UPMC | HEART AND VASCULAR INSTITUTE

UPMC Heart and Vascular Institute Cardiogenic Shock Program

Part of the UPMC Heart and Vascular Institute, the Cardiogenic Shock Program provides 24/7 support for patients in cardiogenic shock. Our dedicated team of experts triage patients quickly and efficiently and we will work with you to develop a treatment plan that best suits the needs of your patient.

REACT to Cardiogenic Shock

R Recognize
EF </=35% or acute MI with systolic <90 and signs of end organ dysfunction, typically with worsening renal and hepatic function and lactate >2.0.

E Establish
Establish access (preferably not femoral) for SV02 and CVP. PA catheter preferred for ongoing hemodynamic monitoring (if available).

A Activate
Call the Cardiogenic Shock team by calling Medcall **412-647-7000** and using option #1.

C Convene
Our multidisciplinary team convenes to discuss the patient plan of care and to provide communication to referring providers.

T Transfer
A decision is made to transfer the patient or provide ongoing consultation.

Goals of the UPMC Cardiogenic Shock Program

- Rapid identification of cardiogenic shock
- Implementation and standardization of hemodynamic monitoring and treatment
- Minimizing vasopressors and inotropes
- Early utilization of mechanical support
- Assess for cardiac recovery or initiate early evaluation for advanced therapy candidacy

Contact Our Team

- If you have questions about the UPMC Cardiogenic Shock Program, call **412-647-6104**.
- For patient consults or transfer requests, call Medcall at **412-647-7000** and dial 1.

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UPMC Heart and Vascular Institute
Cardiogenic Shock Program

HEART FAILURE – CARDIOGENIC SHOCK MANAGEMENT

- Shock severity (SCAI stage)
- Shock profile (LV, RV, or BiV)
- Anticipated exit strategy (recovery, BTT, bridge to durable VAD)
- Presence of hypoxia
- Presence of arrhythmias
- Anticipation of duration on support
- Ability to ambulate
- Contraindications to Permanent Mechanical Circulatory Support

SCAI B CS
Beginning

Hypoperfusion:
Lactate < 2 mmol/L
Minor renal and hepatic dysfunction
+/-
Hypotension:
SBP < 90 mmHg
Current Treatment:
No drugs or devices

→ **LV, RV or BiV**
IABP and/or trial of vasopressors/inotropes

SCAI C CS
Classic

Hypoperfusion:
Lactate ≥ 2 mmol/L
Major renal and hepatic dysfunction
+
Hypotension:
SBP < 90 mmHg
OR
Current Treatment:
1 drug or device

→ **LV-dominant**
IABP
or
Impella 5.5

→ **RV-dominant or BiV**
Impella 5.5
+/-
ProTek Duo

SCAI D CS
Deteriorating

Hypoperfusion:
Lactate ≥ 4 mmol/L
Worsening renal and hepatic function
+
Hypotension:
Escalating pressors
OR
Current Treatment:
2 drugs or devices

→ **LV-dominant**
Impella 5.5

→ **RV-dominant or BiV**
VA-ECMO
+/-
LV Vent

SCAI E CS
Extremis

Hypoperfusion:
Lactate ≥ 8 mmol/L
Severe acidosis and end-organ failure
+
Hypotension:
Refractory
OR
Current Treatment:
≥ 3 drugs or devices

→ **LV, RV or BiV**
VA-ECMO
+/-
LV Vent

Contact Our Team

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Cardiogenic Shock Program

TREATMENT CONSIDERATIONS FOR AMI – CARDIOGENIC SHOCK MANAGEMENT

Activation of Cardiogenic Shock Team post-cath lab intervention if a patient is on a temporary MCS device and/or on pressor support

- Shock Severity (SCAI stage)
- Shock Profile (LV, RV, or BiV)
- Revascularization status (mode and completeness)
- Presence of mechanical complications
- Presence of hypoxia
- Presence of arrhythmias
- Contraindications to Permanent Mechanical Circulatory Support
- Use of IV antiplatelet agent

SCAI B CS
Beginning

Hypoperfusion:
Lactate < 2 mmol/L
Minor renal and hepatic dysfunction
+/-
Hypotension:
SBP < 90 mmHg
Current Treatment:
No drugs or devices

→ **LV, RV or BiV**
IABP and/ or trial of vasopressors/ inotropes

SCAI C CS
Classic

Hypoperfusion:
Lactate ≥ 2 mmol/L
Alteration of renal and hepatic function
+
Hypotension:
SBP < 90 mmHg
OR
Current Treatment:
1 drug or device

