Creating a Team-Based, Education-Centric Program To Manage Cardiogenic Shock:

Featured in this article are:

Featured in this three-part article series are:

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UPMC Heart and Vascular Institute's Multiyear, Multidisciplinary Approach to Improve Mortality and Long-Term Patient Outcomes

Historically: 40 to 50% mortality. That ought to communicate precisely the gravitational force of cardiogenic shock on individuals that develop the syndrome. Not quite as all-consuming of what gets close to it as is a cosmic supermassive black hole, but much too high for any clinician, team, or hospital to accept as a given.

Within the UPMC Heart and Vascular Institute Cardiogenic Shock Program, current mortality is now closer to 25% following systemwide changes in how cardiogenic shock is recognized and cared for. This shift did not result from a single device or protocol, but from a coordinated, education-driven model built and refined over multiple years that treats cardiogenic shock as a time-dependent, progressive syndrome that mandates an early, coordinated, aggressive multidisciplinary response if patients are to survive.

Understanding why this shift has been possible requires first understanding what cardiogenic shock is at a physiologic level and why its progression and mortality has been so difficult to change.

Defining Cardiogenic Shock and Its Clinical Consequences

Cardiogenic shock is a state in which the heart is unable to circulate enough blood at thresholds required to sustain the usual metabolic demands of the body. This leads to a state of systemic hypoperfusion and progressive end-organ dysfunction. Body parts simply are not getting enough circulation to keep performing well enough to, in the long run, stay alive. Patients in a state of cardiogenic shock may present with pulmonary edema, worsening renal function, hepatic congestion, metabolic acidosis, and changes in mental status, and other symptoms, none of which are desirable.

Even with all the advances in reperfusion therapy, critical care, and mechanical circulatory support of the years, mortality has remained stubbornly high. It is difficult to outrun the gravity of a black hole when you are not sure what it is, what it can do, or if you can actually detect it outright.

The clinical presentation of cardiogenic shock is, like many conditions, one of heterogeneity. Some patients develop cardiogenic shock from an acute myocardial infarction, long thought to be the driver of the vast majority of cases. However, chronic or newly recognized heart failure, malignant arrhythmias, myocarditis, and other conditions are now known to be large contributors to the population of people diagnosed with cardiogenic shock.

“Cardiogenic shock has remained one of the most lethal conditions we treat, and for a long time we were seeing the same pattern over and over again. Patients were being identified too late, often after they already had significant end-organ failure,” Dr. Hickey says. “We were having conversations about devices and escalation when the physiology was already far advanced, and at that point, our ability to change the trajectory was limited or futile. The problem was not necessarily that we did not have therapies. The problem was that we did not have a consistent way to define cardiogenic shock, recognize it early, or communicate severity and trajectory across teams and hospitals. Without a shared language and a coordinated system, care was fragmented, timing of that care was inconsistent, and outcomes did not change in a meaningful way. Until we treated cardiogenic shock as a progressive syndrome that required early identification, multidisciplinary decision making, and system-level coordination, we would always be reacting to the disease instead of optimally managing it.”

To change this trajectory, UPMC Heart and Vascular Institute created a Cardiogenic Shock Program with a dedicated team of experts to triage patients quickly and efficiently, and to work with providers internal and external to the UPMC system to develop an optimal treatment plan for each patient.

The UPMC Cardiogenic Shock Program, through a multidisciplinary approach is designed to aid in rapid identification of cardiogenic shock, implement and standardize hemodynamic monitoring and treatment for patients, limit the use of vasopressor and inotropes, instigate early use of mechanical support when dictated by patient needs, and assess patients for cardiac recovery or evaluate them for advanced supportive therapies.

However, to get to the point of a formalized, well-organized, efficient, and scalable program across multiple hospitals and geographies that could meaningfully impact patient outcomes, it involved a multi-year project requiring the expertise of many disciplines, buy-in from institutional leadership, and a rigorous, ongoing focus on education, standardized care pathways, and evolutionary adaptation of the program grounded in evidence-based medicine.

