

Quality Indicators **CMS EP CQM Quality Indicators:**

EP 135: An angiotensin-converting enzyme (ACE) inhibitor or angiotensin receptor blocker (ARB) should be prescribed for patients with heart failure and left ventricular systolic dysfunction (LVEF less than 40%)

EP 144: A beta-blocker should be prescribed for patients with heart failure and left ventricular systolic dysfunction (LVEF less than 40%)

PQRS Quality Indicators:

PQRS 5: ACE inhibitor or angiotensin receptor blocker should be prescribed for patients with a diagnosis of heart failure and a current or prior LVEF less than 40%

PQRS 8: Beta-blocker should be prescribed for patients with a diagnosis of heart failure and a current or prior LVEF less than 40%

PQRS 76: Maximal sterile barrier technique should be performed with central venous catheter insertion including: cap, mask, sterile gown, sterile gloves, large sterile sheet, hand hygiene, and 2% chlorhexidine for cutaneous antisepsis (or acceptable alternative per current guideline) and, if ultrasound used, sterile gel and sterile ultrasound probe

PQRS 111: Pneumonia vaccination should be prescribed for patients greater than 65 years old who have never received the vaccination and for adults with medical conditions that increase risk for pneumococcal disease

Admit / Transfer

Admit inpatient as soon as possible

Transfer

Condition

Good

Fair

Serious

Critical

Code Status:

Full code

Do not resuscitate

Activity

Bed rest

Bed rest with bathroom privileges

Elevate head of bed

Up ad lib with assistance

Up ad lib

Diet

- Sodium restriction has been commonly recommended in patients with acute or chronic heart failure (HF), although there are insufficient data to support any specific level of sodium intake in patients with symptomatic HF as noted in the 2013 American College of Cardiology/American Heart Association (ACC/AHA) and 2012 European Society of Cardiology guidelines. Given the available evidence, UpToDate suggests sodium restriction (eg, less than 2 g/d) in patients with symptomatic HF. The 2013 ACC/AHA guidelines suggest some degree (eg, less than 3 g/d) of sodium restriction in patients with symptomatic HF. (UpToDate)
- Fluid restriction (eg, 1.5 to 2 L/d) may be helpful in patients with refractory heart failure and hyponatremia, as suggested by the 2013 American College of Cardiology/American Heart Association (ACC/AHA) guidelines. Stricter fluid restriction is indicated in patients with severe (serum sodium less than 125 meq/L) or worsening hyponatremia, although patient tolerance of strict fluid restriction may be limited. (UpToDate)

Diet per dietitian

Sodium restricted diet, 2,000 mg (2 g)

Special Diet Instructions: fluids restricted to 2,000 mL per day

Vital Signs

- *Volume status, evidence of congestion, oxygenation, daily weight, fluid intake, and output should be continually reassessed. Monitoring should also include watching for and guarding against side effects (including electrolyte abnormalities, symptomatic hypotension, worsening renal function and metabolic alkalosis). (UpToDate)*

Check vital signs

Obtain weight and then every day

Monitor blood pressure

IV

Lock IV:

Saline lock intravenous

Crystalloid:

Normal saline intravenously and

Other Nursing

Assessments:

Obtain weight every day

Cardiac:

Continuous bedside cardiac monitoring

Arterial line pressure monitoring

Cardiac output

Central venous pressure monitoring

Pulmonary capillary wedge pressure UpToDate

Circulatory:

Peripheral IV line care per protocol

Insert peripheral IV line

knee-high antiembolism stockings

Arterial line care per protocol

Central venous line care per protocol

knee-high sequential compression device

Education:

Provide disease/medical condition education UpToDate UpToDate UpToDate UpToDate

Provide smoking cessation counseling

Fluid Balance:

Intake and output continuously

Peripheral edema assessment in both lower extremities and sacral area every day

Respiratory:

- *Supplemental oxygen therapy and assisted ventilation should be provided as needed to treat hypoxemia (SpO₂ less than 90 percent). Oxygen is not recommended as routine therapy in patients without hypoxemia, as it may cause vasoconstriction and reduction in cardiac output. (UpToDate)*

Maintain oxygen saturation greater than or equal to 90%

Monitor pulse oximetry continuously, notify MD if oxygen saturation is less than 90%

Urinary:

Monitor urine output

Catheter care per protocol

Insert catheter using Foley catheter

Therapies

Lines/Catheters:

