

Ontario Cardiogenic Shock Team Model

June 2024

Table of Contents

Table of Contents	2
Rationale & Purpose	3
Key Shock Team Roles & Responsibilities	4
Shock Team Structure	5

Abbreviations and Acronyms

CS	Cardiogenic Shock
VA-ECMO	Venoarterial Extracorporeal Membrane Oxygenation
LVAD	Left Ventricular Assist Device
MCS	Mechanical Circulatory Support
ICU	Intensive Care Unit
CICU	Cardiac/Coronary Intensive Care Unit
CVICU	Cardiovascular Intensive Care Unit
DI	Diagnostic Imaging

Rationale & Purpose

Background

Patients may develop cardiogenic shock (CS) through myocardial infarction, heart failure, or other causes. In all cases, timely, appropriate care for these patients is critical to provide the best chance for a good outcome. At the same time, patients with CS are increasingly complicated due to a higher burden of comorbidities, the influence of concomitant cardiac arrest, and the increasing use of temporary mechanical circulatory support options, including venoarterial extracorporeal membrane oxygenation (VA-ECMO)¹. Overall, there has been an increase in both cardiac, as well as non-cardiac, organ support therapies for this patient population. Non-cardiovascular therapies include targeted temperature management, dialysis, and blood transfusion. The table below summarizes cardiovascular and non-cardiovascular resources frequently used for CS patients.

Resources Frequently Used in the Management of Patients with Cardiogenic Shock

Cardiovascular	Non-cardiovascular
Inotrope and vasopressor optimization	Mechanical ventilation
Percutaneous coronary intervention	Renal replacement therapy
Antiarrhythmic medications	Targeted temperature management
Anticoagulant therapies	Electroencephalography
Temporary mechanical circulatory support	Blood transfusion
Heart transplant/Left Ventricular Assist Device (LVAD)	Antimicrobial therapies
Non-invasive cardiac imaging	Nutrition optimization

These complex patient needs affect health care delivery, staffing, and training requirements in the cardiac intensive care unit (CICU) as well as multiple other areas of the hospital. As a result, a collaborative approach to caring for CS patients is critical.

Purpose of the Shock Team

A 'Shock Team' is a multidisciplinary, team-based approach to respond to patients who develop CS. This approach is especially critical due to the time-sensitive nature of CS care, the requirement for collaboration between multiple team members, the potential need for cardiac replacement therapies, and the variation in practice patterns within and across healthcare institutions¹. Evidence suggests that Shock Teams improve patient outcomes, including mortality^{1,2}.

As advanced cardiac technologies for supporting CS patients (e.g. VA-ECMO, Left Ventricular Assist Device, Impella) expand across Ontario, there is a need to ensure that appropriate Shock Team structure is in place to support this care. Shock Teams have been a topic of increasing interest internationally, and leading practices in terms of model and structure are well-documented in the literature^{1,3,4}. This document provides an Ontario definition and expectations for the Shock Team and its role in care for CS patients.

Key Shock Team Roles & Responsibilities

The Shock Team is responsible for timely management of patients meeting the criteria of cardiogenic shock, including the following activities⁵:

- Timely recognition and diagnosis of cardiogenic shock
- Resuscitation
- Medical optimization
- Temporary mechanical circulatory support evaluation
- Heart transplant/Left Ventricular Assist Device (LVAD) evaluation
- Provide input for ongoing management of CS patients beyond the initial phase of shock

