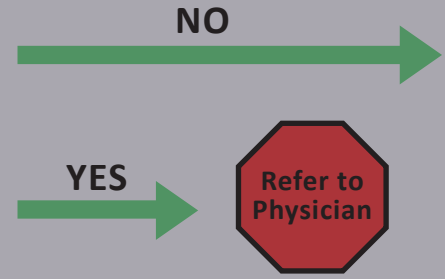


Angiotensin Converting Enzyme Inhibitors (ACEI) / Angiotensin Receptor Blockers (ARBs)* Heart Failure Medication Initiation and Titration

Initiation

Symptomatic HF or LVEF < 40%

| |
|--|
| Bilateral renal artery stenosis |
| Moderate/Severe aortic stenosis |
| Hyperkalemia: K+ > 5.2 mmol/L |
| Renal Dysfunction: Serum creatinine >220 µmol/L |
| Hypotension: SBP < 90 mmHg or symptoms |
| Allergy: angioedema, hives, rash |
| Intolerance: cough (ACEi) |



- Considerations:**
- Baseline cough (ACEi)
 - K+ supplements
 - K+ sparing diuretics
 - MRAs
 - NSAIDs/COX2 inhibitors

See dosing

See monitoring section

Titration

Titrate every 1-3 weeks, depending on tolerance

Goal: Target dose (see dosing) or maximum tolerated dose



Fluid Assessment

- Volume deplete**
- Euvolemic**
- Volume overload**

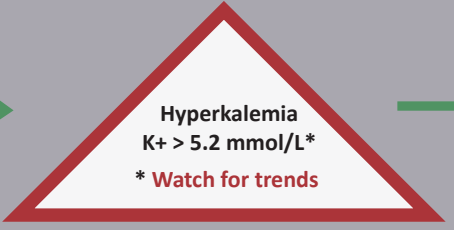
- Reduce/hold diuretic x 2-3 days
- Reassess diuretic dose/other non-essential BP lowering meds. Consider staggering doses
- Reduce/hold dose of other vasodilators +/- ACEI/ARB x 1-2 weeks

No improvement, hold/reduce ACEI/ARB x 1-2 wks & reassess

See Diuretic algorithm → Reassess 1-2 wks

Assess

- BP
- K+
- Scr



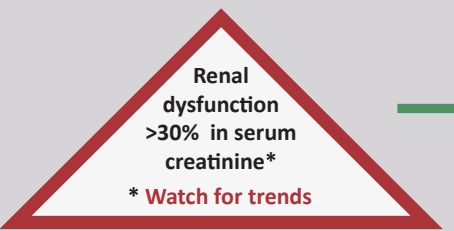
- Considerations:**
- Dietary K+
 - K+ supplements
 - K+ sparing diuretics
 - MRAs
 - Renal dysfunction

- K+ 5.2-5.5**
- K+ 5.6-6.0**
- K+ > 6.0**

- Stop K+ supplements, reduce/hold MRAs (if applicable)
- Stop K+ supplements, MRAs. hold ACEI/ARB
- Treat hyperkalemia. Refer to MD/NP +/- send to ED

Serum K+ in 3-5 days, Reassess ACEI/ARB dose

Serum K+ in 2-3 days, Reassess ACEI/ARB dose



- Considerations:**
- Addition of nephro-toxic drugs: NSAIDs/COX2
 - Worsening HF
 - Co-morbidity: DM, dehydration, CKD

- Fluid Assessment
- Volume deplete**
 - Euvolemic**
 - Volume overload**

- Reduce/hold diuretic x 2-3 days → Scr in 5-7 days
- Hold ACEI/ARB → Scr in 5-7 days → Rechallenge at lower dose
- Increase diuretic per Diuretic algorithm; reduce/hold of ACEI/ARB → Scr in 2-3 days

