Congestive Cardiac Failure

Heart Failure with reduced Ejected Fraction (HFrEF)

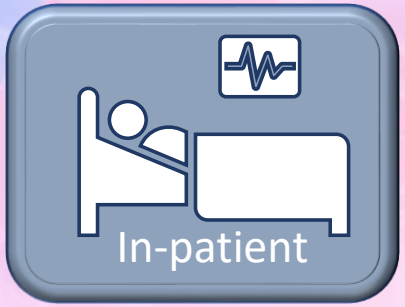
Registrar Evidence Based Education Series

Dynamed
AAFP

What Is?

Medications

Treatment Goals



Interventions

Guideline Directed Therapy

Summary

What is CCF?

- What is the definition of CCF?
- What are the most common etiologies?
- What are the classifications?

Treatment goals

- What are CCF treatment goals?

Guideline Directed Therapy

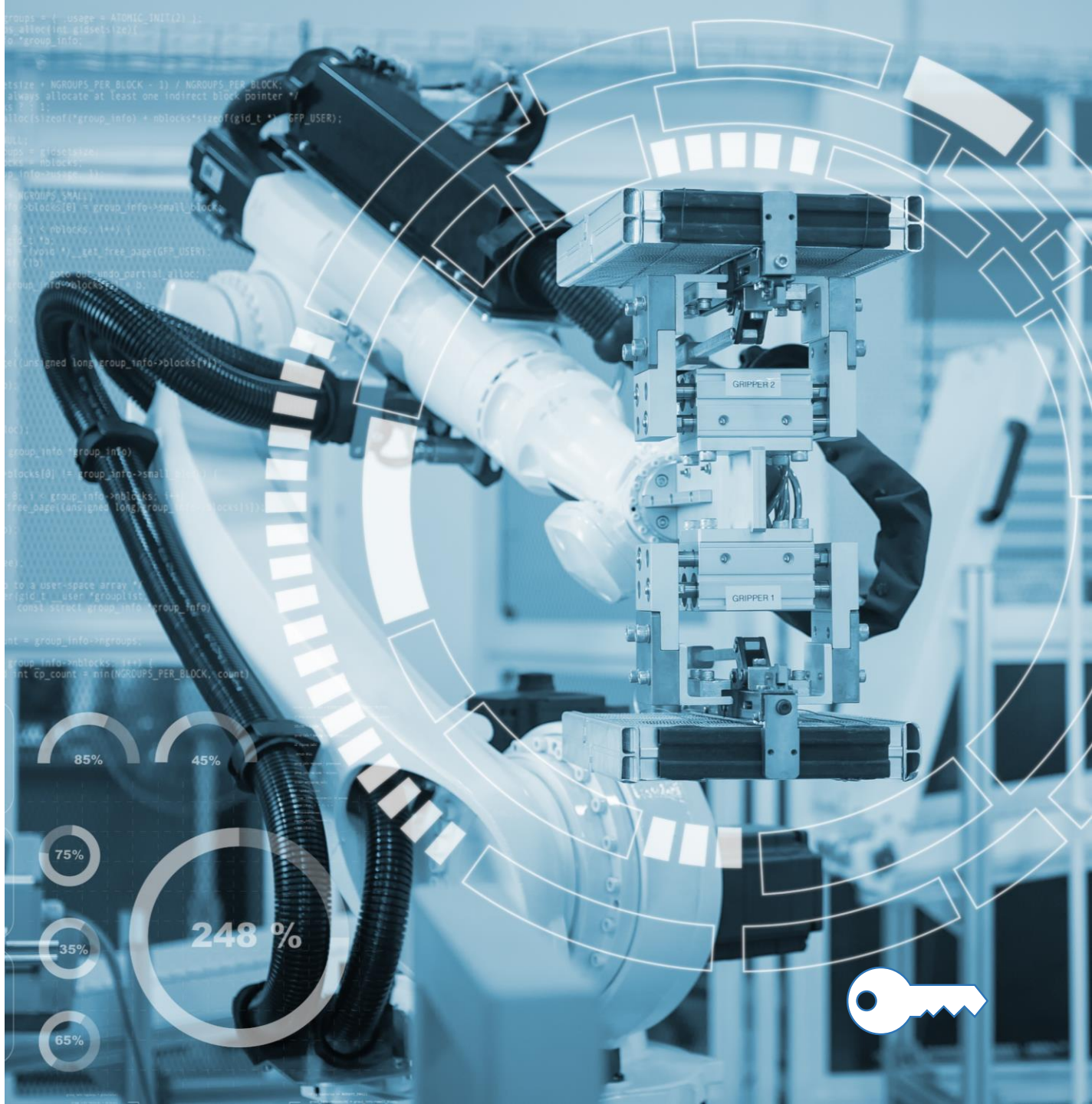
- What is indicated for class B/I?
- What is indicated for class C/II-III?
- What is indicated for class D/IV?

Medications

- What medications can be used to treat CCF?
- When are each indicated?
- What are the starting and target doses?
- Do the medications affect POEMs or DOEs?

Interventions

- What interventions can be implemented with CCF?
- When are those interventions indicated?



What is?

Heart failure is when the heart is unable to pump enough oxygen rich blood to meet the metabolic needs of the body