→ **LV-dominant**
IABP
or
Impella

→ **RV-dominant or Bi-V**
ProTek Duo
+/-
Impella

SCAI D CS
Deteriorating

Hypoperfusion:
Lactate ≥ 4 mmol/L
Worsening renal and hepatic function
+/-
Hypotension:
Escalating pressors
OR
Current Treatment:
2 drugs or devices

→ **LV-dominant**
Impella 5.5
or VA-ECMO
+/-
LV Vent

→ **RV dominant or BiV**
VA-ECMO
+/-
LV Vent

SCAI E CS
Extremis

Hypoperfusion:
Lactate ≥ 8 mmol/L
Severe acidosis and end-organ failure
+/-
Hypotension:
Refractory
OR
Current Treatment:
≥ 3 drugs or devices

→ **LV, RV or BiV**
VA-ECMO
+/-
LV Vent

Contact Our Team

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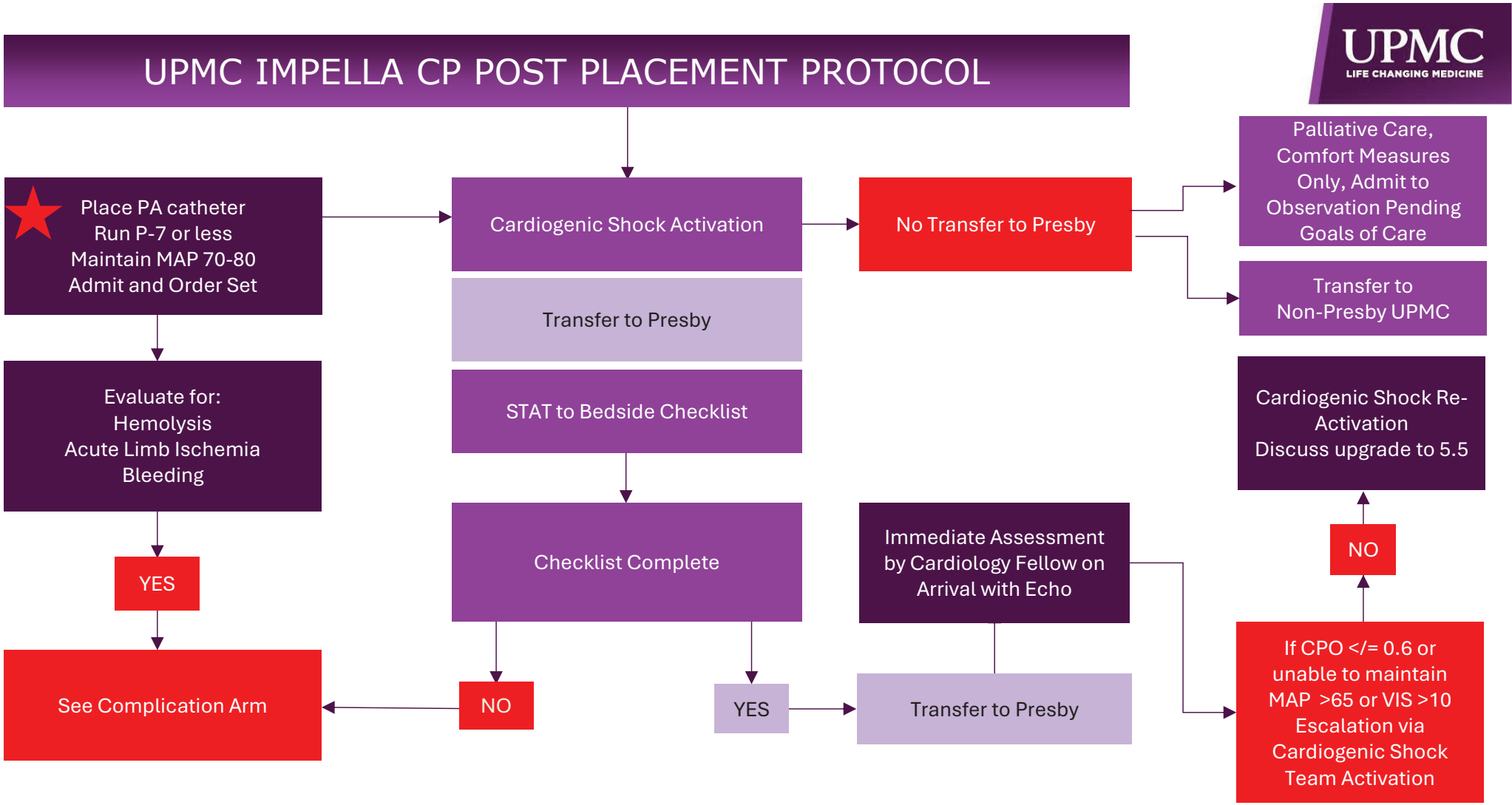
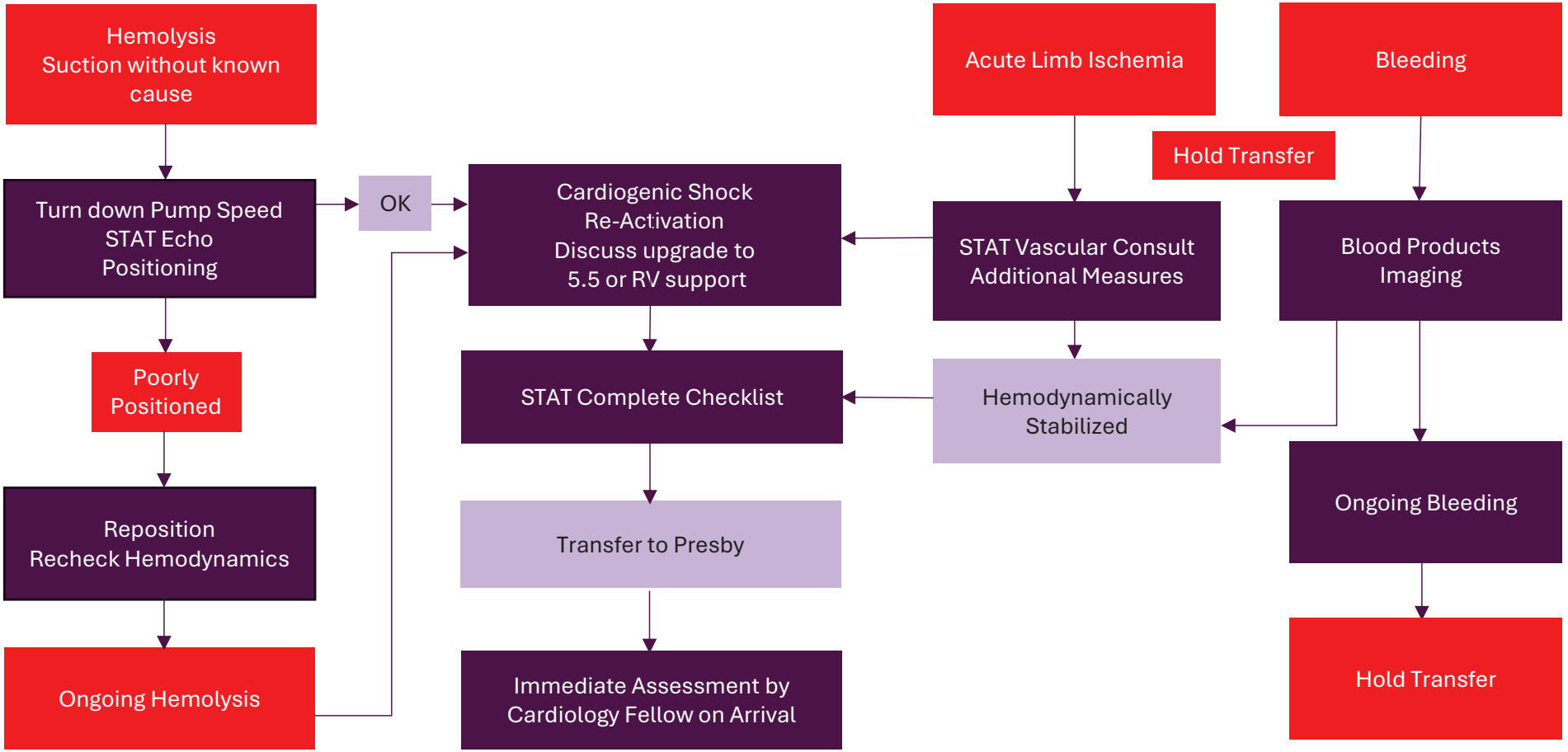
UPMC IMPELLA CP POST PLACEMENT PROTOCOL



