

Assessing the Potential Need for a Multidisciplinary Outpatient Diuresis Clinic to Prevent Heart Failure Readmissions

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Disclosures

- The speaker has no actual or potential conflicts of interest in relation to this presentation.

Background

- HF is prevalent among nearly 6.5 million people today with an expected 8 million people living with a HF diagnosis by 2030¹
- Hospital readmissions occur in nearly 20% of HF patients within 30 days following hospital discharge²
- CMS implemented Hospital Readmission Reduction Program in 2012³
- Total annual expenditure for HF ~ \$31 billion⁴
- Pharmacist-led clinics and outpatient diuresis clinics have shown to decrease readmissions and cost⁵

HF = heart failure

CMS = Centers for Medicare and Medicaid Services

1. Benjamin EJ, et al. *Circulation*. 2019;139:e56-e528.

2. Kwok CS, et al. *Am J Cardiol*. 2019;00:1-10.

3. Hospital Readmissions Reduction Program (HRRP). (2020).

4. Ziaieian B, et al. *Prog Cardiovasc Dis*. 2016;58(4):379-385.

5. Peeples L. *Pharmacy Practice News*. 2019.

Previous Studies

	Makadia S et al.	Roberts JD, et al.	Al-Bawardy R, et al.
Year	2015	2018	2019
Study Type	Prospective	Retrospective	Retrospective
Purpose	To examine the impact of an IV diuretic multidisciplinary clinic for heart failure patients	To determine if outpatient diuretic therapy results in reduced hospital admissions	To determine if attendance to pharmacist-led clinic would reduce 30-day readmission rate
Results	Outpatient HF management reduced hospitalization days and patient cost (p-value < 0.01)	66% of HF patients avoided hospitalization by treatment with outpatient IV diuretic therapy	Pharmacist roles in medication optimization and education revealed reduced 30-day readmissions (p-value = 0.063)

Makadia S, et al. *Am J Med.* 2015;128(5):527-531.

Roberts JD, et al. *J Card Fail.* 2018;24(8):S129.

Al-Bawardy R, et al. *Curr Probl Cardiol.* 2019;00:1-14.

IV = intravenous

SSM Health – St. Clare Hospital

- Heart failure 30-day readmissions
 - 19.2% between April 1, 2018 through March 31, 2019
- AHA national heart failure readmission rate = 21.4%

Study Purpose

- To identify the number of preventable HF readmissions to SSM Health – St. Clare Hospital

Methods

- Study design
 - Single center
 - Retrospective
 - Chart review
- Study period
 - April 1, 2018 – March 31, 2019
- Approved by the SSM Health Institutional Review Board

Inclusion Criteria

- Hospital readmission within 30 days post-discharge
- HF Diagnosis
 - ICD 10 codes for index admission including: I11.0, I13.0, I13.2, I50 – I50.9
- Signs/symptoms of acute HF
 - Dyspnea/shortness of breath
 - Edema/volume overload/weight gain > 3 lbs in one day or 5 lbs within one week
 - Exercise intolerance
 - Weakness/fatigue
- Age \geq 18 years

ICD = International Classification of Disease

Exclusion Criteria

- Hospital encounter in which a patient expired
- Receiving dialysis prior to hospitalization
- No IV diuretic therapy within first 24 hours of hospitalization

Primary Outcome

- Number of preventable 30-day readmissions for acute HF
 - Preventable: patients admitted to the hospital solely for the treatment of heart failure with IV diuretics

Secondary Outcomes

- Hospital supply expense
 - Supply expense for the APD x LOS
- Total number of HF-related hospital admissions within study duration
- Length of hospital stay
- Adverse effects associated with IV diuretic use
- Optimization opportunities for HF medications

APD = average patient day
LOS = length of stay

Additional Data Points Collected

Baseline characteristics
Age
Gender
Weight
Height
Dialysis history
Blood pressure
Heart rate
Temperature
Oxygen saturation
Serum creatinine
Creatinine clearance

