Reducing Heart Failure Hospital Readmissions
It Just Makes Cents!

Stephanie R. Morrison, PharmD, BCPS
Manager, Clinical Operations
East Central District
Objectives

- Review the pathophysiology, risk factors and classification of heart failure
- Describe the clinical presentation of heart failure
- Discuss pharmacological therapies and proper monitoring for patients with heart failure
- Identify causes for hospital readmissions in patients with heart failure
- Define strategies and practical approaches to reduce hospital readmissions due to heart failure
Heart Failure

• Definition
  • Structural or functional impairment
    • Impaired ventricular filling
    • Impaired ejection of blood
  • Most patient symptoms due to myocardial dysfunction of the left ventricle (LV)

• Cardinal Symptoms
  • Dyspnea/fatigue limited exercise tolerance
  • Fluid retention pulmonary congestion/splanchnic congestion/peripheral edema

*Circulation.* 2013;128:e240-e327
Heart Failure in the United States

- Estimated 5.1 million people in the United States have heart failure
- Projected 25% increase by 2030 based on 2013 estimates
- Americans ≥ 40 years of age have lifetime risk of 20% for development of HF
- ~ 50% die within 5 years of diagnosis
- Financial burden of $32 billion each year
- Hospitalizations comprise majority of cost associated with HF treatment
- Most common cause of admission and readmission among older adults

Hospital Admission

- Approximately one quarter of hospitalized HF patients will be readmitted within 30 days of discharge.
- National Healthcare Quality Report of 2010 reported single readmission costs nearly $13,000 per visit in 2007.
- In 2009, CMS implemented public reporting of all-cause readmissions rates after hospitalization for HF.
- Patient Protection and Affordable Care Act established financial penalties for hospitals with the highest readmission rates during the first 30 days after discharge.

Classification

- American College of Cardiology (ACC) / American Heart Association (AHA) classification
- New York Heart Association (NYHA) functional classification
# ACCF/AHA Stages of Heart Failure

<table>
<thead>
<tr>
<th>Stages of Heart Failure</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>At high risk for HF but without structural heart disease or symptoms of HF</td>
</tr>
<tr>
<td>B</td>
<td>Structural heart disease but without signs or symptoms of HF</td>
</tr>
<tr>
<td>C</td>
<td>Structural heart disease with prior or current symptoms of HF</td>
</tr>
<tr>
<td>D</td>
<td>Refractory HF requiring specialized interventions</td>
</tr>
</tbody>
</table>

*Circulation.* 2009;119:e391–479
New York Heart Association Functional Classifications

<table>
<thead>
<tr>
<th>NYHA Functional Classification</th>
<th>No limitation of physical activity. Ordinary physical activity does not cause symptoms of HF.</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Slight limitation of physical activity. Comfortable at rest, but ordinary physical activity results in symptoms of HF.</td>
</tr>
<tr>
<td>II</td>
<td>Marked limitation of physical activity. Comfortable at rest, but less than ordinary activity causes symptoms of HF.</td>
</tr>
<tr>
<td>III</td>
<td>Unable to carry on any physical activity without symptoms of HF, or symptoms of HF at rest.</td>
</tr>
</tbody>
</table>

*Circulation. 2013;128:e240-e327*
Pathophysiology of Heart Failure

- **Left-sided heart failure**
  - Most common type of heart failure
  - May be systolic or diastolic

- **Right-sided heart failure**
  - Right ventricle loses pumping function leading to excess fluid accumulation in the body
  - Often develops after failure begins on the left side

http://www.heart.org/HEARTORG/Conditions/HeartFailure/AboutHeartFailure/Types-of-Heart-Failure_UCM_306323_Article.jsp
Left-sided Heart Failure

- **Systolic heart failure**
  - Impaired contractility of ventricle
  - Reduced ejection fraction (EF)
  - Defined as EF < 40%

