


Mission and 1-Year Outcomes of a Cardiorenal Subspecialty Consultation Service

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The population of patients with, or at risk for, concomitant kidney and heart disease, often termed “cardiorenal” disease, is large and continues to grow. Numerous studies have documented excess mortality risk and significant morbidity in this patient subpopulation (1,2). The interaction of kidney and heart disease leads to unique pathophysiology, disease manifestations, and treatment, necessitating specialized care that may not be addressed adequately by either cardiology or nephrology alone (3). Further, recent advances in kidney and cardiovascular technologies and devices have made the care of these patients increasingly complex (4,5). Together, there is a pressing, unmet need to develop specialized models of care for patients with combined kidney and heart disease (6,7).

In response, the University of Washington (UW) launched the Kidney-Heart Service in August 2020. The UW is a large academic medical center in Seattle, WA, which serves as a catchment area for persons in a five-state region (Washington, Wyoming, Alaska, Montana, and Idaho). The UW Kidney-Heart Service functions as a specialized, inpatient consultation service, staffed by three dedicated nephrologists, based at the UW System’s quaternary care university hospital, the UW Medical Center (UWMC). UWMC is the primary site for care of the most complex intensive cardiology care, including heart transplantation, cardiac device implantation, and cardiothoracic surgery. In this study, we present the clinical, education, and scholarship missions of this new service and 1-year outcomes.

Clinical Mission and Outcomes

The clinical mission of the UW Kidney-Heart Service is to provide exceptional, coordinated, multidisciplinary care for patients hospitalized with concomitant kidney and heart disease, thereby improving patient outcomes and optimizing utilization of resources. To achieve this goal, the service has prioritized consultation for patients admitted to cardiology or cardiothoracic services, or intensive care unit teams.

In just the first year, we have launched several key clinical initiatives. We have developed effective and streamlined communication strategies between the UW Kidney-Heart Service and Cardiology/Cardiothoracic Surgery Inpatient Services. All attendings on the UW Kidney-Heart Service have trained in point-of-care ultrasound, and have incorporated this practice into routine clinical decision making. In collaboration with our cardiology colleagues, we also have revised, updated, and promoted wider use of their evidence-based diuretic algorithm, which was developed to improve diuretic efficacy, reduce rates of diuretic resistance, decrease the risk of AKI and need for dialysis, and reduce length of stay (Supplemental Figure 1). This updated algorithm expands objective measures of diuretic efficacy to include assessment of urinary sodium excretion, expands its stepped approach to intensifying diuretics, and targets the selection of adjuvant diuretics on the basis of serum electrolyte and albumin levels. The updated algorithm also incorporates the use of novel approaches to volume management, such as hypertonic saline.

Although early, the initial results of these clinical initiatives are promising. Admissions and readmissions for acute decompensated heart failure are among the most common causes for hospitalizations in the United States; therefore, reducing frequency and improving outcomes associated with heart failure hospitalizations is a public health priority (8,9). AKI frequently complicates these hospitalizations and is associated with poor clinical outcomes and higher resource utilization (10). Between August 2020 and July 2021, approximately 44% of all patients hospitalized at UWMC with heart failure, and 82% of patients admitted to intensive care with heart failure, had AKI. Before the launch of the Kidney-Heart Service, and consistent with published data, patients admitted to UWMC with heart failure who developed AKI had three times the length of stay, a 3–4 higher rate of in-hospital death, and significantly higher rates of readmission within 30 days, as compared with patients with heart failure without AKI (Table 1). In the first 12-month period since the launch of the UW Kidney-

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Table 1. 1-year outcomes before (pre) and after (post) launch of the UW Kidney-Heart Service in patients hospitalized with heart failure, stratified by the presence or absence of concomitant AKI