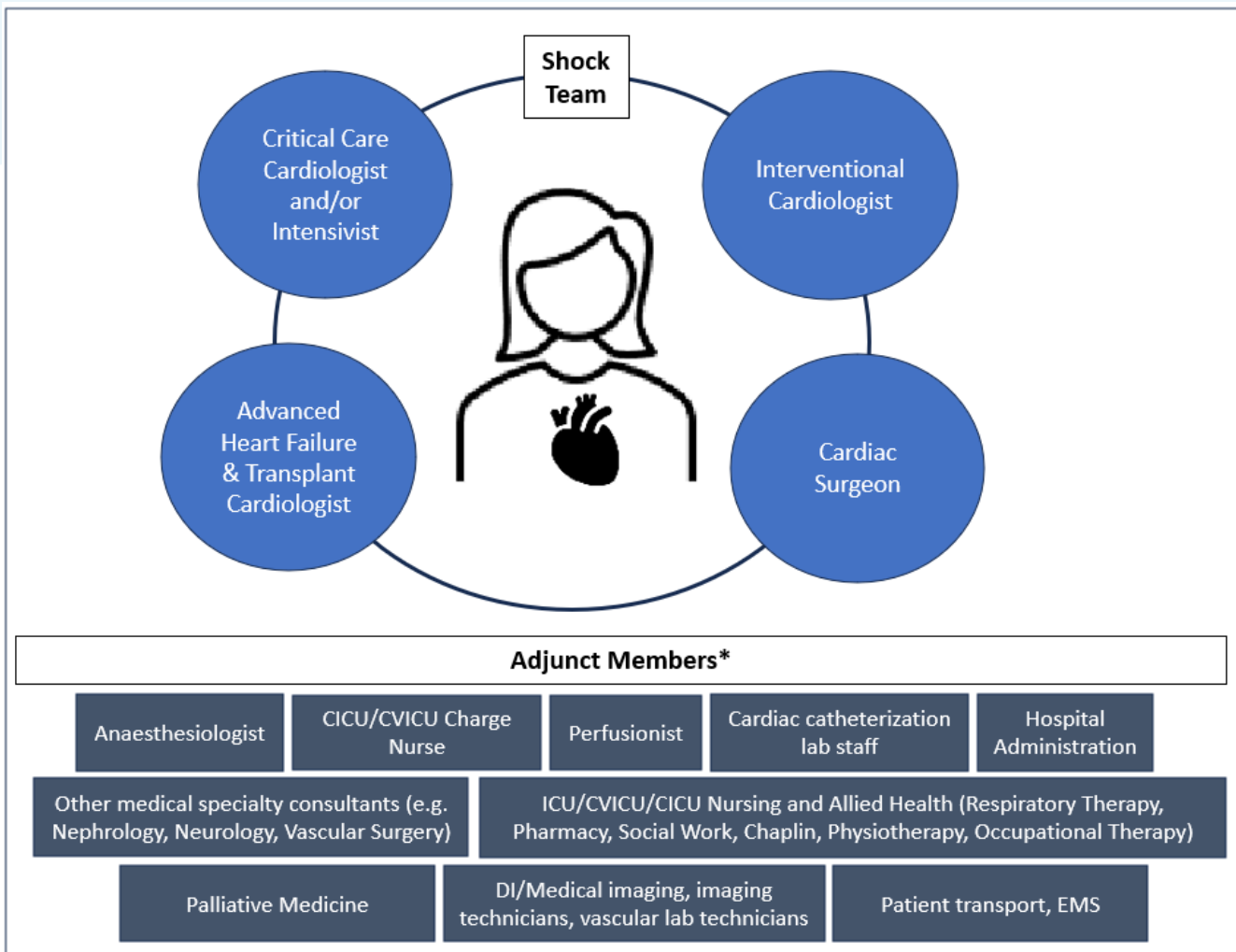
Shock Team Structure

Summary of Shock Team Criteria

Criteria	Description
Multidisciplinary Team	<ul style="list-style-type: none"> • The core Shock Team is focused on management and care decisions for the patient with cardiogenic shock. Core Shock Team members include: <ul style="list-style-type: none"> ○ Critical Care Cardiologist and/or Intensivist ○ Interventional Cardiologist ○ Cardiac Surgeon ○ Advanced Heart Failure & Transplant Cardiologist • The Adjunct Members provide critical services to achieve the patient care goals. Adjunct members include*: <ul style="list-style-type: none"> ○ Anaesthesiologist ○ Perfusionist ○ Cardiac Intensive Care Unit (CICU)/Cardiovascular Intensive Care Unit (CVICU) Charge Nurse ○ Cardiac catheterization lab staff ○ Hospital Administration ○ Palliative Medicine ○ Other medical specialty consultants (e.g. Nephrology, Neurology, Vascular Surgery) ○ ICU/CVICU/CICU Nursing and Allied Health (Respiratory Therapy, Pharmacy, Social Work, Chaplin, Physiotherapy, Occupational Therapy) ○ DI/Medical imaging, imaging technicians, vascular lab technicians ○ Patient transport, Emergency Medical Services (EMS) <p>*Note that Adjunct Members may vary dependent on specific patient case and local organizational structure (including involvement of trainees).</p>
Shock Team Leadership	<ul style="list-style-type: none"> • Group leadership with defined roles and responsibilities, including a designated coordinating physician.