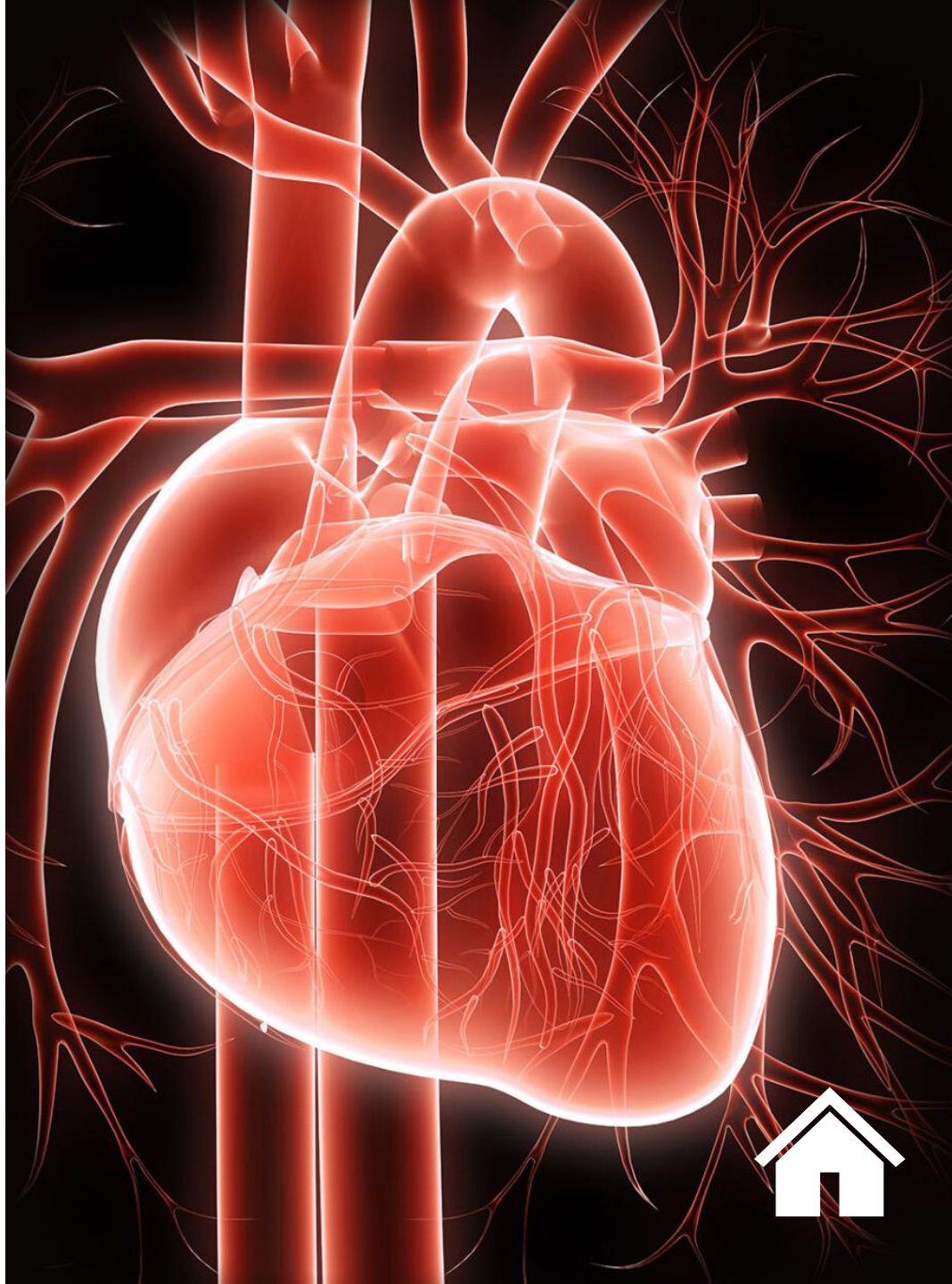
- Heart failure due to Reduced Ejection fraction (HFrEF) LVEF<40%

Common causes include: hypertension, ischemic heart disease, valvular disease, a-fib, LVH, cardiotoxic drugs/substances, viral, idiopathic and congenital

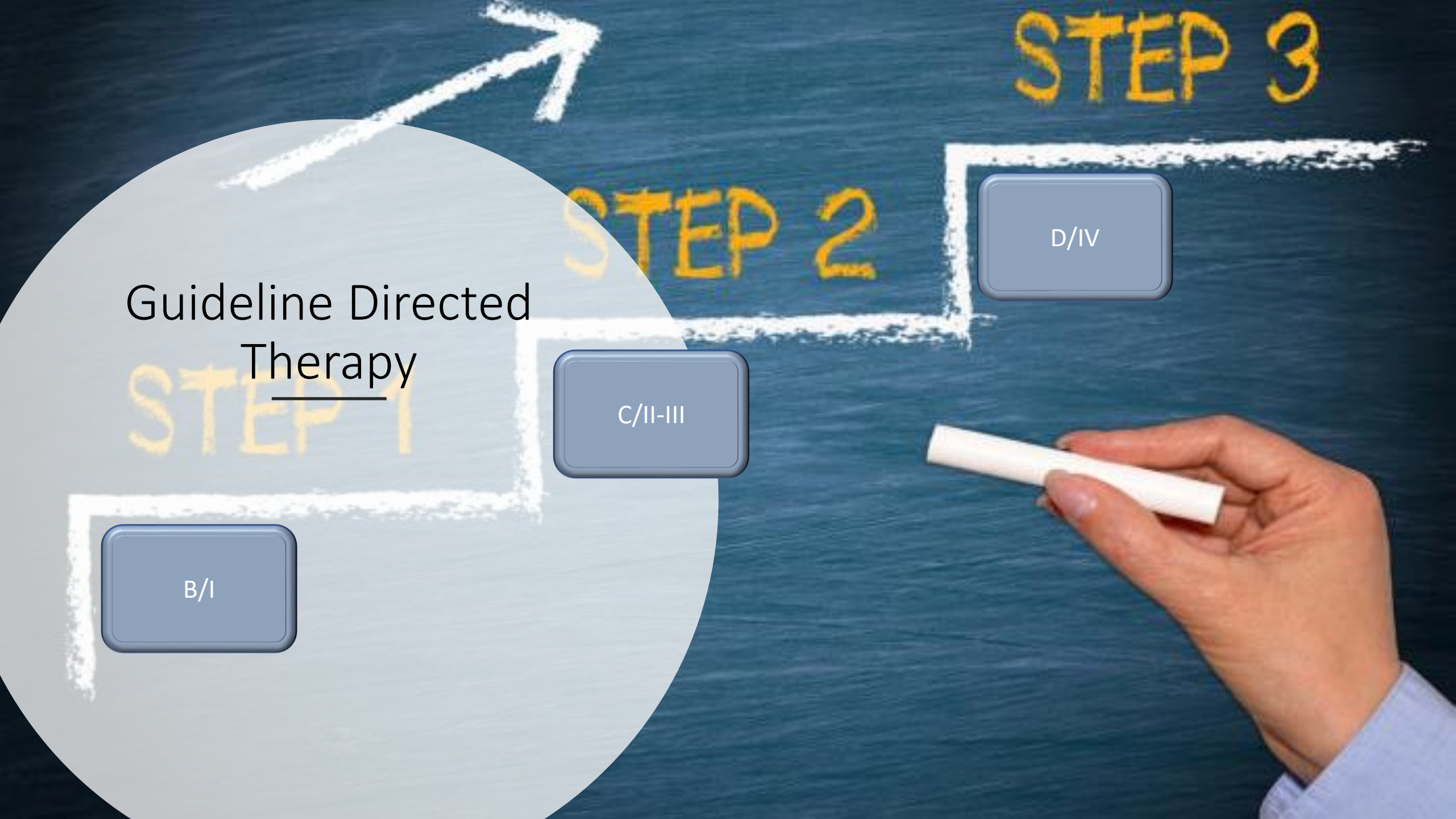
NYHA	ACC/AHA
I: Asymptomatic	A: At risk of heart failure without structural disease
II: Symptoms with modest exertion	B: Structural heart failure without symptoms
III: Symptoms with minor exertion	C: Structural heart failure with current or prior symptoms
IV: Symptoms at rest	D: Symptoms at rest

