

Web Surveillance for CKD

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Editor-in-Chief, *Journal of the American Society of Nephrology*

J Am Soc Nephrol 24: 1–3, 2013.

doi: 10.1681/ASN.2012111098

We all carry a few numbers around regarding the epidemiology of kidney disease. The US Renal Data System (USRDS) remains a treasure chest of robust information about secular trends in ESRD.¹ Notably, annual adjusted incidence rates for new cases of ESRD have flattened, whereas absolute incidence counts increase as the base population enlarges.² Prevalence rates for ESRD are rising, therefore, as a function of increasing incidence counts and the improved longevity of dialysis and transplant patients, all of which suggest that numbers of individuals living with ESRD will grow largely in proportion to size of the population.² Although escalating expense for renal replacement therapy strains government and private insurance programs,³ the leveling of adjusted incidence rate challenges the notion that we are facing a relentless epidemic outside of normal population growth and the emergence of younger obese diabetic patients that have not yet run their course of disease.

Save for the outcome of AKI,² the largest feeder cohort for patients eventually needing renal replacement therapy is the prevalence of CKD in the general population⁴ and what we believe about treatment possibilities.⁵ The magnitude or validity of this pool currently derives from smaller data sources, particularly the National Health and Nutrition Examination Survey (NHANES), which samples approximately 5,000 persons each year.^{6,7} CKD also has definition and staging problems⁸ among other issues related to creatinine-based equations for renal function, where assays for measuring levels of serum creatinine have changed over time and made it harder to marry one annual trend to another.² Sadly, the sensitivity of current guidelines staging CKD cannot predict who will progress among patients with early signs of disease.⁸ The rate of decline of GFR before onset of CKD differs among races or ethnic groups, but traditional risk factors are not highly predictive of who will show decline. Save for a timely stab at modeling CKD from smaller cohorts,⁹ there are no comprehensive datasets readily available for firmer projections of longitudinal progressivity.² The Hoerger model⁹ makes

informed assumptions about progression and risk of diabetes and hypertension to predict that 47.1% of 30-year-old people have a lifetime risk of some degree of CKD and estimate that only 11% of patients with stage 3 CKD will ever progress to stage 5.⁹ Of course, the estimated period prevalence of CKD in the general population greatly exceeds incidence rates for ESRD,^{2,9} reminding us that counting everyone with any level of CKD greatly obscures real risk of renal failure.

The burden of comorbidities embedded in the CKD population is also well known and of great interest to health care planners, particularly in regards to diabetes^{10,11} and obese¹² and elderly¹³ patients, and the contribution cost of comorbidities will vary depending on how new identifiers of progressive CKD are refined from future datasets. The presence of CKD also associates with various complications and their costs, including cognitive impairment,^{14,15} cardiovascular disease,^{16–19} sudden death,²⁰ abnormal mineral metabolism,^{21–23} bone fracture,²⁴ vascular ossification²⁵ and remodeling,²⁶ post-operative mortality,²⁷ risk of AKI,^{28,29} cancer,³⁰ and patient safety³¹ just to mention a few. No one is sure all these risks are shared equally across the spectrum of patients with varying degrees of CKD. Early efforts to map complications with albuminuria or levels of estimated GFR suggest differential associations.³² There also are issues with prevention,¹⁶ pre-ESRD access, socioeconomic, and race that affect quality of care,^{33–35} and save for piecemeal, we cannot interrogate these concerns thoughtfully without establishing a larger pool of valid patients for longitudinal surveillance.

In this regard, the Centers for Disease Control and Prevention (CDC) under a 2006 legislative mandate began working on a surveillance mechanism to identify the burden of CKD in the United States to improve public awareness and assess the risk, process, quality of care, and health system capacity.^{36,37} Work has been underway to integrate several administrative datasets for CKD (NHANES, Veterans Administration, USRDS, and CMS-Medicare) and enumerate topics and measures relevant to surveillance with the intent of reporting periodically on the magnitude and changing dimensions of this problem. The new CDC website is now launched, and its impending largess deserves our attention: <http://www.cdc.gov/ckd>. This site offers a convenient way to find information on prevalence and incidence of CKD, health consequences and system capacity, CKD in the transplant population, burden of risk factors, process and quality of care, and emerging CKD in children. There also are links to Healthy People 2020, a site maintained by the Department of Health and Human Services regarding national objectives for promoting health and disease prevention.