- **Diastolic heart failure**
  - Impaired ventricular relaxation
  - Contractility is normal or hyperdynamic
  - EF is normal (> 50%)
Systolic vs. Diastolic Heart Failure

[Diagram showing normal heart vs. systolic vs. diastolic dysfunction]

The ventricles fill normally with blood
The enlarged ventricles fill with blood
The stiff ventricles fill with less blood than normal

http://www.biomerieux-diagnostics.com/heart-failure
Risk Factors

- Age
- Gender
- Ethnicity
- Family history
- Diabetes
- Obesity
- Lifestyle factors
- Medications
Signs and Symptoms

- Dyspnea (walking, rest, lying flat)
- Persistent coughing or wheezing
- Edema
- Fatigue
- Nausea/loss of appetite
- Confusion
- Increased heart rate
- Weight gain

Circulation. 2013;128:e240-e327,
http://www.heart.org/HEARTORG/Conditions/HeartFailure/WarningSignsforHeartFailure/Warning-Signs-of-Heart-Failure_UCM_002045_Article.jsp
Initial/Serial Evaluation

- Patient history and physical examination
- Risk scoring (e.g., Seattle Heart Failure Model, CHARM Risk Score, etc.)
- Diagnostic tests
  - CBC, UA, serum electrolytes (including calcium, magnesium), Scr, glucose, fasting lipid profile, LFTs, TSH
  - Initial 12-lead electrocardiogram
- Biomarkers
  - B-type natriuretic peptide (BNP) for diagnosis and establishing prognosis or disease severity in chronic HF (serial measurement to reduce hospitalization or mortality not well established)
- Non-invasive cardiac imaging
  - CXR assess heart size and pulmonary congestion
  - 2D echocardiogram with Doppler evaluate ventricular function, size, wall thickness & motion, valve function
  - Radionuclide ventriculography or magnetic resonance imaging in select pts.
Goals of Therapy

- **Systolic heart failure**
  - Control symptoms
  - Patient/caregiver education
  - Prevent hospitalization
  - Prevent mortality

- **Diastolic heart failure**
  - Control symptoms
  - Improve QOL
  - Prevent hospitalization
  - Prevent mortality

- **Strategies**
  - Identification of comorbidities

*Circulation. 2013;128:e240-e327*
Non-Pharmacologic Management

- Daily weights
- Sodium restriction
- Fluid restriction
- Routine exercise
- Smoking cessation
- ETOH limits
- Influenza and pneumonia vaccines
- Avoid exacerbating medications

*J Card Fail* 2010;16:e1-e194
Pharmacological Therapy

- Symptomatic relief
  - Diuretics
  - Digoxin
- Mortality reduction
  - β-blockers
  - Angiotensin converting enzyme (ACE) inhibitors
  - Angiotensin receptor blockers (ARB)
  - Hydralazine/nitrate
  - Aldosterone antagonists

*Circulation. 2013;128:e240-e327*
Diuretics

- Symptomatic relief of congestion and edema
- Recommended in patients with reduced EF and evidence of fluid retention to improve symptoms
- **Loop diuretics** (furosemide, torsemide, bumetanide)
- **Thiazide diuretics** (chlorothiazide, chlorthalidone, hydrochlorothiazide, indapamide, metolazone)
- **K⁺-sparing diuretics** (amiloride, spironolactone, triamterene)
- Monitor: electrolytes, daily weight, BP, renal function, fluid status
- Metolazone may be added to loop diuretic (administer 30 minutes before loop diuretic)

*Circulation.* 2013;128:e240-e327
Digoxin

- Reduce hospitalizations for HF
- Improves HF symptoms, exercise tolerance, quality of life
- Therapeutic plasma levels 0.5-0.8 ng/mL
- Monitoring
  - Toxicity (heart block, visual disturbance, n/v)
  - Renal function
  - $K^+$ level
  - Drug-drug interactions