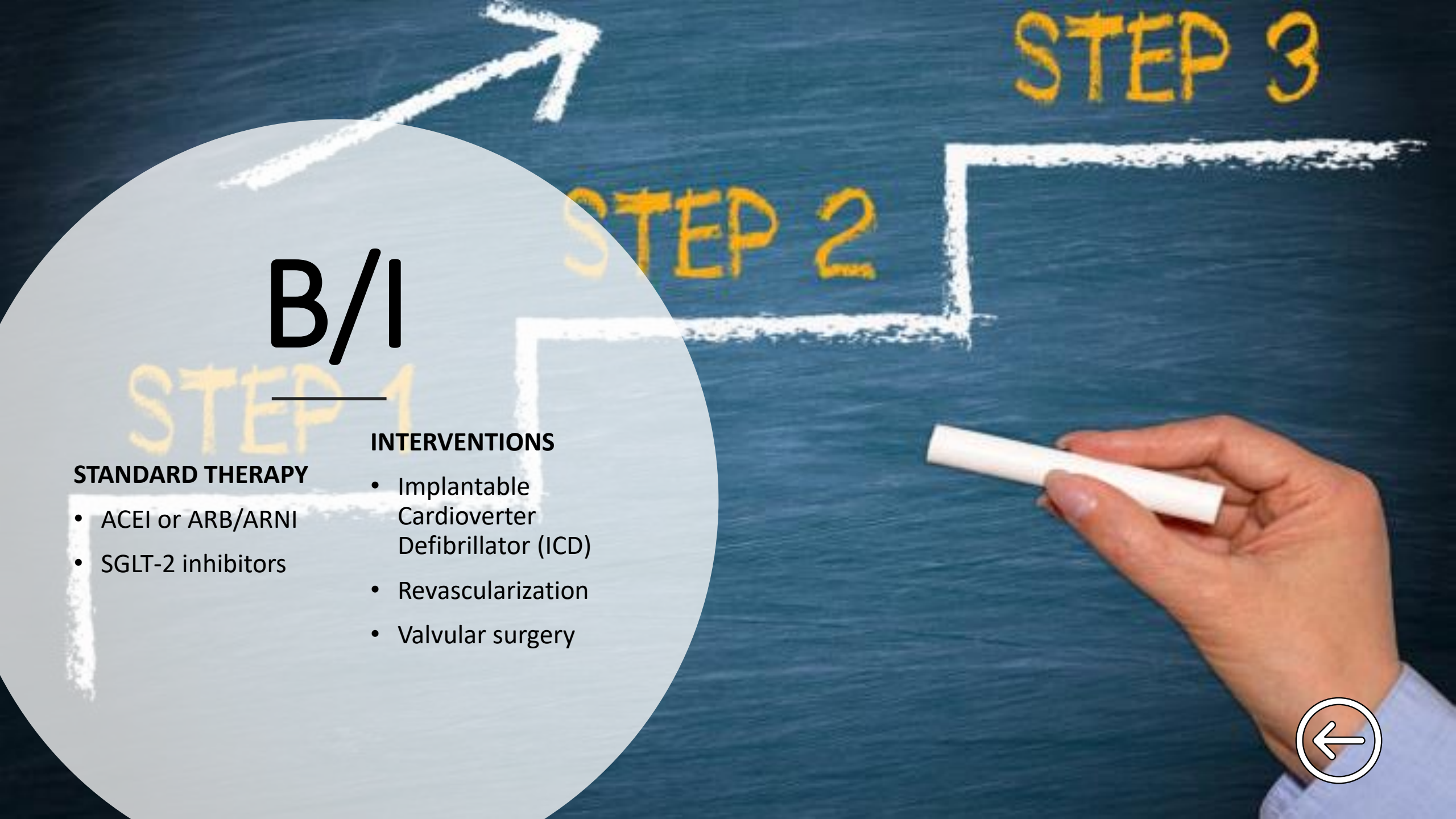
Treatment goals

- Identify cause
- Control: heart rate, blood pressure, volume status
- Guideline mandated therapy
- Decrease hospitalizations
- Decrease mortality
- Improve quality of life



Guideline Directed Therapy





B/I

STANDARD THERAPY

- ACEI or ARB/ARNI
- SGLT-2 inhibitors

INTERVENTIONS

- Implantable Cardioverter Defibrillator (ICD)
- Revascularization
- Valvular surgery

