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EDITORIAL COMMENT

Cardiogenic Shock Management Should Be a Team Sport*



Perwaiz M. Meraj, MD,^a William W. O'Neill, MD^b

The advent of percutaneous mechanical reperfusion therapy of acute myocardial infarction (AMI) in the 1980s (1) instilled the organization of medical care to be a series of sequential trade off of responsibilities from emergency department (ED) physician to catheterization laboratory interventional cardiologist to cardiac intensive care unit (CICU) attending. This same mechanism was incorporated into management of cardiogenic shock (CS). The ED physician identified shock, initiated vasopressor therapy, and transferred the patient to the catheterization laboratory where the interventional cardiologist treated the culprit vessel(s) and often inserted an intra-aortic balloon pump. The patient was transferred to the CICU and patients either survived or did not. For the last 30 years, the management was the same and the results, a 50% mortality rate, have been the same (2-4). The advent of mechanical circulatory support (MCS) devices, such as veno-arterial extracorporeal membrane oxygenator, Impella (Abiomed), Tandem Heart (LivaNova), and combinations of these MCS devices, has provided hope that survival may be improved with more effective support. To optimally use these devices, the process of care must evolve. No individual physician has the experience and background to perform complex PCI, large bore access, vascular cut downs, antegrade sheath limb perfusion, surgical ventricular assist device placement, and rapid determination of whether

and when escalation of care up to and including emergency cardiac transplant is possible and indicated. For this reason, creation of shock teams consisting of ED physicians, interventional cardiologists, cardiac ventricular assist device transplant surgeons, advanced heart failure cardiologists, cardiac intensivists, and palliative care specialists have been organized in many centers to optimize cardiogenic shock care (5-8).

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In this issue of the *Journal*, Papolos et al (9) discuss the management and outcomes of CS as it relates to CICU care with or without shock teams from the multicenter Critical Care Cardiology Trials Network. The authors are to be lauded for their focus on shock teams and postdevice CICU care (10), because these 2 areas are of such importance to further survival of patients in CS. From 2017 to 2019, over a 2-month period, the authors demonstrate that among the 1,242 CS admissions, 44% were at shock team centers, whereas 42% of sites had shock teams. Centers with shock teams were more likely to use invasive hemodynamics, pulmonary artery catheters (PACs), and advanced forms of MCS; however, overall, fewer patients received device therapy, mostly driven by decreased use of the intra-aortic balloon pump. Patient acuity was defined by the SOFA (Sequential Organ Failure Assessment) score, and all invasive hemodynamics were recorded. Centers where veno-arterial extracorporeal membrane oxygenator is managed in the cardiothoracic ICU were not followed, which may lead to further confounding of the results, although both groups had similar numbers of such patients. Both AMI-CS and non-AMI-CS patients demonstrated improved mortality in CICU with shock teams compared with centers without shock teams. Inverse probability weighting was used to reduce confounders inherent in any observational analysis.

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Papalos et al (9) expanded on the previously reported evidence, which demonstrated improved survival from years 1 to 2 after the development of the shock team (8,11), by demonstrating the 28% lower adjusted odds of CICU mortality among CS patients in centers with shock teams. PAC utilization was significantly higher among centers with shock teams (60% vs 49%) and was placed much earlier in the patient's course (0.3 days vs 0.66 days). The combination of increased PAC use and more advanced MCS use appears to lead to the lower CICU mortality in both AMI and non-AMI CS. Although this is observational data, it supports the prior evidence to date where presence of a shock team can rapidly identify and treat patients in CS, prevent the multisystem organ failure that contributes to worse mortality, and decrease the need for renal replacement therapy and prolonged ventilation (7,8), and increased use of PAC leads to improved experience in interpreting, developing a treatment algorithm, and escalating care based on the data obtained (12,13).

An area not addressed in this paper is both escalation of care based on the invasive hemodynamics in the CICU and the protocols to prevent acute vascular/limb complications (ALI) that can arise from the use of MCS, especially in this population of patients. Performing routine peripheral angiography before cannula selection and early recognition of those at risk of developing ALI can play a key role in decreasing such events in these patients. Furthermore, keeping a low threshold for using percutaneous downstream perfusion cannula in high-risk patients can help

reducing events of distal ischemia; however, close monitoring of limb ischemia in the CICU is of utmost importance (14,15). Many procedural techniques and novel CICU models exist to mitigate the risk of ALI in CS patients with MCS (16,17). Finally, escalation of care and support is vital to the continued success of any shock team and center (18).

Although many critics will continue to discuss the lack of randomized controlled trials in the field of CS, this paper supports the process previously outlined of a multidisciplinary team-based approach improving survival. Establishing shock teams and CICUs that are based in centers dedicated to CS is the path to improved survival. Post-MCS care is of the utmost importance to escalate appropriately if patients are not improving and avoid ALI, which are typically fatal in these extremely ill patients. The continued support for shock teams is vital to the improvement in care models and survival while the randomized data on MCS use in CS continues to be developed.

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