HEALTH AND HEALTH CARE INEQUITIES, INFECTIOUS DISEASES AND SOCIAL FACTORS

Edited by Jennie Jacobs Kronenfeld

RESEARCH IN THE SOCIOLOGY OF HEALTH CARE

VOLUME 39

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EDITED BY

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PART 1

COVID-19-RELATED PAPERS

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INTERSECTIONS OF HEALTH INEQUITIES, COVID-19, AND KIDNEY DISEASE CARE IN 2020

Nancy G. Kutner

ABSTRACT

Purpose: *In the context of US kidney disease care in 2020, this chapter highlights challenges of managing COVID-19–related acute pathology, sustaining safe chronic dialysis treatment for individuals with kidney failure during a pandemic, and identifying ways to effectively address intersections of race/ethnicity, SES, and health.*

Methodology/Approach: *Medical literature and American Society of Nephrology (ASN) online member forum review, and Emory School of Medicine Renal Grand Rounds participant observation: April 2020–March 2021.*

Findings: *Among persons infected with COVID-19, especially persons of African descent, acute kidney injury (AKI) risk was elevated and associated with need for long-term dialysis. Dialysis-dependent chronic kidney disease patients constituted a high-risk group for COVID-19 infection and hospitalization, due to underlying chronic conditions as well as required travel to clinics for multiple weekly dialysis treatments with exposure to possibly infected staff and other patients.*

Research Limitations/Implications: *Findings that are discussed are based on a limited time frame. The longer-term impact of COVID-19 for patient outcomes and for the structure of kidney disease care is a fertile area for continued study, especially in relation to broad health equity goals.*

Originality/Value of Paper: *Racial justice activism in 2020 highlighted the imperative to address socioeconomic and racially structured inequities in the*

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United States, and health equity goals and strategies that target kidney disease care have been outlined. The acute/chronic continuum of kidney disease care is a fertile area for research that is informed by the COVID-19 experience and population health inequity challenges.

Keywords: Health inequities; disease burden; chronic kidney disease; dialysis; COVID-19; care paradigms

INTRODUCTION

Persons from socioeconomically disadvantaged and minority group backgrounds have increased risk for developing both acute and chronic health conditions. Kidney disease is a prominent example. Diabetes and hypertension are chronic conditions with high prevalence among disadvantaged and minority persons, and these conditions are in turn closely associated with the development of both acute kidney injury (AKI) and chronic kidney disease (CKD). AKI is an abrupt decline in kidney function that typically requires patients to be supported by renal replacement therapy (RRT) in a critical care setting. CKD is defined by laboratory measured levels of kidney function damage and reduction. In advanced stages CKD may progress to kidney failure, and patient survival then depends on undergoing chronic dialysis treatment or receiving a successful kidney transplant.

The largest component of the US kidney failure population, approximately 500,000 patients in 2020, receives chronic hemodialysis (HD) at one of the 7,500 + outpatient clinics, or centers, in the United States; characteristics of center HD patients are summarized in Table 1. Individuals who develop CKD and kidney

Table 1. US Center Hemodialysis Population Characteristics.

	December 31, 2017 US Point Prevalent Center Hemodialysis Population (n = 458,729)[a]
Age ≥65, %	44.7
Male, %	55.7
Race, %	
White	55.1
Black/African American	37.8
Other	
Native American	1.5
Asian	5.0
Other (Native Hawaiian, Other Pacific Islander, multi-racial, other)	0.6
Hispanic, %	17.1
Primary D (C) for Kidney D, %	
Diabetes	45.2
Hypertension	28.8

[a]*Source:* 2019 Annual Data Report, US Renal Data System (www.usrds.org). (Annual Reports present summary data available as of the calendar year ending 2-years prior.)

failure have lower educational status compared with the overall population (Tripathy et al., 2020). Federal coverage of the costs for treatment of kidney failure (dialysis and kidney transplantation) has been in place in the United States since passage of a designated End Stage Renal Disease Medicare entitlement in 1972, which essentially provided disease-specific population-wide access to treatment.

With the emergence of coronavirus disease 2019 (COVID-19) infections in the United States in early 2020, the kidney disease community quickly became very anxious about implications for increased morbidity and mortality risks and about promptly identifying and implementing appropriate care strategies for persons with COVID-related AKI and for dialysis-dependent CKD patients. This chapter reviews concerns about care for these patient populations that dominated the professional kidney disease literature and online forum communications following the emergence of COVID-19. An additional area of heightened attention, magnified by the 2020 convergence of COVID-19 with racial justice activism, is the perceived obligation of the professional community to acknowledge and confront socioeconomic and racially structured inequities in kidney disease risk and care. Although African Americans comprise just 13% of the US population, they make up one-third of persons who experience kidney failure. Major COVID-19–associated challenges for kidney disease patient care and policy are addressed in the following sections:

