

# PERFORMANCE EXCELLENCE 2020

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Main Line Health®

## ED CHF Pathway and Diuretic Protocol

### Introduction

Main Line Health Physician Partners (MLHPP) initiated this work as part of its strategy for integrated management of high risk patients. This ED CHF pathway and diuretic protocol is a part of cross-continuum of care effort to better manage the dyspneic patient in the ambulatory, ED, observation, inpatient, and SNF settings. This Advisory was developed jointly by the PI team, ED, nursing, and hospitalist leadership with support from cardiology, nephrology, and pharmacy.

### ► KEY POINTS

- Identify appropriate patients for the CHF pathway, and then use either the **normotensive** or **hypertensive** pathway (hypotensive patients to receive early cardiology consultation)
- **Utilize the MLH NIPPV Protocol** as NIPPV is a reasonable strategy with medical therapy
- Give initial IV diuretic dosing based on home dose (to be the equivalence of double the home dose)
- Based on urine output, **consider redosing diuretic** in 2 hours (includes bladder scan if low output) that will increase, be the same, or be held based on the initial response to the diuretic
- Utilize an **hourly disposition decision tree**, which focuses on a timeline after initial diuretic treatment begins:
  - 1) Critically ill: admit 1hr after initial diuretic
  - 2) High risk: admit 2 hrs. after initial diuretic
  - 3) Medium risk: admit to Obs 3 hrs. after initial diuretic
  - 4) Low risk: send home 4 hrs. after initial diuretic
- For patients going home, a) perform a 2 min walk test, b) arrange next day f/u, and c) provide rescue diuretic dosing plan

### Goals

- Reduce % of CHF patients admitted to observation and inpatient from the emergency room to <52%
- Reduce % of ED treat and release CHF visits that returned to ED within 72 hours to < 4.0%
- Reduce CHF 30 Day Readmission observed/expected ratio to 0.84
- Reduce average LOS to 4 days without increasing readmissions
- Reduce CHF cost per case by 15%

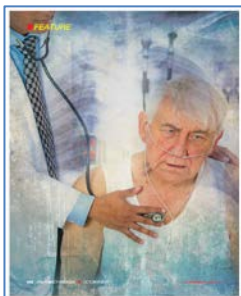
### CHF ED Process Measures

- 1) Placed on an ED CHF Pathway
  - a. Normotensive
  - b. Hypertensive
- 2) Provided NIPPV in ED, if indicated
- 3) Measured and recorded UOP 2 hours after initial diuretic dose

#### If patient discharged

- 4) Performed a 2-minute walk test
- 5) Scheduled next day follow up

### ► WHY FOCUS?



Across MLH, CHF patients currently experience the following: a) **longer LOS than expected**, b) **more 30-day readmissions** than expected, and c) **higher cost of care** than benchmark.

Recent literature supports the following interventions: (*Emergency Medicine*, Oct '17):


- In patients with severe resp. distress, NIV is a reasonable strategy with medical therapy
- Diuretics should be administered via IV dose equal to 1-2.5 times the patient's usual dose
- Repeat dosing titrated to UOP is recommended
- Overall, 44% of IP CHF admissions are < 3 days, which supports an increased use of Obs.
- CHF education should be provided for patients going home

**Safe – Timely – Efficient – Effective – Equitable – Patient-Centered**


## Normotensive ED CHF Pathway: Key Interventions

### First 30 Minutes after Normotensive CHF Dx (Continued)

#### Respiratory

- Goal to maintain O<sub>2</sub> sat > 92%
- Use early and aggressive NIV treatment <sup>(a)</sup> 
- Bronchodilator if needed

#### Initial Diuretic Dose (see page 4 for dosing table)

- Strict I&O's every hour as the subsequent diuretic dosing is titrated to the patient's urine output (UOP) to ensure adequate response <sup>(b)</sup> 
- Recommended 2x the IV equivalent of the daily home oral dose
- Recommended maximum single dose is Furosemide 120 mg IV


#### Other Pharmacologic Therapy

- Nitrate SL & Paste (hold if SBP < 90 mmHg)

### 30 – 60 Minutes After Initial Diuretic Dose

- During normal business hours, notify patient's existing cardiologist
- Consult cardiology at ED physician's discretion <sup>(c)</sup>

### 1 Hour after Initial Diuretic Dose

-  Disposition decision: admit critically ill patients

#### I&O Monitoring

- Min goal UOP following initial diuretic is 125 ml/hr or 500 ml over 4hr


#### Electrolyte Monitoring (see page 4 for replacement table)

- RN to contact physician for order(s) to replace electrolytes

### 2 Hours after Initial Diuretic Dose

#### Urine output-guided diuretic dosing

- If output < 250 ml, obtain bladder scan to estimate urine volume, and RN to notify physician for I/O catheterization consideration
- If total UOP + bladder scan volume < 250 ml, then consider giving a second dose of IV loop diuretic at TWICE the initial IV diuretic up to max dose of 120 mg of IV furosemide or its equivalent
- If total UOP + bladder scan volume > 250 ml, then reevaluate, and if patient is still symptomatic, and hemodynamically stable with appropriate labs, then consider repeat INITIAL IV diuretic dose

