Heart Failure: Refreshers and Updates

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In support of improving patient care, Idaho State University Kasiska Division of Health Sciences is jointly accredited by the Accreditation Council for Continuing Medical Education (ACCME), the Accreditation Council for Pharmacy Education (ACPE), and the American Nurses Credentialing Center (ANCC), to provide continuing education for the healthcare team.
Disclosure Statement

• The planners and presenter of this presentation have disclosed no conflict of interest, including no relevant financial relationships with any commercial interests
Objectives

• Explain the underlying pathophysiology and compensatory mechanisms of heart failure in the context of targets for drug therapy

• Outline an appropriate drug regimen and monitoring plan for a patient with heart failure with reduced ejection fraction (HFrEF)

• Differentiate patient classes for determining candidates for new drugs available to treat HFrEF
CHF: Chronic Heart Failure

• A clinical syndrome resulting from any disorder that
  – Impairs the ability of the ventricle to fill with (diastole) or eject blood (systole)
  – Heart unable to pump blood at a rate sufficient to meet the metabolic demands of the body

• Previously defined as Congestive Heart Failure

• Cardiac Output = Heart rate x Stroke Volume
  – CO = HR x SV
Definitions

• Afterload
  – Tension developed in the left ventricular wall as systole occurs
  – Regulated by systemic vascular resistance or the impedance which the left ventricle must pump against
  – Mainly determined by arterial blood pressure

• Preload
  • Volume in the left ventricle at the end of diastole (relaxation)
Definitions

• Frank-Starling Mechanism
  – Describes the ability of the heart to alter the force of contraction depending on preload
  – In a dysfunctional ventricle, sacromeres are stretched too far limiting the ability to contract

• Ejection Fraction (EF)
  – The percentage of left ventricular blood volume “ejected” during systole (contraction)
  – Normal EF is 60% to 70%

• Right-sided & left-sided HF
  – Anatomical
Heart Failure with Reduced Ejection Fraction (HFrEF)

- Formally: Systolic Dysfunction
- Low EF <40%
- Unable to eject enough blood to keep up with the metabolic demands of the body
- Ventricle has difficulty contracting → ventricles become dilated → congested with retained blood
- Most common cause of systolic heart failure – MI (CAD)
Heart Failure with Preserved Ejection Fraction (HFpEF)

- Associated with an EF >40%
- Ventricle has diastolic stiffness
  - Reduced compliance
  - Unable to fill adequately
- Most common cause of diastolic heart failure is hypertension
  - Therapy aimed at heart rate & blood pressure control
Classification Systems

**NYHA**

Functional status based on symptom severity

I: No symptoms with activity
II: Symptoms with usual activity
III: Symptoms with minimal activity
IV: Symptoms at rest

**ACC/AHA**

Based on disease evolution and progression

A: High risk for development but without of structural heart disease
B: Structural heart disease but without signs or symptoms of HF
C: Structural heart disease but with symptoms now or in past
D: Refractory, end-stage HF
Heart Failure with Reduced Ejection Fraction

**HFrEF**
Pathophysiology

• Compensatory Mechanisms
  – Intended to be short term responses
  – Maintain circulatory homeostasis after acute reductions in blood pressure or renal perfusion
  – Detrimental long term
  – May occur after an acute or chronic event

• Neurohormonal Model
  – Sympathetic nervous system (SNS)
  – Renin-Angiotensin-Aldosterone System (RAAS)
SNS

• Causes tachycardia
  – Tries to increase CO by increasing HR
  – Causes increase in oxygen demand
  – Eventually decreases filling time actually decreases SV

• Increases contractility
  – Tries to increase CO by increasing SV
  – Causes increase in oxygen demand
Beta Receptors

• Overstimulation of β receptors
  – Causes a down regulation and ↓ synthesis of
  – Initiates “uncoupling” of receptors

• Blunting of the sympathetic response in a failing heart
  – Unable to respond to environmental stressors
  – These changes in receptor dynamics are important when initiating beta blockers and especially in a decompensated state
Renin Angiotensin Aldosterone System

Angiotensin II receptors on the heart

- Increased fibrosis of cardiac tissue
- Angiotensin II
- Increases ADH release
- Increases thirst drive