“The challenge is not just identifying cardiogenic shock but making sure that recognition leads to the same response across different teams and hospitals. That requires alignment in how people communicate, how they escalate care, and how they apply the process in real time,” Ms. Kunz says.

Why Traditional Models of Managing Cardiogenic Shock Were Suboptimal

Historically in the field of cardiovascular medicine, cardiogenic shock was conceptualized as a single end-stage event. Patients were often labeled “in shock” only after hypotension, elevated lactate levels, and organ dysfunction were noticeable. At this point, treatment options can be limited. Clinical discussions therefore would focus on hemodynamic collapse and device selection after end-organ failure had already developed, rather than on where a patient was in the disease process or how rapidly they were deteriorating.

“One of the most challenging things about cardiogenic shock is how quickly a patient can move through stages, sometimes within minutes, and you do not always know in advance who will deteriorate fast. That uncertainty makes early recognition and appropriate tiering critical to managing the condition,” Ms. Hopwood-Brophy says.

The absence of a shared framework in the field meant that cardiogenic shock was not approached as a progressive syndrome. Without a consistent way to describe severity or trajectory, escalation of patient care would frequently be delayed and treatment decisions varied widely across teams and institutions, even within the same hospital or system. This was not a UPMC specific issue but a global one for all of cardiovascular medicine.

At the UPMC Heart and Vascular Institute, these limitations were encountered repeatedly. Patients were often transferred from referring hospitals only after multiorgan dysfunction had developed, and teams were asked to make urgent decisions about advanced therapies without a clear way to describe disease severity or predict trajectory. These experiences exposed a fundamental truth: cardiogenic shock could not be managed effectively without first being defined and recognized in the same way by everyone involved in the patient’s care.

“We kept having the same conversations too late. By the time we were talking about devices, the patient already had kidney failure, liver dysfunction, rising lactate. Everything was already far advanced,” Dr. Hickey says. “We did not have a consistent way to define cardiogenic shock, recognize it early, or communicate how sick someone really was across teams and hospitals. Without a shared language and a shared understanding of the continuum, no pathway or technology could function the way it was intended to.”

Early Clinical Work at UPMC (2017–2018)

The recognition that cardiogenic shock was being treated too late did not begin with a formal staging system or a systemwide program. It emerged from years of clinical

discomfort with the same pattern repeating with patients rapidly decompensating, escalation conversations occurring after multiorgan failure had already developed, and advanced therapies being deployed when the physiological window for meaningful recovery had likely closed.

The first response to this discomfort was not a full-blown cardiogenic shock team or program, but a series of targeted clinical initiatives. In 2017, interventional cardiology evaluated and implemented the Detroit cardiogenic shock initiative, which emphasized percutaneous coronary intervention (PCI) Impella placement as a strategy to prevent shock rather than rescue patients after collapse. This work represented a shift in thinking: cardiogenic shock could be anticipated and mitigated, not just reacted to.

In 2018, these efforts expanded into the first systemwide cardiogenic shock meeting led by interventional cardiology. An Impella order set was developed to standardize device use, and point-of-care testing for plasma-free hemoglobin was adopted to support safer management. Best practices for Impella access were established, and heart failure services were formally engaged. These steps did not yet constitute a program, but they created the first shared infrastructure for approaching cardiogenic shock.

At this stage, care remained largely siloed and dependent on individual expertise. Nevertheless, the groundwork was being laid shared protocols, early physiologic monitoring, and interdisciplinary collaboration were beginning to replace ad hoc decision-making.

From Internal Tension to an Early Shock Team

As this early work progressed, it became clear that the problem was not just a technical one. Even with new devices and emerging best practices, recognition of cardiogenic shock remained inconsistent and escalation remained delayed. Patients continued to arrive from referring hospitals after organ failure had already developed, and teams were still being asked to make urgent decisions without a clear way to describe disease severity or predict trajectory.

In response, a small, informal shock team began to take shape. This early group, consisting of five or six providers represented a first attempt to coordinate patient care across disciplines. The team was notified when a case cropped up, they aligned around emerging concepts of early cardiogenic shock and tested more proactive escalation strategies. While these efforts improved communication and planning in the small team, the overall approach also revealed a fundamental limitation: a handful of specialists could not change systemwide behavior on their own.