*Circulation.* 2013;128:e240-e327
β-blockers

- Reduce morbidity and mortality
- Pharmacogenetic considerations

<table>
<thead>
<tr>
<th>β-blocker</th>
<th>Starting Dose</th>
<th>Max Dose</th>
<th>Considerations of Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bisoprolol</td>
<td>1.25mg QD</td>
<td>10mg QD</td>
<td>Titrate dose</td>
</tr>
<tr>
<td>Carvedilol</td>
<td>3.125mg BID</td>
<td>50mg BID</td>
<td>Monitor: HR, BP, BS</td>
</tr>
<tr>
<td>Carvedilol CR</td>
<td>10mg QD</td>
<td>80mg QD</td>
<td>Avoid abrupt discontinuation</td>
</tr>
<tr>
<td>Metoprolol Succinate</td>
<td>12.5mg-25mg QD</td>
<td>200mg QD</td>
<td></td>
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</tbody>
</table>
ACE Inhibitors

- Reduce morbidity and mortality
- All patients with reduced ejection fraction to prevent symptomatic HF

<table>
<thead>
<tr>
<th>ACE Inhibitor</th>
<th>Starting Dose</th>
<th>Max Dose</th>
<th>Considerations of Class</th>
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</thead>
<tbody>
<tr>
<td>Benazepril</td>
<td>2.5-5mg QD</td>
<td>20-40mg QD</td>
<td>Titrate dose</td>
</tr>
<tr>
<td>Captopril</td>
<td>6.25mg TID</td>
<td>50mg TID</td>
<td>Monitor: Cough, K⁺, SCr, BP, Angioedema</td>
</tr>
<tr>
<td>Enalapril</td>
<td>2.5mg BID</td>
<td>10-20mg BID</td>
<td>Avoid in RAS, pregnancy</td>
</tr>
<tr>
<td>Fosinopril</td>
<td>5-10mg QD</td>
<td>40mg QD</td>
<td></td>
</tr>
<tr>
<td>Lisinopril</td>
<td>2.5-5mg QD</td>
<td>20-40mg QD</td>
<td></td>
</tr>
<tr>
<td>Perindopril</td>
<td>2mg QD</td>
<td>8-16mg QD</td>
<td></td>
</tr>
<tr>
<td>Quinapril</td>
<td>5mg BID</td>
<td>20mg BID</td>
<td></td>
</tr>
<tr>
<td>Ramipril</td>
<td>1.25-2.5mg QD</td>
<td>10mg QD</td>
<td></td>
</tr>
<tr>
<td>Trandolapril</td>
<td>1mg QD</td>
<td>4mg QD</td>
<td></td>
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</tbody>
</table>

*Circulation*. 2013;128:e240-e327
# ARBs

- Use in patients intolerant to ACE inhibitors

<table>
<thead>
<tr>
<th>ARBs</th>
<th>Starting Dose</th>
<th>Max Dose</th>
<th>Considerations of Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>Candesartan</td>
<td>4-8mg QD</td>
<td>32mg QD</td>
<td>Titrate dose</td>
</tr>
<tr>
<td>Losartan</td>
<td>25-50mg QD</td>
<td>50-150mg QD</td>
<td>Monitor: $K^+$, SCr, BP</td>
</tr>
<tr>
<td>Valsartan</td>
<td>20-40mg BID</td>
<td>160mg BID</td>
<td>Avoid in pregnancy</td>
</tr>
</tbody>
</table>

*Reference: Circulation. 2013;128:e240-e327*
Aldosterone Antagonists

- Reduce morbidity and mortality
- Close potassium and renal function monitoring

<table>
<thead>
<tr>
<th>Aldosterone Antagonists</th>
<th>Starting Dose</th>
<th>Max Dose</th>
<th>Considerations of Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spironolactone</td>
<td>12.5-25mg QD</td>
<td>25mg QD or BID</td>
<td>Titrate dose</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Monitor: $K^+$, SCr, gynecomastia</td>
</tr>
<tr>
<td>Eplerenone</td>
<td>25mg QD</td>
<td>50mg QD</td>
<td>Avoid in SCr &gt; 2.5 mg/dL in males, &gt; 2.0 mg/dL in females, $K^+$ &gt; 5 meq/L</td>
</tr>
</tbody>
</table>

