Disclaimer

- Omnicare, Inc., as a provider of Infusion Pharmacy Services, is committed to the establishment and maintenance of the highest quality of care in infusion therapy services.

- This Infusion Therapy Education Program has been developed entirely by Omnicare Infusion Services. This program is not meant to be used alone or to replace the practicum necessary at the patient’s bedside with an experienced clinician preceptor. This preceptorship is needed to develop the skill set required to properly perform and administer infusion therapy competently. Determining and documenting competency is the responsibility of your employer.

- Skills validation checklists are available in the Omnicare Nurses’ Infusion Manual and electronically on Omniview, Omnicare’s web portal.

- The nature of infusion therapy requires frequent updates. It is the responsibility of the healthcare professionals involved with infusion management to remain current in his/her practice.
Disclaimer

• The practitioner is responsible for the exercise of independent skill and judgment in the implementation of this information in the clinical setting. This educational program is not intended to replace good professional judgment by the healthcare provider nor is it intended to supersede the necessity for clinically sound prerogatives of a healthcare organization.
• This education program was developed with reference to standards of care and practice guidelines set forth by organizations such as The Joint Commission, the Centers for Disease Control, the Infusion Nurses Society, the Agency for Healthcare Research and Quality, and the Institute for Safe Medication Practices, and USP 797.

Objectives

1. Review anatomy of the heart
2. Discuss electrical conductivity of the heart
3. Define heart failure and discuss its causes
4. Identify right-sided versus left-sided heart failure
5. Discuss remodeling of the heart and the importance of identifying ejection fraction
6. Discuss New York Heart Association classifications of heart failure and identify stages

Objectives

7. Review non-pharmacologic treatment modalities
8. Review pharmacologic treatment modalities
9. Identify LTC guidelines for patients receiving inotropic medications
10. State common inotropic medications which may be administered in LTC
11. Demonstrate inotropic medication calculations
Objectives

13. Review nursing measures in administration of inotropic medications, including laboratory monitoring
14. Identify emergency treatment protocols
15. Discuss end of life considerations (hospice care)

Disclaimer: The licensed nurse may perform inotropic therapy administration procedures according to state law and facility policy. The nurse shall be competent in the safe delivery of infusion therapy within her or his scope of practice. The nurse shall be accountable for attaining and maintaining competence with infusion therapy within her or his scope of practice.

Heart Failure Statistics

• 5.8 million Americans have heart failure
• 400,000 to 700,000 new cases diagnosed yearly
• 50% of heart failure patients die within 5 years of diagnosis
• Heart failure contributes to 300,000 deaths each year
• Heart failure is leading cause of hospitalization for Americans over 65

Heart Failure Statistics

• More Medicare dollars are spent for heart failure diagnosis and treatment than any other diagnosis
• American Heart Association estimates heart failure direct and indirect costs at $32 billion/year
• There is increased access to palliative and hospice care for patients with advanced stage heart failure
• By 2030, it is projected:
  – 8 million Americans will have heart failure
  – Heart failure costs double
The Human Heart

• Vital organ that functions as a pump, providing a continuous circulation of blood through the body

• Complex structure composed of fibrous, muscle and electrical conducting tissue

• To function correctly needs:
  – Good functioning muscle
  – Good valve system
  – Efficient pumping rhythm

The Human Heart

• Normally, in a healthy heart, the right ventricle pumps the same amount of blood into the lungs that the left ventricle pumps out into the circulatory system.

The Human Heart

• The pathways of the blood through the heart are the pulmonary and circulatory systems. This includes the tricuspid, mitral, aortic and pulmonary valves.

• A valve’s purpose is to allow blood to flow in only one direction. Properly functioning valves prevent back flow, or regurgitation of blood.
The Human Heart

<table>
<thead>
<tr>
<th>Valve</th>
<th>Prevents back flow of blood</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aortic</td>
<td>from the aorta into the left ventricle</td>
</tr>
<tr>
<td>Pulmonary</td>
<td>from the pulmonary artery into the right ventricle</td>
</tr>
<tr>
<td>Tricuspid</td>
<td>from the right ventricle into the right atrium</td>
</tr>
<tr>
<td>Mitral</td>
<td>from the left ventricle into the left atrium</td>
</tr>
</tbody>
</table>

Electrical Conductivity of the Heart

- The senatorial node (SA node) is known as the heart's pacemaker and is located in the wall of the right atrium. When it fires, it sends an electrical impulse through the heart muscle and into the right and left atria.

