



# Emergency Department/Urgent Care as Usual Source of Care and Clinical Outcomes in CKD: Findings From the Chronic Renal Insufficiency Cohort Study

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**Rationale & Objective:** Having a usual source of care increases use of preventive services and is associated with improved survival in the general population. We evaluated this association in adults with chronic kidney disease (CKD).

**Study Design:** Prospective, observational cohort study.

**Setting & Participants:** Adults with CKD enrolled in the Chronic Renal Insufficiency Cohort (CRIC) Study.

**Predictor:** Usual source of care was self-reported as: 1) clinic, 2) emergency department (ED)/urgent care, 3) other.

**Outcomes:** Primary outcomes included incident end-stage kidney disease (ESKD), atherosclerotic events (myocardial infarction, stroke, or peripheral artery disease), incident heart failure, hospitalization events, and all-cause death.

**Analytical Approach:** Multivariable regression analyses to evaluate the association between usual source of care (ED/urgent care vs clinic) and primary outcomes.

**Results:** Among 3,140 participants, mean age was 65 years, 44% female, 45% non-Hispanic White, 43% non-Hispanic Black, and 9% Hispanic, mean

estimated glomerular filtration rate 50 mL/min/1.73 m<sup>2</sup>. Approximately 90% identified clinic as usual source of care, 9% ED/urgent care, and 1% other. ED/urgent care reflected a more vulnerable population given lower baseline socioeconomic status, higher comorbid condition burden, and poorer blood pressure and glycemic control. Over a median follow-up time of 3.6 years, there were 181 incident end-stage kidney disease events, 264 atherosclerotic events, 263 incident heart failure events, 288 deaths, and 7,957 hospitalizations. Compared to clinic as usual source of care, ED/urgent care was associated with higher risk for all-cause death (HR, 1.53; 95% CI, 1.05-2.23) and hospitalizations (RR, 1.41; 95% CI, 1.32-1.51).

**Limitations:** Cannot be generalized to all patients with CKD. Causal relationships cannot be established.

**Conclusions:** In this large, diverse cohort of adults with moderate-to-severe CKD, those identifying ED/urgent care as usual source of care were at increased risk for death and hospitalizations. These findings highlight the need to develop strategies to improve health care access for this high-risk population.

## Visual Abstract included

Complete author and article information provided before references.

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Kidney Med. 4(4):100424.  
Published online 1 February  
2022.

doi: 10.1016/  
j.xkme.2022.100424

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Having a usual source of care implies having an ongoing relationship with a primary care provider or facility that enables patient-centered care in a coordinated and accessible manner.<sup>1,2</sup> It is an important marker of

## Editorial, p ●

health care access and has been associated with increased use of preventive services and decreased use of emergency department (ED) services, hospitalizations, and mortality.<sup>3-11</sup> In the general US population, approximately 15% of adults do not have a usual source of care; however, this estimate is not known in populations with chronic kidney disease (CKD).<sup>12</sup>

Effective management of patients with CKD is vital to reducing the risk of adverse consequences of kidney disease progression and associated morbidity from cardiovascular disease. For this reason, having a usual source of

care is important in this high-risk population. This is supported by data published in other chronic conditions including diabetes, chronic obstructive pulmonary disease, and cancer, which have demonstrated a positive association between continuity of care and improved outcomes, decreased cost, and fewer ED visits and hospitalizations.<sup>13-</sup>

<sup>17</sup> In a study of Korean patients with diabetic nephropathy, superior quality continuity of care was associated with a decreased likelihood of progressing to end-stage kidney disease (ESKD) when compared to poorer quality continuity of care.<sup>18</sup> However, we are unaware of other studies that have evaluated the impact of usual source of care on adverse outcomes in a US CKD cohort. The objective of this study was to examine this association in US adults with mild-to-moderate CKD. We hypothesized that individuals using an ED or urgent care center would be at higher risk for adverse outcomes over the study period as compared to those using a clinic for care.

