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Evaluation of Intravenous Loop Diuretic Use in Acute Decompensated Heart Failure in a Community Hospital

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OBJECTIVE

- To characterize the use of intravenous loop diuretics in patients hospitalized with fluid overload secondary to acute decompensated heart failure (ADHF) within the heart failure service of a community hospital.

BACKGROUND

- Loop diuretics cause water excretion renally by inhibiting the sodium-potassium-chloride cotransporter in the ascending loop of Henle to reduce sodium and chloride reabsorption.[1]
- The loop diuretic drug class includes furosemide, bumetanide, torsemide and ethacrynic acid.[1] Furosemide is the most utilized loop diuretic in heart failure.[2]
- Furosemide, bumetanide, and torsemide are on formulary for this facility.
- Prompt treatment with loop diuretics is recommended for fluid overload in ADHF by the 2022 AHA/ACC/HFSA Heart Failure Management Guidelines.[2]
- High doses of loop diuretics have been associated with adverse effects such as acute kidney injury (AKI) and hypokalemia.[1]
- There is lack of data on the optimal regimen for empiric diuresis in ADHF.[3,4]

METHODS

- This is an Institutional Review Board (IRB) approved retrospective study from September 1, 2020 to December 31, 2021.

Inclusion Criteria	Exclusion Criteria
• ≥ 18 years old • ADHF diagnosis • Continuous infusion or more than 1 bolus dose of loop diuretic	• Chronic kidney disease (CKD) stage 5 receiving dialysis • Cirrhosis • Thoracentesis during admission

Primary Endpoints:	Secondary Endpoints:
• Frequency of the initial loop diuretic • Description of subsequent regimen adjustments	• Urine output • IV loop diuretic duration • Total loop diuretic duration • Additional IV non-loop diuretics administered • AKI: a SCr increase from baseline of 0.3 mg/dL within 48 hours or 1.5x within 7 days • Hypokalemia: potassium level < 3.5 mEq/L

RESULTS

Table 1: Patient Demographics

Total patient, n	599
Average age, years ± SD	71.5 ±13.4
Female sex, n (%)	223 (37)
Ejection fraction, mean ± SD	40.1 ± 16.2
Home loop diuretic prior to admission, n (%)	322 (54)
CrCl at admission, mean ± SD	58.7 ± 35.2
Past medical history CKD Stage 1-4, n (%)	371 (62)

RESULTS

Figure 1: Top 10 Most Utilized Initial Regimens (n=524)

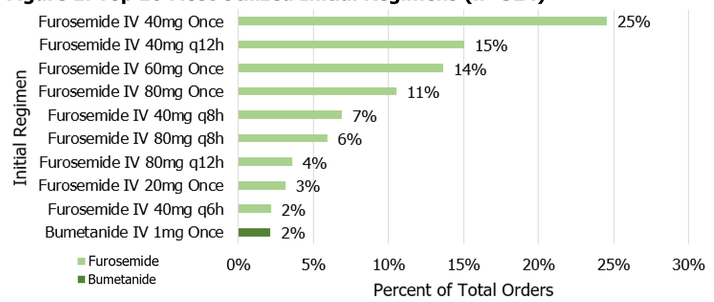


Figure 2: Frequency Classifications Throughout Therapy Changes (n=599)

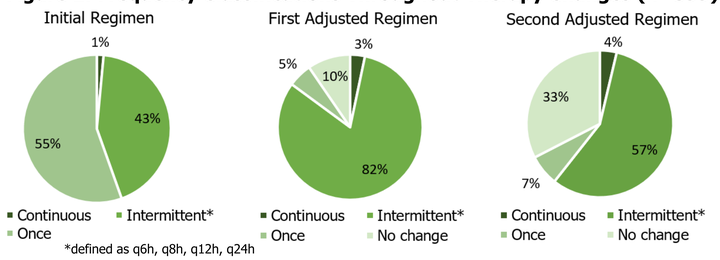


Figure 3: First Adjusted Regimens Following Initial Once Doses (n=279)