Increased Preload

- Increases water reabsorption from collecting duct

- Increases ADH release
- Increases thirst drive

Increased fibrosis of endothelial & cardiac tissue

Direct remodeling of cardiac tissue

- Reduced Renal Blood Flow
- Juxtaglomerular Apparatus
- Increased Aldosterone Secretion
- Sodium Retention
- Fluid Reabsorption
- Increased Blood Volume

Increased Preload

- Increased Afterload
- Increased Preload
BNP

- B-natriuretic peptide
- Elevated levels in CHF pts
- Therapeutic
  - Stored primarily in ventricles
  - BNP is released by way of the ventricular “stretch”
  - Natural diuresis (naturesis) (↓ preload)
  - Vasodilation (equal arteriole & venous dilation; ↓ afterload)
BNP

• Prognostic
  – The level of elevation correlates to increased mortality, symptoms, hospital readmission

• Diagnostic
  – Helps to determine if symptoms are due to CHF exacerbation or some other cause
  – Elevated levels are more indicative of CHF

• BNP < 100 pg/mL indicates no HF
• NT-proBNP < 300 pg/mL indicates no HF
Treatments

• Treatment of HFrEF focuses on
  – Manipulation of SNS & RAAS
  – Management of concomitant disease states
  – Lifestyle changes / management

• ACC/AHA HF Guidelines (2013)
  – Update (2016)
  – Update (2017)
Current Treatments

**Live Longer**
- Mortality benefit
- Beta-Blockers
- ACE-I
- ARB
- Aldosterone antagonists
- Sacubitril / valsartan
- Hydralazine & isosorbide dinitrate

**Feel Better**
- No benefit on mortality
- Can help with hospitalizations
- Diuretics
  - Loop
  - Thiazide (Metolazone)
- Digoxin
- Ivabradine
Figure 1-1. Stages of heart failure and recommended medical therapy.

ACE = angiotensin converting enzyme; ARB = angiotensin II receptor blocker; CAD = coronary artery disease; HFrEF = heart failure with reduced ejection fraction; HFpEF = heart failure with preserved ejection fraction; LVEF = left ventricular ejection fraction.
Live Longer Medications
β Blockers

• Cornerstone for patients with HFrEF
  – Start as soon as diagnosed (studied NYHA II-IV)
• Will increase ejection fraction
  – Especially if due to ischemic causes
• MOA
  – Decreases contractility (acutely)
  – “Resets” β receptors
  – Decreases cardiac remodeling; allowing the heart to return to normal or near normal functioning
• **NDP CCB are NOT an alternative
Drugs & Dosing

• β blockers should **NOT** be started too quickly
  – Start only in stable, euvolemic patients

• Start low and go slow

• Titrate every 2-4 weeks if stable
  – Dose usually doubled
  – Stop at max dose

• Education is vital!

<table>
<thead>
<tr>
<th>Drug Name</th>
<th>Initial Dose</th>
<th>Target Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bisoprolol</td>
<td>1.25 mg daily</td>
<td>10 mg daily</td>
</tr>
<tr>
<td>Carvedilol</td>
<td>3.125 mg twice daily</td>
<td>25 mg twice daily (50 mg twice daily if &gt;85 kg)</td>
</tr>
<tr>
<td>Metoprolol succinate</td>
<td>12.5 – 25 mg daily</td>
<td>200 mg daily</td>
</tr>
</tbody>
</table>
ACE-Inhibitors

• Recommended for all pts with HFrEF
• Improve symptoms and exercise tolerance
• MOA in HF
  – Decrease preload
    • ↓ Na & H₂O retention → ↓ blood volume
  – Decrease afterload (↓ arteriole pressure)
    • Postulated vasodilation benefits of bradykinin & PG
  – Cardiac remodeling
  – ↓ hypertrophy, fibrinogen, & collagen in cardiac myocyte
Drugs & Dosing

• Current data suggests class effect
• Dosing controversy
• Current guidelines still recommend target doses until more information is available
• Be mindful of volume status, kidney function, & potassium