**PLAIN-LANGUAGE SUMMARY**

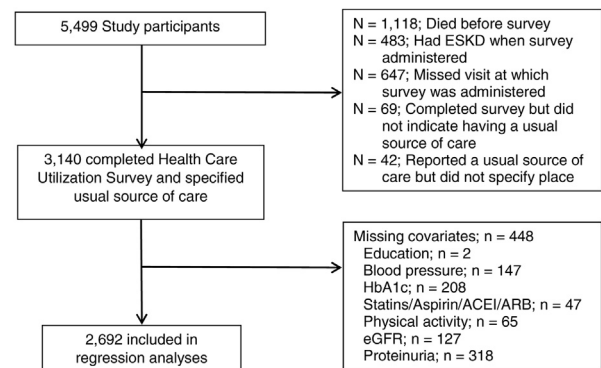
Patients with chronic kidney disease (CKD) are medically complex and may benefit from having coordinated care, most easily provided in a clinic setting. We sought to evaluate how certain outcomes differed among patients with CKD based on where they usually seek medical care. We used data from the Chronic Renal Insufficiency Cohort Study and found that individuals who usually went to an emergency department or urgent care were more likely to be hospitalized or die compared to those who primarily received care in a clinic. Our work identifies patients with CKD who use the emergency department or urgent care as high risk, and highlights the importance of understanding barriers to accessing clinic-based care in order to improve health care in this group.

**METHODS****Study Population**

The Chronic Renal Insufficiency Cohort (CRIC) Study is an ongoing multicenter, observational study of diverse adults with CKD. The rationale, design, methodology, and baseline characteristics of study participants have been previously described.<sup>19-21</sup> Recruitment of 3,939 adults with CKD occurred between 2003-2008 at 7 US clinical centers in Chicago, Illinois; Ann Arbor, Michigan; Philadelphia, Pennsylvania; Baltimore, Maryland; New Orleans, Louisiana; Cleveland, Ohio; and Oakland, California. Inclusion criteria were age (21-74 years) and estimated glomerular filtration rate ([eGFR] 20-70 mL/min/1.73 m<sup>2</sup>) at enrollment. Between 2013-2015, the study recruited an additional 1,560 adults; participants were slightly older (45-79 years) and had milder CKD (eGFR 45-70 mL/min/1.73 m<sup>2</sup> and proteinuria).<sup>22</sup> Detailed exclusion criteria have been previously described.<sup>19</sup> For the current study, 3,140 participants met inclusion criteria (Fig 1). The study protocol was approved by the Institutional Review Board of all participating centers and is in accordance with the Declaration of Helsinki. All participants provided informed consent.

**Measurements and Variable Definition**

Sociodemographic, lifestyle, and medical history information was obtained at baseline using self-reported questionnaires (eg, sex, age, race/ethnicity [non-Hispanic White, non-Hispanic Black, Hispanic, or other], education, marital status, health insurance, receipt of nephrology care, physical activity, smoking). Usual source of care was derived from the Health Care Utilization questionnaire which was adapted from the 2012 National Health Interview Survey Adult Access to Health Care and Utilization, and administered between 2013-2015.<sup>23</sup> Participants were asked, “Is there a place that you usually go



**Figure 1.** Analytic cohort flow chart. Abbreviations: ACEi/ARB, angiotensin-converting enzyme inhibitor/angiotensin receptor blocker; eGFR, estimated glomerular filtration rate; ESKD, end-stage kidney disease; HbA1c, hemoglobin A1c.

to when you are sick or need advice about your health?” Responses included: “1) Yes, there is one place; 2) Yes, there is more than one place; 3) No, there is no place; 4) Don’t know.” Participants were subsequently asked: “What kind of place is it—a clinic, doctor’s office, emergency department, or some other place?” Participants who responded “more than one place” were asked to indicate which place they frequented most often. Responses included: “1) Clinic or health center; 2) Doctor’s office or health maintenance organization (HMO); 3) Hospital emergency department or urgent care center; 4) Some other place; 5) Don’t go to one place most often; 6) Don’t know.” Participants choosing “clinic or health center” or “doctor’s office or HMO” were categorized as receiving their usual source of care in a clinic. Participants choosing “Hospital ED or urgent care center” were categorized as receiving their usual source of care in an ED/urgent care. Few participants responded with options other than clinic or ED/urgent care (options 4-6, n = 42; 1.3%) and therefore were excluded from the analysis.

