



## Key Aspects of Care

- **Assess left ventricular function** before arrival, during hospitalization, or planned after discharge – or document rationale for not doing this
- **Provide an ACE-I, ARB, or ARNI and beta-blocker at discharge** to patients with LVEF < 40% – or document rationale for not doing this
- **Give smoking cessation advice/counseling** to all current smokers during the hospital stay.
- **Provide written discharge instructions and educational materials** to all patients, including information on activity, diet, medications, weight monitoring, heart failure symptom management, and follow-up instructions
- **Consult HF Educator (Transition Navigator)** to provide telephone follow-up within 72 hours of discharge
- **Provide a hospital follow-up appointment** within 7 days
- **Consider HF disease management for high-risk patients** (with >1 admission, numerous co-morbidities, or lack of social/financial support)

## Initial Evaluation

- **History and physical examination**
- Assess volume status and adequacy of peripheral perfusion
- Assess for causative and precipitating factors (for example):
  - Exclude ischemia as etiology
  - Exclude hypertension as etiology (Goal SBP < 130 mmHg)
  - Exclude use of drugs that may provoke or worsen [Calcium channel blockers, NSAIDs, antiarrhythmics (disopyramide, flecainide, dronedarone)]
  - Exclude arrhythmia as etiology, if present, obtain ICD interrogation
  - Assess sleep-disordered breathing
  - Assess for possible pulmonary embolism
- [The Seattle Heart Failure Model](#) Risk Scoring Tool can be useful to estimate subsequent risk of mortality

## Labs (as ordered)

- CBC with differential
- Chem 7, magnesium, calcium, phosphate
- Liver function
- Urinalysis - for possible renal failure
- Thyroid stimulating hormone
- B-type natriuretic peptide (BNP)
  - Alternatively NT-proBNP (Consider if patient on ARNI therapy)
- Lipid panel with calculated LDL
- Troponin (if suspected ischemia)

## Diagnostic Tests

- 12-lead ECG
- Chest X-ray
- Echocardiogram (Assessment of ventricular function) if:
  - Initial heart failure presentation
  - Repeat assessment may be useful if:
    - Significant change in clinical status
    - Patients who have received treatment that might have had a significant effect on cardiac function
    - Evaluating candidacy for device therapy

## Admission Criteria

**Hospitalization is recommended** for the following:

- Evidence of severe acute decompensated heart failure (ADHF), including:
  - Hypotension
  - Worsening renal function
  - Altered mentation
- Dyspnea at rest which is typically reflected by resting tachypnea; less commonly reflected by SaO<sub>2</sub> < 90%
- Hemodynamically significant arrhythmia, including new onset of atrial fibrillation with rapid ventricular response
- Acute coronary syndromes

**Hospitalization should be considered** for the following:

- Worsened congestion, even without dyspnea
- Signs and symptoms of pulmonary or systemic congestion, even in the absence of weight gain
- Major electrolyte disturbance
- Associated comorbid conditions:
  - Pneumonia
  - Pulmonary embolus
  - Diabetic ketoacidosis
  - Symptoms suggestive of TIA or stroke
- Repeated ICD firings
- Previously undiagnosed HF with signs and symptoms of systemic or pulmonary congestion
- Low and intermediate risk patients may be considered for observation admission if clinically indicated and anticipated stay less than two midnights

## Consults

- Heart Failure Educator (Transition Navigator) for all admitted patients
- Cardiac Rehabilitation for all admitted patients
- Heart Failure for:
  - Refractory Heart Failure
  - Diuretic Resistance
  - Ultrafiltration
  - Inotropic therapy (Appendix B)
  - Ventricular Assist Device (LVAD) and/or Cardiac Transplant evaluation (614-293-3787).
  - HF Clinical trials (page 614-346-1880)
- Pain and Palliative Care for:
  - Evaluation for advanced therapies (cardiac transplant, LVAD)
  - Plan for discharge on inotrope therapy
  - Recurrent hospitalizations
- Nutrition for: Heart Failure readmission within 30 days
- Social Work for:
  - Psychosocial assessment for advanced therapies (LVAD/ Transplant)
  - Need for placement (SNF, acute rehab, LTACH)
  - End of life issues, referral to hospice
  - Substance use
  - Mental health
  - Community resource referral
  - Disability counseling
  - Advance directives
- Smoking Cessation if current user or has quit within the last 12 months

## Pharmacologic Management

**Note:** See Appendix B for additional details on agent selection/dosing

In general, efforts should be made to maintain goal-directed medical therapies (ACEi/ARB/ARNI, beta blocker, and aldosterone antagonist) unless not tolerated or contraindications exist.