- This causes the atria to contract which then forces blood into the ventricles.

Electrical Conductivity of the Heart

- The atrioventricular node (AV node) is located at the bottom of the right atrium. After the atria contract, this node briefly slows down the electrical signal so as to give the ventricles time to receive the incoming blood.
Electrical Conductivity of the Heart

- The electrical signal is then passed on to the Bundle of HIS

- The Bundle of HIS is comprised of tissue within the ventricular septum. It splits off to form the right and left bundle branches and the Purkinje fibers. This signal causes the ventricles to contract. The right ventricle will pump blood into the pulmonary artery and on to the lungs while the left ventricle will pump blood to the aorta which goes out to the rest of the body.

Measuring Electrical Activity

- First the SA node fires as the trigger: No EKG effect
- Next, the muscles of the Atria contract: P wave on EKG
- Next, the impulse is slowed by the AV node and carried down the His bundle, the left and right bundle branches, and the Purkinje fibers: No EKG effect
- Next, the muscles of the ventricles contract: QRS complex on EKG
- Next, the muscles of the ventricles relax: T wave on EKG

Ejection Fraction

- Ejection fraction, also called LVEF, is the measure of the function of the left ventricle
- The ejection fraction is the percentage of blood ejected from the left ventricle with each heart beat
- A LVEF of 50% indicates that the left ventricle ejects half its volume each time it contracts
- A normal ejection fraction is 50% or higher
- A reduced ejection fraction indicates that cardiomyopathy is present
- Ejection fraction is measured by echocardiogram, angiogram or other cardiac function tests
Questions to ponder:

1. What diseases or conditions can cause scarring or damage to the heart’s electrical system?
   • Scar tissue can occur from heart surgeries; medications can cause alterations;
   • Atrial dysrythmias such as Atrial Fibrillation or A-Fib, and Atrial Flutter

2. What conditions can occur when your heart does not pump effectively?
   • Heart Failure

3. What problems occur when the heart’s arteries are sclerosed and/or occluded?
   • CAD; Myocardial infarctions

Heart Failure

• Heart failure is the heart’s inability to pump effectively to meet the metabolic needs of the body
• Complex clinical syndrome
• Last stage in the progression of cardiovascular disease
• Coronary artery disease and hypertension often in combination account for approximately 70%-90% of all cases

Causes of Heart Failure

<table>
<thead>
<tr>
<th>Coronary Artery Disease (CAD)</th>
<th>Occurs when arteries that supply blood to heart muscle become hardened and narrowed. This is due to the buildup of cholesterol and other material, called plaque, on the inner arterial wall.</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Blood Pressure</td>
<td>Blood pressure is the force of your blood pushing against the walls of the arteries. If this pressure rises and stays high over time, it can damage the heart, blood vessels, kidneys, and other parts of the body.</td>
</tr>
</tbody>
</table>
| Diabetes                     | In diabetes, the pancreas either produces little or no insulin, or the cells do not respond appropriately to the insulin that is produced. People with diabetes are prone to:  
   • hypertension  
   • abnormal cholesterol  
   • high triglycerides  
   • obesity  
   • lack of physical exercise  
   All of these factors predispose them to cardiac disease |
**Causes of Heart Failure**

Myocardial Infarction (heart attack)
May lead to heart failure if the heart is damaged due to a blood clot that blocks blood flow to an area of the heart weakening the heart’s pumping ability

Faulty heart valve
A damaged valve forces the heart to work harder which, over time, weakens the heart

Cardiomyopathy (damage to heart muscle)
Infections, alcohol abuse, and toxicities from drug abuse (cocaine) may damage the muscle of the heart resulting in heart failure

**Causes of Heart Failure**

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Myocarditis</td>
<td>Inflammation of the heart muscle (viral or bacterial) can cause heart failure</td>
</tr>
<tr>
<td>Congenital heart defects</td>
<td>Uncorrected heart defects cause the healthy parts of the heart to work harder. This may eventually lead to heart failure.</td>
</tr>
<tr>
<td>Hx of alcohol abuse</td>
<td>Alcoholic cardiomyopathy is characterized by left ventricular dilation and heart muscle deterioration. The heart muscle is weakened.</td>
</tr>
<tr>
<td>Hx of rheumatic fever</td>
<td>Rheumatic fever produces inflammation of the heart and subsequent heart valve damage</td>
</tr>
</tbody>
</table>

**Right-sided vs. Left-sided Heart Failure**

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Right Heart Failure</td>
<td>The inability of the right side of the heart to adequately pump venous blood into pulmonary circulation. This causes a back-up of fluid in the body, resulting in edema.</td>
</tr>
<tr>
<td>Left Heart Failure</td>
<td>The inability of the left side of the heart to pump blood into the systemic circulation. Back up in the left ventricle causes accumulation of fluid in the lungs.</td>
</tr>
</tbody>
</table>

A patient may have right-sided or left sided heart failure, but eventually both will be affected.
What Happens to the Heart?