IMPELLA CP COMPLICATION PROTOCOL



IMPELLA WEANING ALGORITHM

Place PA catheter
Run P-7 or less
Maintain MAP 70-80
Admit and Order Set

Hemodynamic Goals
CPO >0.6
CI >2.2
MAP 65-75
Lactate down trending

NO

If CPO </= 0.6 with inotropes/pressors
Escalation via Cardiogenic Shock Team Activation

Cardiogenic Shock Activation

Hemodynamic Goals
CPO >0.6
CI >2.2
PAPi >2
MAP >65 <75
CVP <8
PAD/PWCP <18

Lactate <2, improving end organ function, normalized pH
On low dose inotrope or Off

YES

Wean and explant
See weaning guidelines (word)

Multidisciplinary team discussion regarding weaning vs. escalation pending meeting Impella 5.5 patient selection criteria (See Patient Selection guidelines)

If the patient is a not a candidate for an upgrade in support, consult Palliative care for GOC discussion

WEANING CRITERIA (Section 1)

LABS

- Lactate < 2
- LFTs improving
- Cr improving
  - Unless HD dependent
- pH 7.35-7.45

HEMODYNAMICS

- CPO > 0.6
- CI > 2.2
- PAPi > 2
- MAP 65-75
- CVP < 8
- PAD/PCWP < 18
- VIS < 10

OTHER

- Extubated
- Radiographically improving chest X-ray
- Echocardiogram improved

UPMC
LIFE CHANGING MEDICINE

IMPELLA 5.5 WEANING PROCESS

Weaning Process: Each power level changes should be ordered as a communication order.

a. If above criteria met start appropriate
GDMT: 1. SGLT2i (eGFR >25), 2. Spironolactone 3. IV afterload reduction with nipride/hydralazine. Avoid ARB

b. Weaning increment decrease by P2 every 8 hours.
Note inotropic support may be needed to facilitate weaning.

c. Labs including lactate, LFTs, and Cr should be monitored within 2 hours of power level decrease.
(Refer to section 1 for criteria for further weaning)

d. CPO, CI, PAPi, SVR, PAD, and CVP should monitored within 2 hours of power level decrease.
(Refer to section 1 for criteria for further weaning)

e. Urine output hourly 0.5ml/kg/hr. Maintain CVP <8, PAD <18.

f. Continuous MAP monitoring: Target MAP >65, <75. If greater than 75 use afterload reduction

g. Lowest level before decannulation P2. Maintain adequate anticoagulation.

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LIFE CHANGING MEDICINE

IMPELLA CP TRANSPORT CHECKLIST

MAP >65 and HR >60 on acceptable doses of vasopressors/inotropes
Stable Sp02> 92%
Absence of Impella position alarms unless position confirmed by echo
Catheter secured with securement device
Catheter insertion placement assessed prior to transfer and reassessed upon admission.
Limb ischemia addressed
Absence of suction alarms
Bleeding is controlled
Hemolysis, if present, has been addressed via echo for positioning and valve interaction
Handoff communication between cardiogenic shock attending, and STAT MDOC has been completed

STAT to activate the Cardiogenic Shock Team if an en-route complication occurs

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LIFE CHANGING MEDICINE

METRIC	ABNORMAL METRICS	INITIAL RESPONSE/TREATMENT
Lactic Acid	➢ 2mmol/L or increasing Lactate	Assess hemodynamics with PA catheter
Urine Output	< 30 mL/hour and or increasing Scr 0.3mg/dL from baseline	Assess hemodynamics with PA catheter
Systolic BP or MAP	Systolic BP <90 Or MAP <60	Additional vasopressor support
Cardiac Index (CI=CO/BSA)	<2.2 l/MIN/M2	Consider addition of inotropic support to maintain CI of 2.2
Cardiac Power Output (CPO =MAP X CO/451)	</= 0.9W consider more support </= 0.6W NEEDS more support	Consider MCS or upgrade in MCS
Pulmonary Pulsatililty (PAPi)	</= 1.5 RV Dysfunction </ 0.9 RV failure	Consider RV support

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REFERRAL CHECKLIST: UPMC CARDIOGENIC SHOCK PROGRAM

For patient consults and transfer requests, call 412-647-7000 Option #1.

When to call: Reduced LV function 35% or less or less or acute MI and ANY

SBP < 90 or symptoms of hypotension or ANY inotrope or pressor outside of the catheterization lab typically with signs of end organ dysfunction as noted by worsening renal function, liver function, and an elevated lactate (>2.0)

When speaking with the cardiogenic shock team, the following information may be requested:

- ❑ Demographics
- ❑ Code status
- ❑ PMH
- ❑ Social support/current residence
- ❑ Active use or a history of nicotine, drug, or alcohol abuse
- ❑ Active bleeding
- ❑ End organ function (pre- and post-shock)
- ❑ Prior sternotomy/pertinent surgical history
- ❑ Current neuro exam

Cardiogenic Shock Etiology

- ❑ AMI- revascularization attempt/success?
- ❑ Acute on chronic HF
- ❑ Acute presentation (valve/VSD/Systolic HF unknown etiology)
- ❑ Vitals past 4 hr
- ❑ Current oxygen support/vent settings
- ❑ Any drips
- ❑ Most recent labs
- ❑ Cardiac testing and date (TTE, RHC, LHC, CT)
- ❑ Revascularization status
- ❑ What does your site have available? (ECMO, Impella)
- ❑ Current MCS, level of support, and any adverse events (bleeding, hemolysis, limb issues)

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