C/II-III

STANDARD THERAPY

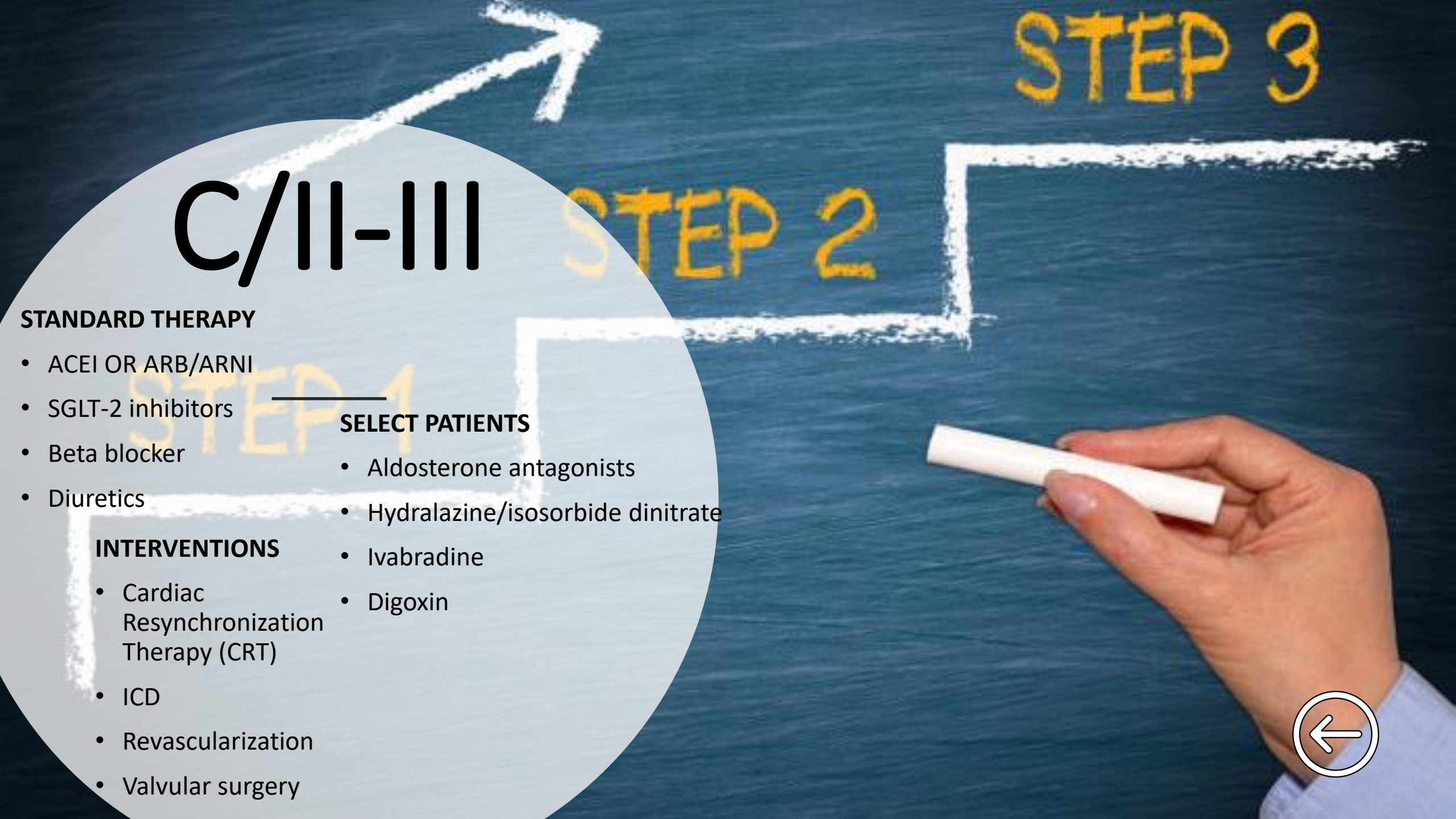
- ACEI OR ARB/ARNI
- SGLT-2 inhibitors
- Beta blocker
- Diuretics