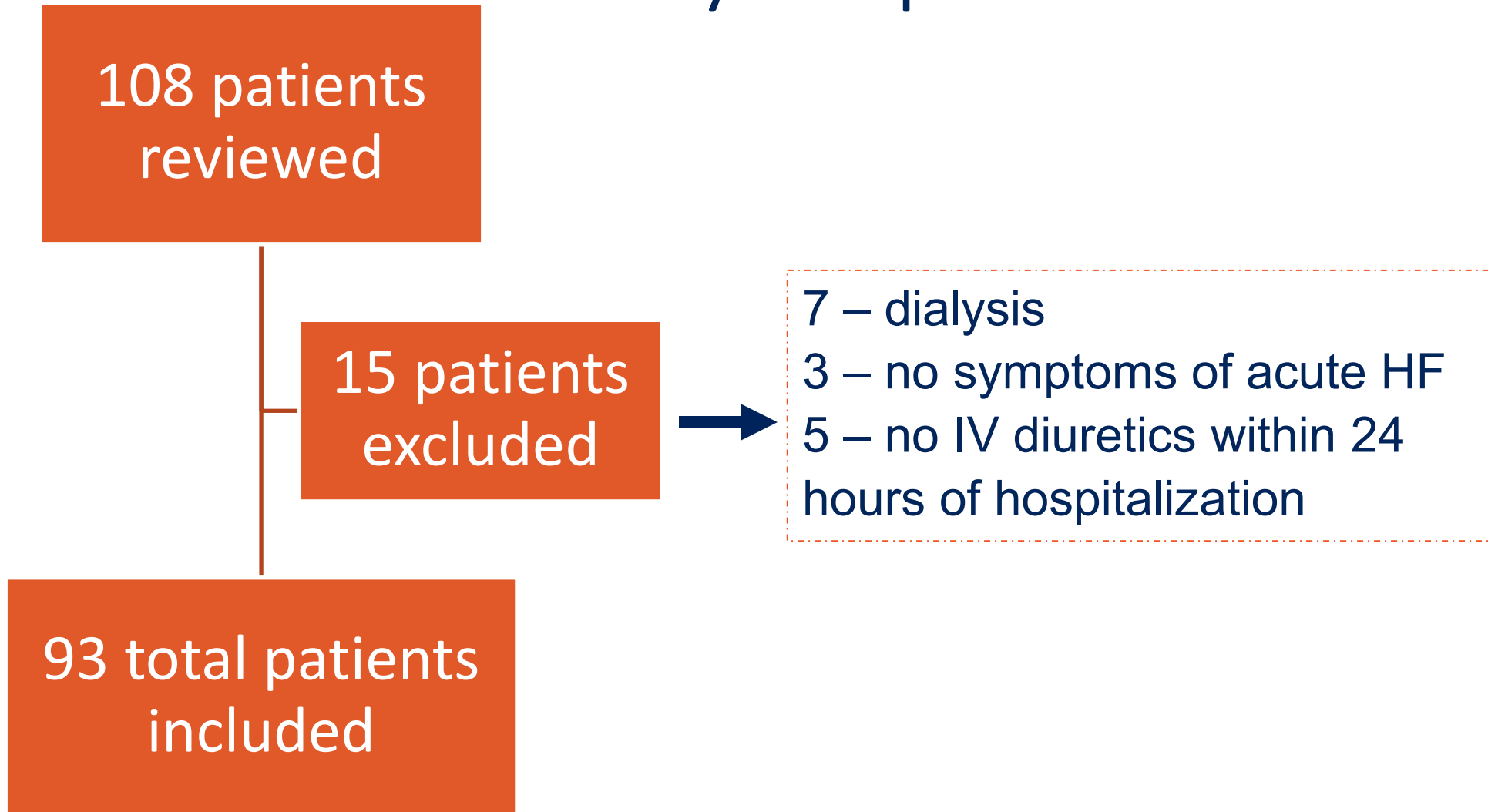
Heart failure and hospital data
ICD code
Weight gain prior to arrival
Signs and symptoms of acute HF
Ejection fraction
Opportunities for optimization
Date of admission
IV diuretic given during admission
IV furosemide dose equivalents*
Urine output

*Furosemide dosing equivalents: 40 mg IV furosemide = 1 mg IV bumetanide

Statistical Analysis

Outcomes	Data Type	Statistical Test
<u>Primary:</u> <ul style="list-style-type: none"> Number of preventable 30-day readmissions for acute HF 	Nominal	Descriptive
<u>Secondary:</u> <ul style="list-style-type: none"> Financial consequences of readmission Total number of HF-related hospitalizations in 1 year Length of hospital stay Adverse effects associated with IV diuretic use Optimization of HF medications 	Continuous Continuous Continuous Nominal Nominal	Descriptive