Medication	On Admission	During Hospitalization	By Discharge
<b>Diuretic</b>	See Appendix C	See Appendix C	See Appendix C
<b>ACEi/ARB/ARNI</b>	Continue home regimen unless: <ul style="list-style-type: none"> <li>• Symptomatic hypotension</li> <li>• AKI</li> <li>• Hyperkalemia</li> </ul>	Continue home regimen as able or initiate for all HFrEF as tolerated if: <ul style="list-style-type: none"> <li>• <math>K^+ &lt; 5.0</math></li> <li>• SCr stable (caution if baseline <math>&gt; 3.0</math>)</li> </ul>	Consider titration toward goal dose Ensure follow up chemistry Evaluate transition to ARNI for patients stable on ACEi/ARB. Verify patient access to ARNI prior to interchange. If converting from ACEi, allow 36 hour washout. May be done outpatient. Avoid if history of angioedema.  If not tolerated or contraindications exist, document rationale for not providing at discharge
<b>Beta Blocker</b>	Continue home regimen unless: <ul style="list-style-type: none"> <li>• Symptomatic hypotension</li> <li>• Signs of cardiogenic shock / need for inotrope therapy</li> </ul>	Continue home regimen as able or initiate as tolerated for all HFrEF once volume status/symptoms improving	Consider slow titration toward goal dose  If not tolerated or contraindications exist, document rationale for not providing at discharge
<b>Aldosterone Antagonist</b>	Continue home regimen unless: <ul style="list-style-type: none"> <li>• AKI</li> <li>• Hyperkalemia</li> </ul>	Continue home regimen as able or initiate for HFrEF with: <ul style="list-style-type: none"> <li>• LVEF <math>\leq 35\%</math>, NYHA II-IV</li> <li>• LVEF <math>\leq 40\%</math> post AMI</li> </ul> Unless: <ul style="list-style-type: none"> <li>• <math>K^+ &gt; 5.0</math></li> </ul> Use caution if baseline SCr $> 2-2.5$ or eGFR $< 30$ ml/min/1.73 m <sup>2</sup>	Ensure follow up to assess potassium, creatinine at 3, 7 days and one month after initiation  If not tolerated or contraindications exist, document rationale for not providing at discharge
<b>Oral Vasodilators</b> (Hydralazine, Nitrates)	Continue home regimen unless: <ul style="list-style-type: none"> <li>• Symptomatic hypotension</li> </ul>	Continue home regimen as able or initiate for symptomatic HFrEF despite above therapies (particularly in African Americans), or if intolerant to ACEi/ARB/ARNI	Consider titration toward goal dose
<b>Digoxin</b>	Consider checking level if AKI, drug interaction or clinical suspicion of toxicity prior to continuation	Consider initiation for symptoms refractory to above therapies or rate control in atrial fibrillation  Goal trough 0.5-1.0, adjust for renal function, drug interactions	
<b>Ivabradine</b>	Continue home regimen unless: <ul style="list-style-type: none"> <li>• Bradycardia (HR <math>&lt; 50</math> or symptomatic)</li> <li>• Symptomatic hypotension</li> <li>• Signs of cardiogenic shock</li> <li>• Atrial fibrillation</li> </ul>	Continue home regimen as able  Generally not initiated during hospitalization for acute HF	Consider follow up for initiation if symptomatic HFrEF (NYHA II-III, LVEF $\leq 35\%$ ) in sinus rhythm with resting HR $\geq 70$ bpm on target or max tolerated beta blocker dose
<b>IV Vasodilators</b> (Nitroglycerin, Nitroprusside, Nesiritide)	Consider for severe/refractory dyspnea and/or hypertension	Consider for severe/refractory dyspnea and/or hypertension  Consult Heart Failure for use $> 48$ hours	Discontinue with resolution of symptoms, replace with oral vasodilator therapy as needed
<b>Inotropes</b> (Dobutamine, Milrinone)	Consider for signs/symptoms of low cardiac output  Consult Heart Failure	Consider for signs/symptoms of low cardiac output  Consult Heart Failure	If unable to wean, consult heart failure for consideration of advanced therapies Consider palliative care consult for goals of care Discuss code status, plan for ICD/LifeVest as needed Obtain durable IV access, coordinate home infusion provider
<b>Electrolyte Replacement</b> (Potassium, Magnesium)	Replace acute electrolyte abnormalities to achieve potassium $> 4.0$ , magnesium $> 2.0$	Order as needed electrolyte replacement protocol  Adjust scheduled doses according to needs, renal function, new therapies	Provide maintenance oral potassium or magnesium as needed
<b>Anticoagulation</b>	Warfarin <ul style="list-style-type: none"> <li>• Obtain INR, continue/adjust as needed</li> </ul> Direct Oral Anticoagulants <ul style="list-style-type: none"> <li>• Obtain Scr, adjust/hold for AKI, CrCl <math>&lt; 30</math> ml/min</li> </ul>	Consider need for invasive procedures, hold as needed; based on indication/risk, provide parenteral anticoagulant bridge	Provide oral anticoagulation for patients with VTE or atrial fibrillation based on risk/benefit assessment. If not provided, document rationale.