*Circulation. 2013;128:e240-e327*
Avoid Pitfalls of Hyperkalemia with Aldosterone Antagonists

- Avoid in patients with $K^+ > 5.0 \text{ mg/dL}$
- Risk increases with SCr $> 1.6 \text{ mg/dL}$
- Increased risk with concomitant higher doses of ACEI
- Avoid NSAIDS and COX-2 inhibitors
- Reduce or discontinue $K^+$ supplementation
- Monitor renal function and $K^+$ every 3 days during 1$^{\text{st}}$ week of initiation
- Address causes of dehydration immediately (e.g., diarrhea)
Hydralazine and Nitrates

- Add-on therapy for African Americans with NYHA class III-IV and reduced EF taking optimal doses of ACEIs and β-blockers to reduce morbidity and mortality
- Useful to reduce morbidity and mortality in patients with current or prior symptomatic HF with reduced EF who cannot tolerate ACE or ARB

*Circulation. 2013;128:e240-e327*
# Hydralazine and Nitrates

<table>
<thead>
<tr>
<th>Medication</th>
<th>Starting Dose</th>
<th>Max Dose</th>
<th>Considerations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydralazine</td>
<td>25-50mg TID-QID</td>
<td>300mg in divided doses</td>
<td>Lupus-like syndrome, GI and hematologic abnormalities</td>
</tr>
<tr>
<td>Isosorbide dinitrate</td>
<td>20-30mg TID or QID</td>
<td>120mg in divided doses</td>
<td>Headache, tachyphylaxis</td>
</tr>
</tbody>
</table>

*Circulation. 2013;128:e240-e327*
Other Drug Therapy

- Hypertension
  - Should be controlled in accordance with contemporary guidelines to lower the risk of HF
  - Patients with reduced LV function goal BP < 120/80 mmHg
  - Keep diastolic BP > 60 mmHg

- Diabetes mellitus
  - Controlled in accordance with current guidelines
  - Avoid Metformin when recent or current ADHF, fluctuating kidney function, heart instability
  - TZDs may worsen HF status

*J Card Fail* 2010;16:e1-e194
Other Drug Therapy

- Anticoagulation for atrial fibrillation
  - Selection of agent should be individualized
- Statins
  - Not beneficial solely for diagnosis of HF in absence of other indications
- Omega-3 fatty acids
  - Omega-3 polyunsaturated fatty acid supplementation as adjunctive therapy in NYHA class II-IV to reduce mortality and cardiovascular hospitalizations

*Circulation. 2013;128:e240-e327*
Concomitant Diseases

- Chronic kidney disease
  - May have impaired response to ACEI/ARB and diuretics
  - Increased risk of digoxin toxicity
  - SCr of 3 mg/dL decreases efficacy and safety of standard HF therapy

- Chronic obstructive pulmonary disease (COPD)
  - Dyspnea occurs in both diseases
  - Long-acting inhaled beta agonists should be avoided if possible
  - Patients should be assessed for pulmonary HTN
  - Cough should only be associated with ACEI after respiratory infection has been ruled out or rechallenge failed

*J Card Fail* 2010;16:e1-e194
Some Medications to Avoid

- Certain antiarrhythmic agents
- Nondihydropyridine calcium channel blockers
- Cilostazol
- NSAIDs
- Thiazolidinediones
- Metformin - avoid when recent or current decompensated HF, fluctuating kidney function, heart instability

_Circulation_. 2013;128:e240-e327
Focus on Hospital Readmissions

- Readmission rates for heart failure patients are a core measure for CMS and JCAHO
- Leading cause of hospitalization for those > 65 years
- Despite advances in pharmacotherapy and device therapy for HF, in-hospital mortality remains high and readmission is common
- Direct costs of treating chronic heart failure largely attributable to hospitalization