Participants underwent annual study visits during which they were asked about medication use and underwent standardized anthropometric and blood pressure measurements.<sup>24</sup> Fasting blood samples were collected to measure serum creatinine, electrolytes, lipids, and plasma glucose. Serum creatinine, cystatin C, urinary total protein, and creatinine were measured using standard assays.<sup>25-27</sup> Glomerular filtration rate (GFR) was estimated using an equation developed in a subgroup of CRIC participants with measured iothalamate GFR, which has been demonstrated to have superior accuracy in this cohort compared to other eGFR equations.<sup>27</sup> Diabetes mellitus was defined by a fasting glucose  $\geq 126$  mg/dL or use of insulin or oral hypoglycemic medications. Hypertension was defined by a systolic blood pressure  $\geq 140$  mm Hg, diastolic blood pressure  $\geq 90$  mm Hg, or use of antihypertensive medications.

## Outcomes

Outcomes included incident ESKD (defined as receipt of maintenance dialysis therapy or kidney transplant), atherosclerotic events (myocardial infarction, stroke, or peripheral artery disease), incident heart failure, hospitalization events, and all-cause death. Outcomes were acquired by study personnel who reviewed hospital billing codes and queried participants every 6 months by telephone or during annual visits about recent hospitalizations, outpatient tests, or interventions. Two independent reviewers adjudicated these events using standardized criteria when reviewing hospital records.<sup>19</sup> Criteria for heart failure events were adapted from the Framingham Heart Study and included a combination of clinical symptoms, radiographic evidence of pulmonary congestion, physical examination of the heart and lungs, and when available, central venous hemodynamic monitoring data and echocardiographic imaging.<sup>28,29</sup> Hospitalization events were recorded as counts using the Agency for Healthcare Research and Quality Clinical Classifications Software categorization scheme as per the *International Classification of Diseases, Ninth Revision* code.<sup>30</sup> Any hospitalizations falling within a “disease of the circulatory system” category were designated as cardiovascular; all others were deemed noncardiovascular.<sup>31</sup> Ascertainment of ESKD was supplemented by cross-linkage with the US Renal Data System. Deaths were ascertained from reports by next of kin, death certificates, hospital records, and linkage with the Social Security Death Master File. Participants were followed until the occurrence of death, withdrawal from the study, or January 2018, when the database was locked for analysis.

## Statistical Analysis

Descriptive statistics for demographic and clinical characteristics were summarized as means (standard deviations) or medians (interquartile ranges) for continuous variables and as frequencies (proportions) for categorical variables. T tests or Wilcoxon rank sum tests were used to compare continuous variables, and  $\chi^2$  tests were used to compare categorical variables. Event rates for time-to-event outcomes were calculated as the ratio of the number of participants with the event divided by the total person-years of follow-up. Cox proportional hazards modeling was used to evaluate the association between usual source of care and incident ESKD, atherosclerotic events, incident heart failure, and all-cause death, and cardiovascular death. Model assumptions were checked, including the proportionality assumption of Cox models. Poisson regression was used to evaluate the association between usual source of care and the total number of hospitalization events over the follow-up period. We assessed for overdispersion and calculated negative binomial regression models as a sensitivity analysis.

Models were stratified by clinical center and adjusted as follows: Model 1: unadjusted; Model 2: clinical center,

enrollment phase, age, sex, race/ethnicity, education, income; Model 3: 2+ hemoglobin A1c, statin, aspirin, angiotensin-converting enzyme inhibitor/angiotensin receptor blocker use, smoking status, physical activity, blood pressure <140/90 mm Hg, eGFR, and log urine protein-creatinine ratio. These covariates, which were ascertained at the time of the baseline visit, were chosen using the Andersen-Aday conceptual framework, as well as evidence from published literature.<sup>32-34</sup> We examined eGFR as a potential effect modifier for each outcome. All regression models used a complete data analysis approach. The number of missing variables is shown in [Table S1](#). All hypothesis tests were 2-sided with a type 1 error rate of 5%. All analyses were performed using SAS 9.3 (SAS Institute).