## Contraindicated Medications

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- Non-steroidal anti-inflammatory drugs (NSAIDs)
- Initiation of Class I anti-arrhythmic agents
- Dronedaron
- Non-dihydropyridine calcium channel blockers:
  - Diltiazem
  - Verapamil
- Thiazolidinediones:
  - Rosiglitazone
  - Pioglitazone

## Other Pharmacologic Interventions

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- High Intensity statin therapy if patient has ischemic cardiomyopathy, ASCVD risk > 20%, or equivalent
- Aspirin if ischemic cardiomyopathy
- Iron supplementation – consider IV replacement if ferritin < 100 or < 300 with iron saturation < 20%
  - Avoid use of erythropoietin-stimulating agents for anemia
- Influenza and Pneumonia vaccination as indicated
- VTE Prophylaxis – subcutaneous unfractionated heparin or alternative if not receiving therapeutic anticoagulation

## Non-Pharmacologic Management & Monitoring

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- Patient education to facilitate HF self-care
- Diet – Cardiac Very Low Sodium
  - 2-gram sodium
  - Restrict fluids to < 2 liters/ day
- Monitor weight daily
- Monitor fluid status (I/O) every 8 hours
- Vital Signs at least every 4 hours
- Pulse oximetry
- Cardiac Monitoring (Telemetry)
- CPAP / BIPAP for central or OSA
- Exercise training (or regular physical activity) / cardiac rehabilitation
- Evaluate for ICD (Implantable Cardioverter-Defibrillator) or CRT (Cardiac Resynchronization therapy)
  - For primary prevention, may occur in the outpatient setting, (consider LifeVest in the interim)
  - For secondary prevention, device implantation should occur prior to discharge
- Smoking cessation
- Advance Directive / Advanced Care Planning / Code Status

## Clinical Documentation

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Document the following in H&P, progress notes:

- [NYHA Functional Classification and ACC/AHA Stages of Heart Failure](#)
- Specific type of heart failure (acute/chronic, systolic/diastolic, left /right) so the appropriate DRG can be coded.

## Discharge / Transition of Care

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### Discharge Planning and Patient Education

- Comprehensive discharge planning with detailed written instructions for the patient and caregivers to promote compliance and understanding of treatment

and educational goals

- Document provision of comprehensive discharge instructions addressing:
  - Activity level
  - Dietary instructions for sodium and fluid restriction recommendations
  - Medication regimen and indications
  - Weight monitoring
  - What to do if heart failure symptoms worsen
  - Follow-up, including an appointment scheduled within 7 days
- Consider outpatient referral to Nutrition & Dietetics

## Disease Management

- Referral to a comprehensive heart failure disease management program at the Ross ACC CHF Transition Clinic (614-293-6081) or OSU Carepoint East (614-688-6540) for high-risk patients, specifically, those with:
  - Previous hospitalizations
  - Multiple co-morbidities or medications
  - Cognitive or functional impairment
  - Depression or limited social support

## Recommended for all HF patients

- Exacerbating factors addressed
- Etiology identified
- Near optimal volume status observed
- Near optimal pharmacologic therapy achieved, including ACE-I, ARB or ARNI and beta-blocker
- Transition from IV to oral diuretic successfully completed
- Obtain BNP (or NT-ProBNP) near time of discharge
- Patient education completed
- Scale present in home
- Visiting nurse or telephone follow-up completed and documented in chart, no longer than 3 days after discharge
- Follow-up clinic visit scheduled, ideally within 7 days

## Additional considerations for patients with advanced HF or recurrent HF admissions

- Oral medication regimen stable for 24 hours
- No IV vasodilator or inotropic agent for 24 hours (unless to be discharged on inotrope)
- Ambulation before discharge to assess functional capacity

