

# Heart Failure:

## Review of Management Guidelines and Improvement Project

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# Objectives



**By the end of this presentation, you will be able to:**

1. Describe current **best practices** for management of Heart Failure
2. Describe current **medication regimen** recommendations for treatment of Heart Failure
3. Describe additional **interventions and programs** that may be appropriate for the management of patients with Heart Failure

# Agenda



01

**Definitions**



02

**Diagnosis**



03

**Classification**



04

**Non-medication treatment**



05

**Guideline Directed  
Medication Therapy (GDMT)**



06

**Advanced heart failure**



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**Improvement project**



08

**Resources**

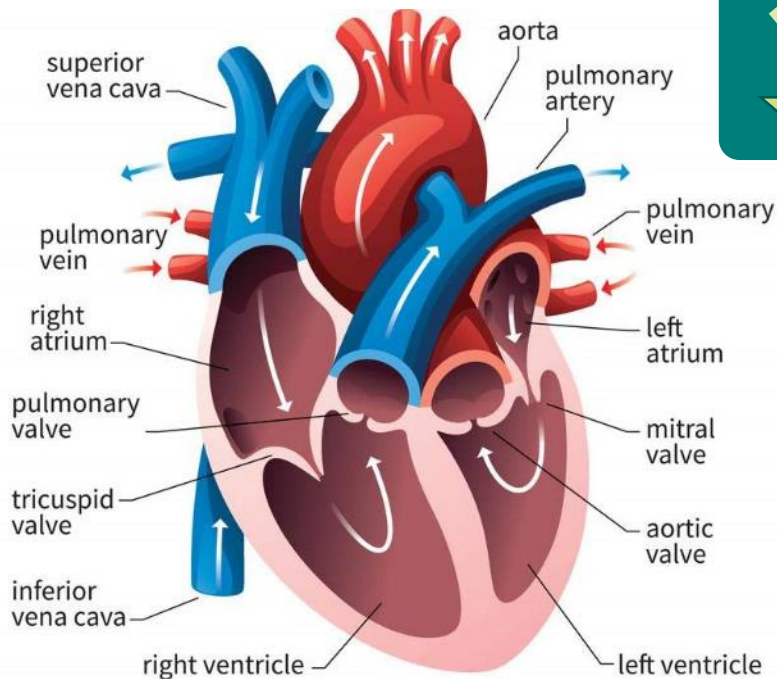


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**Questions and post-test**

# Definition

## Complex Clinical Syndrome



✘ Structure  
↓ Function

↓ Ventricular filling  
Ventricular ejection

↑ Symptoms

# Risk Factors

1. Hypertension
2. Coronary artery disease (CAD)
3. Obesity
4. Excessive alcohol use
5. Smoking
6. Illicit drug use
7. Poor diet
8. Heart failure with preserved ejection fraction (HFpEF):
  - Older female, Hypertension (HTN), obese, anemia, or Atrial Fibrillation (AF)



# Symptoms

## Clinical diagnosis: History and physical examination (H&P)

### Dyspnea and Fatigue

- Limit exercise tolerance

### Fluid Retention

- Pulmonary congestion
- Splanchnic congestion
- Peripheral edema

# Symptoms

## Decreased Perfusion

- Reduced exercise capacity
- Fatigue (unexplained)
- Depression/weakness (specially if elderly)
- Dyspnea at rest or on exertion
- Confusion/delirium
- Gastrointestinal discomfort (early satiety, nausea and vomiting, pain)

## Fluid Retention

- Pulmonary congestion
- Splanchnic congestion
- Ascites
- Peripheral/scrotal edema
- Dyspnea at rest or on exertion
- Orthopnea
- Paroxysmal nocturnal dyspnea/cough
- Wheezing or cough

# Diagnosis

## History and physical exam

- Volume status:
  - Wheezing
  - Rales
  - Edema
  - Ascites
- Perfusion:
  - Cool extremities
  - Prolonged capillary refill
- Rule out pulmonary disease





# Diagnosis



## Testing:

- Complete blood count (CBC), Comprehensive metabolic panel (CMP), Thyroid-stimulating hormone (TSH), Brain natriuretic peptide (BNP), Troponin
- Chest x-rays (CXR), Electrocardiogram (ECG), TTE (trans-thoracic echocardiogram)
- Exercise/functional cardiac testing if CAD suspected
- Coronary angiography: if ischemia contributing to Heart Failure
- May need testing for hemochromatosis, amyloidosis, rheumatological disease, pheochromocytoma or Acquired Immune Deficiency Syndrome (HIV)