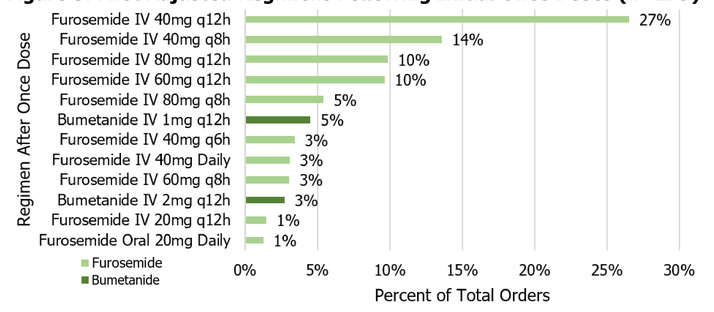
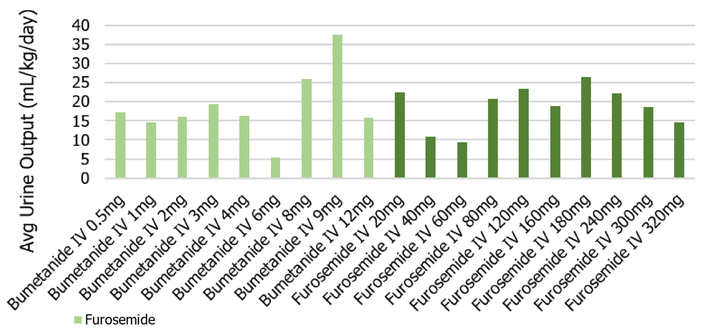


Figure 4: Average Urine Output Based on Estimated 24 Hour dose (n=406)



RESULTS

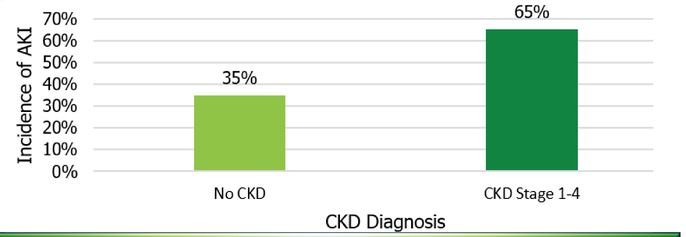
Table 2: Therapy Characteristics

IV loop diuretic duration (days), mean ± SD	3.62 ± 2.72
Total loop diuretic duration (days), mean ± SD	4.98 ± 3.75
Frequency of transition to PO loop diuretic, n (%)	422 (72)
Additional IV non-loop diuretic administered, n (%)	18 (3)

Table 3: Incidence of Side Effects

Acute kidney injury, n (%)	86 (14)
Hypokalemia, n (%)	237 (40)

Figure 5: Occurrence of AKI in CKD Stage 1-4 vs no CKD (n=86)



DISCUSSION & CONCLUSIONS

- There were 36 initial regimens, underscoring the need for standardization. Top 10 most utilized regimens account for 87% of total encounters.
- Majority of regimens following once doses were intravenous and included furosemide, following trends in practice and guideline recommendations. [2]
- Highest average urine output was associated with bumetanide IV 9mg; however, it wasn't highly utilized. 24 hour doses of furosemide IV 80mg, 120mg, and 160mg account for ~50% of regimens with similar urine outputs. Initial regimens could be streamlined to equal those 24 hour furosemide doses.
- Minimal usage of additional non-loop IV diuretics implies the loop diuretic regimens utilized provided adequate congestion management.
- Incidence of hypokalemia warrants further investigation of potassium supplementation for specific loop diuretic regimens.
- Higher incidence of AKI in CKD indicates additional monitoring and conservative loop diuretic dosing may be appropriate.
- This study was limited by inconsistent urine output documentation and patient-specific nature of loop diuretic dosing in ADHF.
- To conclude the best loop diuretic regimen(s), further evaluation of in-patient dosing compared to home diuretic dosing and additional diuresis efficacy endpoints such as clinical signs of congestion and/or weight changes is needed.

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Disclosure
The authors of this presentation have the following to disclose concerning possible financial or personal relationships with commercial entities that may have a direct or indirect interest in the subject matter of this presentation:
Catherine Eichler: Nothing to disclose | Cole Luty: Nothing to disclose | Kris Howard: Nothing to disclose