## Quality Measures

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- 30-day mortality rate
- 30-day readmission rate
- Length of Stay
- Documentation of ACEI, ARB, or ARNI and appropriate beta blocker prescribed at discharge for LVEF < 40%, or contraindication/rationale for not ordering
- Documentation of discharge instructions given on all of the following:
  - Activity
  - Diet
  - Medications
  - Weight monitoring
  - What to do if heart failure symptoms worsen
  - Follow-up
- Documentation of left ventricular systolic function
- % of patients with Cardiac Rehabilitation and Heart

## Order Sets

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- OSU IP ED: CDU/OBS CONGESTIVE HEART FAILURE / DIURESIS
- OSU IP ED: HEART FAILURE (ADHF / CHF)
- OSU IP HRT: ADMISSION HEART FAILURE MANAGEMENT
- OSU IP HRT: CARDIOLOGY FREQUENT ORDERS
- OSU IP HRT: ACEI/ARB MEDICATIONS

## References

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- 2013 ACCF/AHA Guideline for the Management of Heart Failure. *Circulation*, 2013;128:e240-e327
- 2017 ACC/AHA/HFSA Focused Update of the 2013 ACCF/AHA Guideline for the Management of Heart Failure. *Circulation*, 2017
- Heart Failure Society of America (HFSA) 2010 Comprehensive Heart Failure Practice Guideline, Executive Summary. *J Cardiac Failure*, 2010;16(6):475-539.
- Initial Emergency Department Management: ACE acute heart failure clinical policy - <http://www.acep.org/clinicalpolicies>
- 2016 AHA: Drugs that May Cause or Exacerbate Heart Failure. *Circulation* 2016;134(6):e32-69

## Guideline Authors

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## Guideline Approved

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**Disclaimer:** *Clinical practice guidelines and algorithms at The Ohio State University Wexner Medical Center (OSUWMC) are standards that are intended to provide general guidance to clinicians. Patient choice and clinician judgment must remain central to the selection of diagnostic tests and therapy. OSUWMC's guidelines and algorithms are reviewed periodically for consistency with new evidence; however, new developments may not be represented.*

## Appendix A :

### Emergency Department Management

Drug/Intervention	Indication	Notes
<b>Intravenous (IV) Loop Diuretic</b> <i>furosemide</i>	<ul style="list-style-type: none"> <li>• Volume Overload                             <ul style="list-style-type: none"> <li>○ Majority of HF admissions are due to congestion</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• If diuretic naïve, consider 40 mg IVP</li> <li>• If on home diuretics, give 2 times oral equivalent dose, intravenously (see Appendix C for conversion)                             <ul style="list-style-type: none"> <li>○ Max initial dose furosemide 80 mg IVP</li> </ul> </li> </ul>
<b>IV Vasodilators</b> <i>nitroglycerin</i>	<ul style="list-style-type: none"> <li>• Severe dyspnea in presence of hypertension (use with diuretic if congested)</li> </ul>	<ul style="list-style-type: none"> <li>• Nitroglycerin is preferred over nesiritide in the ED</li> <li>• In general, NTG is more effective at higher doses and can be rapidly titrated to &gt; 100 mcg/min as BP allows</li> <li>• Sublingual NTG may be given as NTG drip is titrated upwards</li> </ul>
<b>Noninvasive Ventilation</b>	<ul style="list-style-type: none"> <li>• Severe dyspnea, in absence of hypotension, altered mental status or need for acute intervention</li> </ul>	<ul style="list-style-type: none"> <li>• Use 5 to 10 mmHg CPAP by nasal or face mask as therapy to improve vital signs, and reduce the need for intubation, and possibly reduce in-hospital mortality</li> </ul>
<b>Additional vasodilators</b> <i>IV hydralazine</i>	<ul style="list-style-type: none"> <li>• Severe dyspnea in setting of severe hypertension</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Caution:</b> monitor for first dose hypotension</li> </ul>
<b>IV Inotrope</b> <i>Dobutamine or milrinone</i>	<ul style="list-style-type: none"> <li>• Signs/symptoms of low cardiac output</li> </ul>	<ul style="list-style-type: none"> <li>• If considering inotropes, consult Heart Failure</li> </ul>