# Classification

## New York Heart Association (NYHA) Functional Classification

Class	Objective Assessment
I	No limitation of physical activity. Ordinary activity does not cause symptoms of Heart Failure
II	Slight limitation of physical activity. Comfortable at rest, but ordinary physical activity causes symptoms of Heart Failure
III	Marked limitation of physical activity. Comfortable at rest but less than ordinary physical activity causes symptoms of Heart Failure
IV	Unable to carry on any physical activity without symptoms of Heart Failure or symptoms of Heart Failure at rest

# Classification

## Definitions

Type	Ejection Fraction
I. Heart Failure with <i>reduced</i> Ejection fraction (HFrEF)	≤40%
II. Heart Failure with <i>preserved</i> Ejection fraction (HFpEF)	≥50%
a. HFpEF, borderline	41-49%
b. HFpEF, improved	>40%

## American College of Cardiology (ACC) and American Heart Association (AHA)

Stage	Objective Assessment
<b>A</b>	At risk of Heart Failure but without structural heart disease or symptoms
<b>B</b>	Structural heart disease but without signs or symptoms
<b>C</b>	Structural heart disease with prior or current symptoms
<b>D</b>	Refractory Heart Failure requiring specialized interventions

**Reduced survival and increased  
Brain natriuretic peptide (BNP)**



## 1. **50% mortality in 5 years, worse with reduced ejection fraction (EF)**

- Stage A: 3%
- Stage B: 4.3%
- Stage C: 25.4%
- Stage D: 80%



**5x increase in mortality**

## 2. **Prevalence increases with age**

- 40-59 y/o: 1.5% of men and 0.7% of women
- $\geq 80$  y/o: 8.6 of men and 11.7% of women

## 3. **Ethnicity:**

- African American > Hispanic > White > Chinese American
- Higher prevalence of obesity and diabetes

# Patient Profiles

Stage	NYHA	Clinical Presentation
<b>A</b>	<b>N/A</b>	<ul style="list-style-type: none"><li>• HTN, Diabetes Mellitus (DM), obesity</li><li>• Atherosclerotic disease</li><li>• Metabolic syndrome</li><li>• Using cardiotoxins: Illicit drugs, excessive alcohol, tobacco, chemotherapy</li><li>• Familial hypercholesterolemia or cardiomyopathy</li></ul>
<b>B</b>	<b>I</b>	<ul style="list-style-type: none"><li>• Previous myocardial infarction (MI)</li><li>• Left ventricle remodeling including left ventricular hypertrophy (LVH) and low ejection fraction (EF)</li><li>• Asymptomatic valvular disease</li></ul>
<b>C</b>	<b>I-IV</b>	<ul style="list-style-type: none"><li>• Known structural heart disease and</li><li>• Heart failure signs and symptoms</li></ul>
<b>D</b>	<b>IV</b>	<ul style="list-style-type: none"><li>• Marked heart failure symptoms at rest</li><li>• Recurrent hospitalizations despite compliance with guideline-directed medication therapy (GDMT)</li></ul>

# Goals of Therapy

Stage	Therapy Goals
<b>A</b>	<ul style="list-style-type: none"><li>• Heart Healthy Lifestyle</li><li>• Prevent vascular, coronary disease</li><li>• Prevent left ventricle structural abnormalities</li></ul>
<b>B</b>	<ul style="list-style-type: none"><li>• Prevent heart failure symptoms</li><li>• Prevent further cardiac remodeling</li></ul>
<b>C</b>	<p><b>HFpEF</b></p> <ul style="list-style-type: none"><li>• Control symptoms</li><li>• Improve Health-related quality of life (HRQOL)</li><li>• Prevent hospitalization</li><li>• Prevent mortality</li><li>• Identify comorbidities</li></ul> <p><b>HFrEF</b></p> <ul style="list-style-type: none"><li>• Control symptoms</li><li>• Patient education</li><li>• Prevent hospitalization</li><li>• Prevent mortality</li></ul>
<b>D</b>	<ul style="list-style-type: none"><li>• Control symptoms</li><li>• Improve HRQOL</li><li>• Prevent hospital readmissions</li><li>• Establish patient's end-of-life goals</li></ul>

# Non-Medication Treatment

1. **Education** on disease and self care
2. **Social support**
3. **Sodium restriction** 1.5 to 3 g/day in symptomatic patients
4. **Diet** appropriate for underlying conditions
5. **Treat underlying conditions:**
  - HTN (goal systolic blood pressure (SBP) <130), AF, CAD, DM, etc.
  - Screen and treat sleep disorders
6. **Weight loss**
7. **Exercise training** or regular physical activity for patients able to participate, cardiac rehabilitation to improve function
8. **Fluid restriction in advanced or decompensated heart failure**



