

The Economic Burden of Chronic Kidney Disease and End-Stage Renal Disease



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Summary: The growing prevalence and progression of chronic kidney disease (CKD) raises concerns about our capacity to manage its economic burden to patients, caregivers, and society. The societal direct and indirect costs of CKD and end-stage renal disease are substantial and increase throughout disease progression. There is significant variability in the evidence about direct and indirect costs attributable to CKD and end-stage renal disease, with the most complete evidence concentrated on direct health care costs of patients with advanced to end-stage CKD. There are substantial gaps in evidence that need to be filled to inform clinical practice and policy.

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With the increasing prevalence of chronic kidney disease (CKD) and end-stage renal disease (ESRD), the economic burden of CKD is a growing concern to patients, their caregivers, and payers. Significant health care costs are incurred annually to manage the clinical complexities of patients with CKD and ESRD, including costs associated with the detection and management of CKD, ESRD treatment, and simultaneous management of comorbid conditions (eg, diabetes, congestive heart failure, and hypertension). Furthermore, these conditions cause significant productivity losses for patients and their caregivers in terms of absenteeism, presenteeism (ie, attending work while ill), and premature death. In this article, we summarize the economic burden of CKD and ESRD from a societal perspective and identify numerous research gaps in the evidence about the economic burden over the span of the disease continuum. We consider the impact of CKD and ESRD from a societal perspective, which considers the economic burden on patients and their caregivers,

employers, private payers, and public payers (eg, state and federal government) in the United States (US). Finally, we identify gaps in knowledge that, if addressed, would inform future clinical and policy interventions.

PRINCIPLES OF MEASURING THE ECONOMIC BURDEN OF CKD

Economic evaluation of health conditions principally considers two types of costs: direct and indirect. Direct costs reflect the value of all goods, services, and other resources consumed in the provision of interventions or in dealing with the side effects as well as the current and downstream consequences of disease.¹ From a societal (or social) perspective, this refers to time and financial costs incurred by patients, their caregivers, employers, and payers (private and public). Direct costs can be either health care–related (eg, medications, hospital stay) or non–health-care–related (eg, child care, sneakers, or weight loss program membership). As shown in [Table 1](#), some direct costs likely intensify and others diminish as CKD and ESRD progress.

Indirect costs reflect productivity losses related to illness or death, which typically are considered in terms of absenteeism and presenteeism.¹ Indirect costs are likely to be more pronounced among patients with greater morbidity and disability in the late to end stages of kidney disease, when paid employment decreases, disability payments increase, and patients' needs for caregiver support increase. Given the higher mortality rate in the CKD population compared with the general population, mortality-related indirect costs (eg, lost productivity as a result of death) also are substantial. Unlike many chronic conditions whose treatments have improved and enable patients with these conditions to live longer and more productive lives, many extant CKD and ESRD treatments (beyond kidney transplant) do not substantially improve patient productivity.

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Table 1. Sample Direct and Indirect Costs and Expected Magnitude, by Stage of Disease

Description of Costs	CKD Stage					ESRD
	1	2	3	4	5	
Direct costs						
Medical						
Diagnostic screening, imaging	●	●	●	●	●	●
Physician office visits	●	●	●	●	●	●
Laboratory tests	●	●	●	●	●	●
Medication	●	●	●	●	●	●
Vaccines	●	●	●	●	●	●
Hospitalization	●	●	●	●	●	●
Predialysis surgery (access placement)					●	●
Dialysis					●	●
Transplantation					●	●
Nonmedical						
Transportation	●	●	●	●	●	●
Informal caregiving	●	●	●	●	●	●
Indirect costs						
Presenteeism (eg, reduced work performance)	●	●	●	●	●	●
Absenteeism (eg, work missed, sick days)			●	●	●	●
Productivity loss as a result of disability			●	●	●	●
Productivity loss as a result of premature death	●	●	●	●	●	●

Thus, disability among patients with CKD and ESRD also has significant implications for indirect costs.

In the literature, three related constructs represent costs including charges, reimbursements, and costs.² *Charges* refer to the list price requested by a health care provider, which typically exceeds the true cost of delivering a health care product or service. *Costs* refer to the true cost to health care providers of delivering health care products or health care services, which rarely is known by patients or payers (eg, Centers for Medicare and Medicaid Service). *Reimbursement* (also referred to as *expenditure*) refers to the payment to a health care provider for a health care product or service, which is often an amount above the cost and below the charge. Two of these related constructs—reimbursement and costs—sometimes are used interchangeably. In this article, the term *cost* implicitly refers to reimbursement in nearly all cases.

CHALLENGES IN ESTIMATING THE ECONOMIC BURDEN OF KIDNEY DISEASE

In principle, the factors influencing the direct and indirect costs of kidney disease include the incidence and prevalence of disease, the use of costly therapeutic modalities and care management strategies, CKD-attributable morbidity (eg, existing comorbid conditions, new conditions arising from CKD-associated complications, and hospitalization) and disability, and premature death. Variation in the evidence base about these influencing factors presents several challenges to

the precise estimation of the full economic burden of kidney disease, which we describe here.

Low Rates of Identification and Recognition of CKD

Estimates of CKD prevalence in the US are likely to be conservative because of limited systematic surveillance to identify CKD and inconsistent claims data (eg, diagnostic and billing codes) or electronic health record data (eg, estimated glomerular filtration rate) to quantify clinically recognized CKD, especially for patients in the early and advanced stages of disease.^{3,4} If the true prevalence of CKD is greater than current estimates, published cost estimates likewise are underestimated because they exclude costs for patients with unrecognized disease.

Difficulty Attributing Costs to CKD

Care of patients with CKD involves multiple types of clinicians and the difficulty in attributing costs to CKD is compounded by the co-management of multiple chronic conditions. For instance, many patients receive CKD care by their primary care physician (91%), cardiologist (62%), or their nephrologist (31%) within 1 year of CKD diagnosis.⁵ Furthermore, clinical management frequently co-occurs with management of cardiovascular disease (CVD), diabetes mellitus (DM), stroke, infection, and other comorbidities, which greatly complicates the attribution of health care costs specifically to CKD-related care.⁵

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