## Appendix B

### Heart Failure Pharmacotherapy Dosing Reference

Generic Name	Trade Name	Initial Dose	Target Dose
<b>ACE-INHIBITORS</b>			
Captopril	Capoten	6.25 mg 3 times daily	50 mg three times daily
Enalapril	Vasotec	2.5 mg twice daily	10 mg twice daily
Fosinopril	Monopril	5 - 10 mg daily	40 mg daily
Lisinopril	Zestril, Prinivil	2.5 - 5 mg daily	20 mg daily
Perindopril	Aceon	2 mg daily	8-16 mg daily
Quinapril	Accupril	5 mg twice daily	20 mg twice daily
Ramipril	Altace	1.25 - 2.5 mg daily	10 mg daily
Trandolapril	Mavik	1 mg daily	4 mg daily
<b>ANGIOTENSIN RECEPTOR BLOCKERS</b>			
Candesartan	Atacand	4 - 8 mg daily	32 mg daily
Losartan	Cozaar	12.5 - 25 mg daily	100 – 150 mg daily
Valsartan	Diovan	40 mg twice daily	160 mg twice daily
<b>ANGIOTENSIN RECEPTOR NEPRILYSIN INHIBITOR</b>			
Sacubitril/Valsartan	Entresto	24/26 mg or 49/51 mg twice daily	97/103 mg twice daily
<b>BETA-BLOCKERS</b>			
Bisoprolol	Zebeta	1.25 mg daily	10 mg daily
Carvedilol	Coreg	3.125 mg twice daily	25-50 mg twice daily
Carvedilol ER	Coreg CR	10 mg daily	80 mg daily
Metoprolol succinate ER	Toprol XL	12.5 - 25 mg daily	150 - 200 mg daily
<b>ALDOSTERONE ANTAGONISTS</b>			
Spirolactone	Aldactone	12.5 - 25 mg daily	25 - 50 mg daily
Eplerenone	Inspra	25 mg daily	50 mg daily
<b>OTHER VASODILATORS</b>			
Isosorbide dinitrate/ Hydralazine (Fixed dose)	BiDil	20 mg / 37.5 mg three times daily	40 mg / 75 mg three times daily
Hydralazine	Apresoline	10 - 25 mg three times daily	75 - 100 mg three times daily
Isosorbide dinitrate	Isordil	20 mg three times daily	40 mg three times daily
<b>MISCELLANEOUS</b>			
Digoxin	Digitek/Lanoxin	0.125 - 0.25 mg daily	Per renal function, goal trough 0.5 – 1.0
Ivabradine	Corlanor	5 mg twice daily	7.5 mg twice daily
<b>INOTROPES / IV VASODILATORS*</b>			
		<b>Initial Dose</b>	<b>Max Dose</b>
Dobutamine	Dobutamine	2 mcg/kg/min	10 mcg/kg/min
Milrinone**	Primacor	0.25 mcg/kg/min	0.75 mcg/kg/min
Nesiritide	Natrecor	0.005 - 0.01 mcg/kg/min Optional Initial Bolus - 2 mcg/kg (No bolus if SBP is < 110 mmHg)	0.01 mcg/kg/min
Nitroglycerin		10 mcg/min. Consider starting at 40 mcg/min for hypertensive patients.	200 mcg/min. Titrate as tolerated to relief of dyspnea/hypertension. Rapidly titrate for hypertension.
Nitroprusside		0.5 mcg/kg/min	Titrate as tolerated; generally not greater than 3 mcg/kg/min Hemodynamic monitoring required

\* If prolonged use (i.e., >48 hrs), consider a **Heart Failure consult**.

\*\* May require dose adjustment for renal failure patients.

## Appendix C

### Heart Failure Diuretic Therapy

- Patients with decompensated heart failure and volume overload should be treated with intravenous loop diuretic (furosemide)
- **Initial Dose Selection:**
  - Loop diuretic naïve patients:
    - Furosemide 40 mg IVP
  - Loop diuretic experienced patients:
    - IV Furosemide at a dose, at least equal to, preferably up to 2-fold greater than, home loop diuretic equivalent
    - Review home loop diuretic dose (*refer to individual doses, not total daily dose*), convert to IV Furosemide equivalent based on below:

Home Oral Loop Diuretic Dose	Conversion Factor to Achieve IV Furosemide Dose <i>Equivalent to home dose</i>	Conversion Factor to Achieve IV Furosemide <i>2-fold Greater than home dose</i>
Furosemide	x 0.5	x 1
<i>Ex. Furosemide 40 mg</i>	$40 \text{ mg} \times 0.5 = 20 \text{ mg}$	$40 \text{ mg} \times 1 = 40 \text{ mg}$
Torsemide	x 1	x 2
<i>Ex. Torsemide 60 mg</i>	$60 \text{ mg} \times 1 = 60 \text{ mg}$	$60 \text{ mg} \times 2 = 120 \text{ mg}$
Bumetanide	x 20	x 40
<i>Ex. Bumetanide 2 mg</i>	$2 \text{ mg} \times 20 = 40 \text{ mg}$	$2 \text{ mg} \times 40 = 80 \text{ mg}$

- **Ongoing Dosing during Hospitalization:**
  - If adequate urine output response:
    - Repeat bolus administration every 8-12 hours until diuresis goals achieved
  - If suboptimal response:
    - Increase furosemide bolus dose (max 160 mg)
    - Initiate continuous infusion 5-20 mg/hr (max 40 mg/hr) following bolus
    - Add thiazide diuretic for synergy: Metolazone 2.5-5 mg daily prn, Hydrochlorothiazide 25-50 mg daily prn
    - Consult Heart Failure if failure to achieve goals
- **Transition to Oral Loop Diuretics:**
  - Most patients will require at discharge
  - IV to Oral Dose Equivalency:
    - Furosemide 20 mg IV = Furosemide 40 mg PO = Torsemide 20 mg PO = Bumetanide 1 mg PO
  - Torsemide preferred alternative for diuretic resistance and/or oral furosemide doses exceeding 80 mg

## Appendix D

### **Ultrafiltration for Fluid Removal in Acute Decompensated Heart Failure (ADHF)**

- The ultrafiltration (UF) procedure using the Aquadex FlexFlow System™ is restricted to the Cardiology and Nephrology Services. All other services must consult Cardiology or Nephrology to order the procedure.
- Specialized training in the use of the Aquadex System is required for nurses. See “Ultrafiltration Policy/ Procedure Statements” section in [Management of Continuous Renal Replacement Therapy \(CRRT\)](#) policy.

#### **Patient Selection**

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- **Ultrafiltration can be used in patients with:**
  - Continued weight gain secondary to volume overload heart failure that has not responded adequately to increased diuretic dosing (i.e., diuretic resistance)
    - Usually gained in excess of 5-10 pounds of volume and not responded to, at least 80 mg IV BID of furosemide or equivalent
  - Hemodynamically stable
  - Adequate IV access
  - No contraindication to full anticoagulation
- **Caution:**
  - Stop diuretics with the start of UF therapy
  - Use ultrafiltration cautiously in patients whose serum creatinine is >2.5 mg/dL
  - Do not use ultrafiltration in patients with serum creatinine is >3.0 mg/dL
- **Labs:**
  - PTT every 4 hours until stable x2, then every 8 hours
  - Chem 7 twice daily
  - CBC
  - BNP– pre- and post-treatment

#### **Monitor Effectiveness of Ultrafiltration**

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- Daily weight
- CVP at least every 6 hours if patient has central line

#### **Line Access**

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- Central line access is recommended for preservation of future peripheral chronic dialysis access sites if creatinine > 2 mg/dL
- Peripherally Inserted Central Catheters (PICC) cannot be used for ultrafiltration
- The following central line catheters are the most commonly used and recommended:
  - 7-8F dual lumen CVC
  - 6F dual lumen peripheral UF catheter (inserted per PICC consult)
  - Recommended blood flow rate 40 mL/min
- Peripheral line access may be used if creatinine < 2 mg/dL
  - Two 18g peripheral IVs
  - Recommended blood flow rate 25 ml/min

#### **Anticoagulation**

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- Stop or decrease warfarin therapy
- Withhold direct oral anticoagulant therapy (e.g. apixaban, dabigatran, edoxaban, rivaroxaban)
- Follow weight-based heparin cardiac sliding scale protocol
  - Initial bolus: 60 units/kg IVP 30 minutes prior to initiating therapy (max bolus: 4000 units)
    - Withhold bolus for INR > 2 on warfarin or receipt of direct oral anticoagulant
  - Continuous infusion, initial 12 units/kg/hr, adjusted per PTT
- Anticoagulation can be infused through the withdrawal side port of filter tubing or through existing central venous or peripheral access port
- If contraindication to heparin, use alternative anticoagulant (bivalirudin)

#### **Order Sets**

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- OSU IP HRT: PROC ULTRAFILTRATION INPATIENT
- OSU IP HRT: PROC ULTRAFILTRATION OUTPATIENT