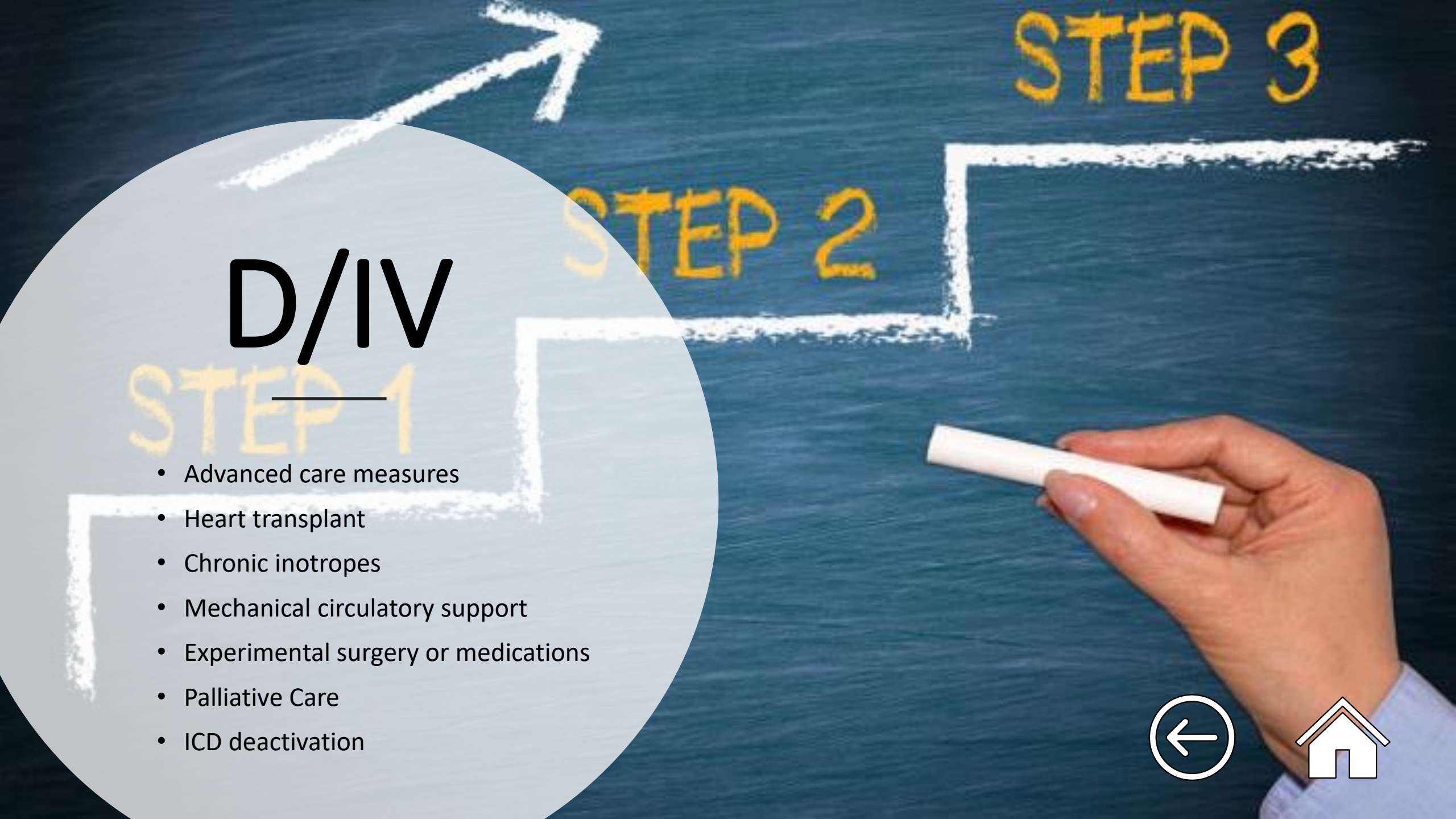
INTERVENTIONS

- Cardiac Resynchronization Therapy (CRT)
- ICD
- Revascularization
- Valvular surgery

SELECT PATIENTS

- Aldosterone antagonists
- Hydralazine/isosorbide dinitrate
- Ivabradine
- Digoxin





D/IV

- Advanced care measures
- Heart transplant
- Chronic inotropes
- Mechanical circulatory support
- Experimental surgery or medications
- Palliative Care
- ICD deactivation

MEDICATONS

STANDARD MEDICATIONS	IF INDICATED	OTHER INDICATIONS
ACEI	Aldosterone antagonist	Statins
ARB or ARNI	Loop diuretics	Antiplatelets
SGLT-2	Vasodilator	Anticoagulation
Beta blocker	Diuretics	
	Sinus node modulator	
	Inotrope	

Click on the class for more information

ACE inhibitor

- For all patients with HFrEF
- Improves mortality, quality of life and alters natural history
- If intolerant can use ARB or ARNI

MEDICATION	Starting dose	Target dose
Lisinopril	5 mg daily	10-20 mg daily
Enalapril	2.5 mg bid	10 mg bid
Ramipril	1.25 mg bid	5 mg bid

ARB/ARNI

- For all patients with HFrEF if not on an ACEI
- Improves mortality, quality of life and alters natural history
- ARNIs are very expensive

MEDICATION	Starting dose	Target dose
Valsartan	40 mg bid	160 mg bid
Candesartan	4 mg daily	32 mg daily
Sacubitril/Valsartan	49/51 mg bid	97/103 mg bid

SGLT-2 Inhibitors

- For all patients with HFrEF
- Improves mortality, quality of life and alters natural history
- Safe to use in the absence of diabetes

MEDICATION	Dose without DM	Dose with DM
Empagliflozin	10 mg daily	25 mg daily
Dapagliflozin	10 mg daily	10 mg daily

Beta blocker

- For all **stable** patients with HFrEF and symptoms already on ACEI/ARB/ARNI
- ACC/AHA Class C-D ○ NYHA Class II-IV
- Improves mortality, quality of life, symptoms, clinical outcomes and alters natural history
- Important to reach target dose

MEDICATION	Starting dose	Target dose
Carvedilol	3.125 mg bid	25 mg bid
Bisoprolol	1.25 mg daily	10 mg daily
Metoprolol succinate (XL)	12.5 mg daily	200 mg daily

Loop diuretics

- Used to manage volume status as needed
- ACC/AHA Class C-D ○ NYHA Class II-IV
- Only therapy that acutely helps symptoms
- No mortality benefit

MEDICATION	Starting dose	Target dose
Bumetanide	1mg once daily	1-10mg/dose (max 10/d)
Furosemide	40mg once daily	20-160mg/dose (max 600/d)
Torsemide	20mg once daily	20-100mg/dose (max 200/d)

Aldosterone antagonist

- Added to ACEI+BB+SGLT2 if still symptomatic and EF < 35%
- ACC/AHA Class C-D ○ NYHA Class III-IV
- Mortality benefit only if the above are met

MEDICATION	Starting dose	Target dose
Eplerenone	25 mg daily	50 mg daily
Spironolactone	12.5 mg daily	25 mg daily

Vasodilators

- Option for those intolerant of ACEI or ARB
- ACC/AHA Class C-D ○ NYHA Class II-IV
- Reduces morbidity and mortality in black patients when added to standard treatment (ACEI+BB)

MEDICATION	Starting dose	Target dose
Hydralazine	37.5 mg TID	75 mg TID
Isosorbide dinitrate	20 mg TID	40 mg TID
Isosorbide dinitrate/hydralazine	20/37.5 mg TID	40/75 mg TID

Thiazides

- Used to manage volume status as needed
- ACC/AHA Class C-D ○ NYHA Class II-IV
- No mortality benefit

MEDICATION	Starting dose	Target dose
Hydrochlorothiazide	25 mg daily	25 - 100 mg daily
Metolazone	2.5 mg daily	2.5 – 10mg daily

Sinus node modulator

- Used in patients with persistent symptoms on standard therapy, a HR > 70 despite beta blockers at target dose and an EF < 35%
- ACC/AHA Class C-D ○ NYHA Class II-IV
- Reduces hospital admissions but not mortality

MEDICATION	Starting Dose	Target Dose
Ivabradine	5 mg bid	7.5 mg bid

Inotrope

- Used for symptom control in patients with persistent symptoms despite optimal therapy
- Stop if there are no improvements in symptoms
- ACC/AHA Class C-D ○ NYHA Class II-IV
- Reduces hospital admissions but not mortality

MEDICATION	Starting dose	Target dose
Digoxin	0.125 mg daily	0.125 – 0.375 mg daily

