = 590	**Bivariable Odds Ratio (95% CI)**	**Model 1, Demographic Factors**	**Model 2, Plus CKD and Other Comorbidities**	**Stage Model 3, Plus Health Service Use**
No. of visits to health provider					
Once/year or less	80 (18.4%)	REF			REF
2–3 times/year	58 (13.3%)	0.80 (0.40–1.60)			0.44 (0.17–1.16)
41 times/year	298 (68.4%)	0.60 (0.36–0.99)*			0.38 (0.19–0.74)†

NOTE: Model 1 demographic factors: gender, race, ethnicity, marital status and education; model 11CKD stage; model 21comorbidities: diabetes, hypertension, and mental status; and model 31healthcare use: hospitalization in the last 12 months and number of visits to a health provider in the last year. Abbreviations: CI, confidence interval; CKD, chronic kidney disease; eGFR, estimated glomerular filtration rate; ICD-9, International Classification of Diseases, Ninth Revision.

*$P<0.05$.

†$P<0.01$.

‡$P<0.001$.

§Includes Asian or mixed race. |Diabetes ICD-9 codes 250.0–250.99.

¶Hypertension ICD-9 codes 401.0, 401.0, 401.9, 403, 405.09, 405.19, 405.91, 405.99.

#From Mini-Mental State Exam telephone version (score 1–26).

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TABLE 2

Patient Chronic Kidney Disease Self-Report by Physician-Coded CKD Stage and eGFR Calculated CKD Stage

CKD Stage*	Physician (ICD-9) Coded†	eGFR Calculated‡	eGFR Coded With ICD-9 Correct§
Unspecified	110 (27.2%)	—	—
1–2	5 (31.2%)	20 (17.4%)	0
3	25 (27.2%)	83 (27.7%)	17 (29.8%)
4	40 (63.5%)	54 (48.2%)	25 (69.4%)
5	11 (78.6%)	31 (63.3%)	10 (83.3%)

NOTE: Percent correct patient CKD self-report, “patient awareness of CKD”, by various methods of CKD stage—physician (ICD-9) versus eGFR calculated CKD stage versus eGFR calculated stage with concordant ICD-9 stage. Abbreviations: CKD, chronic kidney disease; eGFR, estimated glomerular filtration rate; ICD-9, International Classification of Diseases, Ninth Revision; K/DOQI, Kidney Disease Outcomes Quality Initiative.

*$P<0.05$, based on χ^2 comparing physician coded, eGFR calculated, and eGFR coded with correct ICD-9 codes.

†CKD stage based on physician coded ICD-9 data.

‡CKD stage is eGFR calculated using mode CKD stage for hospitalization based on K/DOQI staging guidelines.

§Cases in which eGFR calculated stage and ICD-9–coded stage are concordant.