-  Disposition decision: admit high risk patients

### 3 Hours after Initial Diuretic Dose


-  Disposition decision: admit medium risk patients to Observation


### 4 Hours after Initial Diuretic Dose

#### 2 Minute walk test

- Ambulate patient on RA or on home dose of oxygen and determine if patient has SO<sub>2</sub> < 90% or Heart Rate > 110, or is too ill to walk (patient finding that they can't start or complete the test, or the clinician's determination that the patient is too ill to perform it)

#### CHF Discharge Planning

- Schedule patient for next day follow up appointment <sup>(d)</sup> 
- Complete HomeCare Referral <sup>(e)</sup>
- Conduct CHF discharge education, including when to call physician, and give discharge weight in pounds <sup>(f)</sup>

-  Disposition decision: discharge low risk patients to home

## Pathway Notes

- Try 5L NC before using NIV. See *MLH NIPPV Protocol*, section B. Acute Respiratory Failure Non-Hypercapnic
- If a patient is incontinent, give the initial recommended dose of furosemide (i.e. twice the home dose daily equivalent) but do not follow the pathway for the repeat dosing. The incontinent patient should still receive the other treatment modalities and care coordination efforts
- The goal is to make cardiology aware sooner and get them involved if needed
- Consider next day follow up at Wynnewood Extended Outpatient Care; physician referral hotline is 484-476-7331



- Referral to by calling 484-580-1601 or their link ([HomeCare](#)) for follow up assessment, medication management, home safety evaluation, dietary teaching, and telemonitor program

All referrals that are received within normal business hours M-F between 8:00 am–6:00 pm, or Saturday, Sunday and Holidays between 7:30 am–2:00 pm will receive a return phone call within two hours (all other referrals will be acknowledged on the next business day).


- Please use the Managing your heart health workbook for patient education prior to discharge



## Hypertensive ED CHF Pathway: Key Interventions

### First 30 Minutes after Hypertensive CHF Dx (Continued)


#### Respiratory

- Goal to maintain O<sub>2</sub> sat > 92%
- Use early and aggressive NIV treatment <sup>(g)</sup> 

#### Cardiac

- Establish target goal for SBP prior to initiating blood pressure reduction treatment: 20% reduction in Mean Arterial Pressure (MAP = 1/3 (SBP – DBP) + DBP), keeping SBP ≥ 140mmHg
- Nitrate SL & Paste: hold if SBP < 110 mmHg or MAP below target MAP
- ACE Inhibitor unless contraindications <sup>(h)</sup>
- If SBP greater than 140 and current MAP > Target MAP after nitroglycerin SL / paste and ACEI IV, administer nitro drip <sup>(i)</sup>


#### Initial Diuretic Dose (see page 4 for dosing table)

- Strict I&O's every hour as the subsequent diuretic dosing is titrated to the patient's urine output (UOP) to ensure adequate response <sup>(j)</sup> 
- **Diuretic dosing may not be necessary in the hypertensive CHF patient; primary focus is to achieve target mean arterial pressure**
- If given, recommend IV equivalent of the current daily home oral dose
- Recommended maximum single dose is Furosemide 120 mg IV

### 30 – 60 Minutes After Initial Diuretic Dose

- During normal business hours, notify patient's existing cardiologist
- Consult cardiology at ED physician's discretion <sup>(k)</sup>

### 1 Hour after Initial Diuretic Dose

 Disposition decision: admit critically ill patients

#### I&O and BP Monitoring

- RN to notify physician of BP and UOP
- Min goal UOP following initial diuretic is 125 ml/hr or 500 ml over 4hr


#### Electrolyte Monitoring (see page 4 for replacement table)

- RN to contact physician for order(s) to replace electrolytes

### 2 Hours after Initial Diuretic Dose

#### Urine output-guided diuretic dosing (if patients are still fluid overloaded)

- If output < 250 ml, obtain bladder scan to estimate urine volume, and RN to notify physician for I/O catheterization consideration
- If total UOP + bladder scan volume < 250 ml, then consider giving a second dose of IV loop diuretic at TWICE the initial IV diuretic up to max dose of 120 mg of IV furosemide or its equivalent
- If total UOP + bladder scan volume > 250 ml, then reevaluate, and if patient is still symptomatic, and hemodynamically stable with appropriate labs, then consider repeat INITIAL IV diuretic dose

 Disposition decision: admit high risk patients

### 3 Hours after Initial Diuretic Dose

 Disposition decision: admit medium risk patients to Observation

### 4 Hours after Initial Diuretic Dose

- Perform 2 Minute walk test <sup>(l)</sup> 
- Complete discharge planning (next day f/u, HC referral, education) <sup>(m)</sup> 
-  Disposition decision: discharge low risk patients to home