Remodeling is the alteration in the structure of the heart in response to hemodynamic pressure and/or cardiac injury. It’s the heart’s attempt to maintain adequate blood flow.

<table>
<thead>
<tr>
<th>Systolic Heart Failure</th>
<th>Diastolic Heart</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Inability of left ventricle to pump blood adequately.</td>
<td>• Inability of left ventricle to relax properly.</td>
</tr>
<tr>
<td>• Defined by LVEF of 40% or less</td>
<td>• Restricts ventricular filling</td>
</tr>
<tr>
<td>• Causes impaired contractility/ejection</td>
<td>• Does not typically affect ejection fraction.</td>
</tr>
<tr>
<td></td>
<td>• LVEF is usually greater than 40%-50%</td>
</tr>
</tbody>
</table>

Classification of Heart Failure

New York Heart Association (NYHA) Classification of Functional Heart Capacity

<table>
<thead>
<tr>
<th>Class</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>I (mild)</td>
<td>No limitation of physical activity. Ordinary physical activity does not cause undue fatigue, palpitation or dyspnea.</td>
</tr>
<tr>
<td>II (mild)</td>
<td>Slight limitation of physical activity. Comfortable at rest, but ordinary physical activity results in fatigue, palpitation or dyspnea.</td>
</tr>
<tr>
<td>III (moderate)</td>
<td>Marked limitation of physical activity. Comfortable at rest, but less than ordinary activity causes fatigue, palpitation or dyspnea.</td>
</tr>
<tr>
<td>IV (severe)</td>
<td>Unable to carry out any physical activity without discomfort. Symptoms of cardiac insufficiency at rest. Discomfort increased with any physical activity.</td>
</tr>
</tbody>
</table>
Stages of Heart Failure

<table>
<thead>
<tr>
<th>Stage</th>
<th>Assessment</th>
<th>History</th>
<th>Treatment May Include:</th>
</tr>
</thead>
</table>
| A     | • Persons at risk for heart failure  
• Currently no structural disorder of heart  
• Hypertension  
• CAD  
• NIDDM | • Hypertension  
• Encourage smoking cessation  
• Treat lipid disorders  
• Encourage regular exercise  
• Discourage alcohol intake and illicit drug use  
• ACE inhibitors | |
| B     | • Early changes in heart structure and function  
• No clinical evidence of disease  
• Previous MI  
• Lipid disorders | • All measures above  
• ACE inhibitors and beta blockers as appropriate | |
| C     | • Marked limitation of physical activity  
• Comfortable at rest, but less than ordinary activity causes fatigue, palpitation or dyspnea | | • All measures above  
• Diuretics  
• Dietary salt restrictions should be in place |
| D     | • Unable to carry out any physical activity without discomfort  
• Symptoms of cardiac insufficiency at rest. (e.g., discomfort increased with any physical activity) | | • All measures above  
• Inotropic medications  
• Frequent hospitalizations  
• Heart transplant  
• Hospice |
Goals of Treatment

• Decrease workload of the heart
• Increase cardiac output
• Increase myocardial contractility
• Decrease retention of Na+ and water
• Control symptoms of CHF
• Feel better, live longer and stay out of the hospital

Non-Pharmacological Treatment Modalities

In the heart failure patient, ongoing dietary restrictions are combined with pharmacological modalities to improve cardiac function.

• Dietary restrictions
  – DASH diet (Dietary Approaches to Stop Hypertension) is low in sodium, cholesterol and saturated fat; high in fruits and vegetables, fiber and low fat foods
  – CDC encourages limiting sodium intake to 1500 mg/day (note: one teaspoon equals 2300 mg)
  – CDC theorizes that a decrease in sodium consumption by 400mg/day is projected to prevent up to 28,000 deaths and 7 billion dollars annually
  – The 2010 Dietary Guidelines for Americans recommends limiting sodium to 2300 mg/day, but specific populations at risk (those over 51 years old, children of African American descent, and those with hypertension, DM, or chronic kidney disease) should limit to 1500 mg/day.

