EVALUATION OF ACE/ARB/ARNI IN PATIENTS WITH HEART FAILURE ON HEMODIALYSIS

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BACKGROUND

- Angiotensin converting enzyme inhibitors (ACEi), angiotensin receptor blockers (ARBs), and angiotensin receptor and neprilysin inhibitors (ARNIs) have documented efficacy in reducing mortality and hospitalizations for patients with heart failure (HF).[2,3] However, there is little guidance for patients with HF who also receive hemodialysis.
- Heart failure medications also have a secondary effect of lowering blood pressure (BP). In conjunction with the BP lowering effect intrinsic of dialysis, patients can become severely hypotensive on certain heart failure medications.[1]
- Missing dialysis sessions can also cause accumulation of potassium in the body which when combined with some HF medications can drastically increase the risk of hyperkalemia.[1]

OBJECTIVE

- The purpose of this study was to observe if patients who had scheduled hemodialysis sessions were receiving optimal inpatient drug therapy for their heart failure.
- The primary objective of the study was observing how many patients with heart failure and hemodialysis received an ACEi, ARB, or ARNI.
- Secondary objectives include comparing incidences of hypotension, hyperkalemia, and hospital readmissions.

METHODS

Study Design

- Retrospective, observational, IRB approved, single-center review of patient medical and demographic data between admission and day seven of hospital stay.
- Inclusion Criteria: Cardiovascular-related admission (stroke, myocardial infarction, heart failure, hypertension, hypotension, atrial fibrillation), hospitalization > 48 hours, age 40-89, history or new diagnosis of heart failure, end stage renal disease on scheduled hemodialysis
- Exclusion Criteria: Patients on hospice or end-of-life care

Study Population

- Patients admitted to a 500-bed single hospital in Springfield, Illinois.

Study Measures

- The primary outcome was to determine the number of ACE/ARB/ARNI given to patients with heart failure and on hemodialysis.
- Secondary objectives were to assess safety outcomes between ACE/ARB/ARNI and other heart failure and blood pressure medications.
- Safety outcomes analyzed included: hypotension (at least one blood pressure reading < 100/60 mm Hg), hyperkalemia (K > 5.5), 30-day readmissions, and 30 to 90-day readmissions.

Data Analysis

- Data was analyzed and summarized using descriptive statistics

RESULTS

- The three most common reasons for cardiovascular hospital admission included: heart failure (25%), myocardial infarction (18%), and hypertension (18%)

RESULTS

Table 1: Baseline Characteristics

	Patients (n=100)
Gender	
Male	44 (44%)
Female	56 (56%)
Ethnicity	
White/Caucasian	82 (82%)
Black/African American	17 (17%)
Unknown	1 (1%)
Past Medical History	
History of Hypertension	91 (91%)
History of Atrial Fibrillation	37 (37%)
History of Myocardial Infarction	30 (30%)
History of Stroke/Transient Ischemic Attack	29 (29%)
History of Diabetes	69 (69%)
Heart Failure Classification	
Heart Failure with Reduced Ejection Fraction	34 (34%)
Heart Failure with Mildly Reduced Ejection Fraction	7 (7%)
Heart Failure with Preserved Ejection Fraction	59 (59%)

Table 2: Heart Failure Medications and Secondary Outcomes between ACEi[1]/ARB[2]/ARNI[3] Groups

	Patient Group				
Heart Failure Medications	No ACEi/ARB/ARNI (n=69)	ACEi/ARB/ARNI (n=31)			
Beta Blocker	54 (78%)	28 (90%)			
Loop Diuretic	26 (38%)	10 (32%)			
Aldosterone Antagonist	2 (3%)	1 (3%)			
Thiazide Diuretic	4 (6%)	0 (0%)			
Secondary Outcomes			ACEi (n=15)	ARB (n=13)	ARNI (n=3)
Hypotension	47 (68%)	18 (58%)	10 (67%)	5 (38%)	3 (100%)
Hyperkalemia	17 (25%)	9 (29%)	3 (20%)	5 (38%)	1 (33%)
30-day readmissions	21 (30%)	9 (29%)	2 (13%)	7 (54%)	0 (0%)
31 to 90-day readmissions	21 (30%)	14 (45%)	5 (33%)	7 (54%)	2 (67%)