Knowing exactly who will progress to renal failure has been the holy grail of our elusive clairvoyance. The prospect and hope from this larger dataset is that, over time, robust

Published online ahead of print. Publication date available at www.jasn.org.

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discriminators will emerge to inform cost-effective intervention at increasingly earlier stages of CKD. Critical for productive interrogation of this surveillance program is an urgent need to revisit the staging of CKD;^{8,38} there is growing talk of finding ways to cleverly integrate age,^{8,13} albuminuria,^{39–41} and other markers⁴² with various mathematical representations of changing renal function to better determine who will progress.^{9,38}

Osler once practiced the art of probability using the science of uncertainty. Nephrologists know that world all too well and regularly lose their way by reaching for clinical answers absent of sound information; we substitute inchoate beliefs for certainty and call it conventional wisdom worthy of guidelines.^{43–45} This approach, although paved with good intentions, cannot operate with guiding authority if we ever hope to improve on preventive or therapeutic measures in the future. The new surveillance program at the CDC is a welcome start. It will need the continued attention and financial support of Congress if we are ever to find a better way of defanging renal progression.

DISCLOSURES

None.

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The Inexorable Rise of AKI: Can We Bend the Growth Curve?

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J Am Soc Nephrol 24: 3–5, 2013.

doi: 10.1681/ASN.2012111115

The treatment of anuria should be conservative. If circulatory failure is present, appropriate steps should be taken to correct it.

Published online ahead of print. Publication date available at www.jasn.org.

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Otherwise, therapy is limited to the balanced maintenance of the patient until the kidneys have a chance to affect recovery.

Homer Smith 1951¹

This year marks the 60th anniversary of application of the Kolff-Brigham dialyzer to Korean War casualties with trauma-related AKI. This medical marvel, implemented in the field under extreme conditions, substantially reduced the mortality associated with anuric renal failure.² The use of dialysis has benefited countless hospitalized patients with AKI since; yet continued celebration of this achievement must be tempered by lack of similar progress in the prevention and treatment of accompanying parenchymal kidney injury. The latter remains one of the great challenges for kidney disease researchers and clinicians in the 21st century.

In this issue of *JASN*,³ Hsu and colleagues leverage data from a large, nationally representative sample of hospital databases to examine secular trends in the incidence of dialysis-requiring AKI. Identifying over a million cases between 2000 and 2009, the authors uncover increases in population-based incidence rates of >10% per year with a near tripling in the absolute number of annual cases. Subgroup analyses indicate that increases appear to be most robust among elderly individuals (aged >65 years), men, and non-Hispanic blacks. Attempting to pinpoint underlying causes for these alarming trends, the investigators adjust for changes in demographics, parallel increases in known AKI precipitants including acute heart failure, sepsis, and critical illness, and more liberal application of cardiac catheterization. Yet the aggregate effect of these factors only account for a fraction of the observed increase in rates of dialysis-requiring AKI. Of importance, the authors demonstrate that although the human toll of this disease has risen proportionally to the increase in incidence (as reflected in absolute number of hospital deaths), the individual risk for death during hospitalization appears to be modestly decreasing.

Hsu and colleagues should be commended for effectively examining and updating national trends in AKI among hospitalized patients. The use of reimbursement-linked procedure codes, although perhaps not fully validated, nevertheless likely captured the main outcome with high fidelity and low misclassification. Coupling findings to US Census data also allows for further estimates of the population-based incidence of disease, thus helping to frame the important public health implication of these findings.

Results from this study are congruent with earlier signals that dialysis is being more frequently applied to support patients with AKI.⁴ Although the reasons for this trend are incompletely understood, the authors' current and previous findings suggest that the observed increases are not completely attributable to rising inpatient acuity or changes in coding practices. It is notable that a previous study using a similar dataset also revealed continuing declines in mortality from as high as 41.3% in 1988 to 28.1% in 2002,⁴ which decreased further to 23.5% by 2009 in this study. However, attributing the magnitude of such an improvement to a revolution in