# Guideline Directed Medication Therapy (GDMT)

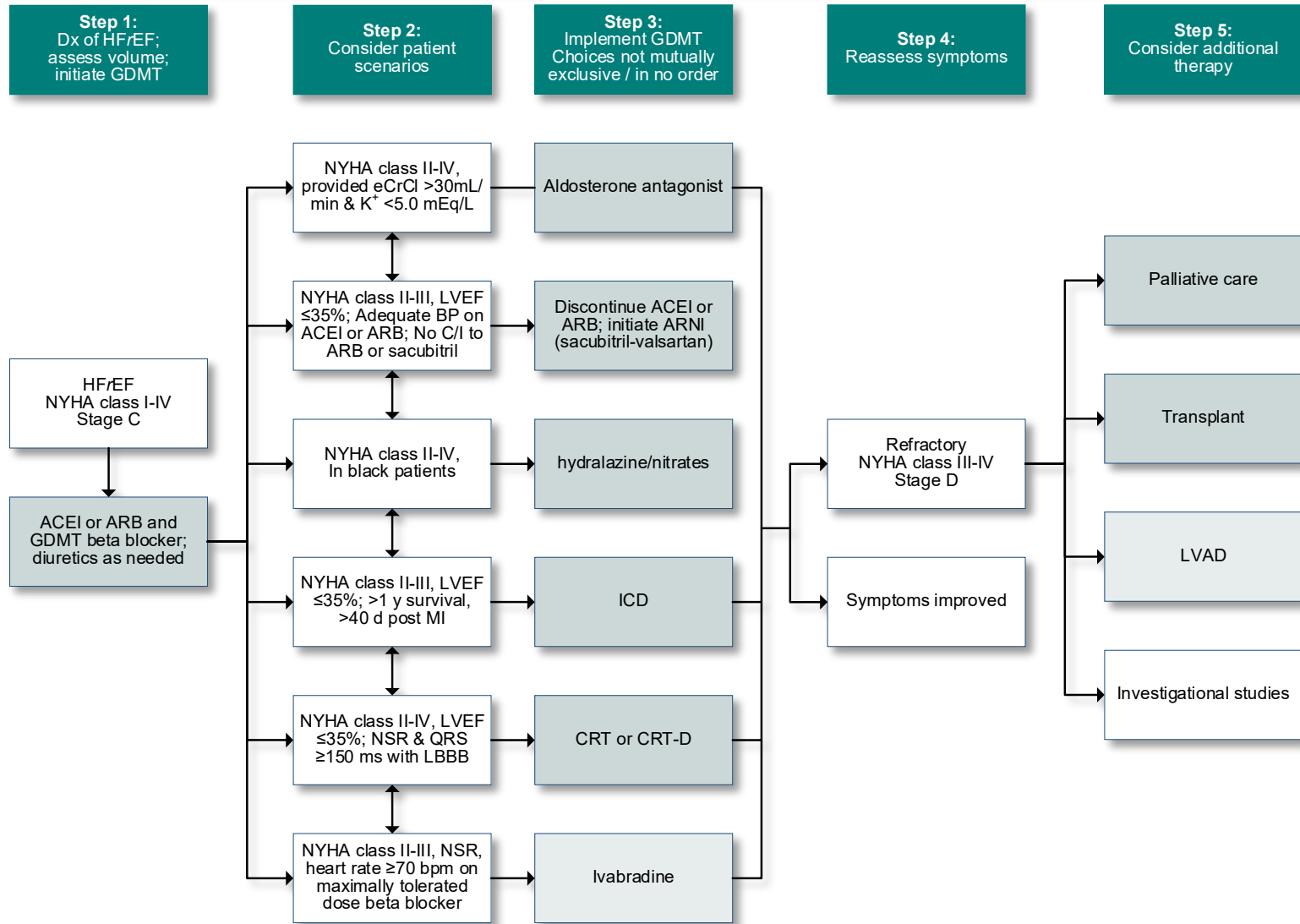
Stage	Treatment Recommendations
A	<ul style="list-style-type: none"><li>• Control HTH, optimal blood pressure (BP) should be &lt;130/80</li><li>• Control lipid disorders, use statins as appropriate</li><li>• Control or avoid: obesity, diabetes mellitus, tobacco use, and cardiotoxic agents: illicit drugs, excessive alcohol, tobacco, chemotherapy</li></ul>
B	<ul style="list-style-type: none"><li>• Angiotensin-converting enzyme inhibitors (ACEI) or Angiotensin receptor blocker (ARB), Beta blockers, and statins as appropriate if history of MI or ACS</li><li>• ACEI or ARB and Beta blockers if <i>r</i>EF even without MI history</li><li>• In selected patients:<ul style="list-style-type: none"><li>• Implantable Cardioverter Defibrillator (ICD): Ischemic Cardiomyopathy</li><li>• Revascularization or valvular surgery</li></ul></li></ul>