## Pathway Notes

g) Try 5L NC before NIV. See MLH NIPPV Protocol, section B. Acute Respiratory Failure Non-Hypercapnic

h) Use with caution in patients with moderate to severe renal insufficiency

i) Nitroglycerin IV drip 25 mg/250 mL D5W, start at 5 mcg/min, double dose every 5 minutes until SBP = 140 or target MAP achieved. Max dose = 200 mcg/min

Once SBP = 140 or target MAP achieved, titrate nitroglycerin IV to maintain target MAP

Hold for SBP less than 90 and notify physician

The 30-60 min time line is only a guideline – add IV nitro drip sooner at the discretion of ED physician

j) If a patient is incontinent, give the initial recommended dose of furosemide (i.e. twice the home dose daily equivalent) but do not follow the pathway for the repeat dosing. The incontinent patient should still receive the other treatment modalities and care coordination efforts

k) The goal of this is to make cardiology aware sooner and get them involved if needed

l) Ambulate patient on RA or on home dose of oxygen and determine if patient has SO<sub>2</sub> < 90% or Heart Rate > 110, or is too ill to walk (patient finding that they can't start or complete the test, or the clinician's determination that the patient is too ill to perform it)

m) Schedule patient for next day follow up (consider Wynnewood Extended Outpatient (484-476-7331 for physician referrals)

Complete HomeCare Referral  
Conduct CHF discharge education, including when to call physician, and give discharge weight in pounds

## Appendix A

### Diuretic Dosing

- Dosing recommendation for normotensive heart failure is 2x the IV equivalent of the daily home oral dose
- Diuretic dosing may not be necessary in the hypertensive CHF patient; primary focus is to achieve target mean arterial pressure (dosing recommendation for hypertensive heart failure, IF GIVEN, is the IV equivalent of the daily home oral dose)
- 40mg furosemide orally is equal in 20 mg IV
- Maximum single IV dose: Furosemide = 120 mg, Bumetanide = 3 mg
- Equivalents: Torsemide (Demedex) 20 mg = Bumetanide (Bumex) 1mg = IV Furosemide (Lasix) 40 mg

| Normotensive Dosing            |                            |                           |
|--------------------------------|----------------------------|---------------------------|
| Home Furosemide Dose Regimen   | Initial IV Furosemide Dose | 2 Hour IV Furosemide Dose |
| No usage or $\leq 20$ mg daily | 20 mg                      | 40 mg                     |
| 40 mg PO daily                 | 40 mg                      | 80 mg                     |
| 60 mg PO daily                 | 60 mg                      | 120 mg                    |
| 40 mg PO BID or 80 mg PO daily | 80 mg                      | 120 mg                    |
| 80 mg PO BID                   | 120 mg                     | Cards. consult            |
| >160 mg total PO home dose     | 120 mg                     | Cards. consult            |

| Hypertensive Dosing             |                          |                           |
|---------------------------------|--------------------------|---------------------------|
| Home Furosemide Dose Regimen    | First Dose IV Furosemide | 2 Hour IV Furosemide Dose |
| No usage or $\leq 20$ mg daily  | 10 mg                    | 20 mg                     |
| 40 mg PO daily                  | 20 mg                    | 40 mg                     |
| 60 mg PO daily                  | 30 mg                    | 60 mg                     |
| 40 mg PO BID or 80 mg PO daily  | 40 mg                    | 80 mg                     |
| 40 mg PO TID or 120 mg PO daily | 60 mg                    | 120 mg                    |
| 80 mg PO BID or 160 mg PO daily | 80 mg                    | 120 mg                    |
| 80 mg PO TID or 240 mg PO daily | 120 mg                   | 120 mg                    |

### Electrolyte Replacement (this is a guide only)

| Potassium Level (Normal Range: 3.6 – 5.1)                  |  |   |
|--|--|---|
| $\leq 3.0$   | 3.1 - 3.4  | 3.5 - 3.9   |
| Treat the electrolyte abnormality based on physician Order | 1) 40 mEq orally now and in 2 hours<br>2) Give orally unless patient unable to tolerate orally | 1) 40 mEq orally now<br>2) Give orally unless patient unable to tolerate orally |
| Magnesium Level (Normal Range: >1.8)                       |  |   |
| <1.4 mEq   | 1.4 – 1.8 mEq  | > 1.8mEq  |
| Treat the electrolyte abnormality based on physician Order | Magnesium Sulfate 2g/50mL IV over 2 hours  | No treatment is Necessary   |

**Disclaimer:** This System Clinical Advisory is based on the best available scientific evidence at the time of publication. It is not a prescription for every physician, every patient, nor does it replace clinical judgement. For questions or concerns, please contact Andrew Keser ([KeserA@MLHS.org](mailto:KeserA@MLHS.org)).

## References

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## Development Team

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**Appendix B:****ED CHF Process Map**