**College of Pharmacy**

**Fourth year. Clinical Pharmacy**

**Treatment of acute decompensated heart failure (ADHF)**

**General Approach**

1-**Acute decompensated heart failure** involves patients with **new or worsening signs or symptoms** [often resulting from volume overload and/or low cardiac output (CO)] **requiring medical intervention**, such as emergency department visit or hospitalization.

2-Admission to an **intensive care unit** (ICU) may be required for some cases.

3-**Signs** and s**ymptoms of volume overload** include dyspnea, orthopnea, PND, ascites, GI symptoms (poor appetite, nausea, early satiety), peripheral edema, and weight gain.

4-**Low output signs and symptoms** include altered mental status tachycardia, hypotension (more commonly) or hypertension, cool extremities, pallor and decreased urine output.

5-**If fluid retention** is evident on physical exam, **start aggressive diuresis**, preferably with IV diuretics.

6-In the absence of cardiogenic shock or symptomatic hypotension, strive to continue all GDMT for HF. **β-blockers may be temporarily held or dose reduced** if recent changes are responsible for acute decompensation.

7-Other GDMT **(ACE inhibitors, ARBs, ARNI, and aldosterone antagonists) may also need to be temporarily withheld in the presence of renal dysfunction**, with close monitoring of serum potassium.

8-Place all patients with congestive symptoms **on sodium restriction** (<2 g daily) and consider fluid restriction for refractory symptoms.

9-Consider **noninvasive ventilation** for patients in respiratory distress due to acute pulmonary edema.

10-**Provide pharmacologic thromboprophylaxis** with unfractionated heparin or low-molecular-weight heparin for most patients with limited mobility; **consider mechanical thromboprophylaxis** with intermittent pneumatic compression devices in patients at high risk for bleeding.

11-Temporary **mechanical circulatory support** may be considered for hemodynamic stabilization until the underlying etiology has been corrected or until definitive therapy (e.g., cardiac transplantation).

12-**Cardiac transplantation** is the best option for patients with irreversible advanced HF. New surgical strategies such **myocardial cell transplantation** offer additional options for patients ineligible for device implantation or heart transplantation.

**Pharmacologic Therapy for ADHF**

**A-Loop Diuretics**

1-Current guidelines **recommend IV loop diuretics** (furosemide, bumetanide) as first-line therapy for **ADHF patients with volume overload**.

2-Bolus administration **reduces preload** by functional **venodilation** within 5–15 minutes and **later** (>20 minutes) **via sodium and water excretion**, thereby improving pulmonary congestion.

3-**Diuretic resistance may be improved by** administering larger IV **bolus** doses, transitioning from IV bolus to continuous IV **infusions**, or **adding a second diuretic** with a different mechanism of action, such as a distal tubule blocker (eg, oral metolazone, oral hydrochlorothiazide, or IV chlorothiazide).

**B-Vasopressin Antagonists**

1-Vasopressin receptor antagonists affect one or two AVP (**antidiuretic hormone**) receptors, V1A or V2. Stimulation of V1A receptors (located in vascular smooth muscle cells and myocardium) results in vasoconstriction, and positive inotropic effects. V2 receptors are located in renal tubules, where they regulate water reabsorption.

* **Tolvaptan** selectively binds to and inhibits the V2 receptor. It is an oral agent indicated for hypervolemic and euvolemic **hyponatremia in patients with HF**.
* **Conivaptan** nonselectively inhibits both the V1A and V2 receptors. It is an IV agent indicated for hypervolemic and euvolemic hyponatremia due to a variety of causes but is not indicated for patients with HF.

2-**Monitor patients** closely to avoid an **excessively rapid rise in serum sodium** requiring drug discontinuation.

**C-Vasodilators**

1-**Venodilators** **reduce preload** by increasing venous capacitance, and improve symptoms of pulmonary congestion. **Arterial vasodilators** **decrease afterload and causing increased CO**. **Mixed vasodilators** act on both arterial resistance and venous capacitance vessels, **reducing congestive symptoms while increasing CO.**

2-IV **vasodilators should be considered before positive inotropic** therapy in patients with low CO and elevated systemic vascular resistance (SVR). However, **hypotension may preclude their use in patients with preexisting low BP or SVR.**

3-**IV nitroglycerin is often preferred for preload reduction in ADHF**. Nitroglycerin displays potent coronary vasodilating properties making it the vasodilator of choice for patients with severe HF and ischemic heart disease.

4-**Sodium nitroprusside** is a **mixed arteriovenous vasodilator**. **Hypotension** is an important dose-limiting adverse effect of nitroprusside, and its use should be primarily reserved **for patients with elevated SVR**.

**D-Inotropes (**Dobutamine, Milrinone**, Norepinephrine** and **dopamine)**

1-Prompt correction of low CO in patients with hypoperfusion is required to **restore peripheral tissue perfusion and preserve end-organ function**.

2-**Inotropes should be considered only as a temporizing measure to maintain end-organ perfusion** in patients with cardiogenic shock or severely depressed CO and low systolic BP (ie, ineligible for IV vasodilators).

**Evaluation of therapeutic outcomes**

**Chronic Heart Failure**

1-Ask patients about the **presence and severity of symptoms** and how symptoms affect daily activities.

2-**Evaluate efficacy of diuretic treatment by** disappearance of the signs and symptoms of excess fluid retention.

3-**Body weight** is a sensitive marker of fluid loss or retention, and patients should weigh themselves daily and report changes of (1.4–2.3 kg) to their healthcare provider so adjustments can be made in diuretic doses.

4-**Symptoms may worsen initially on β-blocker therapy**, and it may take weeks to months before patients notice symptomatic improvement.

5-**Routine monitoring of** serum electrolytes (especially potassium and magnesium) and renal function (BUN, serum creatinine, eGFR) is mandatory in patients with HF.

**Acute Decompensated Heart Failure**

1-**Assess the efficacy of drug therapy with** **daily** monitoring of weight, strict fluid intake and output measurements, and HF signs/symptoms.

2-**Monitor frequently for** electrolyte depletion, symptomatic hypotension, and renal dysfunction. Assess vital signs frequently throughout the day.

**Reference**

**Joseph T. DiPiro, Robert L. Pharmacotherapy: A Pathophysiologic Approach, 12th Edition. 2023.**