Documented Cardiogenic Shock Response Algorithm	<ul style="list-style-type: none"> • Including aspects of response such as: <ul style="list-style-type: none"> ○ Patient inclusion/exclusion criteria ○ Patient evaluation pathway and team members involved ○ Procedure for Shock Team activation ○ Process and team members for Shock Team review of patient • Created with multidisciplinary input • Specific to local resources • Internally published and available to all team members • See Appendix for local examples
Quality Improvement	<ul style="list-style-type: none"> • Formalized internal quality improvement review process including case debriefing/review, ideally on a quarterly basis. • Participation in ongoing outcome measurement.
Shock Team Activation	<ul style="list-style-type: none"> • 1-call system for Shock Team activation <ul style="list-style-type: none"> ○ i.e. all relevant providers are notified about a CS case simultaneously by a single mechanism (phone call or page, electronic messaging)
Partnership	<ul style="list-style-type: none"> • Partnership with other hospital sites/regional cardiac programs, industry partners, professional societies, community stakeholders etc. as appropriate.
Education	<ul style="list-style-type: none"> • Demonstrated provision of appropriate education for all team members. • Demonstrated commitment to training learners in all disciplines.
Team Communication	<ul style="list-style-type: none"> • Availability of efficient communication tools to enable timely Shock Team discussions e.g. virtual meetings.
Hospital Administration Support	<ul style="list-style-type: none"> • A dedicated hospital administrator to support the Shock Team and ensure all necessary infrastructure is in place. • Commitment to ensuring sufficient health human resources to support Shock Team.

Diagram of Shock Team Structure: Core Shock Team and Adjunct Members



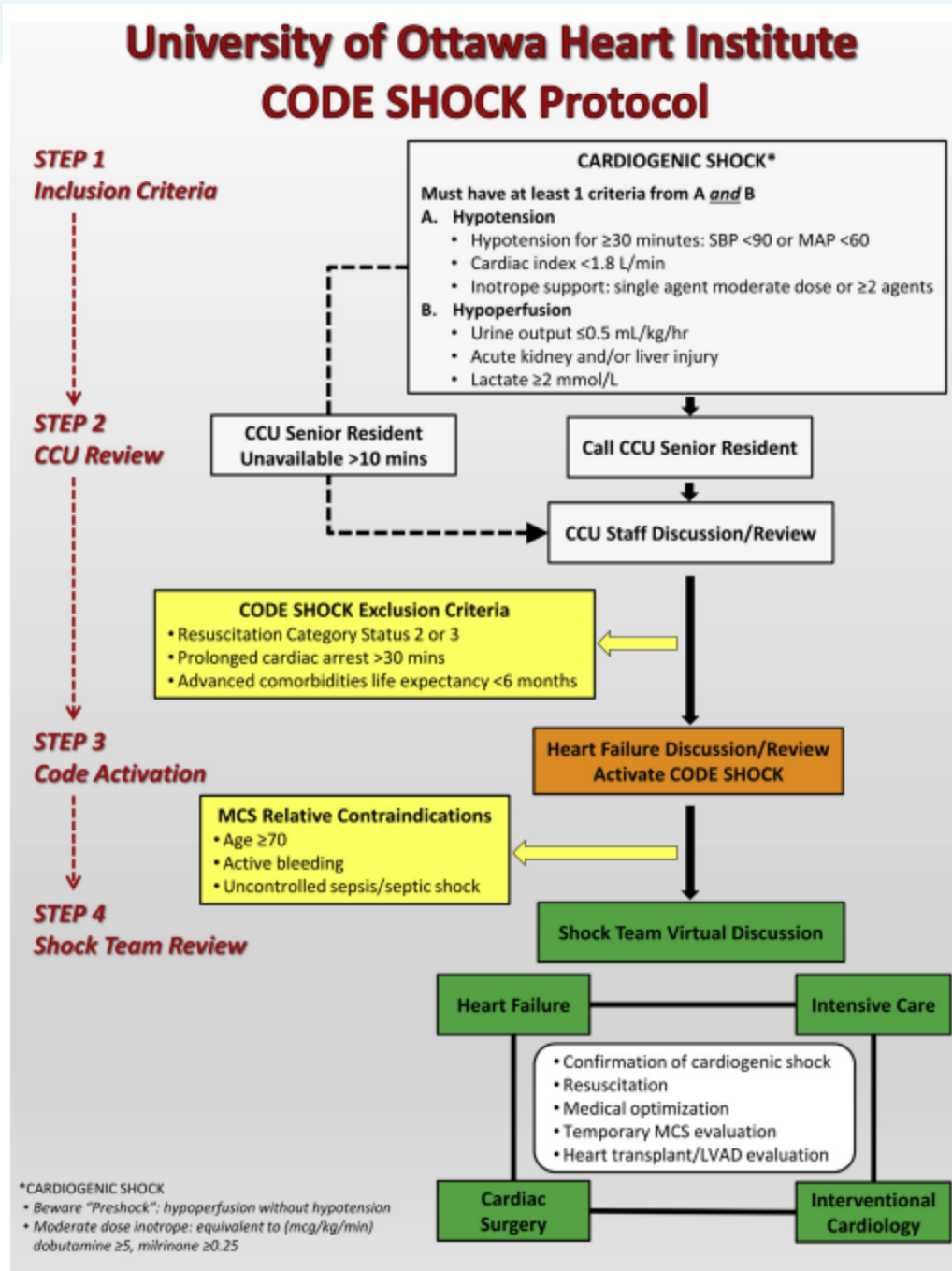
The core Shock Team is focused on management and care decisions for the patient with cardiogenic shock. The Adjunct Members provide critical services to achieve the patient care goals. *Note that Adjunct Members may vary dependent on specific patient case and local organizational structure (including involvement of trainees). ICU=Intensive Care Unit; CVICU=Cardiovascular Intensive Care Unit; CICU=Cardiac/Coronary Intensive Care Unit; DI=Diagnostic Imaging; EMS=Emergency Medical Services.