Statins

- Statins are not beneficial for adjunctive therapy for the diagnosis of heart failure
- Indicated per USPSTF guidelines
  - High dose for proven clinical CVD
  - Low-moderate dose for ASCVD ≥ 10%

Statin	Low-intensity	Moderate-intensity	High-intensity
Atorvastatin	----	10 – 20 mg	20 – 40 mg
Rosuvastatin	----	5 - 10 mg	20 - 40 mg
Simvastatin	10 mg	20 – 40 mg	----
Lovastatin	20 mg	40 mg	----

Antiplatelet

- Antiplatelet is not recommended for adjunctive therapy for the diagnosis of heart failure
- Indicated if clinical CVD for secondary prevention
  - History of MI, CVA, PAD, symptomatic carotid artery stenosis
- Single therapy recommended over dual therapy

MEDICATION	Dose
Aspirin	75-100 mg daily
Clopidogrel	75 mg daily

Anticoagulation

- Recommended with
  - atrial fibrillation and additional risk factors for cardioembolic stroke
    - CHA_2DS_2-VASc calculator
  - Left ventricular clot
- Warfarin with an INR of 2-3 for 3 months
- Direct Oral AntiCoagulant if not valvular a-fib

MEDICATION	Dose
Warfarin	Titrated
Dabigatran	150 mg bid
Apixaban	5 mg bid
Rivaroxaban	20mg daily

Interventions

Revascularization

- CABG or PCI/fibrinolytics with angina/significant coronary artery disease

Valvular surgery

- If valvular disease severe

Implantable cardioverter-defibrillator

- Class C/I-III with an EF < 35% and life expectancy of > 1 year
- Decreases sudden death and mortality

Cardiac resynchronization therapy (+/- defibrillator)

- Class C/III biventricular pacing if EF < 35%, LBBB, QRS > 150ms, symptoms despite max therapy
- Increases quality of life and decreases hospitalization

Mechanical circulatory support

- Improves cardiac output if refractory to medical management

Heart transplant

- Class D/IV with a life expectancy ≤ 1-2 years
- Improves functional status and quality of life

IN-PATIENT

Presentation

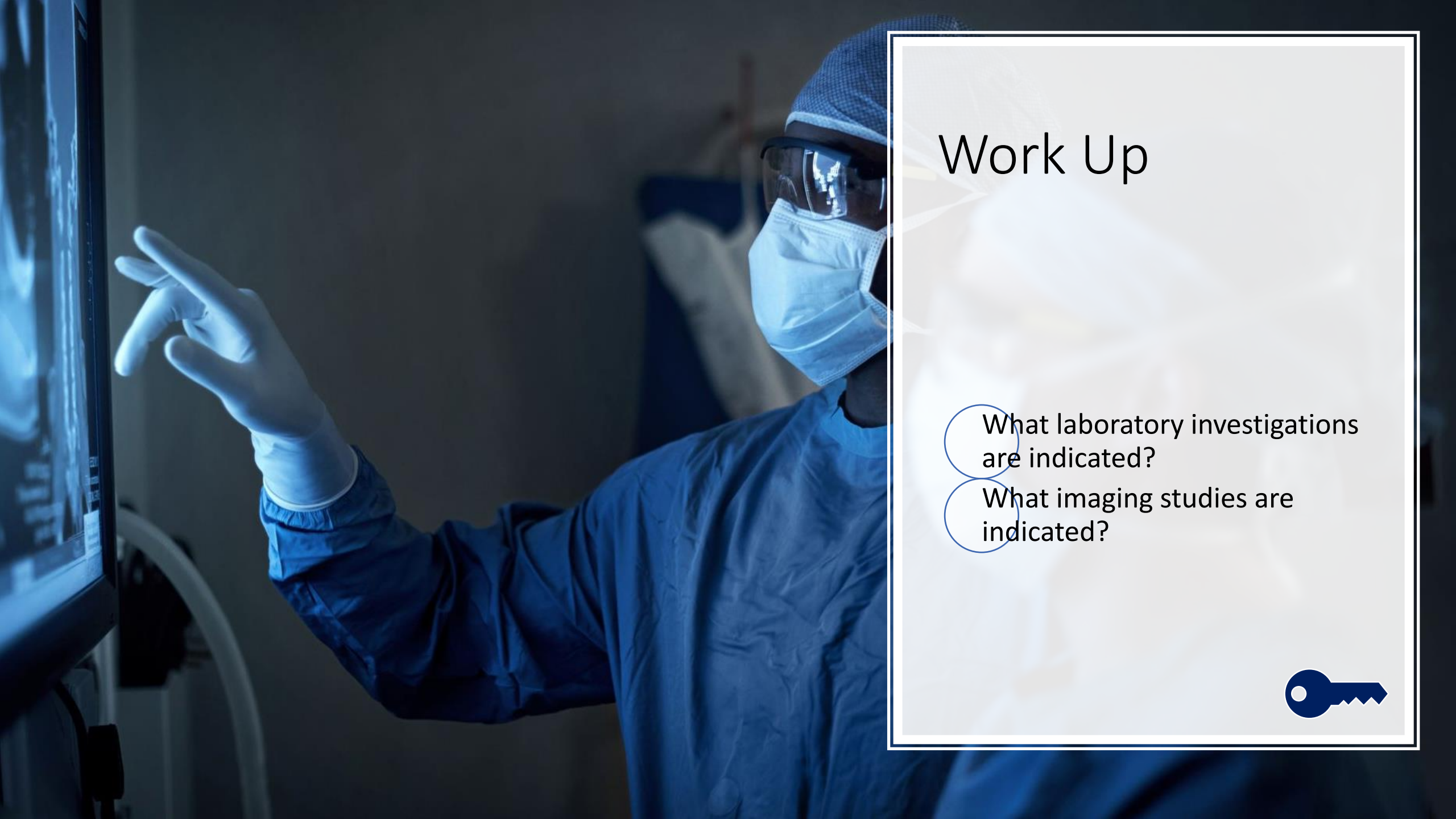
Treatment

Work Up

Discharge

Presentation

- How do patients with new onset or acute compensated heart failure present?
- What are typical precipitating factors prior to admission?
- What is on the differential diagnosis?