Non-Pharmacological Treatment Modalities (continued)

– CDC, in 2012, listed 10 foods that are responsible for more than 40% of sodium in our diets:
  • Breads/rolls
  • Luncheon meat
  • Pizza
  • Poultry
  • Soups
  • Cheeseburgers
  • Cheese
  • Pasta dishes
  • Meat loaf
  • Snack foods
Non-Pharmacological Treatment Modalities

- Bedrest during acute illness (decreases workload on heart)
- Cardiac rehabilitation
  - Exercise
  - Evaluation for CPAP/BIPAP therapy
  - Smoking cessation
  - Lifestyle management
  - Discourage alcohol use
  - Decrease illicit drug use
  - Diagnose/treat lipid disorders

Pharmacological Treatment Modalities

**Diuretics**
- Relieve pulmonary congestion and edema (number one choice for treating fluid overload in heart failure patients)
- Doses typically will start at 40 mg/day, and are increased to achieve maximum effect
- Routes of administration include: PO, IM, IV push, continuous infusions
- Examples: furosemide, bumetanide

**Morphine**
- Used to relieve symptoms in acute heart failure (e.g., anxiety)

Pharmacological Treatment Modalities

**ACE Inhibitors:** Angiotensin converting enzymes
- Decrease peripheral vascular resistance, increased diuresis, vasodilation and lower BP without any change in heart rate, improves NYHA functional class
- Should be prescribed to all systolic heart failure patients unless contraindicated
- Development of a nonproductive cough may be a sign of intolerance to an ACE inhibitor
- Patients who can’t tolerate ACE inhibitors due to side effects (e.g., coughing) may be given an Angiotensin II Receptor Blockers (ARBs)
- Examples: Lisinopril, Enalapril, Captopril, Altace

**Angiotensin II Receptor Blockers**
- Vasodilators that widen blood vessels to lower blood pressure, improve blood flow and decrease the workload on the heart
- Provides same benefits as ACE inhibitors
- Indicated for patient’s with intolerance to ACE inhibitors
- Examples: Atacandol, Avapro, Cozaar, Diovan, Telzten
Pharmacological Treatment Modalities

<table>
<thead>
<tr>
<th>Beta Blockers</th>
<th>Pharmacological Treatment Modalities</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Slows heart rate and lowers blood pressure</td>
<td>Pharmacological Treatment Modalities</td>
</tr>
<tr>
<td>• May slow down progression of heart failure and improve survival</td>
<td>Pharmacological Treatment Modalities</td>
</tr>
<tr>
<td>• Examples: Propranolol, Metoprolol, Labetolol, Atenolol</td>
<td>Pharmacological Treatment Modalities</td>
</tr>
</tbody>
</table>

Inotropes and Phosphodiesterase Inhibitors

• Ordered when traditional regimens have failed and patient’s chronic symptoms result in frequent hospitalizations for exacerbations of heart failure
• Act upon adrenergic receptors in the body
  -- Mimic the effects of natural catecholamines (adrenaline, epinephrine)
  -- Effects can be seen within 5-15 minutes of initiating therapy
  -- Can cause exacerbation or other cardiac instabilities
• Inotropics
  -- Digitalis, Dopamine, Dobutamine
• Phosphodiesterase inhibitors
  -- Potent inotropic and vasodilators
  -- Milrinone, Inamrinone
• May increase risk of abnormal heart rhythm when other drugs are taken with Inotropes

Why are Inotropes prescribed?

• To stimulate an injured or weakened heart to pump stronger to send blood through the body
• To increase cardiac output. May also speed up the heart’s rate.
• In end-stage heart failure, to help relieve and control heart failure symptoms. These medications are only used when other medications/modalities no longer control heart failure symptoms.
• Goal: tissue perfusion and oxygenation

Skilled Nursing Facility Guidelines in the Care of the Patient Receiving Inotropic Therapy

• Patients receiving inotropic therapy in an acute care setting MUST be screened carefully for appropriateness to the LTC facility
• Inotropic infusion therapy will NOT be initiated in the LTC setting
• Patient MUST be under the care of a cardiologist
• Patients MUST not exhibit:
  -- Clinically unstable diagnosis
  -- Uncontrolled arrhythmias
  -- Atrial fibrillation with rapid ventricular response
  -- MI within past 6 weeks
  -- Hypertrophic subaortic stenosis
  -- Severe obstructive aortic disease
  -- Pulmonary valvular disease
Skilled Nursing Facility Guidelines in the Care of the Patient Receiving Inotropic Therapy