The experience highlighted the big problem in the field. Cardiogenic shock is not only a clinical problem; it is a systems problem. Without shared definitions, standardized triggers,

and aligned pathways, recognition and escalation will continue to depend on where a patient presented and who happened to be on call.

Formalizing the Continuum (2019)

Between April and July 2019, the publication of cardiogenic shock outcomes from the University of Utah and Inova Health System, alongside the introduction of the Society for Cardiovascular Angiography and Interventions (SCAI) cardiogenic shock staging system, provided the first formal frameworks for understanding what cardiogenic shock really is and how it might best be approached. The staging system described cardiogenic shock as a spectrum of severity rather than a single diagnosis and linked clinical findings, laboratory markers, hemodynamics, and the need for pharmacologic or mechanical support to discrete stages.

“When SCAI put forward a staged definition of cardiogenic shock in 2019, it made the point that the condition is a continuum — A through E— rather than a yes-or-no diagnosis. That reframing was a major inflection point for the field and for our system in terms of developing a cohesive approach to patient care,” Dr. Hickey says.

The introduction of the SCAI staging criteria did not initiate the transformation that the UPMC Heart and Vascular Institute was already starting to make around the care of patients in cardiogenic shock, but it did accelerate it. The SCAI staging system gave structure and shared language around what actually is cardiogenic shock, allowing clinicians to describe where a patient was on the continuum and how rapidly they were progressing.

“Once there was a shared way to describe cardiogenic shock, conversations changed. Teams could align more quickly around where a patient was in the progression and what needed to happen next,” Ms. Kunz says.

At the same time, internal processes were changing. Team development accelerated, and immediate send-transfer prioritization was established for patients meeting high-risk criteria. In July 2019, STAT MedEvac became involved in the process and program that was being built, text alerts were adopted, and QuickLaunch was implemented to reduce delays in mobilization. By August 2019, the fully formed cardiogenic shock program at UPMC went live, and cardiac catheterization lab attendings began taking first call for cardiogenic shock cases.

Cardiogenic shock could now be recognized, staged, and escalated using a shared language and a defined pathway no matter where the patient was at in the broader UPMC system or where they might be coming from if being transported from another care setting.

“We used to think that if we identified cardiogenic shock within a day, we were doing well. What the data now show is that the window is much smaller. We are really talking about the

first six hours, and ideally the first 90 minutes, to identify these patients and activate a shock team so that intervention can actually change their trajectory. This is the equivalent of a STEMI. Time matters in exactly the same way," Dr. Hickey says.

Transforming a Concept into an Action Plan: REACT Model

The conceptual shift toward earlier recognition of cardiogenic shock requires a corresponding operational framework. At UPMC and the UPMC Heart and Vascular Institute, this became the REACT model, an executable translation of a staged, time-dependent view of cardiogenic shock.

The REACT framework created by the cardiogenic shock team leaders created a clear sequence of actions for clinicians and care teams. REACT means: Recognize; Establish; Activate; Convene; Transfer.

Recognition comes when a patient's ejection fraction is less than 35% or they have an acute myocardial infarction with systolic blood pressure less than 90 and clinical values indicating end organ dysfunction, primarily kidney and liver function impairment, and a lactate level more than 2.0. Establishing access for invasive monitoring follows, with a preference for pulmonary artery catheter–guided assessment. Activation of the Cardiogenic Shock team is next achieved through a single Medcall alert.

The multidisciplinary shock team then convenes to align on patient severity, trajectory, and next steps. Finally, a decision is made to either call for the patient to be managed locally if possible or have them transferred to another center if higher level of care advanced intervention is justified. The process ensures that patients receive the appropriate level of care at the appropriate time.

This framework operationalizes education. It converts shared definitions into shared behavior and embeds cardiogenic shock recognition and reaction by clinical teams into everyday workflow.

"The goal was to make the response to cardiogenic shock predictable. Instead of each team approaching these patients differently, there was now a defined sequence that helped guide decisions in real time," Ms. Kunz says.