(1) Estimating COVID-19 escalation of health risks in vulnerable persons
(2) Mobilizing science to interpret and manage newly observed acute pathology
(3) Adapting/expanding chronic care paradigms
(4) Acknowledging/addressing health inequities in kidney disease risks and outcomes

RISK ESCALATION: COVID-19/KIDNEY DISEASE INTERSECTIONS

Early patient observation suggested that diabetes, hypertension, and cardiovascular disease were the leading risk factors for experiencing severe COVID-19 illness. However, as the disease spread across the globe, information became available from large populations, with greater granularity on risk factors. Analysis of data from >17 million adults with almost 11,000 COVID-19–related deaths, using a health analytics platform covering 40% of all patients in England, indicated that kidney disease was an important risk factor for COVID-19 death. Dialysis-dependence and CKD levels approaching kidney failure were found to be two of the four conditions associated with the highest mortality from COVID-19 (ERA-EDTA, 2021).

Among Medicare beneficiaries age 65 and older in the United States, CKD was shown to be the second most frequent condition associated with older adults' chances of dying from COVID-19. In order, these conditions were: sickle cell disease, CKD, leukemias and lymphomas, heart failure, diabetes, cerebral palsy,

obesity, lung cancer, and heart attacks (Dun et al., 2020). As of April 2020, US data indicated that 2,738 patients on dialysis had tested positive for COVID-19 and that 305 patients on dialysis had died from the virus (KCER, 2020). Rates of complication and mortality continued to be elevated as of early 2021, although, as in the general population, estimates of COVID-19 incidence in dialysis-dependent kidney patients were closely linked with disease spread in the larger community and were influenced by infection precaution measures specific to communities and treatment locations (e.g., Bruchfeld, 2021; Rodríguez-Espinosa, Jesús Broseta, Cuadrado, & Maduell, 2020).

COVID-19/AKI EMERGENT PATHOPHYSIOLOGY: WHAT IS THE SCIENCE?

Although predominantly a respiratory infection, COVID-19 was found to frequently result in multisystem disease. Kidney involvement was common in persons who developed moderate to severe COVID-19, with AKI being a severe complication of COVID-19 occurring in temporal association with respiratory failure. As noted above, AKI involves an abrupt reduction in kidney function that may require emergency RRT. Risk of mortality increases with the severity of AKI and need for RRT (Batlle et al., 2020; Kuehn, 2020; Palevsky, 2021). Hospitals providing both maintenance dialysis and critical care were challenged to balance dialysis equipment, nurse and technician personnel, and personal protective equipment (PPE) resources to simultaneously address acute and chronic patient care needs within their system (McAdams, Ostrosky-Frid, Rajora, & Hedayati, 2021; Palevsky, 2021).

Heightened understanding of the etiology of AKI and modifiable contributors has become an increasing focus of attention among kidney professionals in recent years. COVID-19–associated AKI generated new questions about etiology, especially the potential contribution of direct viral involvement; PubMed included more than 800 publications in 2020 that focused on COVID-19 and AKI (Batlle et al., 2020). SARS-CoV-2, the virus that causes COVID-19, infects the lung and small intestine, but it was unclear whether it infects kidney cells. Evidence that it does infect kidney cells became evident from the kidneys of patients dying of COVID-19. Whether kidney cells commonly become infected in more moderate COVID-19 cases, and whether direct infection of kidney cells is a significant contributor to the AKI often seen in the disease, remain unknown. A study of US veterans hospitalized with COVID-19 showed that 32% developed AKI, with many not fully recovering kidney function by discharge, and Black individuals had increased risk for developing AKI during hospitalization and also for increased risk for resulting mortality (Bowe et al., 2021).

The inquiry that is stimulated by novel pathologies fosters scientific advance (e.g., Friedman, 2021), and AKI is viewed as having multiple implications for medical science. According to Siew and Birkelo (2020, p. 1383), the prevalence of AKI in COVID-19 has "raised important questions regarding the underlying pathophysiology of kidney damage, treatment, resource management, and its

public health consequences…With a staggering amount remaining to be learned, taking up this gauntlet will require leveraging the tools developed over the past 2 decades to refine our phenotyping of AKI in this disease, understand its molecular mechanisms, identify modifiable risk factors and novel treatments, and reduce the long-term implications on kidney health…"

Uncertainty is a pervasive aspect of medical practice, "whether a physician is defining a disease, making a diagnosis, selecting a procedure, observing outcomes, assessing probabilities, assigning preferences, or putting it all together…" (Eddy, 1984, p. 75). Physicians who care for persons with kidney disease show keen interest in the details of challenging cases, especially when there is an acknowledged "high level of uncertainty" about "ideal" management (Glassock, 2017). Interpreting and addressing uncertainty takes on enhanced urgency within a context of infectious and chronic disease convergence, especially in a patient population that is already at increased risk for adverse morbidity and mortality outcomes.