Work Up

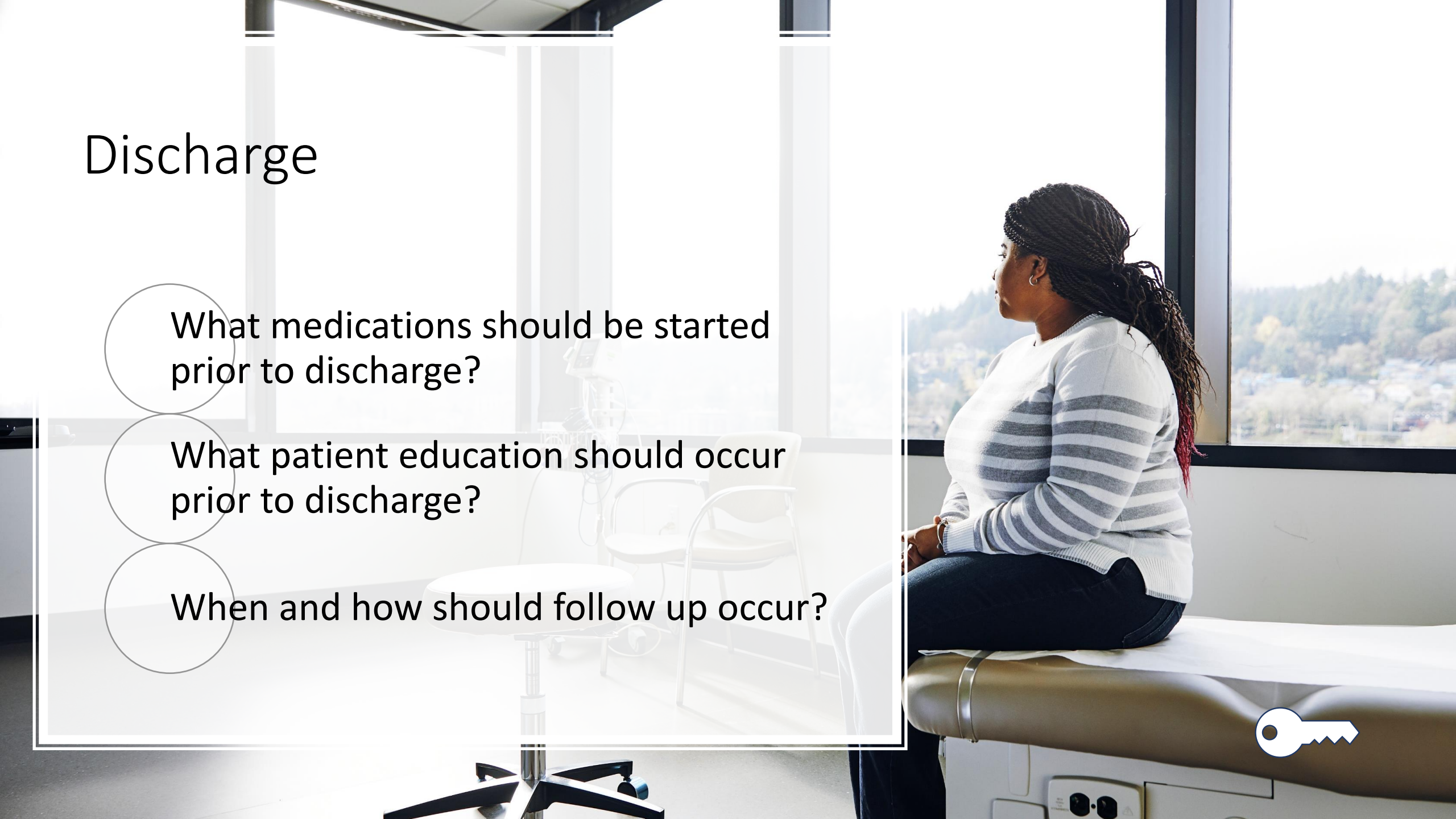
- What laboratory investigations are indicated?
- What imaging studies are indicated?

Treatment

What are the foundations of HFrEF treatment while in-patient?

Discharge

- What medications should be started prior to discharge?
- What patient education should occur prior to discharge?
- When and how should follow up occur?



Presentation

Signs and symptoms

- Dyspnea/ Fatigue
- Orthopnea
- DOE
- PND
- Weight gain
- Cough
- Increasing abdominal girth
- Lower extremity edema
- JVD
- Hypotension
- S3 (LR +4.0)
- Crackles

Precipitating factors

- New/worsened LV dysfunction
- Medication non-compliance
- Diet non-compliance
- Volume overload
- Drug exposure
- Arrhythmia
- Valvular disease
- Uncontrolled HTN
- High output state
- Increased metabolic demand

Differential diagnosis

- Asthma
- COPD
- Pulmonary infections
- Pulmonary embolism

Work Up

BNP if diagnosis is uncertain:

- BNP < 100 rules it out
- BNP > 400 suggests HF
- BNP > 800 LR [+] >5.0

Initial labs:

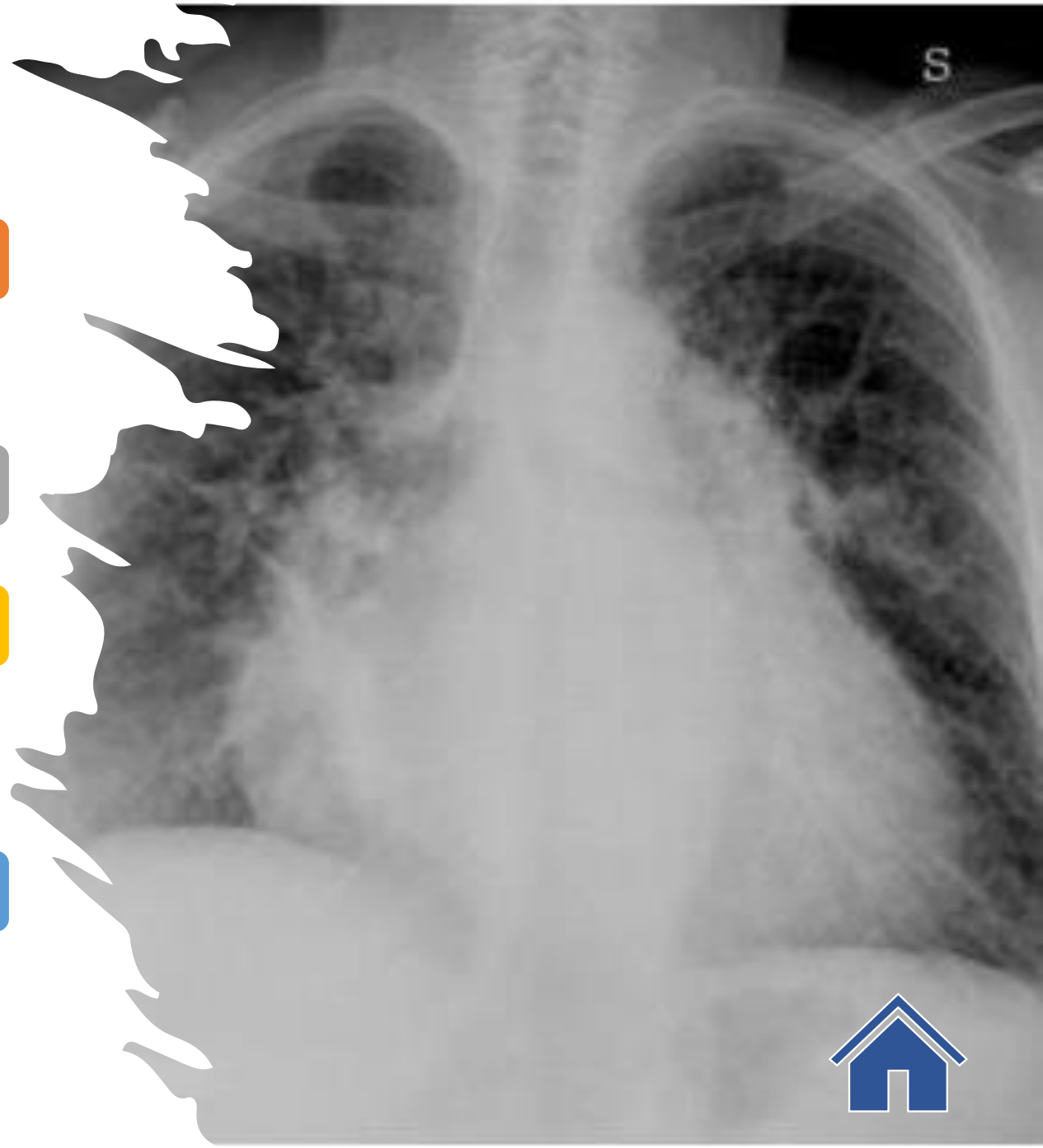
- troponins, FBC, RFTs, LFTs, TSH

Diagnostics:

- ECG: ACS, arrythmia
- CXR: pulmonary edema, heart size
- Echo: left/right systolic dysfunction, L atrial size, other structural abnormalities

POCUS:

- Lung: ≥3 B lines in 2 b/l lung zones
  - LR [+] 7.4 and LR [-] 0.16
- Cardiac POCUS with visually estimated reduced EF
  - LR [+] 4.1



Treatment

- Diuretics: should be ≥ chronic daily dose to treat symptoms of overload
  - IV furosemide 40mg followed by another 80mg after 1 hour if no response
  - Oral furosemide 20 - 80mg initial dose, repeated every 6-8 hours increasing 20-40mg until desired response
  - IV Bumetanide IV 0.5-1mg over 1-2 minutes repeat every 2-3 hours until desired response
  - PO Bumetanide 0.5-2mg repeated every 4-5 hours until desired response
- Monitor fluid intake and output
- 0_2 for saturation < 90% or PaO_2 < 60mmHg
- Continue home ACEI and BB unless hemodynamically unstable
- VTE prophylaxis with LMWH unless *risk of bleeding* outweighs benefits

Treatment with little evidence

Aggressive sodium and fluid restriction does not affect weight loss or clinical stability

If additional diuresis is needed:

- use higher doses of loop diuretics
- add a second diuretic (thiazide or spironolactone)
- add low-dose dopamine
- add vasopressin antagonist

If significant dyspnea despite O_2 and aggressive diuresis consider:

- Vasodilators (IV nitro)
- Non-invasive positive pressure ventilation

If borderline or low blood pressure consider:

- Dopamine: 2-5 mcg/kg/minute IV infusion
- Can also use Dobutamine or milrinone

Discharge

- Once not needing aggressive diuresis start beta blocker
- Start ACE inhibitor prior to discharge
- Start aldosterone antagonist if C/II-III with an EF ≤ 35% prior to discharge
- *Lifestyle education*: BP, diabetes, tobacco, alcohol, exercise regularly, lose weight
- Watch for: worsening shortness of breath or edema, PND, abdominal pain/swelling, weight gain, frequent cough, feeling more tired than usual
- Vaccines: Flu, pneumonia and COVID
- Follow up within 1 week: Office, telehealth, phone

Seed Global Health

Etiology

- HTN, ischemic heart disease, valvular disease, a-fib, LVH, post-partum, cardiotoxic drugs/substances, viral, idiopathic

Classification

- A-B/I: no limitations
- C/II-III: mild-marked symptoms
- D/IV: refractory, symptoms at rest

Guideline directed therapy

- Start specified medications/interventions for each class to decrease morbidity and mortality

Medications

- Mortality: ACEI (ARB or ARNI), BB, spironolactone, SGLT-2 inhibitor
- Symptoms: furosemide

Interventions

- ICD, CRT, revascularization, valvular surgery, LVAD, transplant

Lifestyle

- Control: BP, diabetes, tobacco, alcohol, exercise regularly, lose weight
- Worsening shortness of breath or edema, orthopnea PND, abdominal pain/swelling, weight gain, frequent cough, feeling more tired than usual

Vaccines

- Flu, pneumonia, COVID

CCF

HFrEF