- Routine use of invasive hemodynamic monitoring in patients with acute decompensated heart failure (ADHF) is not recommended. However, invasive hemodynamic monitoring is indicated in patients who are in respiratory distress or have clinical evidence of hypoperfusion in whom clinical assessment cannot adequately determine intracardiac filling pressures. (UpToDate)

Arterial catheter

central venous catheter

Pulmonary arterial catheter

UpToDate

Procedures:

- Restoration of sinus rhythm should be considered if atrial fibrillation (AF) is associated with hypotension or cardiogenic shock, if AF is the cause for pulmonary edema or if the response to therapy of pulmonary edema is suboptimal. (UpToDate)
- Ultrafiltration is reserved for patients with fluid overload who do not achieve an adequate response to an aggressive diuretic regimen. This recommendation is consistent with the 2013 American College of Cardiology Foundation/American Heart Association heart failure (HF) guidelines. (UpToDate)
- For selected patients with severe heart failure with reduced ejection fraction (HFrEF), with acute, severe hemodynamic compromise (cardiogenic pulmonary edema with cardiogenic shock), nondurable mechanical support is an option as a "bridge to decision" or "bridge to recovery". Mechanical modalities used in this setting include intraaortic balloon pump (IABP), extracorporeal membrane oxygenation (ECMO), or short-term left ventricular assist devices. (UpToDate)

Cardioversion

UpToDate

Endotracheal intubation per protocol

Intra-aortic balloon pump

UpToDate

Left ventricular assist device (LVAD)

UpToDate

Ultrafiltration

UpToDate

Respiratory Therapy Service:

Humidified oxygen via non-rebreather mask, at 12 liters per minute titrate to keep SpO2 greater than or equal to 90%

Ventilation: UpToDate UpToDate

- For patients with acute decompensated heart failure (ADHF) with respiratory distress, respiratory acidosis, and/or hypoxia with oxygen therapy, UpToDate recommends a trial of noninvasive ventilation (NIV) if emergent intubation is not indicated, no contraindications to NIV exist, and personnel with experience in NIV are available (Grade 1A). (UpToDate)
- Patients with respiratory failure due to acute decompensated heart failure (ADHF) who fail to improve with non-invasive ventilation (NIV) (within one-half to two hours), do not tolerate NIV, or have contraindications to NIV require endotracheal intubation for conventional mechanical ventilation. (UpToDate)

Bilevel positive airway pressure (BPAP)

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Continuous positive airway pressure (CPAP)

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Invasive ventilation

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UpToDate UpToDate

Intensivist to manage ventilator settings

Medications UpToDate

Loop Diuretics: UpToDate UpToDate

- In patients with acute decompensated heart failure (ADHF) and fluid overload, UpToDate recommends that initial therapy include a loop diuretic (administered intravenously) (Grade 1B). (UpToDate)
- For patients who have not previously received loop diuretic therapy, the following are common initial intravenous doses of loop diuretics in patients with normal renal function: furosemide – 20 to 40 mg intravenously; bumetanide – 1 mg intravenously; and torsemide – 10 to 20 mg intravenously. If there is little or no response to the initial dose, the dose should be doubled at two-hour intervals as needed up to the maximum recommended doses. (UpToDate)
- Patients treated with loop diuretics chronically may need a higher dose in the acute setting; the initial intravenous dose should be equal to or greater than (eg, 2.5 times) their maintenance total daily oral dose and then adjusted depending upon the response (eg, an initial intravenous furosemide dose of 40 to 100 mg for a patient who had been taking 40 mg orally per day). (UpToDate)

Furosemide 20 mg via intravenous bolus every 6 hours

Furosemide at 5 mg/hour via intravenous continuous infusion

Bumetanide 1 mg intravenously every 3 hours (not to exceed 10 mg in 24 hours)

Bumetanide at 0.5 mg/hour via intravenous continuous infusion

Torsemide 10 mg via intravenous bolus every 2 hours

Torsemide at 5 mg/hour via intravenous continuous infusion

Thiazide Diuretics:

- For patients in whom the diuretic response is inadequate, intravenous chlorothiazide or oral metolazone or spironolactone are reasonable choices for a second diuretic. (UpToDate)

Chlorothiazide 500 mg intravenously 1 time per day

Chlorothiazide 500 mg orally 2 times per day

Hydrochlorothiazide 25 mg orally 2 times per day

Metolazone 2.5 mg orally 1 time per day

Mineralocorticoid Receptor Antagonists:

- If not already being given, it is reasonable to initiate mineralocorticoid receptor antagonist therapy prior to the addition of a thiazide diuretic in patients with a low or low-normal serum potassium on loop diuretic therapy alone. (UpToDate)

Eplerenone 25 mg orally 1 time per day

Spironolactone 25 mg orally 1 time per day

Vasodilators:

- The routine use of vasodilators does not improve outcomes, and should be avoided. (UpToDate)
- For patients with urgent need for afterload reduction (eg, severe hypertension) or as a temporizing measure in patients with acute aortic regurgitation or acute mitral regurgitation, UpToDate suggests balanced vasodilator therapy (eg, nitroprusside) (Grade 2C). UpToDate suggests use of vasodilator therapy (eg, nitroglycerin) as an adjunct to diuretic therapy for patients without adequate response to diuretics (Grade 2C). UpToDate suggest vasodilator therapy as a component of therapy for patients with refractory heart failure and low cardiac output (Grade 2C). (UpToDate)
- For most patients hospitalized with acute decompensated heart failure (ADHF), UpToDate recommends against treating with nesiritide (Grade 1A). (UpToDate)

Nitroglycerin at 5 mcg/minute via intravenous continuous infusion titrate by 5 mcg/minute every 5 minutes (not to exceed 200 mcg/minute)

Nitroprusside sodium at 5 mcg/minute via intravenous continuous infusion titrate by 5 mcg/minute every 5 minutes (not to exceed 400 mcg/minute) Nitroprusside doses above 400 mcg/min generally do not provide greater benefit and may increase the risk of thiocyanate toxicity. (UpToDate)

Vasopressors-Inotropes: UpToDate

- Intravenous inotropic agents such as dobutamine and/or milrinone may be required as a temporizing measure in patients with severe heart failure with reduced ejection fraction (HFrEF) and low output syndrome (diminished peripheral perfusion and end-organ dysfunction). (UpToDate)
- Vasopressor use should be limited to patients with persistent hypotension with symptoms or evidence of consequent end-organ hypoperfusion despite optimization of filling pressures and the use of inotropic agents as appropriate. In this setting, invasive monitoring can be helpful to assess filling pressures and systemic vascular resistance. (UpToDate)
- Digoxin is NOT indicated as primary therapy for the stabilization of patients with acutely decompensated heart failure (HF). (UpToDate)

DOBUTamine HCl at 2.5 mcg/kg/minute via intravenous continuous infusion titrate by 0.5 mcg/kg/minute (not to exceed 20 mcg/kg/minute)

Milrinone lactate 50 mcg/kg via intravenous bolus single dose Loading dose.

Milrinone lactate at 0.375 mcg/kg/minute via intravenous continuous infusion titrate by 0.05 mcg/kg/minute (not to exceed 0.75 mcg/kg/minute)

Norepinephrine bitartrate at 2 mcg/minute via intravenous continuous infusion titrate by 1 mcg/minute (not to exceed 16 mcg/minute)

DOPamine HCl at 5 mcg/kg/minute via intravenous continuous infusion titrate by 1 mcg/kg/minute every 10 minutes (not to exceed 50 mcg/kg/minute)

Digoxin 0.125 mg orally 1 time per day

ACE Inhibitors:

- For patients who are not already taking an angiotensin converting enzyme (ACE) inhibitor, single-agent angiotensin II receptor blocker (ARB), or angiotensin receptor-neprilysin inhibitor (ARNI), UpToDate suggests that such therapy not be initiated at the time of presentation with an episode of acute decompensated heart failure (ADHF). An oral ACE inhibitor or ARB can usually be started within 24 to 48 hours, once the patient is hemodynamically stable. Initiation of these therapies known to improve outcomes is recommended prior to hospital discharge. UpToDate suggests reserving use of the ARNI sacubitril-valsartan for selected patients with heart failure with reduced ejection fraction (HFrEF) who have tolerated high doses of ACE inhibitor (or ARB) therapy (equivalent to at least enalapril 10 mg twice daily) for at least four weeks. However, some experts recommend sacubitril-valsartan as initial oral therapy (in place of ACE inhibitor or single-agent ARB) once the patient is hemodynamically stable. (UpToDate)
- For patients who are already taking an angiotensin converting enzyme (ACE) inhibitor, single-agent angiotensin II receptor blocker (ARB), or angiotensin receptor-neprilysin inhibitor (ARNI), UpToDate suggests that maintenance of oral therapy be cautiously continued. However, the dose should be decreased or the drug discontinued if hypotension, worsening renal function, or hyperkalemia is present. (UpToDate)