*Circulation. 2013;128:e240-e327*
Focus on Hospital Readmissions

- Hospital readmission rate for HF 24% within 30 days of discharge
- 30% readmission rate within 60-90 days of discharge
- Readmission rate of ≥ 50% within 6 months of discharge

Focus on Hospital Readmissions

- In 2009, CMS implemented public reporting of all-cause readmissions rates after hospitalization for HF
- Patient Protection and Affordable Care Act established financial penalties for hospitals with the highest readmission rates during the first 30 days after discharge
Hospital Financial Penalties

In 2012, CMS began financially penalizing hospitals with “excessive” 30 day readmission rates

- Calculate the “excess admission ratio”
  - Measure of hospital’s readmission performance compared to the national average for hospital’s set of patients with HF
- Payment adjustment
  - FY 2013 - 1% reduction
  - FY 2014 – 2% reduction
  - FY 2015 – 3% reduction
- How to improve the problem is not addressed

http://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/AcuteInpatientPPS/Readmissions-Reduction-Program.html
Strategies to Reduce Readmissions

- Proper transitions
- Transitional care model
- Multidisciplinary follow-up
- Proper monitoring
- Palliative care programs
## Hospital Strategies to Prevent Readmissions

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Estimated Absolute Reduction in Risk-Standardized 30-Day Readmission Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collaborate with community physician or physician groups</td>
<td>33%</td>
</tr>
<tr>
<td>Partner with local hospitals to reduce readmissions</td>
<td>34%</td>
</tr>
<tr>
<td>Nurses performing medication reconciliation</td>
<td>18%</td>
</tr>
<tr>
<td>Follow-up appointments scheduled at discharge</td>
<td>18%</td>
</tr>
<tr>
<td>Method implemented to send all discharge papers or electronic summaries to primary physician directly</td>
<td>21%</td>
</tr>
<tr>
<td>Staff assigned to follow up on test results that return after patient discharge</td>
<td>26%</td>
</tr>
</tbody>
</table>

*Circ Cardiovasc Qual Outcomes. 2013;6(4):444-450*
Readmissions Largely Preventable

Causes of Readmission for HF

- Dietary Non-compliance: 24%
- Medication Non-compliance: 24%
- Inappropriate Medication: 16%
- Failure to Seek Care: 19%
- Other: 17%

Modifiable Factors Leading to Hospitalization

- Failure to address multiple issues that complicate care
  - Older age, multiple comorbidities, lack of social support or social isolation, failure of existing social support systems, functional or cognitive impairments, poverty, presence of anxiety or depression
- Failure of clinicians to use evidence-based practice and follow published guidelines regarding pharmacologic and non-pharmacologic therapy
Modifiable Factors Leading to Hospitalization

- Inadequate patient and family or caregiver education and counseling
- Poor communication and coordination of care among health care providers
- Inadequate discharge planning
- Failure to organize adequate follow-up care
- Clinician failure to emphasize non-pharmacologic aspects of HF care, such as diet, activity, and symptom monitoring recommendations

_Circulation_. 2013;128:e240-e327
Multi-disciplinary Approach

- Dietary non-compliance (24%)
  - Assistance from dietician/nursing/family
- Medication non-compliance (24%)
  - Assistance from consultant pharmacist/nursing/family
- Failure to seek care (19%)
  - Assistance from nursing staff
- Inappropriate medication (16%)
  - Assistance from prescriber/consultant pharmacist
Symptom Onset Prior to Hospitalization

- Study examined the time course, contributing factors, and patient responses to decompensated heart failure
  - 83 patients
  - Symptoms associated with decompensation included:
    - Dyspnea in 98% of patients
    - Edema in 77% of patients
    - Weight gain in 41% of patients
Symptom Onset Prior to Hospitalization