• All candidates MUST have an established CVAD with confirmation of tip placement in SVC
• On admission a plan MUST be established for potential interruption of therapy due to loss of vascular access or patency
• All candidates must:
  – Be stable for at least 72 hours prior to transfer
  – Have had at least 48 hours of continuous EKG monitoring
  – Provide documentation that indicates the patient has not experienced adverse reactions or evidence of life threatening complications
• Inotropic agents MUST be premixed by the pharmacy

Dosing

• Doses may be given continuously or intermittently
• Doses are given based on patient’s weight in kilograms (s)
• As the patient weight changes the rate may be adjusted without rehospitalization

Since isotropes are dosed based on weight, rates may change if weight fluctuates, but the dose per kg of body weight may stay the same

Dosing

• Doses are adjusted based on patient’s response as measured by:
  – Blood pressure
  – Heart rate
  – Urine output
  – Presence of arrhythmias
• If dose change is required, patient must be re-admitted to the acute care setting
Inotropic Medications

<table>
<thead>
<tr>
<th>Medication</th>
<th>Action</th>
<th>Recommended Dose</th>
<th>Adverse Drug Reactions</th>
</tr>
</thead>
<tbody>
<tr>
<td>DOBEP (Troxirine)</td>
<td>Increases myocardial contractility and improves left ventricular filling; increases cardiac output. Used for palliation of symptoms with and without heart failure.</td>
<td>• 5-10 mcg/kg/min IV over 4-6 hrs every 4-6 hrs or twice a week. • 5-10 mcg/kg/min IV; 8 hrs once a week. • 2.5-5 mcg/kg IA, IM, or SC, continuously.</td>
<td>• Tachycardia, palpitation, hypotension, hypotension. • May necessitate reduction or discontinuation of dose. • Angina, dyspnea—secondary to increased CO demand. • Witnessing of arrhythmias—secondary to hypokalemia. • Nausea, vomiting, paraesthesia (paresthesia). • Edema, muscle spasms (primarily in ESPD residents).</td>
</tr>
</tbody>
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Inotropic Medications

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<tr>
<td>DOPamine</td>
<td>Vasodilates increases renal blood flow and increases cardiac output.</td>
<td>2.5-5 mcg/kg/min continuously.</td>
<td>• Tachycardia, hypotension, hypotension, and hypokalemia. • Tissue necrosis/paresthesia (secondary to hypokalemia). • Fatigability occurs, rapid phlebitis, rapid phlebitis, rapid hypotension, hypotension, or hypotension. • Tissue necrosis/paresthesia (secondary to hypokalemia). • Fatigability occurs, rapid phlebitis, rapid phlebitis, rapid hypotension, hypotension, or hypotension.</td>
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**Inotropic Medications**

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<th>Recommended Dose</th>
<th>Adverse Drug Reactions</th>
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</table>
| Milrinone (Primacor®) | Vasodilator that works by relaxing the muscle in blood vessels to help them dilate. This lowers blood pressure and allows blood to flow more easily. Has an increased prolonged duration of action with a longer lasting effect after discontinuation. | 0.375–0.75 mg/kg/min, continuously | • Worsening of arrhythmias, tachycardia, palpitations, angina.  
• Hypotension, syncope, headache.  
• Nausea, vomiting, tremors  
• Thromboembolism  
• Hypokalemia (secondary to diarrhea)  
Monitor blood pressure and electrolytes |

Pentoxifylline (Trental®, Treprostinil) should never be given via IV access devices containing Milrinone (Primacor®) flushes or medications. Inotropes are usuaoled on weight-based mg change if weight fluctuates, but the dose per kg of body weight may stay the same.