# Guideline Directed Medication Therapy (GDMT)

Stage	Treatment Recommendations
<b>C</b>	<p><b>HFpEF</b></p> <ul style="list-style-type: none"><li>• Diuretics to relieve symptoms of volume overload</li><li>• Follow guideline driven indications for comorbidities:<ul style="list-style-type: none"><li>• HTN: goal SBP &lt;130, use ACEI/ARB/Beta Blockers</li><li>• AF, CAD, DM</li></ul></li><li>• Screen for and treat sleep disorders</li><li>• Consider ARBs</li><li>• Consider aldosterone receptor antagonists in appropriate patients</li></ul> <p><b>HFrEF Step 1:</b></p> <ul style="list-style-type: none"><li>• ACEI or ARB and Beta Blockers</li><li>• Diuretics as needed for fluid overload</li></ul>

## Treatment of HF/EF Stage C and D



**Continue Guideline Directed Management and Therapy with serial reassessment and optimized dosing/adherence**

# Anemia



## **Anemia Treatment:**

1. IV iron replacement to improve functional status and quality of life
2. NYHA class II and III
3. Iron deficiency
  - ferritin  $<100$  ng/mL or
  - 100 to 300 ng/mL if transferrin saturation is  $<20\%$

# GDMT Medications

## ACEI: Angiotensin Converting Enzyme Inhibitors

**Mechanism of action:** Relax blood vessels to lower blood pressure and reduce strain on the heart and improve blood flow

Drug	Initial Daily Dose	Maximum Dose
Captopril	6.25 mg 3 times	50 mg 3 times
Enalapril	2.5 mg twice	10-20 mg twice
Fosinopril	5-10 mg once	40 mg once
Lisinopril	2.5-5 mg once	20-40 mg once
Perindopril	2 mg once	8-16 mg once
Quinapril	5 mg twice	20 mg twice
Ramipril	1.25-2.5 mg once	10 mg once
Trandolapril	1 mg once	4 mg once

# GDMT Medications

## ARB: Angiotensin Receptor Blockers

**Mechanism of action:** Relax blood vessels to lower blood pressure and reduce strain on the heart and improve blood flow

Drug	Initial Daily Dose	Maximum Dose
Candesartan	4-8 mg once	32 mg once
Losartan	25-50 mg once	50-150 mg once
Valsartan	20-40 mg twice	160 mg twice

## ARNI: Angiotensin Receptor-Neprilysin Inhibitors

**Mechanism of action:** A combination of an ARB and a medicine that inhibits the production of neprilysin, an enzyme that breaks down natural substances in the body that widen blood vessels and reduce sodium retention. The effect is to lower blood pressure and decrease strain on the heart

Drug	Initial Daily Dose	Maximum Dose
Sacubitril/ valsartan	49/51 mg twice a day (BID) may start at 24/26 mg BID	97/103 mg BID

# GDMT Medications

## Aldosterone Antagonists

**Mechanism of action:** Help the body to get rid of salt and water through urine. Lowers the volume of blood that the heart must pump.

Drug	Initial Daily Dose	Maximum Dose
Spironolactone	12.5-25 mg once	25 mg once or twice
Eplerenone	25 mg once	50 mg once

## Beta Blockers

**Mechanism of action:** Can slow a rapid heart rate and lower blood pressure.

Drug	Initial Daily Dose	Maximum Dose
Bisoprolol	1.25 mg once	10 mg once
Carvedilol	3.125 mg BID	50 mg BID
Carvedilol CR	10 mg once a day (QD)	80 mg QD
Metoprolol succinate extended release Metoprolol (CR/XL)	12.5–25 mg QD	200 md QD

# GDMT Medications

## Hydralazine (HYD) and Isosorbide Dinitrate (ISDN)

**Mechanism of action:** Relax blood vessels to lower blood pressure. A combination that has shown to improve outcomes in African Americans and is often used if someone is allergic to or can't take angiotensin converting enzyme (ACE) inhibitors or ARBs.