<table>
<thead>
<tr>
<th>Name</th>
<th>Initial Dose</th>
<th>Target Dose for Survival Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Captopril</td>
<td>6.25 mg TID</td>
<td>50 mg TID</td>
</tr>
<tr>
<td>Enalapril</td>
<td>2.5 mg twice daily</td>
<td>10-20 mg twice daily</td>
</tr>
<tr>
<td>Fosinopril</td>
<td>5-10 mg once daily</td>
<td>40 mg once daily</td>
</tr>
<tr>
<td>Lisinopril</td>
<td>2.5-5 mg once daily</td>
<td>20-40 mg once daily</td>
</tr>
<tr>
<td>Perindopril</td>
<td>2 mg once daily</td>
<td>8-16 mg once daily</td>
</tr>
<tr>
<td>Quinapril</td>
<td>5 mg once daily</td>
<td>20 mg twice daily</td>
</tr>
<tr>
<td>Ramipril</td>
<td>1.25-2.5 mg twice daily</td>
<td>5 mg twice daily</td>
</tr>
<tr>
<td>Trandolapril</td>
<td>1 mg once daily</td>
<td>4 mg once daily</td>
</tr>
</tbody>
</table>

Adapted from Heart Failure in Pharmacotherapy: A Pathophysiologic Approach. Chisolm-Burns et al. 2013 page 92
Use of ARBs in HFrEF

- Major role
  - Consider as an alternative to ACE-I in pts w/ intolerance
    - Cough or angioedema
    - Data is not as good with ARB
- Combination therapy with ACE-I
  - Fallen out of favor d/t increased potassium
  - New agents available
- Not considered a class effect...possible?

<table>
<thead>
<tr>
<th>Drug Name</th>
<th>Initial Dose</th>
<th>Target Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Candesartan*</td>
<td>4 - 8 mg daily</td>
<td>32 mg daily</td>
</tr>
<tr>
<td>Valsartan*</td>
<td>40 mg twice daily</td>
<td>160 mg twice daily</td>
</tr>
<tr>
<td>Losartan</td>
<td>12.5 – 25 mg daily</td>
<td>50 – 150 mg daily</td>
</tr>
</tbody>
</table>

*preferred agents
BB or ACE-I/ARB Initiation First?

- Different options

1. If patient is congested (“wet”) → ACEI/ARB
   - RAAS system is not as activated

2. If patient is less congested (“dry”) with adequate HR → BB

3. In selected patients, a low dose of both a BB and an ACEI/ARB may be started.
Aldosterone Antagonists

• Starting to be used more often and sooner
• Recommend in NYHA II-IV
  – EF≤35%
  – After optimal doses β blockers, ACE-I, (and diuretics)
  – Of note, class II pts need CV hospitalization or high BMP
  – After acute MI with EF<40%
• Useful in pts needing additional antihypertensive agents
MOA

• Aldosterone receptor antagonist
• Decreases preload
  – Diuretic effect in distal tubule; K+ sparing
• Decreases afterload
  – Possible decrease of sympathetic activation
  – Increase arterial compliance
• Cardiac remodeling
  – Decrease myocardial and vascular fibrosis
• Decrease baroreceptor dysfunction
• Watch potassium!
Drugs & Dose

Spironolactone
- Studied in NYHA class III & IV
- Dose
  - Initiate at 12.5 mg to 25mg daily
  - Target of 25mg daily
- Anti-androgen effects

Eplerenone
- Studied in NYHA class II
  - CHF after MI
- Dose
  - Initiate at 25mg daily
  - Target of 50 mg once daily
- Other considerations
  - More selective
  - Better tolerated
  - More expensive
The Three-Legged Stool

B-Blockers

ACE-I / ARB

Aldosterone Antag

http://www.sailinghappilyeverafter.com/marriage-three-legged-stool/
Hydralazine/Nitrates

1. Self-described patients of African decent with NYHA class III-IV HFrEF
   - In addition to optimal therapy with ACEI/ARB & BB, (AA)

2. Use as an alternative to ACE-I & ARBs (in any race)
   - Intolerant of ACE-I or ARB
   - Pts w/ severe renal dysfunction
   - Persistent hyperkalemia on ACE-I or ARB
   - Mortality benefit is not to the extent of ACE-I/ARBs

