

Duration of Oral Loop Diuretics and 30-Day Readmission in Patients With Acute Decompensated Heart Failure

Benjamin Laliberte, Pharm.D.¹; Brent N. Reed, Pharm.D.²; Sandeep Devabhakthuni, Pharm.D.²; Kristin Watson, Pharm.D.²; Vijay Ivaturi, Ph.D.²; Tao Liu, B.Sc.²; Stephen S. Gottlieb, M.D.³

¹Department of Pharmacy, Massachusetts General Hospital, Boston, MA

²Department of Pharmacy Practice and Science, University of Maryland School of Pharmacy, Baltimore, MD

³Department of Medicine, University of Maryland School of Medicine, Baltimore, MD

Background

- Fluid overload is a common cause of hospitalization in patients with acute decompensated heart failure (ADHF).¹⁻⁵
- The Healthcare Cost and Utilization Project found that 25% of patients with ADHF are readmitted to the hospital within 30 days.⁶
- Practice guidelines recommend oral loop diuretics be initiated prior to discharge in order to confirm their effectiveness for patients admitted with heart failure (HF).^{1,2}
- Limited guidance is provided on how diuretics should be managed as patients approach euvolemia.
- A study of 433 U.S. hospitals found 24% of patients were administered intravenous (IV) diuretics on the day of discharge.⁷

Methods

Study Design

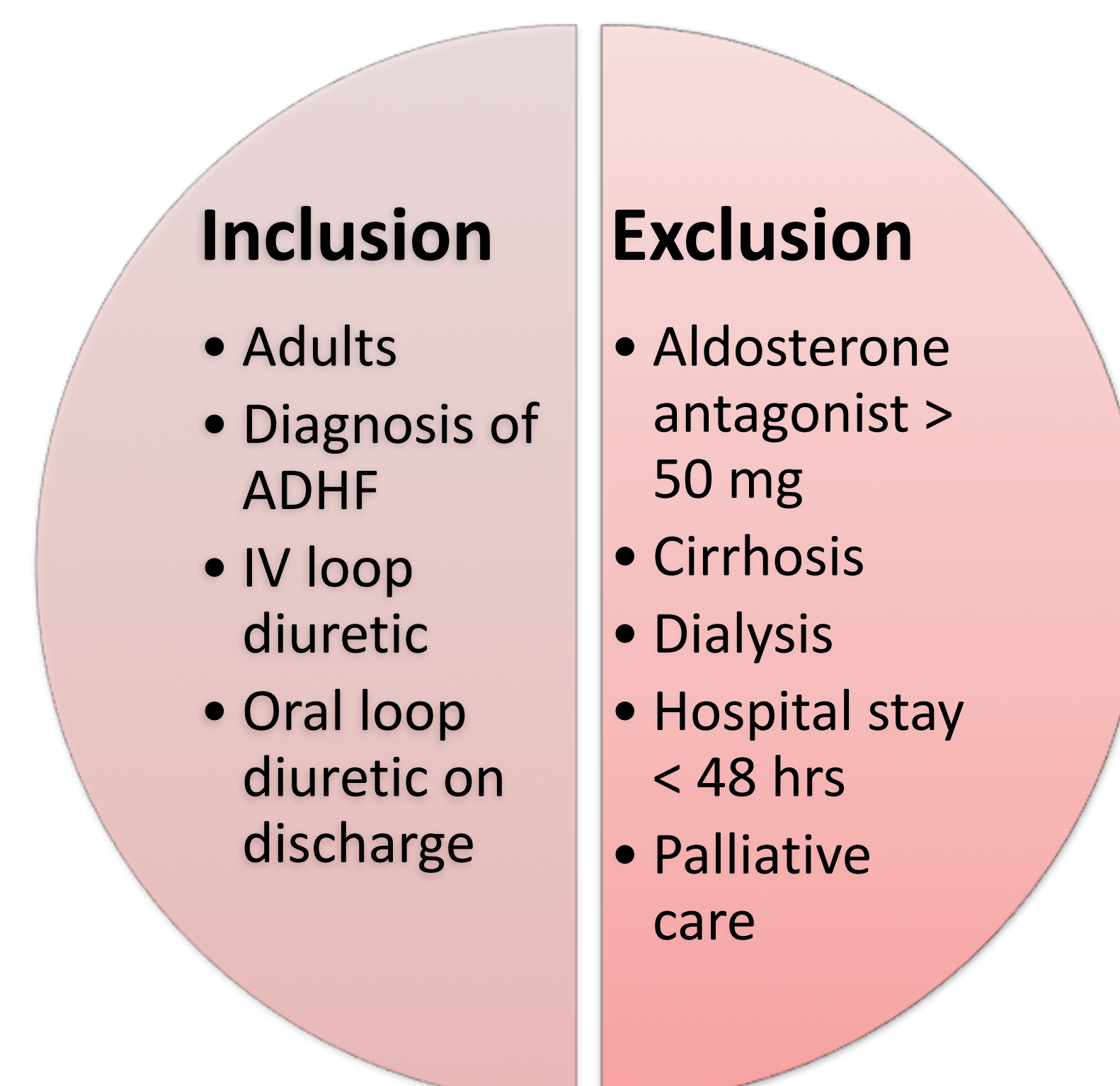
- Retrospective, single center, cohort study
- Two groups: observation on an oral loop diuretic < 24 hours versus observation on an oral loop diuretic ≥ 24 hours

Primary Objective: Determine if the duration of observation on oral loop diuretics was associated with 30-day HF readmission.