Drug	Initial Daily Dose	Maximum Dose
Fixed-dose combination	37.5mg HYD/20mg ISDN 3 times daily	75mg HYD/40mg ISDN 3 times daily
Hydralazine (HYD) and isosorbide dinitrate (ISDN)	HYD 25-50mg 3 or 4 times daily and ISDN 20-30mg 3 or 4 times daily	HYD 300mg daily in divided doses and ISDN 120mg daily in divided doses

# GDMT Medications

## I<sub>f</sub>Channel Inhibitor

**Mechanism of action:** Sinoatrial node modulator. This new drug is used with beta blockers when they cannot lower the heart rate sufficiently. It helps reduce the amount of oxygen the heart needs and the amount of work the heart has to do to pump blood through the body.

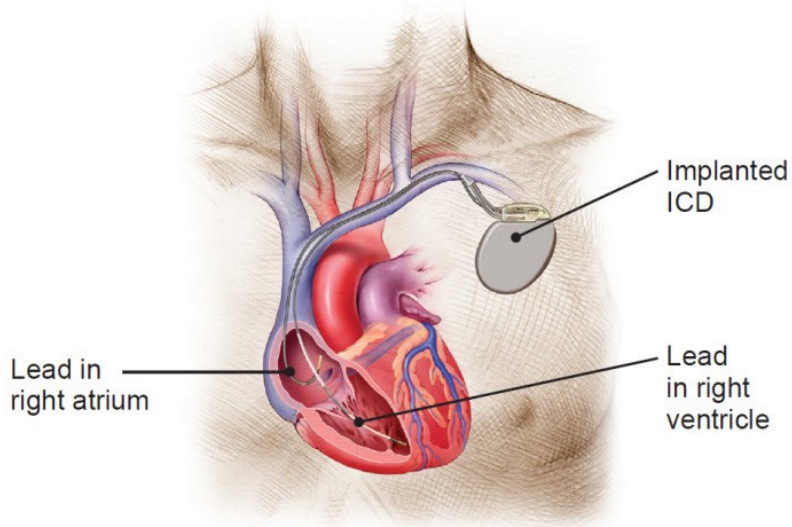
Drug	Initial Daily Dose	Maximum Dose
Ivabradine	5 mg BID	7.5 mg BID



# Device Therapy

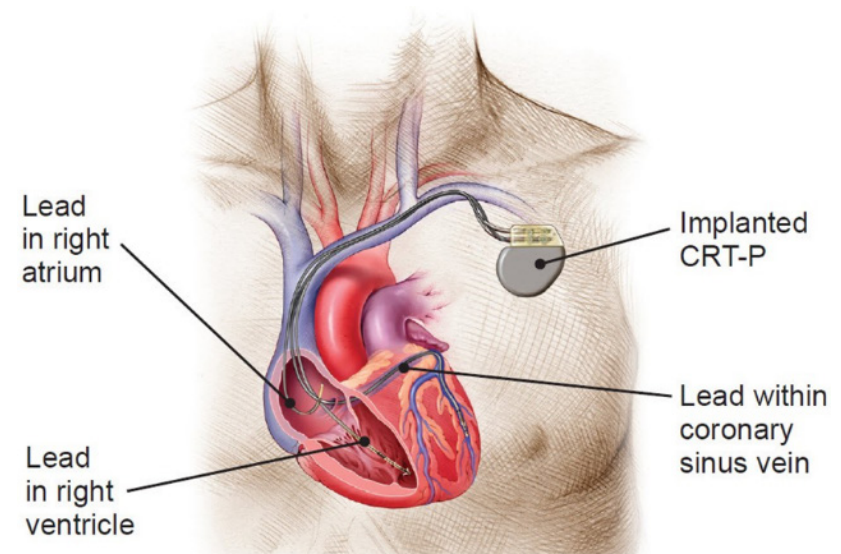
## Implantable Cardioverter Defibrillator (ICD)

(Resets normal rhythm)



## Cardiac resynchronization therapy- pacemaker (CRT-P) or Cardiac resynchronization therapy- defibrillator (CRT-D)

(Biventricular pacing  $\pm$  ICD)



# Device Therapy



## Implantable cardioverter-defibrillator (ICD)

- Recommended: primary prevention of sudden cardiac death (SCD)
  - HFrEF,  $\geq 40$ d post-MI
  - Left ventricular ejection fraction (LVEF)  $\leq 35\%$
  - NYHA II-III on GDMT
  - Life expectancy  $> 1$  year