<table>
<thead>
<tr>
<th>Drug Name</th>
<th>Initial Dose</th>
<th>Max Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Isosorbide dinitrate</td>
<td>20-30 mg 3-4 times daily</td>
<td>120 mg daily in divided doses</td>
</tr>
<tr>
<td>Hydralazine</td>
<td>25-50 mg 3-4 times daily</td>
<td>300 mg daily in divided doses</td>
</tr>
<tr>
<td>Fixed dose combo*</td>
<td>1 tablet three times daily</td>
<td>2 tablets three times daily</td>
</tr>
</tbody>
</table>

* 1 tablet equals 37.5 mg hydralazine and 20mg isosorbide dinitrate
Feel Better Medications
Diuretics

• Symptomatic relief of volume overload
• Can improve exercise tolerance
• Goal is euvolemia
  – Sub- and supra-therapeutic doses may inhibit dose escalations of other drugs
  – Constant monitoring is important: patient and provider
• Elimination of sodium and water results in a reduction of preload
• Furosemide is most commonly used; but bumentanide and torsemide have better oral bioavailability
Dosing

• Begin at low dose
  – Furosemide 20 to 40mg po q day
• Titrate to a loss of 1-2 lbs/day acutely, then tailor
• Self-adjusted diuretics for some pts
• Diuretic resistance: long-term use changes tubule or ion transport
  – ↑dose or add thiazide to loop regimen
    • Loops have ceiling dose
    • Metolazone is most common thiazide
Digoxin

- Used in HFrEF only, may worse HFpEF
- Added to pts with persistent symptoms despite treatment with optimal doses of neurohormonal antagonists
  - Positive inotropic effects
  - Negative chronotropic effects
- The usual oral maintenance dose: 0.125 to 0.25 mg
- Females may not benefit and may have increased mortality
NEW DRUGS IN HFrEF

Approved 2015
ANRI
Angiotensin II + Neprilysin inhibitor

- Sacubitril / Valsartan (Entreso®️)
MOA

- Blocks neprilysin, which is responsible for the breakdown of natriuretic peptides, bradykinin, adreomedullin, AND angiotensin II
  - Speculated that those with HF has increased levels of neprilysin
  - BNP levels are altered, therefore unreliable and not used in these patients
    - Must use NT-proBNP
- ARB must be used in combination with neprilysin inhibitor to block increased RAAS levels
- To be used in place of ACEI / ARB
PARADIGM-HF

- ARNI (valsartan 160mg equ.dose twice daily) vs enalapril 10 mg twice daily over 2 years
  - Mean daily dose for ANRI 375mg vs enalapril 18.9 mg
    - Low dose of enalapril
- Classes II-IV with symptomatic HFrEF (EF ≤35%), elevated BNP
  - 70% had class II
- Treated with evidence-based therapy as indicated and tolerated
- Stopped early at 27 months
## Outcomes

### Table 2. Primary and Secondary Outcomes

<table>
<thead>
<tr>
<th>Outcome</th>
<th>LCZ696 (N=4187)</th>
<th>Enalapril (N=4212)</th>
<th>Hazard Ratio or Difference (95% CI)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary composite outcome — no. (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Death from cardiovascular causes or first hospitalization for worsening heart failure</td>
<td>914 (21.8)</td>
<td>1117 (26.5)</td>
<td>0.80 (0.73–0.87)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Death from cardiovascular causes</td>
<td>558 (13.3)</td>
<td>693 (16.5)</td>
<td>0.80 (0.71–0.89)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>First hospitalization for worsening heart failure</td>
<td>537 (12.8)</td>
<td>658 (15.6)</td>
<td>0.79 (0.71–0.89)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Secondary outcomes — no. (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Death from any cause</td>
<td>711 (17.0)</td>
<td>835 (19.8)</td>
<td>0.84 (0.76–0.93)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Change in KCCQ clinical summary score at 8 mo†</td>
<td>−2.99±0.36</td>
<td>−4.63±0.36</td>
<td>1.64 (0.63–2.65)</td>
<td>0.001</td>
</tr>
<tr>
<td>New-onset atrial fibrillation‡</td>
<td>84 (3.1)</td>
<td>83 (3.1)</td>
<td>0.97 (0.72–1.31)</td>
<td>0.83</td>
</tr>
<tr>
<td>Decline in renal function§</td>
<td>94 (2.2)</td>
<td>108 (2.6)</td>
<td>0.86 (0.65–1.13)</td>
<td>0.28</td>
</tr>
</tbody>
</table>

* Hazard ratios were calculated with the use of stratified Cox proportional-hazard models. P values are two-sided and were calculated by means of a stratified log-rank test without adjustment for multiple comparisons.