- Number of days from onset of worsening symptoms of HF to hospital admission
  - Edema - $12.4 \pm 1.4$ days
  - Weight gain - $11.3 \pm 1.6$ days
  - Dyspnea - $8.4 \pm 0.9$ days
    - Walking (most frequent)
    - Rest (least frequent)
    - Lying flat
  - Dyspnea walking > dyspnea lying flat ~ edema > weight gain > dyspnea at rest

*Am J Med. 2003;114(8):625-630*
The Next Step: Reducing Readmissions in Long-term Care

- Multi-disciplinary approach to care for residents with HF
- Education of front-line staff regarding HF and recognizing early signs of decompensation
- Close monitoring of residents with HF, in particular those admitted post acute decompensation
- Early and regular assessment by physician/NP and other healthcare providers
Practical Steps to Reduce Readmissions in Long-term Care

- Establish a comprehensive protocol for monitoring residents with HF
  - Multi-disciplinary contribution during development, including prescriber
- Considerations:
  - Establish point person within facility to oversee program and ensure compliance
  - Appoint liaison with hospital(s) to coordinate transition
  - Medication reconciliation on admission by nursing staff
  - Routine weight monitoring (e.g., daily and notify prescriber if 3-5 lb weight gain per week)
Practical Steps to Reduce Readmissions in Long-term Care

- Considerations:
  - Fluid restriction (e.g., 1 to 2.5 L per day)
  - Salt restriction (e.g., 2 gm sodium restricted diet)
  - Routine monitoring of symptoms with defined criteria for prescriber notification (e.g., vital signs, edema, dyspnea, fatigue, exercise intolerance, etc.)
  - Routine laboratory monitoring (e.g., BMP, etc.)
  - Notification system and plan if resident non-compliant with protocol requirements (e.g., refusing meds, refusing weights, dietary non-compliance, etc.)
Practical Steps to Reduce Readmissions in Long-term Care

- **Considerations:**
  - Initial and periodic physician/NP visits defined (e.g., within 3 days following hospital discharge and weekly thereafter for first 30 days)
  - Focused review by consultant pharmacist and dietician during routine visits
  - Tracking HF readmissions for the facility and setting a goal and timeline for reduction
Practical Steps to Reduce Readmissions in Long-term Care

- Other considerations:
  - Ensure management of other disease states (e.g., HTN, CAD, DM, cognitive disorders, obesity, etc.)
  - Smoking cessation
  - Exercise
  - Vaccinations
  - Provide emotional support for resident (e.g., address depression, anxiety, etc.)
  - Family education/support
  - Advance care planning
Impact on Cost

- Financial burden of HF in U.S. $32 billion
- Medicare expenditure on HF hospitalization exceeds $17 billion annually
- Hospitalizations account for 53% of expenditures
- Reducing readmissions by a fraction can save billions!
- 15% reduction in hospitalizations would save $2.6 billion
- Hospitals tracking facilities with high readmission rates
- Resident remains in facility

Improved Quality of Life

- Symptomatic relief
- Resident remains at “home”
- Concurrent disease management to improve overall health
- Emotional/social support
- Advance care planning
Summary

- HF is the primary diagnosis for admission to hospital in patients > 65 years of age
- Hospital readmission rate within one month of hospital discharge is 25%
- Annual cost of $32 billion with more than half of the total cost for treatment attributable to hospitalization
- Acute decompensated heart failure results in reduced quality of life
Summary

- One approach to reduce hospital readmission is development of a multi-disciplinary protocol focused on HF residents in the LTC setting.
- Identifying initial clinical symptoms of decompensation results in early intervention and reduction in progression leading to hospitalization.
- Early detection of symptoms can contribute to a reduction in hospitalizations associated with HF, resulting in improved quality of life and decreased cost.
QUESTIONS

Heart muscle pumps blood out of the left ventricle.

Normal

Weakened heart muscle cannot pump enough blood.

Heart Failure