Monitoring**

Initiation of ACEI/ARB

- Baseline Scr / GFR
- Baseline K+
- Baseline blood pressure

Blood Pressure

- Every visit
- Sitting
- Standing
- +/- lying

Serum Creatinine

- One week after:**
1. initiation
 2. dosage increase*
 3. > 30% ↑ in Scr

Serum Potassium

- One week after:**
1. initiation
 2. dosage increase*

* Obtain baseline value prior to any up-titration or change in symptom status
If stable: Q 3-6 months

Other Considerations:

- Angioedema:**
- Stop ACEI/ARB contact physician; refer to ED
 - Do not rechallenge
 - Caution when substituting ARB for ACEI

- Cough:**
- Assess at baseline as may be due to worsening HF
 - If intractable cough secondary to ACEI consider:
 - Trial of another ACEI or lower dose
 - Switch to ARB
 - Reassess in 2 weeks and document

* This algorithm is intended for single agent (ACEI or ARB)
** This is a guide to monitoring; increase monitoring may be required given patient's status and co-morbidities (ie. renal insufficiency)

Beta - Blockers

Heart Failure Medication Initiation and Titration

Initiation

LVEF < 40%

- Bifascicular block, PR interval prolongation (>0.24 msec)
- Bradycardia: HR < 60 bpm or symptomatic
- 2nd or 3rd degree AV block without a pacemaker
- Hypotension: SBP < 90 mmHg or symptoms
- Asthma
- Acute decompensated heart failure
- Intolerance or allergy

NO

YES

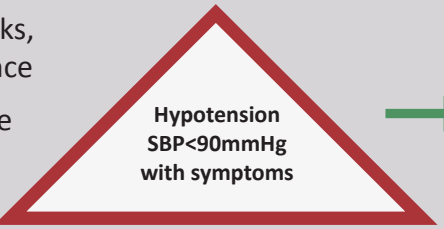


- Considerations:**
- COPD with reversible component
 - Other rate controlling drugs:
 - verapamil, diltiazem
 - amiodarone
 - sotalol
 - digoxin
 - ivabradine

- See dosing
- See monitoring section

Titration

Titrate every 2-4 weeks, depending on tolerance
 Goal: Target dose (see dosing) or maximum tolerated dose



- Considerations:**
- Other BP lowering drugs:
 - vasodilators (nitrates, hydralazine, CCB)
 - ACEI/ARB/ARNI
 - diuretics

Volume deplete

Reduce/hold diuretic x 2-3 days

Euvolemic

Reassess diuretic dose, other BP lowering drugs. Consider staggering doses

Volume overload

See below (volume overload)

No improvement, hold/reduce BB x 1-2 wks reassess

Assess

- BP
- Heart Rate
- Fluid Status



- Considerations:**
- Other rate controlling drugs:
 - diltiazem, verapamil
 - sotalol
 - amiodarone
 - digoxin
 - ivabradine

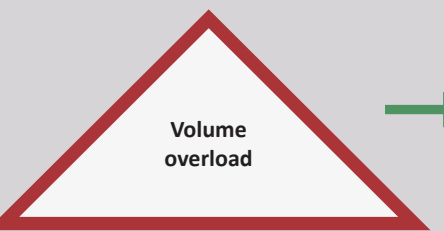
- Conduction Abnormality:**
- Bifascicular block
 - PR interval prolongation
 - 2nd or 3rd degree AV block in the absence of PPM

NO

Consider decreasing BB dose. Reassess in 1-2 weeks

YES

Stop BB Consider referral to Cardiologist



- Considerations:**
- Other precipitants of fluid retention:
 - NSAIDs/COX2, glitazones
 - Salt/fluid intake
 - Non adherence
 - Co-morbidity
 - Worsening HF

Mild symptoms

- Maintain BB dose
- Increase diuretic
- Sodium/fluid restriction

Moderate to severe symptoms

- Consider reducing BB dose
- Increase diuretic
- Sodium/fluid restriction

see diuretic algorithm

Monitoring **

Initiation Beta-Blocker

- Baseline ECG
- Baseline heart rate
- Baseline blood pressure

Blood Pressure

- Every visit
 - Sitting
 - Standing
 - +/- lying

Heart Rate

- Every visit
- ECG as clinically indicated:
 - after each up-titration
 - Δ in symptom status