## Cardiac resynchronization therapy-pacemaker (CRT-P) or Cardiac resynchronization therapy-defibrillator (CRT-D)

- Indicated: LVEF  $\leq 35\%$ 
  - Sinus, Left bundle branch block (LBBB) with QRS  $\geq 150$ ms, useful if QRS 120-149ms
  - NYHA II, III, or ambulatory IV symptoms on GDMT



## **Cardiac resynchronization therapy-pacemaker (CRT-P) or Cardiac resynchronization therapy-defibrillator (CRT-D)**

- Useful: LVEF  $\leq 35\%$ 
  - sinus, non-LBBB pattern, QRS  $\geq 150\text{ms}$
  - NYHA III or ambulatory class IV symptoms
- Useful: AF and LVEF  $\leq 35\%$  on GDMT if
  - a) requires ventricular pacing or meets CRT criteria and
  - b) AV nodal ablation or rate control allows near 100% ventricular pacing with CRT on GDMT
- Useful: on GDMT, LVEF  $\leq 35\%$ , undergoing new or replacement device implantation with anticipated ventricular pacing ( $>40\%$ )

# Acute Heart Failure

- **Acute Decompensated heart failure**
  - Dyspnea, weight gain, low BP, tachypnea
  - Labs: AKI, myocardial ischemia
  - Etiologies: 56% CAD, need functional testing
  - In-hospital mortality: 3.9% HF<sub>r</sub>EF, 2.9% HF<sub>p</sub>EF
- **Mortality risk**
  - **SBP ≤125, BUN >37, Cr >2**
  - 60-90 day mortality: 9.5%
- **Readmission Risk**
  - **No family support, low BP, high HR**
  - 60-90 day readmission: 29.2%, 6 months: 50%



# Hospital Management



Multidisciplinary including cardiology consultation

- **Oxygen** to correct hypoxemia, Nasal intermittent positive pressure ventilation (**NIPPV**) for dyspnea
- Systemic and pulmonary decongestion: **IV diuretics**
- **Sodium restriction <2g/d, fluid restriction <2L/d**
- **Monitor electrolytes and renal function**
- AF rate/rhythm control: beta blocker, digoxin, amiodarone
- Inotropes (dobutamine, milrinone) for low BP/perfusion
- Pulmonary wedge pressure monitoring as needed
- Interventional and Surgical Therapy
  - CAD: higher in-hospital and 60-90 day post-discharge mortality 3.7% vs 2.9% and 9.2% vs 6.9%
  - Stress testing, coronary angiography, revascularization
  - Valve replacement

# Transitions of Care



## 1. Elements to address Inpatient (IP), at discharge, and Outpatient (OP)

- Initiation of **GDMT** if not done or contraindicated
- Causes of heart failure, barriers to care, and limitations in support
- Assessment of volume status and blood pressure with adjustment of heart failure therapy
- Optimization of chronic oral heart failure therapy
- Renal function and electrolytes
- Management of comorbid conditions
- Heart failure education, self-care, emergency plans, and adherence
- Palliative or hospice care

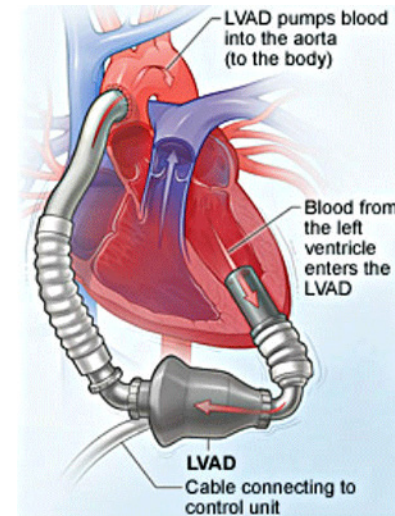
# Transitions of Care



2. Multidisciplinary heart failure DM programs for patients at high risk for hospital readmission:
  - to facilitate the implementation of GDMT
  - to address different barriers to behavioral change
  - to reduce the risk of subsequent rehospitalization for heart failure
3. Schedule an early follow-up visit (within 7 to 14 days) and early telephone follow-up (within 3 days) of hospital discharge
4. Use clinical risk-prediction tools and/or biomarkers to identify patients at higher risk for postdischarge clinical events