**Inotropic Medications**

<table>
<thead>
<tr>
<th>Medication</th>
<th>Action</th>
<th>Recommended Dose</th>
<th>Adverse Drug Reactions</th>
</tr>
</thead>
</table>
| Neosinide (INPACOR®) | Used to treat patients with acutely decompressed heart failure who have dyspnea at rest or with minimal activity. May cause prolonged hypertension. | 2 mcg/kg increase of infusion of therapy followed by continuous infusion 0.05–0.010 mcg/kg/min | • High risk of hypotension  
*Monitor blood pressure closely  
*Dose should be reduced or discontinued if hypotension occurs  
Angina, syncope, arrhythmia  
Acute: *Monitor effects closely in residents with renal impairment  
Dehydration, headaches, confusion, muscle cramps, nausea  
Syncope, dizziness, tremor, paresthesias |

**Inotrope Drug Interactions**

- May increase risk of abnormal heart rhythm when other drugs are taken with inotropes
- May cause build up of inotropes in blood, therefore increasing risk of overdose
- May decrease $K^+$ level
- May increase intensity of signs and symptoms
Physician/LIP orders
Must include, but are not limited to:
• Inotropic agent and dosage based on patient's weight in kilogram (kg)
• Frequency and duration of infusion
• Laboratory monitoring with reportable parameters
• Vital sign frequency with reportable parameters
• Daily weight with reportable parameters
• Extravasation protocol, if applicable

Calculating Weight Based Dosages in mL/hr

All math equations must be checked with a second nurse

Step 1
Convert lbs to kg
170 lbs
2.2 lb = 1 kg
170/2.2 = 77 kg

Calculating Weight Based Dosages in mL/hr

All math equations must be checked with a second nurse

Step 2
Multiply kg by dose
kg x dose = mcg/min
77 kg x 5 mcg/min = 385 mcg/min
Calculating Weight Based Dosages in mL/hr

Step 3
Calculate mcg/hr
mcg/min x 60
minutes/hr
= 386 mcg/min x 60 min/hr
= 23100 mcg/hr

All math equations must be checked with a second nurse

Calculating Weight Based Dosages in mL/hr

Step 4
Calculate mL/hr
mcg/hr concentration = mL/hr
= 23100 mcg/hr divided by 2000 mcg/mL
= 11.55 mL/hr

All math equations must be checked with a second nurse

Nursing Measures

• Inotropic medications require a central vascular access device
• Inotropic agents must be given via elastomeric or electronic infusion device
• A backup electronic infusion device/elastomeric device must be available
• Inotropic agents cannot be piggy-backed or admixed with other medications infusing into the same vascular access line. Mark one lumen of the CVAD to be used for Inotropic Therapy only.
• Two nurses must verify label/infusion device settings:
  – Prior to initiation
  – Every 8 hours
  – With all dose changes
Laboratory Monitoring
The facility nurse is responsible for reporting results to pharmacist and physician/LIP within one hour of receiving from lab.
- Complete blood count (CBC)
- Serum electrolytes
- Renal and hepatic function tests
- Fasting blood glucose
- Lipid profile
- Thyroid function tests
- Brain natriuretic peptide (BNP)
- Urinalysis

Administration of Inotropic Therapy
- Develop written emergency plan for potential loss of vascular access, or infusion complications
  - Continuous infusions
  - Intermittent infusions
- Assessment prior to initiating therapy must include, but is not limited to:
  - Weight
  - Intake and output
  - Vital signs
  - BP and HR acts as a baseline from which response to drug can be assessed
  - Recent lab values

Administration of Inotropic Therapy
- Physical assessment
  - Patient’s overall appearance
  - Height, weight, and vital signs
  - Auscultation of lungs
    - Intake & output
    - Respiratory pattern: rales (crackles), wheezing, rhonchi, and diminished or absent breath sounds
  - Edema, orthopnea, jugular vein distention (JVD)
- Two nurses must verify label/infusion device settings for:
  - Proper dose
  - Dosage calculations
  - Electronic infusion device settings
Administration of Inotropic Therapy

• Patient Monitoring
  - Vascular access site assessments:
    • Every two hours during infusion
    • Every shift when not in use
  - Vital signs and lung sounds must be obtained:
    • Prior to initiation of inotropic infusion
    • Every 15 min for first hour
    • Every hour for two hours
    • Every four hours
  - Daily weights
  - Intake & Output
  - Complaints of chest pain, palpitations or change in cardiovascular status
  - Symptoms of adverse reaction to inotropic agent

Parameters for calling physician/LIP

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight</td>
<td>Increase or decrease</td>
</tr>
<tr>
<td>Blood Pressure</td>
<td>&lt; 90 or &gt; 150 and change from baseline</td>
</tr>
<tr>
<td>Heart Rate</td>
<td>&lt; 60 or &gt; 100 and change from baseline</td>
</tr>
<tr>
<td>Symptoms</td>
<td>Dysrhythmia, chest pain, headache, increased/new onset SOB (with rest or activity), nausea, vomiting, anxiety, change in breath sounds</td>
</tr>
</tbody>
</table>