## RESULTS

### Baseline Characteristics

Of the 3,140 eligible participants, 2,862 (91%) identified a clinic as usual source of care and 278 (9%) identified an ED/urgent care as usual source of care ([Table 1](#)). At study entry, mean age was 65 years, 44% were female, 45% were non-Hispanic White, 43% were non-Hispanic Black, and 9% were Hispanic. Baseline mean eGFR was 50 mL/min/1.73 m<sup>2</sup> and median urinary protein excretion was 0.2 g/24 hours. Compared to those identifying a clinic as usual source of care, participants identifying ED/urgent care as usual source of care were more likely to be a racial/ethnic minority, have less than a high school education, earn less than \$20,000 annually, be permanently disabled, and have a higher baseline urine protein. These individuals were also less likely to be full-time employed and currently married. Although a large proportion of the cohort had health insurance (97%), those identifying an ED/urgent care as usual source of care were less likely to have private/commercial health insurance and to have seen a nephrologist in the past. Compared to those identifying a clinic as usual source of care, those identifying ED/urgent care as usual source of care were more likely to be active smokers and less likely to have blood pressure <140/90 mm Hg, hemoglobin A1c <7%, and to be taking an angiotensin-converting enzyme inhibitor/angiotensin receptor blocker. Of the 3,140 participants, 286 were excluded from the regression analyses due to missing data (see [Fig 1](#), [Table S1](#)). Compared to participants excluded from the regression analyses, those included in the regression analyses (n = 2,854) were similar in terms of age, sex, and other demographic and clinical characteristics ([Table S2](#)).

### Incident ESKD

During a median follow-up of 3.6 years, there were 181 incident ESKD events. Unadjusted event rates were significantly higher in those with ED/urgent care as usual source of care compared to those with clinic (27.3 vs 16.2 per 1,000 person-years; [Table 2](#), [Fig 2](#)). Participants identifying ED/urgent care as usual source of care were at higher

**Table 1.** Baseline Characteristics by Usual Source of Care

Characteristic	Overall (N = 3,140)	Clinic (n = 2,862)	Emergency Department/ Urgent Care (n =278)
Age, y, mean (SD)	65 (9)	65 (9)	65 (9)
Female sex	1,380 (44%)	1,270 (44%)	110 (40%)
Race/ethnicity	—	—	—
Non-Hispanic White	1,421 (45%)	1,365 (48%)	56 (20%) <sup>a</sup>
Non-Hispanic Black	1,344 (43%)	1,145 (40%)	199 (72%)
Hispanic	273 (9%)	261 (9%)	12 (4%)
Other	102 (3%)	91 (3%)	11 (4%)
Less than high school education	457 (15%)	394 (14%)	63 (23%) <sup>a</sup>
Annual income <\$20,000	784 (25%)	672 (24%)	112 (41%) <sup>a</sup>
Health insurance	2,953 (97%)	2,696 (97%)	257 (97%)
Health insurance type	—	—	—
Private/commercial	616 (20%)	595 (21%)	21 (8%) <sup>a</sup>
Any Medicare	1,269 (42%)	1,163 (42%)	106 (40%)
Medicaid/public aid	407 (13%)	337 (12%)	70 (26%)
Veterans Affairs/Military/CHAMPUS	188 (6%)	155 (6%)	33 (12%)
None	104 (3%)	95 (3%)	9 (3%)
Unknown	473 (16%)	446 (16%)	27 (10%)
Unable to fill a prescription due to cost	561 (18%)	501 (18%)	60 (22%)
Unable to see a doctor due to cost	266 (9%)	236 (8%)	30 (12%)
Ever seen a nephrologist (yes)	2,204 (70%)	2,030 (71%)	174 (63%) <sup>a</sup>
Marital status	—	—	—
Currently married	1,705 (54%)	1,590 (56%)	115 (41%) <sup>a</sup>
Never married	425 (14%)	378 (13%)	47 (17%)
Formerly married	1,010 (32%)	894 (31%)	116 (42%)
Employment status	—	—	—
Full-time employed	851 (27%)	818 (29%)	33 (12%) <sup>a</sup>
Part-time employed	321 (10%)	297 (10%)	24 (9%)
Permanently disabled	515 (16%)	416 (15%)	99 (36%)
Retired	1,155 (37%)	1,068 (37%)	87 (31%)
Unemployed	166 (5%)	144 (5%)	22 (8%)
Hypertension	2,838 (91%)	2,572 (90%)	266 (96%) <sup>a</sup>
Diabetes	1,671 (53%)	1,512 (53%)	159 (57%)
Cardiovascular disease	1,167 (37%)	1,030 (36%)	137 (49%) <sup>a</sup>
Current smoker	284 (9%)	236 (8%)	48 (17%) <sup>a</sup>
ACEi/ARB	2,026 (66%)	1,860 (66%)	166 (61%)
Ideal physical activity <sup>b</sup>	1,552 (51%)	1,434 (51%)	118 (43%) <sup>a</sup>
Blood pressure <140/90, mm Hg	2,287 (76%)	2,103 (77%)	184 (70.5%) <sup>a</sup>
BMI, kg/m <sup>2</sup> , mean (SD)	32.29 (7.4)	32 (7)	32 (8)
Hemoglobin A1c <7%	2,114 (72%)	1,952 (73%)	162 (63%) <sup>a</sup>
eGFR, mL/min per 1.73 m <sup>2</sup> , mean (SD)	49.87 (17)	50 (17)	48 (17)
CKD Stage (per mL/min/1.73 m <sup>2</sup> )	—	—	—
Stage 2 (eGFR ≥60)	833 (28%)	766 (28%)	67 (26%) <sup>a</sup>
Stage 3a (eGFR 45-59)	1,003 (33%)	925 (34%)	78 (30%)
Stage 3b (eGFR 30-44)	781 (26%)	700 (25%)	81 (31%)
Stage 4 (eGFR <30)	396 (13%)	361 (13%)	35 (13%)
Urine protein, g/24 h, median (IQR)	0.2 (0.08-0.70)	0.1 (0.1-0.4)	0.2 (0.1-0.8) <sup>a</sup>