† Scores on the Kansas City Cardiomyopathy Questionnaire (KCCQ) range from 0 to 100, with higher scores indicating fewer symptoms and physical limitations associated with heart failure. The treatment effect is shown as the least-squares mean (±SE) of the between-group difference.

‡ A total of 2670 patients in the LCZ696 group and 2638 patients in the enalapril group who did not have atrial fibrillation at the randomization visit were evaluated for new-onset atrial fibrillation during the study.

§ A decline in renal function was defined as end-stage renal disease or a decrease of 50% or more in the estimated glomerular filtration rate (eGFR) from the value at randomization or a decrease in the eGFR of more than 30 ml per minute per 1.73 m², to less than 60 ml per minute per 1.73 m².

- All-cause mortality NNT = 36
- First hospitalization for worsening HF NNT=36
# Adverse Effects

Table 3. Adverse Events during Randomized Treatment.*

<table>
<thead>
<tr>
<th>Event</th>
<th>LCZ696 (N = 4187)</th>
<th>Enalapril (N = 4212)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypotension</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Symptomatic</td>
<td>588 (14.0)</td>
<td>388 (9.2)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Symptomatic with systolic blood pressure &lt;90 mm Hg</td>
<td>112 (2.7)</td>
<td>59 (1.4)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Elevated serum creatinine</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥2.5 mg/dl</td>
<td>139 (3.3)</td>
<td>188 (4.5)</td>
<td>0.007</td>
</tr>
<tr>
<td>≥3.0 mg/dl</td>
<td>63 (1.5)</td>
<td>83 (2.0)</td>
<td>0.10</td>
</tr>
<tr>
<td>Elevated serum potassium</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;5.5 mmol/liter</td>
<td>674 (16.1)</td>
<td>727 (17.3)</td>
<td>0.15</td>
</tr>
<tr>
<td>&gt;6.0 mmol/liter</td>
<td>181 (4.3)</td>
<td>236 (5.6)</td>
<td>0.007</td>
</tr>
<tr>
<td>Cough</td>
<td>474 (11.3)</td>
<td>601 (14.3)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Angioedema†</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No treatment or use of antihistamines only</td>
<td>10 (0.2)</td>
<td>5 (0.1)</td>
<td>0.19</td>
</tr>
<tr>
<td>Use of catecholamines or glucocorticoids without hospitalization</td>
<td>6 (0.1)</td>
<td>4 (0.1)</td>
<td>0.52</td>
</tr>
<tr>
<td>Hospitalization without airway compromise</td>
<td>3 (0.1)</td>
<td>1 (&lt;0.1)</td>
<td>0.31</td>
</tr>
<tr>
<td>Airway compromise</td>
<td>0</td>
<td>0</td>
<td>—</td>
</tr>
</tbody>
</table>

* Shown are results of the analyses of prespecified safety events at any time after randomization. The numbers of patients who permanently discontinued a study drug were as follows: for hypotension, 36 (0.9%) in the LCZ696 group and 29 (0.7%) in the enalapril group (P = 0.38); for renal impairment, 29 (0.7%) and 59 (1.4%), respectively (P = 0.002); and for hyperkalemia, 11 (0.3%) and 15 (0.4%), respectively (P = 0.56).

† Angioedema was adjudicated in a blinded fashion by an expert committee.
Guideline Recommendations

*2016 Update:

“In patients with chronic symptomatic HFrEF NYHA class II or III who tolerate an ACE-I or ARB, replacement with an ARNI is recommended to further reduce morbidity and mortality.”