• Never stop an inotrope without first weaning
  - Can cause cardiovascular instability

• As condition improves, the inotrope will be weaned to the point where it can be stopped
Emergency Treatment Protocol

For suspected adverse reaction:
• Stop the infusion IMMEDIATELY, leaving central vascular access device intact
• Stay with patient and call for assistance
• Instruct assistant to notify physician/LIP
• Prepare for possible transfer to acute care setting
• Obtain vital signs and support patient as necessary
• DO NOT restart infusion without specific orders

Emergency Treatment Protocol

Before calling physician/LIP:
• Assess the patient
• Check vital signs, SaO2, weight, blood sugar if indicated
• Review chart (use most recent information, clinical notes)
• Have ALL information available when reporting (Patient record, Advanced Directive status, DNR, Do Not Hospitalize, other care limiting orders)
• Updated medication list/medication allergies

Emergency Treatment Protocol

What to report
• Increase/new shortness of breath with rest/activity
• Episodes of chest pain/discomfort/length of episode/action taken to relieve
• Change in breath sounds
• Decrease in endurance
• Orthopnea
• Weight gain greater than 2 lbs in 24 hours/4 lbs or more in 1 week
• Edema location/grade
Grades of Edema
Depth and Duration:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Definitions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1+</td>
<td>2 mm or less; slight pitting, no visible distortion, disappears rapidly</td>
</tr>
<tr>
<td>2+</td>
<td>2-4 mm indents; somewhat deeper pit, no visible detectable distortion, disappears in 10-20 seconds</td>
</tr>
<tr>
<td>3+</td>
<td>4-6 mm; pit is noticeably deep, may last more than a minute, dependent extremity becomes swollen and falls</td>
</tr>
<tr>
<td>4+</td>
<td>6-8 mm; pit is very deep, lasts for 2-6 minutes, dependent extremity is grossly distorted</td>
</tr>
</tbody>
</table>

Documentation

Documentation in the medical record includes, but is not limited to:
- Date and time
- Second licensed nurse verification
- CVAD site assessment
- Prescribed flushing agent(s)
- Medication, rate, route and total dose administered
- Patient assessment and response to therapy
- Complications and interventions
- Patient/significant other teaching
End of Life (Hospice Care)

- The 2007 Journal of Pain and Symptom Management states that heart failure patients who enroll in Hospice Care live on average 81 days longer than those who don’t enroll.

- Patients with advanced heart failure have many symptoms, but of utmost importance is treating anxiety from breathlessness and pain.

- The goal for all end stage hospice patients should be aimed at a peaceful death. This however, requires active participation of caregivers to assess and advocate for that individual by obtaining physician orders that will treat their problems.

End of Life (Hospice Care) Monitor

<table>
<thead>
<tr>
<th>Shortness of breath</th>
<th>Oxygen therapy (assessment includes skin color, nail beds, RR, protective cream around nares and early identification of complications)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positioning</td>
<td>Assess/assist patient to find comfortable sleeping position (chair, bed with HOB elevated) and make sure patient is well supported with pillows</td>
</tr>
<tr>
<td>Breathlessness</td>
<td>Maintaining a cool environment may help relieve these feelings</td>
</tr>
</tbody>
</table>

End of Life (Hospice Care) Monitor

<table>
<thead>
<tr>
<th>Loss of appetite</th>
<th>Congestion from heart failure may cause loss of appetite, as well as abdominal distention and constipation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Bowel regimen appropriate for patient is crucial</td>
</tr>
<tr>
<td></td>
<td>Constipation occurs easily since fluids are usually restricted. Fatigue decreases the ability to exercise and fiber is difficult to digest.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Skin integrity</th>
<th>Check sacrum and heels regularly. Keep skin clean, dry and intact.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Compression stockings bilaterally may help return the pooled fluid back to the heart.</td>
</tr>
<tr>
<td></td>
<td>If skin is weeping, place towels under legs and change frequently and keep legs elevated</td>
</tr>
</tbody>
</table>

Hospice care can be instrumental with grief and bereavement counseling.
Next Step

• Complete Exam

• Print/Save Certificate of Completion

• Complete evaluation

• Schedule practicum with your local Omnicare Pharmacy, or your employer