Lisinopril 5 mg orally 1 time per day

Enalapril maleate 2.5 mg orally 2 times per day

Captopril 6.25 mg orally 3 times per day

Quinapril HCl 5 mg orally 2 times per day

Angiotensin II Receptor Blockers: UpToDate

Candesartan cilexetil 4 mg orally 1 time per day

Valsartan 20 mg orally 2 times per day

Losartan potassium 25 mg orally 1 time per day

Angiotensin Receptor-Neprilysin Inhibitors: UpToDate

Sacubitril-valsartan 24-26 mg tablet 1 tablet orally 2 times per day

Sacubitril-valsartan 49-51 mg tablet 1 tablet orally 2 times per day

Sacubitril-valsartan 97-103 mg tablet 1 tablet orally 2 times per day

Beta-Adrenergic Blockers: UpToDate UpToDate

- For patients who are not already taking a beta blocker, UpToDate suggests that a beta blocker NOT be initiated at the time of presentation with an episode of acute decompensated heart failure (ADHF). Beta blockers are started at low doses and are generally started later than angiotensin converting enzyme (ACE) inhibitors or angiotensin II receptor blocker (ARBs), when the patient is euvoletic, usually shortly before discharge. (UpToDate)
- For patients who are already taking a beta blocker for heart failure with reduced ejection fraction (HFrEF), management depends upon the severity of heart failure decompensation and hemodynamic instability: for patients with severe decompensation (eg, severe volume overload and/or requiring inotropic support), UpToDate suggests withholding beta blockers; for patients with moderate-to-severe decompensation or hypotension, UpToDate suggests decreasing or withholding beta blocker therapy; for patients with mild decompensation without hypotension or evidence of hypoperfusion, UpToDate suggests continuation of beta blocker as tolerated. (UpToDate)

Carvedilol 3.125 mg orally 2 times per day

Metoprolol succinate extended release tablet 12.5 mg orally 1 time per day

Bisoprolol fumarate 1.25 mg orally 1 time per day

Other Anti-Anginal Agents: UpToDate

- For patients who are already taking ivabradine, management depends upon the severity of heart failure (HF) decompensation, heart rate, and hemodynamic instability. If an increased heart rate appears necessary to maintain cardiac output, then UpToDate suggests holding ivabradine in patients with severe decompensation. (UpToDate)
- For patients who are not already taking ivabradine, UpToDate suggests that this agent not be initiated at the time of presentation with an episode of acute decompensated heart failure (ADHF) or with initial oral therapy that generally includes an angiotensin inhibitor and then a beta blocker. UpToDate suggests ivabradine for patients with chronic heart failure with reduced ejection fraction (HFrEF) (with left ventricular ejection fraction [LVEF] less than or equal to 35 percent) in sinus rhythm with a resting heart rate greater than or equal to 70 beats per minute (bpm) and who are either on a maximum tolerated dose of beta blocker or have contraindication to beta blocker use. Concurrent treatment should include angiotensin-converting-enzyme (ACE) inhibitor (or angiotensin II receptor blocker [ARB]), and a mineralocorticoid receptor blocker (if potassium can be appropriately monitored). (UpToDate)

Ivabradine HCl 2.5 mg orally 2 times per day

Anticoagulants: UpToDate

- For patients with heart failure with reduced ejection fraction (HFrEF) in sinus rhythm and prior thromboembolic event, UpToDate suggests a vitamin K antagonist (eg, warfarin) versus no anticoagulant (Grade 2C). Due to lack of data, UpToDate does not consider newer anticoagulants such as dabigatran or rivaroxaban alternatives to warfarin in this setting.

Warfarin sodium 2 mg orally 1 time per day

Antiplatelet Agents:

- For patients in sinus rhythm with left ventricular systolic dysfunction (with or without heart failure [HF]) without acute left ventricular thrombus, coronary artery disease, or other indication for antithrombotic therapy, UpToDate recommends not administering antiplatelet or anticoagulant therapy (Grade 1B). (UpToDate)
- Given the lack of demonstrated benefit of antithrombotic therapy in patients with heart failure with reduced ejection fraction (HFrEF), antiplatelet or anticoagulant therapy is not used in patients with HF with preserved left ventricular ejection fraction in the absence of a specific indication for such therapy. (UpToDate)

Aspirin delayed release tablet 81 mg orally 1 time per day

Aspirin 81 mg orally 1 time per day

Electrolytes:

Potassium chloride extended release tablet 20 mEq orally 1 time per day

Potassium effervescent 20 mEq orally 1 time per day

Potassium chloride 10 mEq in 100 mL half-normal saline intravenously single dose over 1 hour *Administer through central line.*

Magnesium chloride-calcium carbonate delayed release tablet (equivalent to Slow-Mag) 71.5 mg (based on elemental magnesium) orally 1 time per day

Magnesium oxide 400 mg orally 2 times per day

Magnesium sulfate 2 grams in 100 mL 5% dextrose in water intravenously single dose over 60 minutes

Venous Thromboembolism Prophylaxis: UpToDate

- *Prophylaxis against venous thromboembolism (deep vein thrombosis and pulmonary embolism) with low-dose unfractionated heparin or low molecular weight heparin, or fondaparinux is indicated in patients admitted with acute decompensated heart failure (ADHF) who are not already anticoagulated and have no contraindication to anticoagulation. In patients admitted with ADHF who have a contraindication to anticoagulation, venous thromboembolism prophylaxis with a mechanical device (eg, intermittent pneumatic compression device) is suggested. (UpToDate)*
- *Among the available agents for pharmacologic thromboprophylaxis, UpToDate prefers low molecular weight (LMW) heparin rather than other anticoagulants (Grade 2C), particularly in high risk populations (eg, critically-ill, cancer, stroke). For those with renal failure (creatinine clearance less than 30 mL/min) or for those in whom cost is an issue, unfractionated heparin (UFH) is a reasonable alternative. For patients with heparin-induced thrombocytopenia, fondaparinux may be used as an alternative to heparin. (UpToDate)*

Enoxaparin sodium 40 mg subcutaneously 1 time per day

Heparin sodium 5,000 units subcutaneously every 12 hours

Vaccines- Pneumococcal:

Pneumococcal 13-valent conjugate vaccine 0.5 mL intramuscularly single dose

Pneumococcal 23-valent polysaccharide vaccine 0.5 mL intramuscularly single dose

Laboratory UpToDate

- *Recommended initial blood tests for patients with symptoms and signs of heart failure (HF) include: a complete blood count, serum electrolytes (including calcium and magnesium), blood urea nitrogen, creatinine, liver function tests, fasting blood glucose, lipid profile, and thyroid stimulating hormone. (UpToDate)*

Blood Gases:

Arterial blood gas (arterial blood)

Venous blood gas (venous blood)

Chemistry:

Comprehensive metabolic panel (serum)

Magnesium (serum)

Albumin (serum)

Electrolyte panel (serum)

Fasting glucose (serum)

Fasting lipid panel (serum)

Hepatic function panel (serum)

Renal function panel (serum)

Thyroid stimulating hormone (serum)

Hematology:

CBC with platelets (whole blood)

Cardiac Markers:

- *Measurement of plasma brain natriuretic peptide (BNP) or N-terminal pro-brain natriuretic peptide (NT-proBNP) is suggested in the evaluation of patients with suspected heart failure (HF) when the diagnosis is uncertain. Elevated natriuretic peptide levels should be interpreted in the context of other clinical information but should NOT be used in isolation to diagnose HF. (UpToDate)*

B-type natriuretic peptide (serum) UpToDate

NT-proBNP (serum)

Troponin-I (serum) UpToDate

Troponin-T (serum)

Creatine kinase-MB (serum)

Coagulation:

Partial thromboplastin time (plasma)

Prothrombin time/international normalized ratio (plasma)

Therapeutic Drug Levels:

Digoxin (serum)

Urinalysis:

Urinalysis (urine)

Imaging**X-Ray:**

Portable inspiration AP (upright) X-ray of the chest today

Routine inspiration PA/lateral X-ray of the chest today

Other Tests

- *Echocardiography should be performed in all patients with new onset heart failure. (UpToDate)*

Cardiovascular Testing:

12-lead ECG today

12-lead serial ECG

Transthoracic echocardiogram today

Consultations UpToDate UpToDate UpToDate

Cardiac Electrophysiology consultation today

Cardiac Rehabilitation consultation today

Cardiac Transplant Surgery consultation today

Cardiology consultation today

Cardiothoracic Surgery consultation today

Critical Care Medicine consultation today

Dietitian consultation today

Home Care Nursing consultation today

Interventional Cardiology consultation today

Interventional Radiology consultation today

Nephrology consultation today

Social Services consultation today