Note: Data presented as n (%) unless otherwise noted.

Abbreviations: ACEi/ARB, Angiotensin-converting enzyme inhibitor/angiotensin II receptor blocker; CHAMPUS, Civilian Health and Medical Program of the Uniformed Services; eGFR, estimated glomerular filtration rate; IQR, interquartile range; SD, standard deviation.

<sup>a</sup>P < 0.05

<sup>b</sup>≥150 minutes/week vigorous activity ≥75 minutes/week, or moderate plus vigorous activity ≥150 minutes/week.<sup>45</sup>

risk to develop ESKD (hazard ratio [HR], 1.68; 95% confidence interval [CI], 1.09-2.58) (Table 2). However, this association became nonsignificant after adjustment for

clinical center, enrollment phase, age, sex, race/ethnicity, education, and income (Table 2). All model assumptions were met.



**Table 2.** Association Between Usual Source of Care and Outcomes

Outcome	No. of Events	Unadjusted Event Rate Per 1,000 Person-Year (95% CI)	Hazard Ratio (95% CI)		
			Model 1 (n = 3,140)	Model 2 (n = 3,138)	Model 3 (n = 2,692)
<b>Incident ESKD</b>					
Clinic	157	16.2 (13.9-19.0)	Referent	Referent	Referent
ED/urgent care	24	27.3 (18.3-40.8)	1.68 (1.09-2.58)	1.49 (0.95-2.33)	0.86 (0.49-1.52)
<b>Atherosclerotic event</b>					
Clinic	230	24.6 (21.6-28.0)	Referent	Referent	Referent
ED/urgent care	34	41.5 (29.6-58.0)	1.67 (1.16-2.39)	1.26 (0.86-1.83)	1.12 (0.74-1.70)
<b>Incident heart failure</b>					
Clinic	224	24.0 (21.0-27.4)	Referent	Referent	Referent
ED/urgent care	39	47.9 (35.0-65.6)	1.95 (1.39-2.75)	1.43 (1.00-2.05)	1.25 (0.83-1.86)
<b>All-cause death</b>					
Clinic	247	24.8 (21.9-28.1)	Referent	Referent	Referent
ED/urgent care	41	45.3 (33.4-61.6)	1.86 (1.33-2.58)	1.52 (1.07-2.15)	1.53 (1.05-2.23)

Notes: Model 1: Unadjusted

Model 2: Clinical center, enrollment phase; age, sex, race, ethnicity, education, income,

Model 3: 2 + hemoglobin A1c, statin, aspirin, ACEi/ARB, smoking status, physical activity, blood pressure <140/90 mm Hg, eGFR, log urine protein (Model 3 is shown in Fig 2)

Abbreviations: ACEi/ARB, angiotensin-converting enzyme inhibitor/angiotensin receptor blocker; ED, Emergency department; ESKD, end-stage kidney disease.

