



# KEY TAKEAWAYS

The Heart House Roundtable on **Evaluation and Management of Cardiogenic Shock** identified the following key takeaways.

1

**Cardiogenic shock (CS) is heterogenous, multifactorial, and dynamic.**

2

**Stage the shock.**

3

**Early recognition of CS is critical.**

4

**Invasive hemodynamics may help.**

5

**End-organ perfusion is the name of the game.**

6

**Think about temporary mechanical support.**

7

**Reassess, reassess, reassess.**

8

**Care of CS is a team-based sport.**

9

**Prevention, recognition, and management of complications of therapy is key.**

10

**Palliative care options are essential.**





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## 1 CS is a heterogenous multifactorial syndrome in which a cardiac disorder results in inadequate cardiac output (CO) culminating in clinical or biochemical evidence of end-organ hypoperfusion or both.

- Although various definitions of CS have been employed in clinical trials and registries, the canonical definition includes impaired CO resulting in hypotension (systolic blood pressure [SBP] of < 90 mmHg or need for vasopressors or mechanical support to maintain a SBP > 90 mmHg) and clinical or laboratory evidence of end-organ hypoperfusion, as manifested by elevated lactic acid. Other CS phenotypes, normotensive CS, and mixed vasodilatory CS, are also now recognized.
- CS is associated with persistently high morbidity and mortality ranging from 25% to 40% depending on etiology.

## 2 A standardized taxonomy developed by the Society for Cardiovascular Angiography and Intervention (SCAI) should be used to classify the severity of CS to facilitate communication and risk stratification.

- The SCAI Shock Stages use a combination of clinical assessment, physical examination, laboratory markers, and hemodynamic parameters to categorize patients across a spectrum of acuity and severity of illness (namely A through E).
- SCAI Staging is dynamic, and early interventions with emerging changes in trajectory may be critical to interrupting irreversible clinical deterioration.
- Use of the Cardiogenic Shock Working Group parameters to define SCAI stages may improve clinical application and adoption of the staging system.

## 3 Early recognition of CS is critical to improving outcomes in this highly lethal syndrome. The initial assessment for CS should include evaluation for congestion and perfusion as well as severity of CS and end organ involvement.

- Along with clinical assessment for congestion (pulmonary edema, jugular venous distension, and peripheral edema) and hypoperfusion (altered mental status, oliguria, cool extremities), initial evaluation should include laboratory markers (including complete blood count, comprehensive metabolic panel, cardiac biomarkers including troponin and natriuretic peptides, lactic acid, and arterial or venous blood gas).
- 12-lead electrocardiogram, chest radiography—and a transthoracic echocardiogram and/or point-of-care ultrasound, if available—should be completed as soon as possible after CS is suspected.

## 4 Invasive hemodynamic monitoring via a pulmonary artery catheter, when available, may be useful for both the diagnosis and management of CS, including mixed phenotypes (i.e., mixed cardiogenic and vasodilatory shock).

- Invasive hemodynamic monitoring provides valuable information regarding biventricular filling pressures, pulmonary artery pressures, pulmonary vascular resistance, and CO.
- Observational data from multicenter registries suggests that pulmonary artery catheterization is associated with lower in-hospital mortality.

## 5 Medical management of CS should be focused on maintaining tissue perfusion and unloading the ventricle(s) involved in CS to preserve end organ performance.

- Norepinephrine is reasonable as the preferred initial agent in the management of CS.
- Either milrinone or dobutamine may be used for intravenous inotropic support.



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## 6 Temporary mechanical circulatory support (MCS) may be reasonable in SCAI C, D, and E CS to provide hemodynamic support when end organ perfusion cannot be maintained with pharmacologic interventions alone.

- Temporary MCS should serve as a bridge to decision or bridge to candidacy for advanced therapies (i.e., cardiac transplantation or durable left ventricular assist device), myocardial recovery, or to another intervention.
- For patients who are not responding to initial pharmacologic measures or temporary MCS, transfer to centers that provide advanced heart failure therapies, additional options for temporary MCS and critical care support may be reasonable.

## 7 Structured periodic reassessment of hemodynamic status, perfusion, and response to therapy is central to characterizing the clinical trajectory of the patients with CS.

- Reassessment of the patient with serial physical examination, review of vital signs and other hemodynamic and physiological data, and measurement of laboratory measures of end-organ perfusion is vital to monitoring the clinical evolution of CS.
- The frequency of reassessment should be tailored to the phase of CS, with the timing as frequently as 1-2 hours, in the earliest acute phase, and 12-24 hours, if eventual stabilization.

## 8 Care of the patient with CS is a team-based sport.

- Community-based centers with limited resources should identify an on-site clinician to serve as their “shock champion” as well as a quaternary center providing advanced heart failure therapies to partner with on complex CS cases.
- Coordinated interdisciplinary care in the cardiac intensive care unit, involving critical care cardiologists, advanced heart failure specialists, interventional cardiologists, cardiac surgeons, specialized nurses, respiratory therapists, cardiovascular pharmacists, dietitians, physical therapists, and social workers appears to be a key ingredient to successful strategies for managing this complex syndrome.
- An interdisciplinary care team may be useful in matching the right therapy to the right patient at the right time and has been associated with improved outcomes in single center and multicenter observational studies.

## 9 Prevention, recognition, and management of the complications of the therapies for CS is potentially as important as those therapies to improve patient outcomes.

- Morbidity related to complications of advanced critical care, including MCS, positive pressure ventilation, and vascular access contribute substantially to the high in-hospital mortality rate of patients with CS.
- Mitigation of such complications is likely to be an essential element of making progress toward improving the survival and post-hospital quality of life for patients with critical illness related to CS.

## 10 Palliative care is essential in the management of critically ill patients with CS.

- CS patients, who are unable to wean from temporary MCS and do not have a bridge to advanced therapies or recovery, should be provided palliative care.