Secondary Objectives:

- 60- and 90-day all-cause and HF readmission rates
- Hospital length of stay
- Predictors of observation periods of < 24 hours duration

Figure 1. Patient Selection



Results

Table 1. Patient Characteristics	Observed < 24 hr (n = 61)	Observed ≥ 24 hr (n = 62)	P-value
Age (years)	60.8 (14.1)	56.7 (13.8)	NS
Male	41 (67.2)	45 (72.6)	NS
Black	38 (62.3)	40 (64.5)	NS
Body weight (kg)	97.5 (25.2)	98.3 (25.5)	NS
Ejection fraction	25.1 (14.7)	23.4 (15.2)	NS
Prior 30-day readmission	15 (24.6)	6 (9.7)	NS
Non-ischemic etiology	29 (47.5)	37 (59.7)	NS
NYHA Class			
II	10 (16.4)	10 (16.1)	NS
III	29 (47.5)	25 (40.3)	NS
Past medical history			
Atrial fibrillation	25 (41.0)	16 (25.8)	NS
Chronic kidney disease	26 (42.6)	27 (43.5)	NS
Coronary artery disease	31 (50.8)	28 (45.2)	NS
Diabetes mellitus	29 (47.5)	24 (38.7)	NS
Admission medications			
ACEI or ARB	33 (58.9)	26 (43.3)	NS
Beta-blocker	48 (85.7)	35 (60.3)	0.005
Aldosterone antagonist	20 (35.7)	19 (32.2)	NS
Loop diuretic	49 (78.9)	44 (70.0)	NS
IV inotrope	2 (3.4)	6 (9.8)	NS
Admission laboratories			
Sodium (mEq/L)	138.9 (5.1)	139.8 (5.6)	NS
Potassium (mEq/L)	4.1 (0.7)	4.2 (0.7)	NS
Serum creatinine (mg/dL)	1.5 (0.8)	1.7 (0.9)	NS
BUN (mg/dL)	35.6 (23.1)	37.6 (27.5)	NS
NT-proBNP (pg/mL)	11257 (9790)	10588 (9256)	NS
IV inotrope during admission	19 (31.1)	28 (45.2)	NS
≥ 1 dose of oral loop diuretic	42 (68.9)	62 (100)	<0.001
IV loop diuretic on day of discharge	26 (42.6)	0 (0.0)	<0.001
Weight change (kg)	-4.8 (4.4)	-6.8 (6.6)	NS
Time observed on oral loop diuretic (hr)	7.6 (9.1)	86 (122.2)	<0.001
Discharge medications			
ACEI or ARB	37 (60.7)	34 (54.8)	NS
Beta-blocker	48 (78.7)	46 (74.2)	NS
Aldosterone antagonist	24 (39.3)	29 (46.8)	NS
Loop diuretic dose (FE)	116.4 (74.6)	126.1 (81.3)	NS
IV inotrope	15 (24.2)	6 (9.8)	NS

*Data presented as mean (SD) or n (%)

*ACEI = angiotensin-converting enzyme inhibitor, ARB = angiotensin II receptor blocker, BUN = blood urea nitrogen, FE = furosemide equivalent, IV = intravenous, NYHA = New York Heart Association, NT-proBNP = N-terminal pro-B-type natriuretic peptide