Study Sample



Patient Baseline Characteristics (n = 93)

Age (years), mean \pm SD	72.4 \pm 13.93
Gender (males), n (%)	53 (56.9)
BMI (kg/m ²), mean \pm SD	29.8 \pm 8.9
Signs/symptoms of acute HF, n (%)	
- Dyspnea/SOB	84 (90.3)
- Edema	67 (72.0)
- Weight gain PTA	37 (39.8)
- Weakness/fatigue	35 (37.6)
- Exercise intolerance	29 (31.2)
Ejection fraction, n (%)	
- HFrEF	40 (43)
- HFpEF	53 (57)

BMI = body mass index

PTA = prior to arrival

SOB = shortness of breath

HFrEF: heart failure with reduced ejection fraction

HFpEF: heart failure with preserved ejection fraction

Heart Failure Medications PTA (n = 93)

Drug class/name	n (%)
ACE-I/ARB	28 (30.1)
Beta-blocker	60 (64.5)
Aldosterone antagonist	15 (16.1)
Nitrates	18 (19.4)
Hydralazine	19 (20.4)
ARNI	0 (0)
Ivabradine	0 (0)
Diuretics	67* (71.0)
- Loop	63 (94.0)
- Thiazide	4 (6.0)
- Metolazone	3 (4.5)

*3 patients on a combination of diuretics

ACE-I = angiotensin-converting enzyme inhibitor
 ARB = angiotensin receptor blocker
 ARNI = Angiotensin receptor-neprilysin inhibitor

Primary Outcome

93 Hospital Readmissions

Preventable*

n = 44 (47.3%)

PNA or COPD
Treatment
n = 22 (44.9%)

IV antibiotic
treatment
n = 6 (12.2%)

Atrial fibrillation
treatment
n = 8 (16.3%)

Cardiac
catheterization
n = 5 (10.2%)

Other
n = 8 (16.3%)

Non-Preventable

n = 49 (52.7%)

*Preventable: patients admitted to the hospital solely for the treatment of heart failure with IV diuretics

PNA = pneumonia
COPD = chronic obstructive pulmonary disease

Secondary Outcomes

	Median (IQR)	Total
Hospital supply expense*, dollars (\$)	1,946 (1,003-2,922)	99,424
Length of hospitalization, days	4.0 (2.0-6.0)	204
	Mean ± SD	Total
Total number of HF-related hospital admissions within study duration	3.0 ± 1.0	130

*Hospital supply expense = LOS x supply expense APD

IV Diuretics within 24 Hours of Hospitalization

Diuretic	n (%)	Furosemide dose equivalent, mg (mean \pm SD)
Furosemide	41 (93.2)	114 \pm 55
Bumetanide	1 (2.3)	
Furosemide + bumetanide	2 (4.5)	