### Atherosclerotic Events

There were 264 atherosclerotic events. Atherosclerotic event rates were higher among those identifying an ED/urgent care as usual source of care (Table 2). On multivariable analyses, there was no significant association between usual source of care and atherosclerotic events (Table 2). There was a potential violation of the proportional hazards assumption for this outcome (Fig S1).

### Incident Heart Failure

During follow-up, there were 263 incident heart failure events. Heart failure events were almost 2-fold higher among those identifying ED/urgent care as usual source of care (Table 2). In our unadjusted model, those identifying ED/urgent care as usual source of care were more likely to develop heart failure compared to those identifying a clinic (HR, 1.95; 95% CI, 1.39-2.75). This association was no longer significant after adjustment for clinical center,

enrollment phase, age, sex, race, ethnicity, education, and income (Table 2). All model assumptions were met.

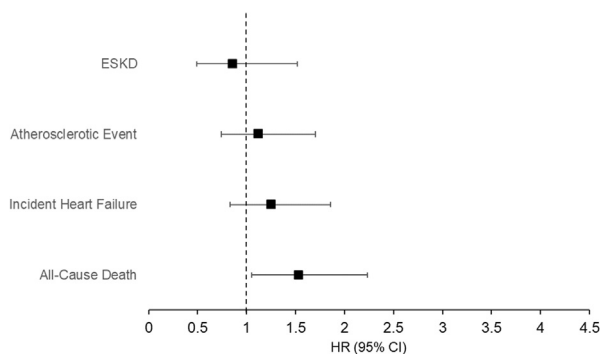
### Death

There were 288 deaths during follow-up. Compared to clinic as usual source of care, ED/urgent care was associated with higher risk for death after adjustment for sociodemographic and clinical variables (HR, 1.53; 95% CI, 1.05-2.23) (Table 2). All model assumptions were met.

There was no evidence of effect modification by eGFR for the outcomes of incident ESKD, cardiovascular events, or death.

### Hospitalizations

There were a total 7,957 hospitalization events, of which 6,301 (79%) were noncardiovascular and 1,656 (21%) cardiovascular. Unadjusted hospitalization rates were markedly higher among those identifying ED/urgent care as usual source of care (1,341 per 1,000 person-years) as compared to clinic (680 per 1,000 person-years). In the fully-adjusted model, ED/urgent care was associated with higher risk for hospitalizations as compared to clinic (rate ratio [RR], 1.41; 95% CI, 1.32-1.51) (Table 3, Fig 3). This association was significant for both noncardiovascular and cardiovascular hospitalizations (RR, 1.44; 95% CI, 1.34-1.56 and RR, 1.29; 95% CI, 1.11-1.51, respectively). We found a statistically significant interaction for eGFR. Therefore, hospitalization RRs are presented by eGFR categories (Table S3). Negative binomial regression results were similar to the main analysis (Table S4).



**Figure 2.** Forest plot of the fully-adjusted hazard ratios for the association between usual source of care and outcomes. Abbreviations: CI, Confidence interval, HR, hazard ratio; ESKD, end-stage kidney disease.

## DISCUSSION

In this large prospective CKD cohort, use of ED/urgent care as usual source of care was associated with higher risk

**Table 3.** Association Between Usual Source of Care and Hospitalizations

Hospitalizations	No. of Events	Unadjusted Event Rate per 1,000 Person-Year (95% CI)	Rate Ratio (95% CI)		
			Model 1	Model 2	Model 3
<b>All-cause</b>					
Clinic	6,751	680 (664-696)	Referent	Referent	Referent
ED/urgent care	1,206	1,341 (1,268-1,419)	1.97 (1.86-2.10)	1.43 (1.35-1.53)	1.41 (1.32-1.51)
<b>Noncardiovascular</b>					
Clinic	5,365	540 (526-555)	Referent	Referent	Referent
ED/urgent care	936	1,040 (976-1,110)	1.93 (1.80-2.07)	1.43 (1.33-1.53)	1.44 (1.34-1.56)
<b>Cardiovascular</b>					
Clinic	1,386	140 (132-147)	Referent	Referent	Referent
ED/urgent care	270	300 (267-338)	2.15 (1.89-2.45)	1.47 (1.28-1.68)	1.29 (1.11-1.51)

Model 1: Unadjusted

Model 2: clinical center, enrollment phase; age, sex, race, ethnicity education, income,

