

6-30-2021

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Recommended Citation

Rangaswami, Janani, "Closing gaps in the care of patients with heart-kidney disease: the time is now." (2021). *Department of Medicine Faculty Papers*. Paper 306.

<https://jdc.jefferson.edu/medfp/306>

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Closing gaps in the care of patients with heart-kidney disease: the time is now

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DOI:10.31083/j.rcm2202029

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Submitted: 5 March 2021 Accepted: 5 March 2021 Published: 30 June 2021

Keywords

Cardiorenal; Cardiovascular disease; Chronic kidney disease; Heart failure

As early as in 1836, Sir Richard Bright highlighted the intricate link between heart and kidney function, making astute observations about a myriad of structural changes in the hearts in patients with shrunken kidneys [1]. Since that notation in the literature, the field of cardiorenal medicine has seen major developments in defining mechanisms of heart-kidney cross talk, based on a strong foundation of physiological experiments in the early 1900s, that have set the stage for our current understanding of the pathophysiology of cardiorenal syndrome via hemodynamic, inflammatory and maladaptive neurohormonal pathways [2]. These observations were further studied and validated in clinical settings and have formed the basis for phenotyping cardiorenal syndrome (CRS) into subtypes based on the “primum movens” of the disease (heart vs kidney), acuity of the syndrome and the presence or absence of systemic multi-organ involvement [3]. In parallel, the field of cardio-renal disease has extended beyond the syndrome itself which centrally revolves around the kidneys’ response to the failing heart, to the study of all phenotypes of cardiovascular disease in patients with kidney disease including coronary artery disease, valvopathies and arrhythmias, healthcare resource utilization, economics and precision medicine profiling of patients with dual heart and kidney disease. This expanded scope has been inevitable, given the increasing prevalence of vascular risk factors such as diabetes, hypertension and obesity which form the common soil for the development and maintenance of cardiovascular and kidney disease. The rapidly expanding scope of cardiorenal medicine now involves early risk mitigation (primordial as well as primary prevention), aggressive secondary prevention, cardiorenal therapeutics in the high-risk patient such as dialytic therapies in patients with left ventricular assist devices and emphasis on patient and caregiver involvement in decision-making, as part of a multidisciplinary care approach with emphasis on personalized goals and quality of life. Su-

perimposed on the existing landscape of cardio-renal disease, the added burden imposed by COVID-19 has brought the current limitations of health care delivery, sub-optimal cardiorenal risk factor control and care fragmentation in patients with complex cardiorenal disease to the forefront, highlighting the urgent need for an overhaul towards our approach to optimizing care in these vulnerable patients [4].

In this context, this special issue of *Reviews in Cardiovascular Medicine* brings together several leading thought leaders in cardiology and nephrology, who have converged their expertise across several key topics of interest, making this collection of articles timely, relevant and practice changing. Several takeaway messages from this collection are worth an in-depth read to solidify the understanding of the importance of a multidisciplinary approach to key controversies and concepts in the cardiorenal space.

Heart-kidney hemodynamics and the nuances of disease modifying therapies in CRS occupy forefront attention with the manuscripts by Kazory A and Costanzo MR describing the role of chloride as a cardiorenal connector, prognostic marker and potential therapeutic target [5]. Toroghi HM. *et al.* [6] describe the use of newer predictors of kidney function in patients with heart failure with preserved ejection fraction such as pulmonary artery capacitance. This sheds light on the utility of newer markers of right ventricular function as potential options for kidney function prognostication across the spectrum of heart failure irrespective of ejection fraction and may have implications on selection of guideline directed medical therapies (GDMT) for these patients. The maintenance, up-titration and de-escalation of renin angiotensin system inhibitors is a subject of clinical uncertainty in real world practice with differing practice patterns between cardiology and nephrology. To that end, the review by Singhania G *et al.* on the continuation of renin angiotensin system inhibitors (RASi) in patients with acute heart failure (AHF) is an important contribution to the literature and emphasizes the need to ensure that vulnerable patients with AHF benefit from the continuation of GDMT, as well as appropriate decongestive therapies. Along the same vein, the manuscript by Lo KB *et al.* [7] describes RASi usage patterns in AHF with

data from right heart catheterizations delineating hemodynamic profiles in these patients and confirming the deleterious effects of persistent congestion and withdrawal of RASi in the setting of AHF, which include high rates of inpatient mortality as well as 6-month HF re-admissions. The management of HF in patients with ESKD assumes a higher level of complexity with challenges towards ascertaining an accurate diagnosis, implementing GDMT with limited high-quality data given exclusion of these patients from major RCTS in HF, and focusing on patient goals and quality of life. In their detailed review on this topic, Joseph MS *et al.* [8] bring out the nuances on the diagnosis and management of heart failure (HF) in ESKD using a practical and data driven approach, which will undoubtedly be an extremely valuable resource to cardiologists and nephrologists caring for these high-risk patients.

The importance of CKD as an independent risk factor for coronary artery disease (CAD) has been well delineated in the literature. However not much attention is paid to the high burden of coronary microvascular dysfunction in patients with CKD. In their manuscript on accelerated and intensified calcific atherosclerosis and microvascular dysfunction in patients with CKD, Fakhry M. *et al.* [9] elegantly describe the pathophysiological processes that drive the accelerated and disproportionate burden of CAD in CKD with emphasis on future areas for study in microvascular dysfunction. Finally, the importance of insulin resistance as a key element contributing to the elevated cardiovascular disease risk in CKD and glomerular hyperfiltration and the utility of high sensitivity troponin assays in CKD by Adeva-Andany M. *et al.* and Chuang A. *et al.* [10] respectively are reflective of the emerging role of biomarkers of cardiorenal disease that will help shape our understanding of the complex cross talk between the heart and kidneys in the future.

In summary, this special issue of the Reviews in Cardiovascular Medicine provides a panoramic view of current concepts and future directions in cardiorenal medicine, across several interfaces of heart-kidney disease. The contributing authors are to be congratulated for their valuable contributions to this effort, which will help integrate these practice changing data into clinical care, resulting in optimal and coordinated multidisciplinary care for vulnerable patients with cardio-renal disease.

Ethics approval and consent to participate

Not applicable.

Acknowledgment

Not applicable.

Funding

This study received no external funding.

Conflict of interest

The author declares no conflict of interest.

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