[1]Angiotensin converting enzyme inhibitor
[2]Angiotensin receptor blocker
[3]Angiotensin receptor neprilysin inhibitor

RESULTS

Table 3: Medications and Secondary Outcomes Between Heart Failure Classification Groups

	Patient Group			
Medications	All (n=100)	HFrEF[1] (n=34)	HFmrEF[2] (n=7)	HFpEF[3] (n=59)
Angiotensin Converting Enzyme Inhibitor	15 (15%)	11 (32%)	1 (14%)	3 (6%)
Angiotensin Receptor Blocker	13 (13%)	3 (9%)	1 (14%)	9 (17%)
Angiotensin Receptor Neprilysin Inhibitor	3 (3%)	3 (9%)	0 (0%)	0 (0%)
Beta Blocker	82 (82%)	28 (82%)	7 (100%)	47 (87%)
Aldosterone Antagonist	3 (3%)	0 (0%)	0 (0%)	3 (6%)
Loop Diuretic	36 (36%)	10 (29%)	3 (43%)	23 (43%)
Thiazide Diuretic	4 (4%)	1 (3%)	0 (0%)	3 (6%)
Dihydropyridine Calcium Channel Blocker	36 (36%)	7 (21%)	3 (43%)	26 (48%)
Non-dihydropyridine Calcium Channel Blocker	13 (13%)	6 (18%)	1 (14%)	6 (11%)
Alpha-2 Agonist	6 (6%)	1 (3%)	1 (14%)	4 (7%)
Alpha-1 Antagonist	12 (12%)	0 (0%)	2 (29%)	10 (19%)
Midodrine	13 (13%)	9 (26%)	0 (0%)	4 (7%)
Secondary Outcomes				
Hypotension	65 (65%)	27 (79%)	5 (71%)	33 (61%)
Hyperkalemia	25 (25%)	7 (21%)	1 (14%)	17 (31%)
Readmissions Within 30 Days	31 (31%)	7 (21%)	3 (43%)	21 (39%)
Readmissions Between 31 and 90 Days	35 (35%)	17 (50%)	3 (43%)	15 (28%)

[1]Heart failure reduced ejection fraction
[2]Heart failure mildly reduced ejection fraction
[3]Heart failure preserved ejection fraction

CONCLUSION

- From the study population, only 31% of patients received either an ACEi, ARB, or ARNI in the hospital.
- There are opportunities to optimize patients heart failure medications in dialysis while carefully balancing these safety concerns.
- ACE inhibitors seemed better tolerated compared to ARB/ARNI for patients with HF due to lower incidences of adverse events, however, the data comparing ACEi/ARB/ARNI vs no ACEi/ARB/ARNI did not show significant benefit in incidence of hyperkalemia, or hospital readmissions.
- A greater sample of patients in the future should be utilized to acquire more data.
- The study did not account for hydralazine or isosorbide heart failure medications. Medications were only assessed during the first 7 days and did not account for home medications. Patients may not have been symptomatic when experiencing hypotension or hypokalemia

REFERENCES

1. House AA, Wanner C, Sarnak MJ, et al. Heart failure in chronic kidney disease: conclusions from a Kidney Disease: Improving Global Outcomes (KDIGO) Controversies Conference. Kidney Int. 2019 Jun;95(6):1304-1317. PMID: 31053387.
2. Heidenreich PA, Bozkurt B, Aguilar D, et al. 2022 AHA/ACC/HFSA Guideline for the Management of Heart Failure: A Report of the American College of Cardiology/American Heart Association Joint Committee on Clinical Practice Guidelines. Circulation. 2022 May 3;145(18):e895-e1032. PMID: 35363499.
3. McMurray JJ, Packer M, Desai AS, et al. Angiotensin-neprilysin inhibition versus enalapril in heart failure. N Engl J Med. 2014 Sep 11;371(11):993-1004. PMID: 25176015.