Population/Fiscal Year	Total Discharges	Average Length of Stay, d	Inpatient Dialysis, %	30-Day Readmission Rate, %	In-Hospital Death Rate, %
Heart failure with AKI					
1-year pre–Kidney-Heart Service	691	17.1	11	21	13
1-year post–Kidney-Heart Service	713	14.4	9	22	16
Heart failure without AKI					
1-year pre–Kidney-Heart Service	877	5.8	0	13	3
1-year post–Kidney-Heart Service	985	5.1	0	14	3

Heart Service, a 3-day reduction in average length of stay in patients with heart failure and AKI was observed, compared with the previous 12-month period. Importantly, this reduction in length of stay did not lead to an increase in 30-day readmission rates. There was also a modest decline in the rates of inpatient acute dialysis in the 12 months after launch of the UW Kidney-Heart Service. We did observe a modest increase in hospital death rate; the reason for this is unclear and may be related to the coronavirus disease 2019 pandemic, or to possibly greater overall illness severity among patients hospitalized during this period. By contrast, there were no significant changes in length of stay, readmission rate, or death rate in patients with heart failure without AKI (Table 1). Although encouraging, these early preliminary data need to be verified over a longer period after the launch of the UW Kidney-Heart Service, and in the post coronavirus disease era.

Educational Mission and Outcomes

The educational mission of the UW Kidney-Heart Service is to provide educational opportunities for specialized training in the care of patients with kidney and heart disease. To fulfill this mission, we developed a specialized curriculum that includes core topics, such as volume and hemodynamic assessment, physiology of diuretic resistance, diuretic pharmacokinetics and management, cardiorenal physiology, kidney disease in patients with durable and nondurable mechanical circulatory support, electrolyte disorders, and acid-base disorders. We also introduced core cardiorenal lectures to the nephrology fellow Accreditation Council for Graduate Medical Education didactic series. Finally, both nephrology and cardiology fellows rotate on the service, allowing for crossdisciplinary training.

Scholarship Mission and Outcomes

The scholarship mission of the UW Kidney-Heart Service is to build a foundation to advance quality improvement and research in cardiorenal diseases. We have made several important strides to achieve this mission. First, we are collecting longitudinal electronic medical record data on patients seen by the Kidney-Heart Service, and tracking their in-hospital outcomes. Second, patients seen by the

service are recruited directly into several research studies. For example, we have recently received funding for a National Institutes of Health R01 “Kidney Injury in Patients with Acute Decompensated Heart Failure” and a National Institutes of Health Administrative Supplement to study bioethical issues in patients admitted with acute decompensated heart failure and acute kidney injury (principal investigator: Bansal). We believe the UW Kidney-Heart Service will continue to inspire and support scholarship to advance care of patients with kidney and heart disease.

In summary, the UW Kidney-Heart Service is an innovative model to advance clinical care, education, and scholarship in cardiorenal disease. With the increasing complexity of disease and therapeutic options, integrated and subspecialty nephrology care models should be considered at other institutions across the United States.

Disclosures

D. Mariuma reports having an ownership interest in Amazon. J. A. Jefferson reports receiving research funding from Novartis; and reports receiving honoraria from Uptodate. N. Bansal reports having an advisory or leadership role as *Kidney360* Associate Editor. All remaining authors have nothing to disclose.

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Author Contributions

N. Bansal and S. Shankland conceptualized the study; N. Arora, N. Bansal, J. Jefferson, D. Mariuma, K. O'Brien, and S. Shankland were responsible for the data curation; N. Bansal and S. Shankland were responsible for the formal analysis, the investigation, the methodology, and wrote the original draft; N. Bansal was responsible for the project administration; N. Arora, N. Bansal, J. Jefferson, D. Mariuma, K. O'Brien, and S. Shankland reviewed and edited the manuscript.

Supplemental Material

This article contains the following supplemental material online at <http://kidney360.asnjournals.org/lookup/suppl/doi:10.34067/KID.0000602022/-/DCSupplemental>.

Supplemental Figure 1. UW HEART FAILURE IV Diuretic Protocol.