# Advanced Heart Failure

- Refractory, stage D heart failure
- NYHA class IV with terminal diagnosis or considering cardiac transplant
- Estimate Prognosis: [www.SeattleHeartFailureModel.org](http://www.SeattleHeartFailureModel.org)
- Severe cardiac dysfunction and poor functional capacity
- Quaternary hospital referral:
  - Palliative care
  - Left Ventricular Assist Device
  - Cardiac transplantation
  - Investigational therapies



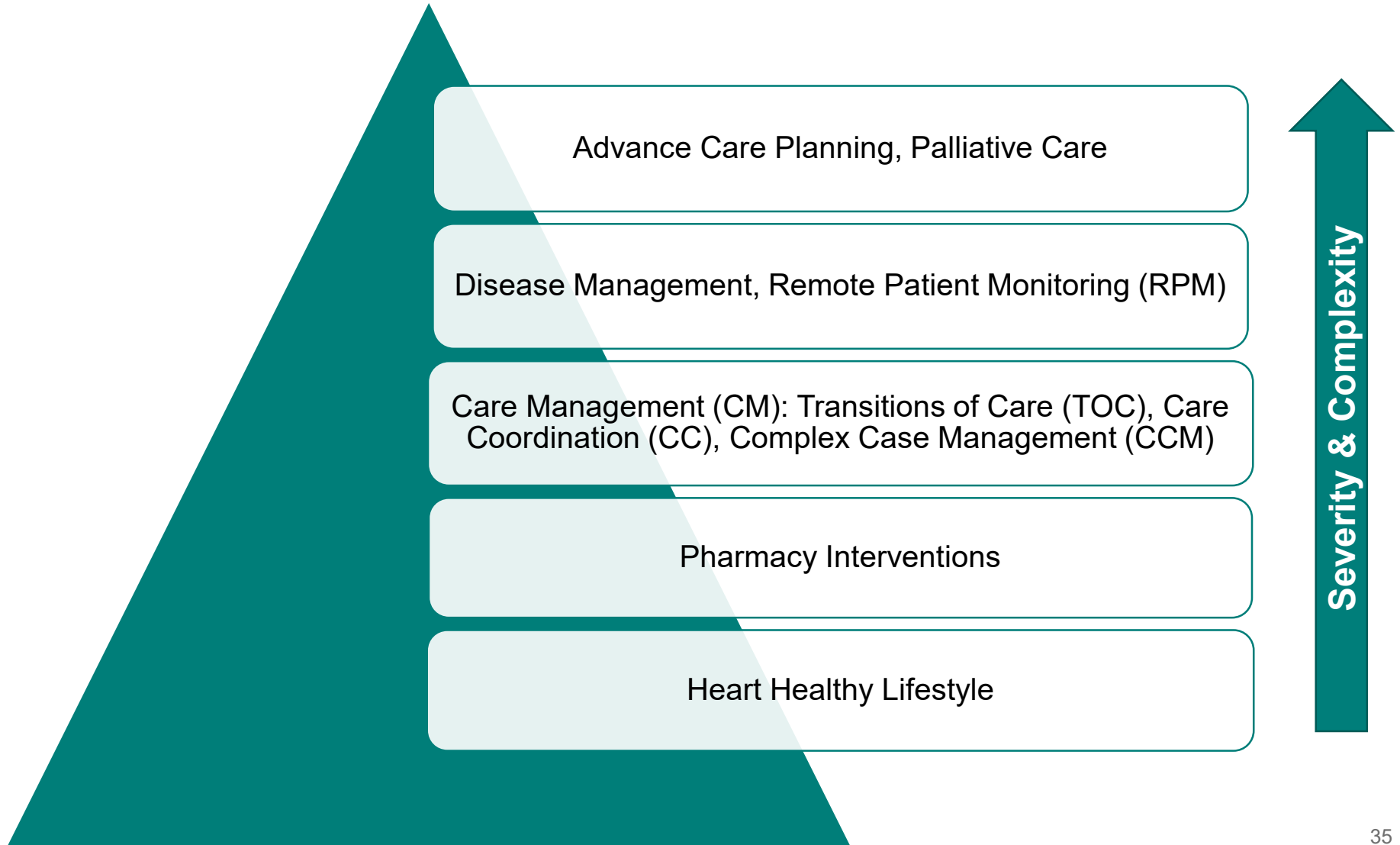


# Advanced Heart Failure



- Repeated heart failure ( $\geq 2$ ) hospitalizations or emergency department visits in last year
- Deterioration in renal function
- Weight loss
- Intolerance to:
  - ACEI due to hypotension and/or worsening renal function
  - Beta blockers due to worsening heart failure or hypotension
- Frequent SBP  $< 90$  mmHg
- Persistent dyspnea with dressing or bathing requiring rest
- Inability to walk one block on the level ground
- Recent need to escalate diuretics to maintain volume status
  - Reaching daily furosemide equivalent dose  $> 160$  mg/d and/or
  - Use of supplemental metolazone therapy
- Progressive decline in serum sodium, usually to  $< 133$  mEq/L
- Frequent ICD shocks