Racial disparities are evident among COVID-infected persons in the risk for experiencing AKI, as Bowe et al. (2021) showed for hospitalized veterans. Similarly, a study of 5,449 persons hospitalized with COVID-19 in metropolitan New York reported that, after accounting for underlying health conditions, mechanical ventilation, and use of vasoactive medications, Black race was associated with 23% greater odds of experiencing AKI (Hirsch et al., 2020). Observed racial and ethnic differences in kidney disease risk contribute prominently to scientific inquiry regarding the association of AKI with COVID-19. Williams (2012) observed that the disproportionate share of chronic disease that is concentrated among minority groups generates biomedical research interest to a large extent because of what race and ethnic differences may reveal about disease processes and clues to genetic contributors.

Consistent with Williams' insights, case reports in the kidney disease literature have documented COVID-19-associated kidney function decline in the setting of the high-risk APOL1 genotype, the same genetic variants that predispose Black patients to high rates of several kinds of nondiabetic kidney disease. Biopsies conducted with AKI patients have revealed collapsing glomerulopathy, a distinct form of glomerular injury that has been associated with other viruses, including HIV (Shetty et al., 2021). (*Glomerulopathy* is a set of diseases, inflammatory or noninflammatory, affecting the glomeruli of the nephrons that make up the kidney.) The excerpts below illustrate physicians' online discussion of kidney damage observed in patients of African ancestry and high-risk APOL1 genotype who were infected with SARS-CoV-2. Physician observations in their online ASN Open Forum 2020 communications illustrated not only the writers' concerns with the diagnostic and management challenges of patients presenting with collapsing glomerulopathy, but also the writers' keen interest in the related science and the potential links with genetic differences associated with race:

> I just saw a patient who is a 58-year-old African male from the Congo but has been living in the US for 30 years. Overall healthy but has history of hypertension. Tested positive for COVID 19 around 20 days back. Initially stayed at home for few days but then became hypoxic and

admitted to the hospital. Biopsy showed collapsing glomerulopathy. Renal function has slowly started recovering. My questions include: This is such a new entity. Any role of steroids or just wait and watch? Anyone had success in using immunosuppressants? In addition, COVID being a hypercoagulable state I have started him on low-dose Eliquis. Not sure how long should I keep doing that? If anyone has had a similar case, what's the prognosis like?

PS: I have read a few case reports where it seems to be a newly emerging entity in patients of sub-Saharan descent. And apparently it's linked with APOL1 mutation.

We have published 3 cases: First patient was a young African-American female with no co-morbidity and a second one with baseline CKD. Both had high-risk alleles for APOL1, both required dialysis and had recovery in 2–3 months. Per pathology, the prognosis was poor…It is a two-hit theory–has APOL1, and interferon surge was the 2nd hit. The third patient had HIV, baseline CKD, and developed acute kidney injury and nephrotic syndrome. He is still dialysis-dependent…

We have observed similar findings in several transplant recipients with COVID, majority of African-American descent. Most of them have recovered renal function, and proteinuria has diminished remarkably within few weeks of subsiding COVID infection without the addition of high dose steroids…

I just did a biopsy on a 14-year-old African-American young man; biopsy showed collapsing variant of glomerulopathy. No history of COVID but his serology showed that he was COVID positive…

Most persons who survive COVID-19-associated AKI regain kidney function, but it has been estimated that up to 30% may remain on dialysis at hospital discharge. A very important concern for the kidney community is whether AKI as a sequela of COVID-19 will increase the prevalence of CKD and, in turn, the number of patients who may require ongoing maintenance (chronic) dialysis (Nugent et al., 2021; Winkelmayer, Khairallah, & Charytan, 2020). The role of race in this outcome is a central question for continued study.

ADAPTING CHRONIC CARE PROTOCOLS: INSIGHTS GAINED?

In the US population, older persons and those at increased risk due to chronic health conditions were strongly advised to quarantine themselves to minimize their exposure to COVID-19 infection. However, dialysis-dependent patients typically must undergo treatment at their dialysis clinic three times a week, where they are in close proximity to other patients and staff for at least four hours at a time. Dialysis centers do have long-standing experience with infection control measures, including isolating patients with hepatitis, but dialysis clinics had to incorporate multiple strategies in the effort to reduce COVID-19 risks to patients and staff.

Frequent screening of dialysis patients for COVID-19 symptoms was a priority (Weiss, Bhat, Fernandez, Bhat, & Coritsidis, 2020), especially in geographic locations with a high prevalence of community transmission. Swabbing all patients was recommended, followed by moving any symptomatic individuals (regardless of test positivity/negativity) to a dedicated COVID-19 shift, as well as informing patients' families (or their retirement/long-term care residence) of their