Model 3: 2 + hemoglobin A1c, statin, aspirin, ACEi/ARB, smoking status, physical activity, blood pressure <140/90 mm Hg, eGFR, log urine protein (Model 3 is shown in Fig 3)

Abbreviations: ACEi/ARB, angiotensin-converting enzyme inhibitor/angiotensin receptor blocker; CI, confidence interval; ED, emergency department.

for hospitalizations and death as compared to using a clinic. We found that individuals who relied on ED/urgent care as usual source of care were a vulnerable population in terms of lower socioeconomic status, higher comorbid condition burden, and poorer blood pressure and glycemic control. Future efforts are needed to better understand barriers to care and facilitate access to care for this group.

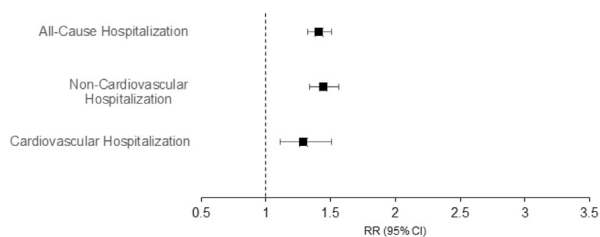
It is well established that patients with CKD experience higher rates of hospitalizations than those without CKD.<sup>35,36</sup> Among patients with CKD, we found that those who identified ED/urgent care as usual source of care were at a particularly high risk for hospitalizations, experiencing rates 2-fold higher than those with a clinic as usual source of care. These findings have important implications in view of the physical and mental toll of hospitalizations on patients, as well as the high costs associated with hospitalizations. Furthermore, patients with CKD are particularly vulnerable to experiencing hospital-acquired complications. In a Canadian population study, patients with CKD had 20% higher odds for developing hospital-acquired complications than those without CKD.<sup>37</sup>

Providing care for patients with CKD requires managing multiple comorbid conditions and often necessitates multispecialty care.<sup>38</sup> EDs and urgent care centers are not designed to deliver care for chronic conditions. In our cohort, the lack of coordinated care for those relying on ED/urgent care likely contributed to the lower

achievement of guideline recommended goals (ie, blood pressure, Hemoglobin A1c, and use of angiotensin-converting enzyme inhibitor/angiotensin receptor blocker) and the higher rates of adverse clinical events and hospitalizations.

It is very likely that individuals in our cohort who used ED/urgent care as usual source of care faced significant barriers to accessing primary care. Two studies using data from the Medical Expenditure Panel Survey reported that individuals who were dissatisfied with their usual source of care or perceived access barriers to primary care were more likely to have nonurgent ED visits.<sup>39,40</sup> Furthermore, it is well established that populations with lower socioeconomic status face greater barriers to primary care (eg, transportation issues, difficulty making limited office hours, affordability, etc).<sup>41</sup> An important finding in our cohort was that those reporting ED/urgent care as usual source of care were disproportionately people of color and had significantly lower educational attainment and annual income. Similarly, a recent report examining ED use in the state of New Jersey reported that individuals from poorer communities were more likely to seek care in the ED for management of chronic conditions.<sup>42</sup> In our cohort, although over 90% of individuals relying on ED/urgent care as usual source of care had medical insurance, the majority had public insurance, which may have led to greater difficulty accessing primary care services. This suggests efforts to expand health coverage (eg, the Affordable Care Act) must also address barriers to establishing and maintaining access to primary care.

Our findings suggest that there is a critical need for interventions to facilitate access to primary care for individuals with CKD who rely on ED/urgent care as usual source of care. For example, case management at the time of the ED encounter could be used to evaluate potential barriers to regular care and facilitate follow-up. Of note, a recent systematic review reported that interventions targeting frequent ED users were successful in decreasing ED visits and costs.<sup>43</sup> Furthermore, lessons may be learned from system-based coordination of care for other health



**Figure 3.** Forest plot of the fully-adjusted hazard ratios for the association between usual source of care and hospitalizations. Abbreviations: CI, Confidence interval; RR, rate ratio.

conditions. For example, in heart failure patients, transitional care interventions have been found to lower hospitalization rates and improve quality of life.<sup>44</sup> Finally, our finding that baseline differences in education and income explained the higher risk for incident ESKD and heart failure among those relying on ED/urgent care reinforces the importance of taking into account social determinants of health and addressing broader systemic issues facing the US health care system.<sup>42</sup>