References

1. Go AS, Chertow GM, Fan D, McCulloch CE, Hsu CY: Chronic kidney disease and the risks of death, cardiovascular events, and hospitalization. *N Engl J Med* 351: 1296–1305, 2004 <https://doi.org/10.1056/NEJMoa041031>
2. Rangaswami J, Bhalla V, Blair JEA, Chang TI, Costa S, Lentine KL, Lerma EV, Mezue K, Molitch M, Mullens W, Ronco C, Tang WHW, McCullough PA; American Heart Association Council on the Kidney in Cardiovascular Disease and Council on Clinical Cardiology: Cardiorenal syndrome: Classification, pathophysiology, diagnosis, and treatment strategies: A scientific statement from the American Heart Association. *Circulation* 139: e840–e878, 2019 <https://doi.org/10.1161/CIR.0000000000000664>
3. House AA: Cardiorenal syndrome: Introduction. *Clin J Am Soc Nephrol* 8: 1798–1799, 2013 <https://doi.org/10.2215/CJN.06030613>
4. Ross DW, Stevens GR, Wanchoo R, Majure DT, Jauhar S, Fernandez HA, Merzkani M, Jhaveri KD: Left ventricular assist devices and the kidney. *Clin J Am Soc Nephrol* 13: 348–355, 2018 <https://doi.org/10.2215/CJN.04670417>
5. Jentzer JC, Bihorac A, Brusca SB, Del Rio-Pertuz G, Kashani K, Kazory A, Kellum JA, Mao M, Moriyama B, Morrow DA, Patel HN, Rali AS, van Diepen S, Solomon MA; Critical Care Cardiology Working Group of the Heart Failure and Transplant Section Leadership Council: Contemporary management of severe acute kidney injury and refractory cardiorenal syndrome: JACC Council perspectives [published correction appears in *J Am Coll Cardiol* 77: 107–109, 2021]. *J Am Coll Cardiol* 76: 1084–1101, 2020 <https://doi.org/10.1016/j.jacc.2020.06.070>
6. Hatamizadeh, P: Introducing nephrocardiology. *CJASN* 17: 311–313, 2022
7. Sachdeva M, Shah AD, Singh HK, Malieckal DA, Rangaswami J, Jhaveri KD: Opportunities for subspecialization in nephrology. *Adv Chronic Kidney Dis* 27: 320–327.e1, 2020 <https://doi.org/10.1053/j.ackd.2020.05.002>
8. Goldgrab D, Balakumaran K, Kim MJ, Tabtabai SR: Updates in heart failure 30-day readmission prevention. *Heart Fail Rev* 24: 177–187, 2019 <https://doi.org/10.1007/s10741-018-9754-4>
9. Virani SS, Alonso A, Aparicio HJ, Benjamin EJ, Bittencourt MS, Callaway CW, Carson AP, Chamberlain AM, Cheng S, Delling FN, Elkind MSV, Evenson KR, Ferguson JF, Gupta DK, Khan SS, Kissela BM, Knutson KL, Lee CD, Lewis TT, Liu J, Loop MS, Lutsey PL, Ma J, Mackey J, Martin SS, Matchar DB, Mussolino ME, Navaneethan SD, Perak AM, Roth GA, Samad Z, Satou GM, Schroeder EB, Shah SH, Shay CM, Stokes A, VanWagner LB, Wang NY, Tsao CW; American Heart Association Council on Epidemiology and Prevention Statistics Committee and Stroke Statistics Subcommittee: Heart disease and stroke statistics-2021 update: A report from the American Heart Association. *Circulation* 143: e254–e743, 2021 <https://doi.org/10.1161/CIR.0000000000000950>
10. Smith GL, Lichtman JH, Bracken MB, Shlipak MG, Phillips CO, DiCapua P, Krumholz HM: Renal impairment and outcomes in heart failure: Systematic review and meta-analysis. *J Am Coll Cardiol* 47: 1987–1996, 2006 <https://doi.org/10.1016/j.jacc.2005.11.084>

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