Fluids/ Weight Status

- Every visit
- Patient should be instructed to perform daily weights

Other

- Extreme limiting fatigue (other causes ruled out):
 - could consider decreasing dose of BB, review in 1-2 weeks

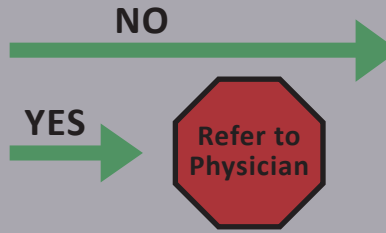
*verapamil and diltiazem are contraindicated in systolic heart failure (EF < 40%)
 **This is a guide to monitoring; increase monitoring may be required given patient's status and co-morbidities

Mineralocorticoid Receptor Antagonists (MRA) Heart Failure Medication Initiation and Titration

Initiation

Symptomatic heart failure (NYHA II-IV) on ACEI/ARB or ARNI + BB and LVEF < 40%

| |
|---|
| Hyperkalemia: K+ > 5.2 mmol/L |
| Renal Dysfunction: Serum creatinine > 220 μmol/L or a creatinine clearance < 30 ml/min |
| Intolerance or allergy |



Considerations:

- K+ supplements
- K+ sparing diuretics
- NSAIDS/COX2 inhibitors
- ACEI/ARB or ARNI

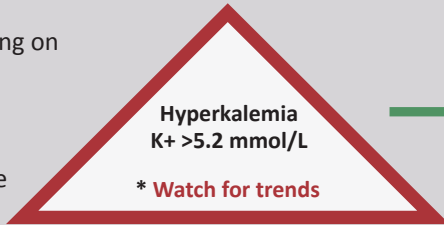
See dosing

See monitoring section

Titration

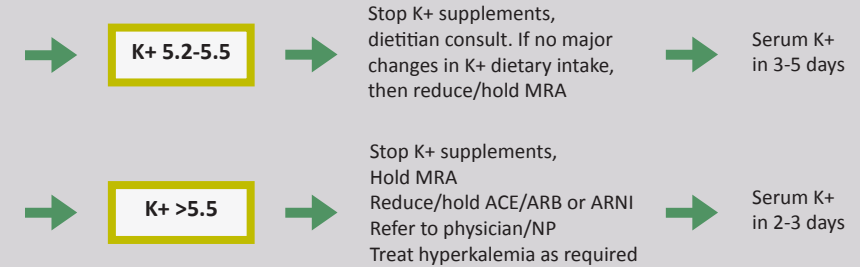
Titrate monthly depending on tolerance

Goal: Target dose (see dosing below) or maximum tolerated dose



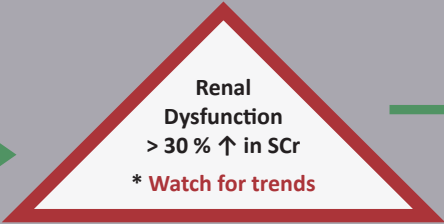
Considerations:

- K+ supplements
- K+ sparing diuretics
- Dietary K+
- ACEI/ARB or ARNI
- Renal dysfunction



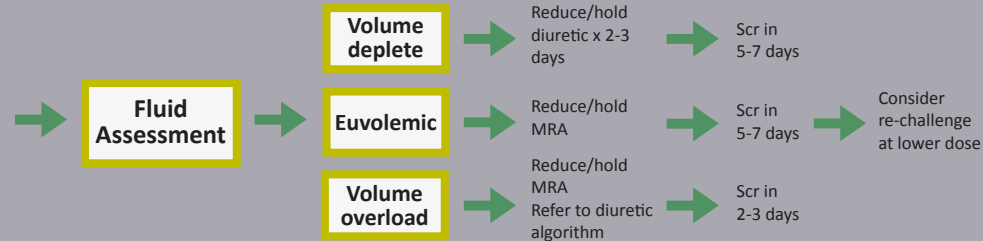
Assess

- K+
- SCr



Considerations:

- Addition of nephrotoxic drugs: NSAIDS/COX2
- ACEI/ARB or ARNI
- GI loss



Monitoring **



- Baseline Scr / GFR
- Baseline K+

- After initiation: 3 days, 1 week, 4 weeks, then monthly x 3
- Prior to up-titration of MRA
- 1 week post up-titration of MRA
- With dehydration, illness, change in symptom status or change in other medications affecting potassium/serum creatinine

Dosing:

The usual dose is 25 mg daily, however, those with poor renal function and/or a history of hyperkalemia should be initiated on 12.5 mg daily and titrated as tolerated. Some patients may have their dose increased to 50mg with close monitoring.

Other considerations:

Gynecomastia (4-5% of males) with spironolactone. Consider switching to Eplerenone.

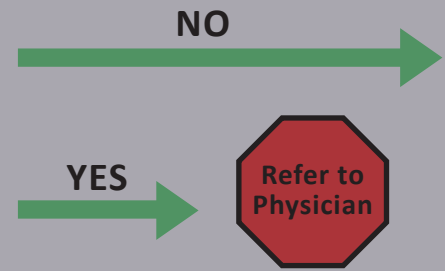
** This is a guide to monitoring; increase monitoring may be required given patient's status and co-morbidities (ie. renal insufficiency)

ARNI (Angiotensin Receptor blocker / Neprilysin Inhibitors [Sacubutril/Valsartan]) Heart Failure Medication Initiation and Titration

Initiation

Symptomatic HF despite ACEI/ARB and B-blocker therapy
LVEF < 40%

- Bilateral renal artery stenosis
- Moderate/Severe aortic stenosis
- Hyperkalemia: K+ > 5.2 mmol/L
- Renal Dysfunction: GFR < 30 ml/min
- Hypotension: SBP < 90 mmHg or symptoms
- Allergy: angioedema, hives, rash



- Considerations:**
- K+ supplements
 - K+ sparing diuretics
 - MRA
 - NSAIDs/COX2 inhibitors
 - Stop ACEI x 36hr prior to start
 - Stop ARB and start following day

See dosing

See monitoring section

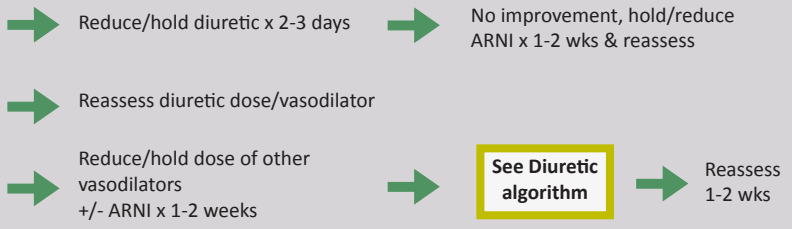
Titration

Titrate every 3-6 weeks, depending on tolerance
Goal: Target dose (see dosing) or maximum tolerated dose