Strengths of this study include the large, diverse, and well-characterized cohort. In addition, the study captured comprehensive information on access to health care, as well as extensive clinical and laboratory measures. One important limitation of our study is that location of care is used as a proxy for measuring health care continuity, coordination, and quality. Unfortunately, these factors are difficult to capture with any single measure. In addition, the National Health Interview Survey does not capture information regarding type of provider delivering care in the clinic setting or the frequency of clinic visits. Another factor that limits generalizability of our findings is that study participants were recruited from academic centers. It is possible that study participants may be more actively engaged in their care than patients with CKD in the general population. Finally, in view of the observational study design, causal relationships cannot be established.

In summary, we found that ED/urgent care as usual source of care was associated with a higher risk for hospitalizations and death in patients with CKD. Future interventions are needed to facilitate access to care for this high-risk group with the goal of improving health outcomes and reducing costs.

## SUPPLEMENTARY MATERIAL

### Supplementary File (PDF)

**Figure S1:** Overall and Time-Dependent Hazard Ratios of Atherosclerotic Events for Usual Source of Care

**Table S1:** Number of Missing Data by Usual Source of Care

**Table S2:** Baseline Characteristics for Those Included Vs Not Included in Regression Analyses

**Table S3:** Stratified Association Between Usual Source of Care and Hospitalizations by eGFR Categories

**Table S4:** Association Between Usual Source of Care and Hospitalizations Using Negative Binomial Regression

## ARTICLE INFORMATION

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**Support:** Funding for the CRIC Study was obtained under a cooperative agreement from the National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK U01DK060990, U01DK060984, U01DK061022, U01DK061021, U01DK061028, U01DK060980, U01DK060963, and U01DK060902). In addition, this work was supported in part by: the Perelman School of Medicine at the University of Pennsylvania Clinical and Translational Science Award NIH/National Center for Advancing Translational Sciences (NCATS) UL1TR000003, Johns Hopkins University UL1TR000424, University of Maryland GCRC M01RR16500, Clinical and Translational Science Collaborative of Cleveland, NIH/NCATS UL1TR000439 and NIH Roadmap for Medical Research, Michigan Institute for Clinical and Health Research (MICH) UL1TR000433, University of Illinois at Chicago CTSA UL1RR029879, Tulane COBRE for Clinical and Translational Research in Cardiometabolic Diseases P20GM109036, Kaiser Permanente NIH/NCRR UCSF-CTSI UL1RR024131. Dr. Toth-Manikowski is funded by the NIDDK 3R01DK072231-13S1. Dr. Ricardo is funded by the NIDDK R01DK118736 Award. Dr. Lash is funded by the NIDDK K24DK092290 and R01DK072231-91 Awards.

**Financial Disclosure:** The authors declare that they have no relevant financial interests.

**Peer Review:** Received July 21, 2021 as a submission to the expedited consideration track with 3 external peer reviews. Direct editorial input from the Statistical Editor and the Editor-in-Chief. Accepted in revised form December 5, 2021.

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## Emergency Department/Urgent Care as Usual Source of Medical Care and Clinical Outcomes in CKD

Kidney  
Medicine



Prospective, observational cohort  
CRIC Study



N = 3140  
adults with CKD



Mean eGFR  
50 mL/min/1.73m<sup>2</sup>



44 % female  
45 % non-Hispanic White  
43 % non-Hispanic Black  
9 % Hispanic

### Usual source of care



Clinic

90%



ED/Urgent care

9%



Other

1%



### All-cause mortality

HR 1.53  
95% CI (1.05, 2.23)



### Hospitalizations

RR 1.41  
95% CI (1.32, 1.51)

### Events during follow-up (median time 3.6 years)



181  
Incident  
ESKD



263  
Incident heart  
failure



288  
Deaths



7,957  
Hospitalizations

**Conclusion:** Individuals with CKD identifying ED/urgent care as their usual source of care were at increased risk for death and hospitalizations. These findings highlight the need to develop strategies to improve health care access for this high risk population.

**Reference:** Toth-Manikowski SM, Hsu JY, Fischer MJ et al. Emergency department/urgent care as usual source of care and clinical outcomes in CKD: findings from the CRIC study. *Kidney Medicine*, 2022.

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