Moving Toward a Coordinated, Multidisciplinary Program (2020–2025)

The early iteration of the cardiogenic shock program faced its first major test in 2020 with the onset of the COVID-19 pandemic. Capacity constraints, surges in critically ill patients, and other factors forced rapid adaptation. These pressures accelerated the need for standardized pathways, transparent triage, and real-time communication.

The Impella 5.5 with SmartAssist is an FDA-approved, temporary, surgically inserted micro-axial ventricular support device that delivers up to 5.5 L/min of blood flow. It acts as a bridge to recovery, ventricular assist device, or transplant by unloading the left ventricle, reducing its workload, and providing circulatory support in patients with severe heart failure or cardiogenic shock. In 2021, the increased programmatic use of this device and standardization of care has shown to decrease mortality, increase native heart survival, and continue to bridge patients to advanced therapies such as VAD and transplant.

By 2022, the program began to extend outward. Outreach efforts intensified, a Recognition Team process was formalized, referring follow-up was established, and educational resources were developed and posted to the UPMC Heart and Vascular Institute website. Data collection and outcomes tracking became integral components of how the program efficacy is measured.

In 2023, governance structures were introduced. A Steering Committee was formed, shock outreach workshops were launched, and dedicated clinical pathways or treatment algorithms for acute myocardial infarction and heart failure generated cardiogenic shock were established. Intake notes standardized documentation processes, and quarterly patient reviews created structured feedback loops to help the team improve the function of the cardiogenic shock program over time.

By 2024, the program's learning infrastructure matured. Impella interrogation billing and device-level outcomes tracking were implemented. Recovery data and internal catheterization lab activation processes were incorporated. Observed/expected reports, a Clinical Quality Council review was established, and tracking of futile cases and nontransfers strengthened accountability.

In 2025, the cardiogenic shock program entered a new phase of growth. Order sets were integrated across electronic health record systems. Patient selection guidelines for Impella 5.5, weaning protocols, transport checklists, and reposition training were standardized. Multicenter morbidity and mortality reviews, the Cardiogenic Shock Survivor Clinic, and high-risk PCI hemodynamic optimization were all implemented as part of the program's ongoing evolution.

"Way back in the beginning we thought the team was just a small group of physicians on a call, but it became obvious that five doctors is not a functional shock program by itself. You need the bed and staffing infrastructure, the nurse leadership, and transport that can assess patients at the bedside and move them to the right facility with communication across the entire chain," Dr. Hickey says.

The cardiogenic shock program that has been created by the UPMC Heart and Vascular Institute is not defined by a single unit, specialty, or technology. It functions as a network of clinicians, hospitals, and care environments operating under a shared model of recognition, communication, and escalation.

“Once patients are identified, having order sets, algorithms, and standards of care matters whether they are transferred or managed at a tiered center. We have been rolling those tools out beyond a single site, and the goal is to broaden standardization as we continue expanding across the system,” Ms. Kunz says.

Making the Program Work Over Time: Education Is the Foundation

The entire program – none of it would be possible or exist in its present form without the extensive educational efforts and outreach across the UPMC system and into the community. The goal was to ensure that cardiogenic shock was recognized earlier, described consistently, and understood as a dynamic process rather than an end-stage event. By everyone, no matter where they might be.

“We realized very quickly that a fully functioning, multidisciplinary cardiogenic shock program was not going to work if the only people who understood the process were at the tertiary center. Most of these patients are first seen somewhere else, and by the time the call comes in, we are already behind,” Ms. Kunz says. “Education became the foundation of our program. Everyone had to know what cardiogenic shock looks like early, what information needs to be gathered, and how to communicate severity and trajectory. Once we aligned around that, everything else from activation of the shock program, patient transport, bed placement, and team response could finally move fast enough to matter.”

This educational effort was multidisciplinary and systemwide. Cardiologists, cardiothoracic surgeons, intensivists, emergency clinicians, advanced practice providers, nurses, and transport teams were taught to identify cardiogenic shock using common definitions and to communicate severity using the same staged framework.

