Expanded Protocol Schema 2: Acute Management & GDMT Initiation

Society of Hospital Medicine

HEMODYNAMIC PHENOTYPE DETERMINATION

PERFUSION: Warm (adequate) or Cold (hypoperfused - SBP less than 90, cool extremities, altered mentation, oliguria) |
CONGESTION: Wet (volume overload - JVD, rales, edema, S3, dyspnea, weight gain) or Dry (euvolemic)

WARM & WET

(Approximately 50% of admissions)
Adequate perfusion + Congestion

TREATMENT:
IV diuretics | Consider vasodilators

COLD & WET

(Approximately 15% of admissions)
Hypoperfused + Congestion

TREATMENT:
IV diuretics (caution) | Inotropes/pressors

WARM & DRY

(Compensated)
Adequate perfusion | No congestion

TREATMENT:
GDMT optimization | Continue home meds

COLD & DRY

(Rare, approximately 5%)
Hypoperfused | No congestion

TREATMENT:
Inotropes/pressors | Hold diuretics

INTRAVENOUS DIURETIC PROTOCOL

INITIAL DOSING: Diuretic-naive: Furosemide 20-40 mg IV or Bumetanide 1 mg IV | Home diuretic: Double oral daily dose converted to IV equivalent

ADMINISTRATION: Intermittent Bolus Q6-12H or Continuous Infusion (load dose + continuous for refractory cases)

MONITORING: Target net negative 1-2 L/day, urine output greater than 100-150 mL/hr | Inadequate response: Double dose after 2-4 hours | Check BMP, Mg daily | Acceptable Cr increase: ≤0.3 mg/dL

Goal: Weight loss 1-2 kg/day until euvolemic

ADJUNCTIVE THERAPIES

DIURETIC RESISTANCE: Add thiazide (HCTZ or chlorothiazide IV) | Add acetazolamide 500 mg IV daily | Add metolazone 2.5-10 mg PO

VASODILATORS (IF SBP greater than 140):
Nitroglycerin 5-200 mcg/min | Nitroprusside 0.3-10 mcg/kg/min

INOTROPES (Cold-Wet):
Dobutamine 2.5-20 mcg/kg/min | Milrinone 0.375-0.75 mcg/kg/min

HEMODYNAMIC STABILIZATION CRITERIA (Before GDMT Initiation)

SBP ≥90 mmHg (preferably ≥100) | HR 50-100 bpm | No IV inotropes/pressors ×24 hrs | Stable diuretic dose ×24 hrs | Adequate UOP without escalation | Improving congestion signs | K^+ 3.5-5.5, stable Cr (increase less than 0.3 acceptable) | eGFR stable | Patient comfortable at rest

GUIDELINE-DIRECTED MEDICAL THERAPY (GDMT) QUADRUPLE THERAPY INITIATION

For HFrEF (LVEF ≤40%) - INITIATE ALL FOUR PILLARS SIMULTANEOUSLY IF TOLERATED

PILLAR 1: RAAS INHIBITOR

PREFERRED: ARNI: Sacubitril-Valsartan (Start: 24/26 mg BID, Target: 97/103 mg BID, 48hr washout from ACEI)

ALTERNATIVES: ACEi: Enalapril 2.5-5 mg BID (Target: 10-20 mg BID) or Lisinopril 2.5-5 mg daily (Target: 20-40 mg daily) |
ARB (if ACEI intolerant): Losartan 25-50 mg daily

PILLAR 2: BETA-BLOCKER

Carvedilol (preferred if HNT): Start 3.125 mg BID, Target 25 mg BID (less than 85 kg) or 50 mg BID (≥85 kg)

Metoprolol Succinate: Start 12.5-25 mg daily, Target 200 mg daily

Bisoprolol: Start 1.25 mg daily, Target 10 mg daily

Titrate Q2 weeks as tolerated

PILLAR 3: MRA

Spironolactone: Start 12.5-25 mg daily, Target 25-50 mg daily

Eplerenone: Start 25 mg daily, Target 50 mg daily

REQUIREMENTS: K^+ less than 5.0 mEq/L | eGFR ≥30 mL/min/1.73m^2 | Check K^+, Cr in 1 week

PILLAR 4: SGLT2i

Dapagliflozin: 10 mg daily (No titration needed)

Empagliflozin: 10 mg daily (No titration needed)

REQUIREMENTS:
eGFR ≥20 mL/min/1.73m^2 | Check Cr in 2 weeks

ADDITIONAL THERAPIES TO CONSIDER

Hydralazine-Isosorbide Dinitrate: For self-identified Black patients or RAAS-intolerant (Hydral 37.5 mg + ISDN 20 mg TID) |
Ivabradine: If sinus rhythm, HR greater than 70 on max BB, symptomatic (Start 2.5-5 mg BID, target 7.5 mg BID) |
Vericiguat: If recent HF hospitalization/IV diuretics, LVEF less than 45% (Start 2.5 mg daily, titrate to 10 mg) |
Digoxin: If AFib needing rate control or persistent symptoms (0.125-0.25 mg daily, target level 0.5-0.9)

ABSOLUTE CONTRAINDICATIONS

SBP less than 90 mmHg | HR less than 50 bpm (for BB) | K^+ greater than 5.5 mEq/L | eGFR less than 20 (SGLT2i), less than 30 (MRA) | Pregnancy (RAAS) | Prior angioedema (ACEI)

MONITORING AFTER INITIATION

BMP 1 week after RAAS/MRA change | BMP 2 weeks after SGLT2i | BP, HR at each dose change | Titrate Q2 weeks toward target | Hold diuretics if euvolemic | Continue GDMT even if asymptomatic

CRITICAL IMPLEMENTATION PRINCIPLES

START ALL 4 PILLARS simultaneously during hospitalization (no sequential approach) | Use LOW starting doses initially, then uptitrate Q2 weeks outpatient | Benefits appear within 1-2 weeks; early initiation reduces 30-day events by 34% | Preventing ONE death requires treating FOUR patients with complete quadruple therapy for 2 years

Evidence: 2022 AHA/ACC/HFSA Guidelines | 2024 ACC ECDP | STRONG-HF, PIONEER-HF, EMPULSE Trials | NNT=4 to prevent 1 death with quadruple therapy over 2 years.[4, 10, 24, 101, 266]

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