# Health Plan Heart Failure Care Improvement Project



# Comprehensive Medication Management (CMM) by Clinical Pharmacy Services Team

Member outreach and provider outreach to promote GDMT

- **Indication:**
  - Unnecessary medications
  - Needs additional medications
- **Effectiveness:**
  - Ineffective medication
  - Dosage too low
  - Needs additional monitoring
- **Safety:**
  - Adverse medication event
  - Dosage too high
  - Needs additional monitoring
- **Adherence:**
  - Adherence
  - Cost



# Disease Management Remote Patient Monitoring of Weight



- Eligible members and control group in initial phase
- Numberless scale with Apple iOS or Google Android smartphone app
  - Weight feedback and alerts of excessive weight gain
  - Tailored messaging on heart healthy lifestyle driven by Machine Learning (ML) and Artificial Intelligence (AI)
- Inclusion Criteria:
  - NYHA Class I-III heart failure
  - Hospital admissions or emergency room (ER) visits within the last year
  - Weight up to 395 lbs
  - May have additional co-morbidities including Diabetes Mellitus Type 2 (DM2), CAD, Chronic kidney disease (CKD)  $\leq$  stage 3
  - Has a Bluetooth-enabled smart phone and can download apps
  - Has Internet access (via Wi-Fi or cellular data) at primary residence
- Exclusion Criteria:
  - Not meeting all inclusion criteria
  - Unsteady on feet/poor balance

# Palliative Care



- Advance Care Planning (ACP) - Advance Directives
  - [POLST, Durable Power of Attorney for Health Care \(DPA-HC\) - Proxy](#)
  - Counsel patients about prognosis
  - Enable informed decisions about medications, devices, and transplantation
- Symptom alleviation even for non-terminal patients
- Addresses caregiver and patient psychosocial concerns
- Improves quality of life
- Decreases anxiety and in-hospital mortality

# Contact Information



## Referral guidance for any intervention

- **Health Net:**

Tel: Check the back of the members' ID card for the correct contact number

Website: [healthnet.com](http://healthnet.com)

- **California Health & Wellness**

Tel: [1-877-658-0305](tel:1-877-658-0305)

Website: [cahealthwellness.com](http://cahealthwellness.com)

### **CalViva Health**

Tel: [1-888-893-1569](tel:1-888-893-1569)

Website: [calvivahealth.org](http://calvivahealth.org)

## Clinical Pharmacy central line

Tel: [1-888-893-1569](tel:1-888-893-1569)

Hours of operation: 7:30am - 5:30pm Pacific

(voicemail can be after hours, and calls are returned the next business day)

# Appendix



# Citations and Resources

- Yancy CW, Jessup M, Bozkurt B, et al. 2013 ACCF/AHA guideline for the management of heart failure: a report of the American College of Cardiology Foundation/American Heart Association Task Force on practice guidelines. [Circulation. 2013;128\(16\):e240-e327](#)
- Yancy CW, Jessup M, Bozkurt B, et al. 2017 ACC/AHA/HFSA Focused Update of the 2013 ACCF/AHA Guideline for the Management of Heart Failure: a report of the American College of Cardiology Foundation/American Heart Association Task Force on practice guidelines and the Heart Failure Society of America. [Circulation. 2017;136\(6\):e137-e161](#)
- Korabathina R, Fountain LB, Eckstein D, Wojnowich K. 2016 Heart Failure Update. FP Essent. 216;442:1-48.
- American College of Cardiology ([www.acc.org](http://www.acc.org))
- American Heart Association ([professional.heart.org](http://professional.heart.org))
- Heart Failure Society of America ([www.hfsa.org](http://www.hfsa.org))



# Patient Tools and CM Resources

- <https://www.cardiosmart.org/Heart-Conditions/Heart-Failure>
- <https://www.cardiosmart.org/Heart-Conditions/Heart-Failure/Understand-Your-Condition>
- <https://www.cardiosmart.org/~media/Documents/Heart-Failure-Guide.ashx>
- <https://www.cardiosmart.org/~media/Documents/Fact%20Sheets/en/tb1470.ashx>