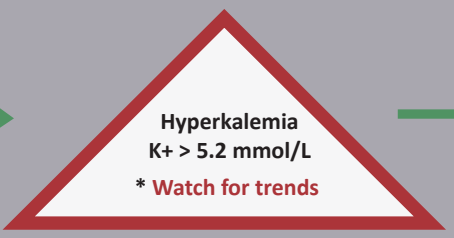
Fluid Assessment

- Volume deplete**
- Euvolemic**
- Volume overload**



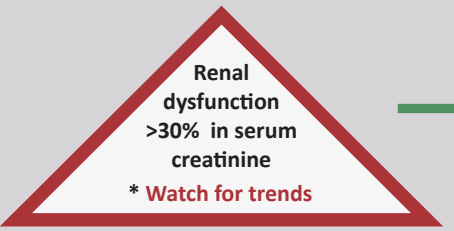
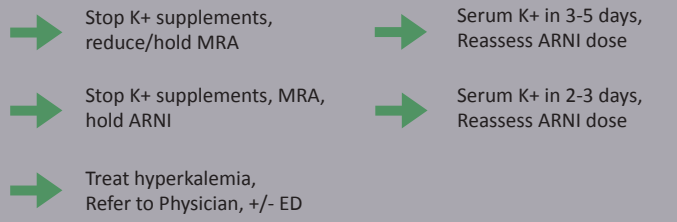
Assess

- BP
- K +
- Scr



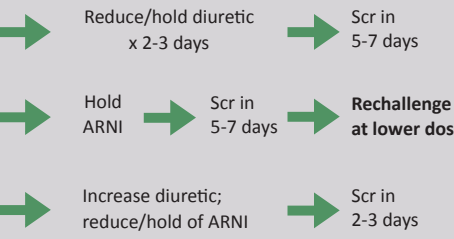
- Considerations:**
- Dietary K+
 - K+ supplements
 - K+ sparing diuretics
 - MRA
 - Renal Dysfunction

- K+ 5.2-5.5**
- K+ 5.6-6.0**
- K+ > 6.0**



- Considerations:**
- Addition of nephrotoxic drugs (NSAIDs/COX2)
 - Worsening HF
 - Co-morbidity

- Fluid Assessment**
- Volume deplete**
- Euvolemic**
- Volume overload**



Monitoring **

Initiation ARNI

- Baseline Scr / GFR
- Baseline K+
- Baseline blood pressure

Blood Pressure

- Every visit

Serum Creatinine

- One week after:**
1. initiation
 2. dosage increase*
 3. > 30% ↑ in Scr

Serum Potassium

- One week after:**
1. initiation
 2. dosage increase*

Other Considerations:

- Angioedema:**
- Stop ARNI, contact physician, refer to ED
 - Do not re-challenge

* Obtain baseline value prior to any up-titration or change in symptom status
If stable: Q 3-6 months

** This is a guide to monitoring; increase monitoring may be required given patient's status and co-morbidities (ie. renal insufficiency)

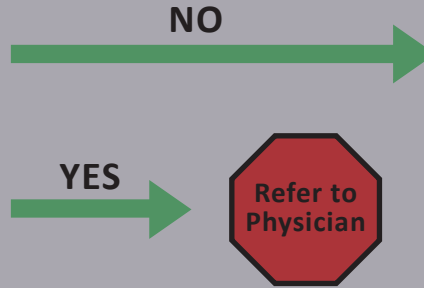
Ivabradine (IVA)

Heart Failure Medication Initiation and Titration

Initiation

LVEF < 40% + HF symptoms
HR ≥ 70 bpm on maximally tolerate BB
Normal sinus rhythm

| |
|----------------------------------|
| 2° or 3° AV block, SSS, SA block |
| Pacemaker dependence |
| Atrial arrhythmia |
| Ventricular arrhythmia |
| Prolonged QT |
| Intolerance or allergy |



Considerations:

Other rate controlling drugs:

- CCB*: verapamil, diltiazem
- beta-blockers
- amiodarone
- digoxin
- sotalol

Caution:

- in combo with QT prolonging drugs
- 1° AV block
- Drug interactions: 3A4 substrate

See dosing

See monitoring section

Titration

Titrate every 2-4 weeks, depending on tolerance

Goal: Heart rate 50 - 60bpm

Assess

Heart Rate



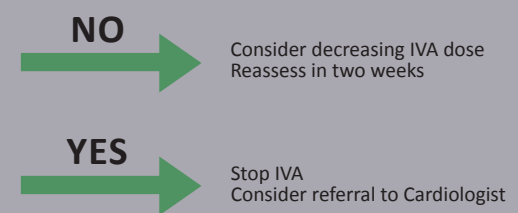
Considerations:

- Other rate controlling drugs:
 - diltiazem, verapamil
 - sotalol
 - amiodarone
 - digoxin

Note: IVA dose should be ↓ over beta-blocker dose.