Figure 2. 30-Day Heart Failure Readmission

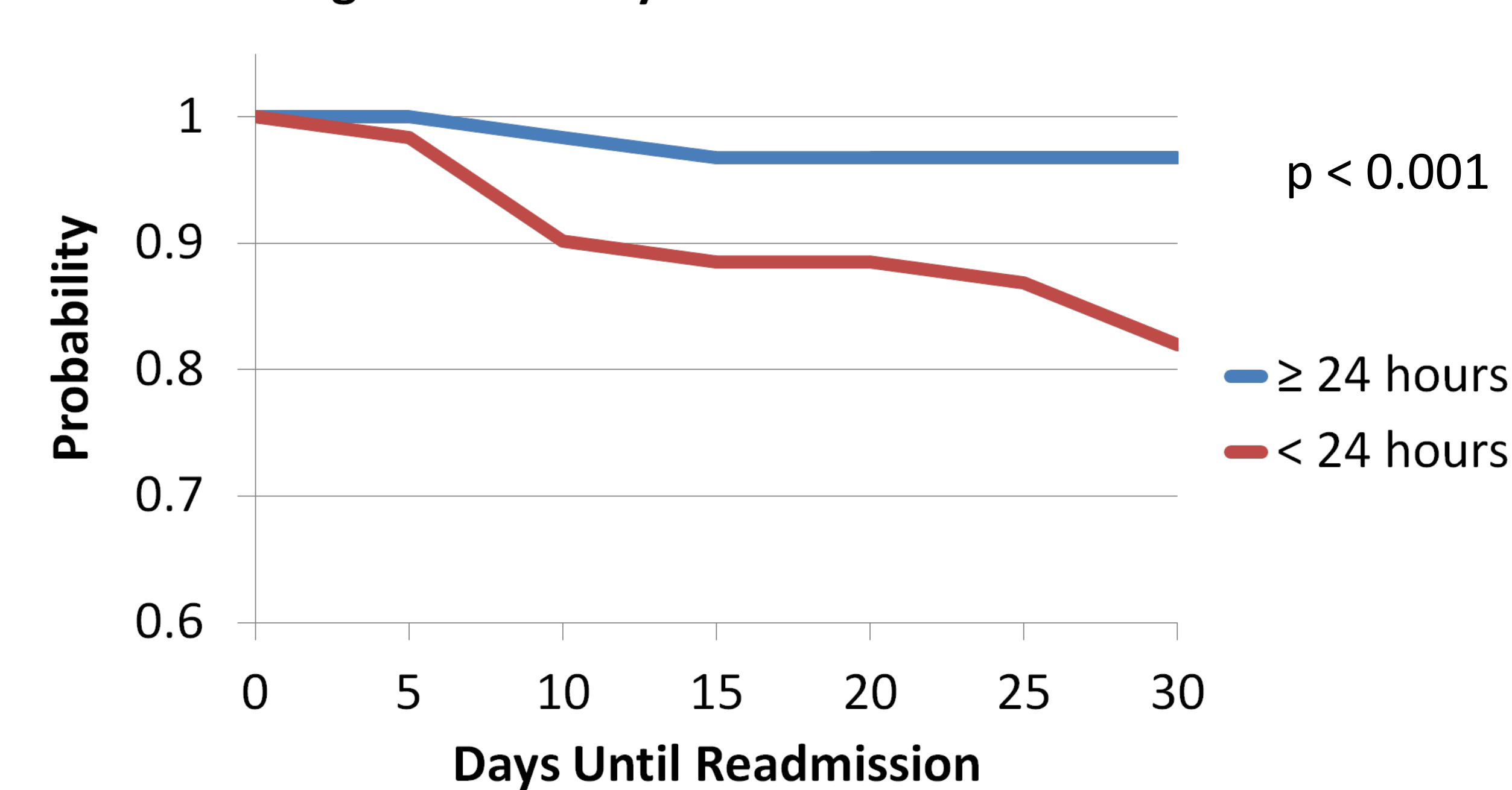


Table 2. Outcomes	Observed < 24 hr (n = 61)	Observed ≥ 24 hr (n = 62)	P-value	P-value (Adj)
Primary Outcome				
30-day HF readmission	11 (18.0)	2 (3.2)	0.023	<0.001
Secondary Outcomes				
60-day HF readmission	18 (29.5)	6 (9.7)	0.014	<0.001
90-day HF readmission	23 (37.7)	12 (19.4)	0.049	<0.001
HF readmission	34 (55.7)	23 (37.1)	0.049	<0.001
All-cause readmission	39 (64.0)	38 (61.3)	NS	0.009
Length of stay (days)	7.8 (6.2)	10.6 (7.4)	0.023	NS
Cardiology follow-up	43 (70.5)	47 (75.8)	NS	NS
Time to follow-up (days)	15.0 (19.2)	13.7 (11.6)	NS	NS

*Data are number (%) of patients
*Adj = adjusted, HF = heart failure

Table 3. Variables	Estimate (SD)	95% CI	P-value
Observation < 24 hr	6.0 (0.8)	1.4 – 42.4	0.033
Age	1.0 (0.3)	1.0 – 1.1	NS
Readmission within 30 days	4.3 (0.7)	1.1 – 16.7	0.032
ACEI or ARB at discharge	1.1 (0.7)	0.3 – 4.1	NS
Beta-blocker at discharge	2.1 (0.9)	0.4 – 17.6	NS
IV dobutamine at discharge	3.0 (1.3)	0.1 – 33.5	NS
IV milrinone at discharge	4.4 (1.1)	0.5 – 35.0	NS

*ACEI = angiotensin-converting enzyme inhibitor, ARB = angiotensin II receptor blocker, CI = confidence interval, IV = intravenous

Limitations

- 24-hour threshold selected based on expert consensus recommendations rather than evidence from clinical trials
- Select number of confounders included in adjusted analysis
- Single center, retrospective design; demographics may not be representative of all centers
- Cannot completely rule out the potential for selection bias

Conclusion

- Observation on an oral loop diuretic ≥ 24 hours was associated with significantly lower 30-, 60-, and 90-day HF readmission.
- Observation < 24 hours and prior 30-day readmission were independent prognostic factors for 30-day HF readmission.
- This simple and feasible practice should be strongly considered prior to discharging patients who initially present with ADHF.
- Prospective trials are warranted to confirm these results.

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Disclosures

Benjamin Laliberte, Pharm.D. - Nothing to Disclose