“In addition to building internal communication, we had to educate externally and repeatedly. Once the process started working, the next step was telling referring teams, ‘identify shock early, call us early, and transfer patients as soon as possible,’ and we iterated on how we communicate that for years,” Dr. Hickey says. “We’ve never stopped, nor can we. The educational work that Nicole and the rest of the team has done in service to informing and promoting what the program is, how it functions, and how every touch point needs to be aligned for it to work is the reason it works and why we’ve been able to meaningfully decrease mortality within our system.”

Part of scaling education was the recognition by the team that physician outreach is not enough. Building nursing champions at outside hospitals strengthens recognition and coordination at the point of first contact.

“When I speak with other centers about their shock teams, a common challenge is implementation. What made this possible here was early buy-in and culture change across interventional cardiology, surgery, critical care, and the cardiac ICU. There was shared agreement that building a coordinated, protocolized team was necessary to improve

survival," Dr. Hickey says. "But, without the education piece and the community work, it doesn't work."

Longitudinal Model of Care

Caring for patients with cardiogenic shock who survive does not end when they are discharged from the hospital. Many patients experience prolonged recovery and require coordinated follow-up across specialties. Because of this dynamic, the UPMC Heart and Vascular Institute Cardiogenic Shock Program works on a longitudinal perspective because cardiogenic shock is a condition with lasting physiological and psychosocial consequences. Education and care coordination extend into the post discharge period to reinforce and provide continuity of care. Recovery from cardiogenic shock is an ongoing process and not one with a fixed timeframe or endpoint.

"For many patients, cardiogenic shock is the first time they have ever had to navigate the medical system, and survival is only the first step. After discharge, they may be dealing with medications, follow-up logistics, insurance and financial stress, and psychological sequelae, and the clinic is built to help patients stay connected to cardiac care and address those barriers," Ms. Hopwood-Brophy says.

One of the most recent outgrowths of the program in 2025 was the creation of a formal Cardiogenic Shock Survivor clinic. The clinic is run by Ms. Hopwood-Brophy and is designed to address the long-term care needs for patients.

Typically, this is going to involve the need for cardiac rehabilitation, coming to terms with and working through the psychosocial and mental stress aspects of having survived cardiogenic shock, and various resources in the community that can help support patients through a lengthy recovery process.

"We're talking about time away from work and medical bills and how to deal with that dynamic, what the recovery process may look like, medication management, and a lot more," Ms. Hopwood-Brophy says. "For a lot of these patients there's a risk for another occurrence of cardiogenic shock, so how can we work toward avoiding that scenario."

What's Next for the Cardiogenic Shock Program at UPMC?

From recognizing cardiogenic shock as a systems problem, to leveraging new shared definitions and staging for the condition and building a program based in education and multidisciplinary alignment, the UPMC Heart and Vascular Institute has created a new model of cohesive care for cardiogenic shock. By ensuring that providers and care teams everywhere understand what cardiogenic shock looks like, that is recognized earlier, described consistently, and managed collaboratively, the program is working to overcome many of the root causes that make mortality so high in this patient population.

The work of redefining cardiogenic shock, aligning around a shared framework, and embedding education across disciplines has fundamentally changed how this syndrome is recognized and managed within UPMC and UPMC Heart and Vascular Institute, and the medical community at large. Recognition does not begin in the catheterization lab, the ICU, or even the emergency department of a tertiary center. For many patients, the first opportunity to alter the trajectory of cardiogenic shock occurs hours earlier, in community hospitals, ambulances, and emergency settings where the syndrome is most likely to be missed. If education is the key, its greatest accomplishment is reaching clinicians at the point of first contact with the patient.

More Information

- UPMC Heart and Vascular Institute Cardiogenic Shock Program website.
- **Cardiogenic Shock Workshop: The War on Shock**
  Dr. Hickey and Ms. Kunz discuss improving outcomes in cardiogenic shock through early recognition, standardized hemodynamic monitoring, and multidisciplinary team action to guide timely treatment and support escalation. Click here to view the educational course.
- Click here to view our educational resources (PDF).

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