Conduction Abnormality ?

- Bi-fascicular block
- 2° or 3° degree AV block



Monitoring **

Initiation of IVA

- Baseline ECG
- Baseline heart rate

Heart Rate

- Every visit
- ECG as clinically indicated:
 - after each up-titration
 - Δ in symptom status

Other

- Transient visual changes
- May ↑ risk of atrial fibrillation

*verapamil and diltiazem are contraindicated in systolic heart failure (EF < 40%), these drug also increase IVA levels through CYP3A inhibition
**This is a guide to monitoring; increase monitoring may be required given patient's status and co-morbidities

Diuretics

Heart Failure Medication Initiation and Titration

Initiation

Heart failure with signs and symptoms of fluid overload

| Fluid Assessment | |
|---------------------------------------|------------------------|
| Worsening / new SOB | Orthopnea/PND |
| Worsening SOBOE | Sacral edema / Ascites |
| Recent weight gain** | JVP assessment-JVD |
| Peripheral pitting edema | Hepatojugular reflex |
| Pulmonary edema: rales, crackles, CXR | |

Considerations:

- Fluid restriction
- Sodium restriction (<2gm/d)
- Underlying renal dysfunction
- History of past diuretic use
- Non-adherence
- Other precipitants: NSAIDs, COX2, glitazones, increase BB dose
- Sodium load
- Worsening HF/ Co-morbidity

See dosing

See monitoring section

Titration

Titrate **up, down or maintain** according to symptoms

Goal: Minimum dose to achieve euvolemia

dose should be reassessed each visit

Hypotension
SBP<90mmHg with symptoms

Fluid Assessment

Volume deplete

Euvolemic

Volume overload

- Reduce/hold diuretic x 2-3 days & reassess maintenance dose in 3-7 days
- Reassess diuretic dose/vasodilators
Decrease diuretics/stagger dose of other medications affecting BP
- Reduce/hold dose of other vasodilators +/- ACEI/ARB/ARNI x 1-2 wks, ↑ diuretic dose as tolerated

Assess

- Fluid Status
- Blood Pressure
- K+
- SCr

Hypokalemia
K+<3.5 mmol/L*
* Watch for trends

Considerations:

- K+ supplementation
- Addition of ACEI/ARB/ARNI
- MRA
- Renal function
- GI loss

Consider K+ Supplementation

Fluid Assessment

Reassess diuretic dose

Renal dysfunction
>30% ↑ in serum creatinine
* Watch for trends

Considerations:

- Addition of ACEI/ARB/ARNI
- MRA
- Nephrotoxic drugs: NSAIDs, COX2
- Worsening HF
- GI losses

Fluid Assessment

Volume deplete

Euvolemic

Volume overload

- Reduce/hold diuretic x 2-3 days → Scr in 5-7 days
- Reassess diuretic dose
- Consider reduce/hold dose MRA first; then ACEI/ARB/ARNI, ↑ diuretic dose as tolerated → Scr in 2-3 days

Monitoring **

Initiation of Diuretic

- Baseline Scr / GFR
- Baseline K+
- Baseline blood pressure

Fluid/Weight Assessment

- Every visit
- Patient should be instructed to perform daily weights

Serum Creatinine

- One week after:**
1. initiation
 2. dosage increase**
 3. 30% ↑ in SCr

Serum Potassium

- One week after:**
1. initiation
 2. dosage increase**

Blood Pressure

- Every visit
- Sitting
- Standing
- +/- lying

** Obtain baseline value prior to any up-titration or Δ in symptom status

** Weight gain: 2-3 lbs in 1-2 days or 5 lbs in 1 week
** This is a guide to monitoring; increased monitoring may be required given patient's status and co-morbidities