We would like to thank the following individuals for their contributions to this document:

Name	Organization
Dr. Faizan Amin	Hamilton Health Sciences
Dr. Phyllis Billia	University Health Network
Dr. Michael Chu	London Health Sciences Centre
Ms. Erika MacPhee	University of Ottawa Heart Institute
Dr. Madhu Natarajan	Hamilton Health Sciences
Ms. Rachel Rushton	London Health Sciences Centre
Dr. Michael Ward	London Health Sciences Centre
Dr. Harindra Wijesundera	Ontario Health
Ms. Amy Burke	Ontario Health
Ms. Jana Jeffrey	Ontario Health

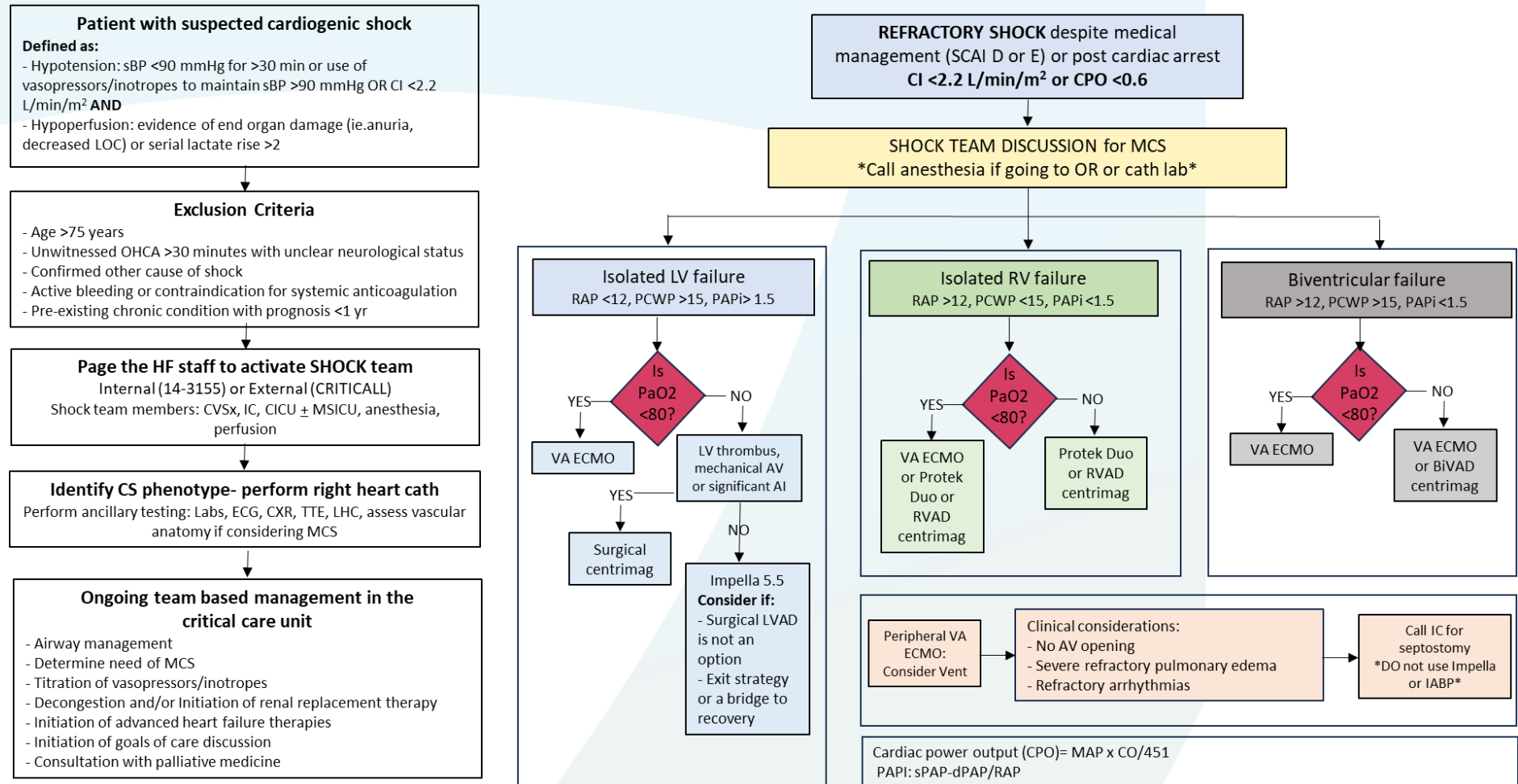
Appendix

Example #1:

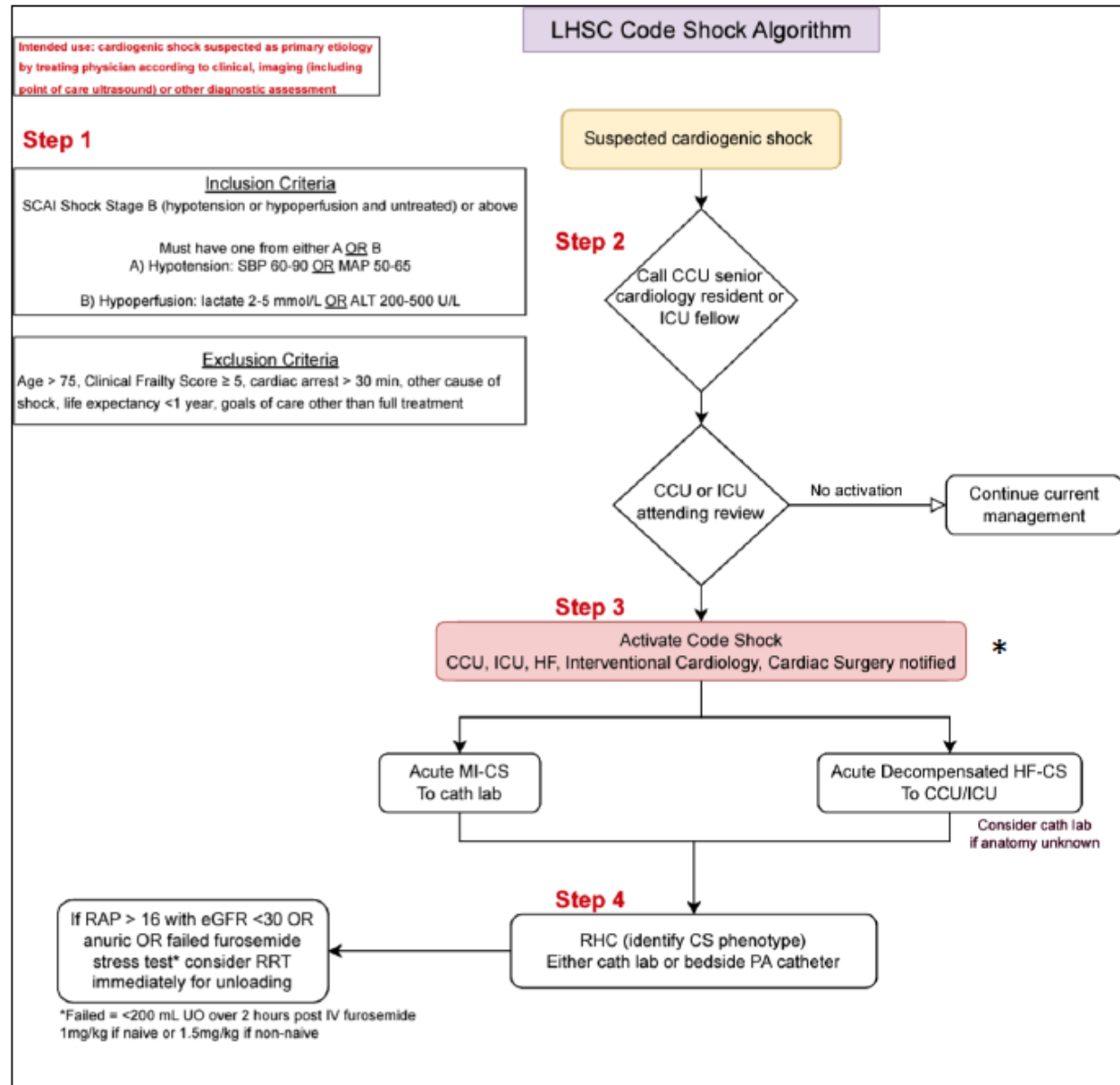


Example #2:

UHN/SHS Cardiogenic Shock algorithm and MCS selection



Example # 3:



*: HF/Tx team contacted once invasive haemodynamic data obtained (i.e. PAC or mixed venous O2)

References

1. Senman, B., Jentzer, J. C., Barnett, C. F., Bartos, J. A., Berg, D. D., Chih, S., Drakos, S. G., Dudzinski, D. M., Elliott, A., Gage, A., Horowitz, J. M., Miller, P. E., Sinha, S. S., Tehrani, B. N., Yuriditsky, E., Vallabhajosyula, S., & Katz, J. N. (2024). Need for a Cardiogenic Shock Team Collaborative-Promoting a Team-Based Model of Care to Improve Outcomes and Identify Best Practices. *Journal of the American Heart Association*, 13(6), e031979–e031979. <https://doi.org/10.1161/JAHA.123.031979>
2. Aboal, J., Pascual, J., Loma-Osorio, P., Nuñez, M., Badosa, E., Martín, C., Ferrero, M., Moral, S., Ballesteros, E., Pedraza, J., Tapia, S., & Brugada, R. (2024). Impact of a Cardiogenic Shock Program on Mortality in a Non-Transplant Hospital. *Heart, Lung & Circulation*, 33(1), 38–45. <https://doi.org/10.1016/j.hlc.2023.11.010>
3. Stevenson, M. J., Kenigsberg, B. B., Singam, N. S. V., & Papolos, A. I. (2023). Shock Teams: A Contemporary Review. *Current Cardiology Reports*, 25(12), 1657–1663. <https://doi.org/10.1007/s11886-023-01983-7>
4. Moghaddam, N., Diepen, S., So, D., Lawler, P. R., & Fordyce, C. B. (2021). Cardiogenic shock teams and centres: a contemporary review of multidisciplinary care for cardiogenic shock. *ESC Heart Failure*, 8(2), 988–998. <https://doi.org/10.1002/ehf2.13180>
5. Lee, F., Hutson, J. H., Boodhwani, M., McDonald, B., So, D., De Roock, S., Rubens, F., Stadnick, E., Ruel, M., Le May, M., Labinaz, M., Chien, K., Garuba, H. A., Mielniczuk, L. M., & Chih, S. (2020). Multidisciplinary Code Shock Team in Cardiogenic Shock: A Canadian Centre Experience. *CJC Open (Online)*, 2(4), 249–257. <https://doi.org/10.1016/j.cjco.2020.03.009>