— Evidence B-R
Dosing

<table>
<thead>
<tr>
<th>Drug Name</th>
<th>Initial Dose</th>
<th>Target Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sacubitril / Valsartan</td>
<td>49/51 mg twice daily for patients previously on ACEI or ARB</td>
<td>97 / 103* mg twice daily</td>
</tr>
<tr>
<td></td>
<td>24/26 mg twice daily for ACEI / ARB naive pts, eGFR &lt;30, moderate liver impairment</td>
<td></td>
</tr>
</tbody>
</table>

*103 mg is equivalent to 160mg BID of valsartan (different salts)
**tablets are NOT proportionately the same (ie two 24/26 mg tablets ≠ 49/51 mg tablet)

- ***ARNI administered 36 hours after last dose of ACEI or ARB
- Dose should be increased every 2-4 weeks as tolerated
Additional Info

• Precautions/Contraindications
  – Angioedema
    • Contraindicated with those with history
  – Hypotension
  – Drugs that increase potassium

• Adverse Effects
  – Hypotension
  – Hyperkalemia
  – Cough
  – Dizziness
  – Renal failure
  – Angioedema
More Additional Info...

• Monitoring
  – Potassium and renal function 1-2 weeks after initiation / dosage change

• Issues to consider
  – Cost: ~$500 /month
  – Recommendation: continue use of standard HF therapy
  – Consider use if pt continues to have symptoms or recent exacerbation on optimized treatment
If Channel Inhibitor

• Ivabradine (Corlanor)
• Selectively binds to the If (funny current) channels in the SA node
  – Funny current because it is unusual in behavior
    • Accelerates diastolic depolarization in SA
• Ivabradine slows depolarization $\rightarrow$ slows SA activity $\rightarrow$ reduces HR
  – Does NOT alter myocardial contractility or intra-cardiac conduction
  – Does NOT affect other ion channels
SHIFT

• Over 6000 patients on standard therapy
  – Added ivabradine or placebo over 2 years

• Patient inclusion criteria
  – Stable, symptomatic HF, LVEF ≤35%, sinus rhythm with HR of ≥70 bpm, hospital admission within last 2 years

• No difference in CV death or total mortality
  – Death from HF over 2 years NNT=50

• All-cause hospital admission NNT=25

• 26% on target beta-blocker dose
  – 56% reached >50% of target
Ivabradine Use

- Reduce the risk of hospitalization in chronic HF in patients:
  - Stable, symptomatic heart failure
  - LVEF $< 35\%$
  - Sinus rhythm with resting HR $\geq 70$ bpm
  - On maximum tolerated doses of BB or contraindication to BB therapy

<table>
<thead>
<tr>
<th>Drug Name</th>
<th>Initial Dose</th>
<th>Max Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ivabradine</td>
<td>5mg twice daily</td>
<td>10 mg twice daily</td>
</tr>
</tbody>
</table>

- If after 2 weeks and HR is $> 60$ bpm, increase to 10mg twice daily
  - HR $< 50$ bpm decrease to 2.5mg twice daily
ADR

- Bradycardia
- Atrial fibrillation (d/c in this instance)
  - NNH 100 in SHIFT trial
- Phosphenes (visual brightness)
  - NNH 50 in SHIFT trial
  - Sudden change in brightness of light
  - Counsel patients on operating machinery, especially at night
  - Most resolve in 2 months
Additional Info

• Monitoring
  – Heart rate and rhythm
    • Dizziness and fatigue
  – Blood pressure
  – Vision changes

• Issues to consider
  – Cost: ~$500 / month
  – Recommendation: continue use of standard HF therapy
  – Consider use if pt continues to have symptoms or HR > 70 bpm on optimized treatment
  – Consider use in pt intolerant of BB
Reading & References:

1) 2016 ACC/AHA/HFSA Focused Update on Pharmacological Therapy for Heart Failure: An Update of the 2013 ACCF/AHA 2013 Guidelines for the Management of Heart Failure. Available at http://circ.ahajournals.org/content/circulationaha/early/2016/05/18/CIR.0000000000000435.full.pdf


3) 2017 ACC/AHA/HFSA Focused Update of the 2013 ACCF/AHA 2013 Guidelines for the Management of Heart Failure. Available at: http://circ.ahajournals.org/content/early/2017/04/26/CIR.0000000000000509