Adverse Effects Associated with IV Diuretics

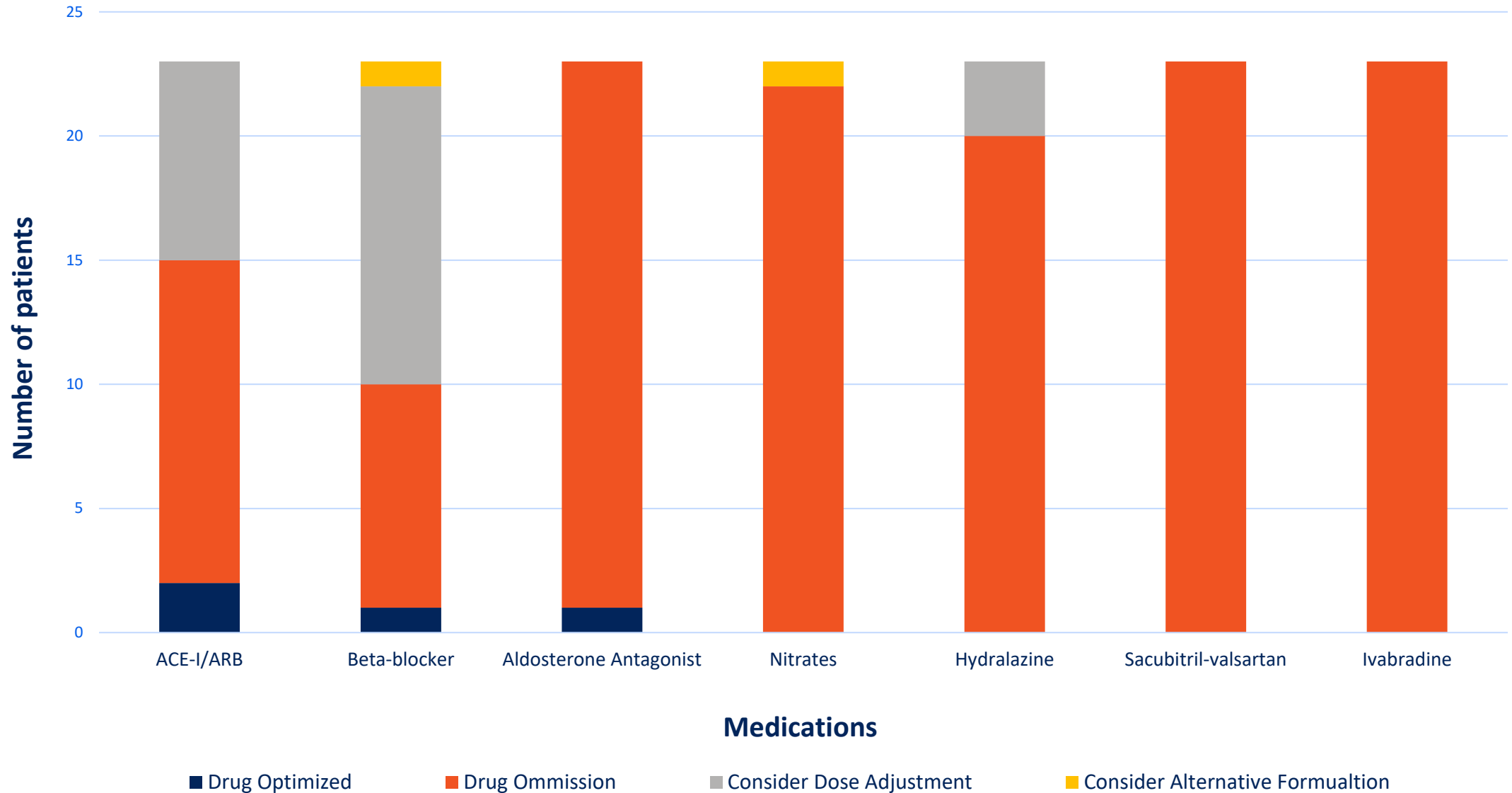
Adverse effects	n (%)
Muscle cramps	0 (0)
Hypotension	1 (2.3)
Dizziness	0 (0)
Syncope	0 (0)
Hypokalemia	8 (18.2)

Opportunities for Medication Optimization in HFrEF (n = 23)

Class/drug	Drug Omission	Consider Dose Adjustment	Consider Alternative Formulation	No Opportunity Identified
ACE-I/ARB	13	8	0	2
Beta-blocker	9	12	1	1
Aldosterone Antagonist*	22	0	0	1
Nitrates*	22	0	1	0
Hydralazine*	20	3	0	0
Sacubitril-valsartan*	23	0	0	0
Ivabradine*	23	0	0	0

*potential opportunities for optimization based on individual patients

Opportunities for Medication Optimization in HFrEF (n = 23)



Discussion

- Strengths

- Validated diagnosis codes
- Confirmed HF status based on symptoms
- Definitions consistent with current literature
- Study duration
- Adjudication committee

- Limitations

- Cost of admission is not all-inclusive
- Primary outcome excludes HF-related admissions falling outside 30-days from index admission
- Medications that may exacerbate HF were not addressed
- Some hospitalizations may have been missed due to being outside of the Epic network

Conclusions

- Nearly 50% of HF readmissions to SSM Health – St. Clare Hospital were preventable, resulting in nearly \$100,000 in hospital supply expenses
- Outpatient multidisciplinary HF diuresis clinics can possibly prevent HF readmissions
 - Provide opportunities for medication optimization and education
 - Lower hospital supply expense
- SSM Health – St. Clare Hospital outpatient multidisciplinary HF diuresis clinic proposal

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