SUPPLEMENTAL MATERIAL

Epidemiology of Shock in Contemporary Cardiac Intensive Care Units: Data from the Critical Care Cardiology Trials Network (CCCTN) Registry

David D. Berg, M.D.[1] Erin A. Bohula, M.D., D.Phil.,[1] Sean van Diepen, M.D., M.Sc.,[2] Jason N. Katz, M.D., M.H.S,[3] Carlos L. Alviar, M.D.,[4] Vivian M. Baird-Zars, M.P.H.,[1] Christopher F. Barnett, M.D., M.P.H.,[5] Gregory W. Barsness, M.D.,[6] James A. Burke, M.D.,[7] Paul C. Cremer, M.D.,[8] Jennifer Cruz, D.O.,[9] Lori B. Daniels, M.D., M.A.S.,[10] Andrew DeFilippis, M.D., M.Sc.,[11] Affan Haleem, M.D.,[7] Steven Hollenberg, M.D.,[9] James M. Horowitz, M.D.,[12] Norma Keller, M.D.,[12] Michael C. Kontos, M.D,[13] Patrick R. Lawler, M.D., M.P.H.,[14] Venu Menon, M.D.,[8] Thomas S. Metkus, M.D.,[15] Jason Ng, M.D.,[12] Ryan Orgel, M.D.,[3] Christopher B. Overgaard, M.D., M.Sc.,[14] Jeong-Gun Park, Ph.D.,[1] Nicholas Phreaner, M.D.,[10] Robert O. Roswell, M.D.,[12] Steven P. Schulman, M.D.,[15] R. Jeffrey Snell, M.D.,[16] Michael A. Solomon, M.D.,[17] Bradley Ternus, M.D.,[6] Wayne Tymchak, M.D.,2 Fnu Vikram, M.D.,[7] David A. Morrow, M.D., M.P.H.[1]

[1]Levine Cardiac Intensive Care Unit, TIMI Study Group, Cardiovascular Division, Department of Medicine, Brigham and Women's Hospital and Harvard Medical School, Boston, MA
[2]Department of Critical Care and Division of Cardiology, Department of Medicine, University of Alberta, Edmonton, Alberta, Canada
[3]Divisions of Cardiology and Pulmonary and Critical Care Medicine, University of North Carolina, Center for Heart and Vascular Care Chapel Hill, Chapel Hill, North Carolina
[4]University of Florida, Gainesville, FL
[5]Department of Cardiology, Medstar Washington Hospital Center, Washington, DC
[6]Mayo Clinic, Rochester, MN
[7]Lehigh Valley Health Network, Allentown, PA
[8]Cleveland Clinic Foundation, Cleveland, OH
[9]Cooper University Hospital, Camden, NJ
[10]Sulpizio Cardiovascular Center, University of California San Diego, La Jolla, CA
[11]University of Louisville, Louisville, KY
[12]New York University Langone Health, New York, NY
[13]Virginia Commonwealth University, Richmond, VA
[14]Peter Munk Cardiac Centre, Toronto General Hospital, University of Toronto, Toronto, ON Canada
[15]Johns Hopkins Hospital, Baltimore, MD
[16]Rush University Medical Center, Chicago, IL
[17]Critical Care Medicine Department, National Institutes of Health Clinical Center, Bethesda, MD

Address for Correspondence:
David A. Morrow, M.D., M.P.H.
TIMI Study Group
60 Fenwood Road
Suite 7022
Boston, MA 02115
dmorrow@bwh.harvard.edu

Supplemental Table 1. CCCTN Leadership and Investigators.

EXECUTIVE COMMITTEE
David A. Morrow, MD MPH, Jason N. Katz, MD MHS, Sean van Diepen, MD MSc.

STEERING COMMITTEE
Gregory W. Barsness, MD, Christopher B. Granger, MD, Steven M. Hollenberg, MD, James D. Horowitz, MD, Venu Menon, MD, Robert O. Roswell, MD, Michael A. Solomon, MD.

CCCTN DATA COORDINATING CENTER (TIMI STUDY GROUP)
Marc S. Sabatine, MD MPH (TIMI Study Group Chairman), David A. Morrow, MD MPH (TIMI Principal Investigator), Erin A. Bohula, MD DPhil (Co-Investigator), David D. Berg, MD (Co-Investigator), Vivian Baird-Zars, MPH (Project Manager/Data Manager), Sabina A. Murphy, MPH (Director of Statistics), Cardiovascular Division, Department of Medicine, Brigham and Women's Hospital, Boston, MA.

COLLABORATING ENROLLING CENTERS

Brigham and Women's Hospital, Boston, MA: E Bohula (PI), D Morrow (Co-Investigator), D Silva (Research Coordinator).

Cleveland Clinic Foundation, Cleveland, OH: V Menon (PI), P Cremer (Investigator), A Schenone (Sub-I), K Rutkowski (Nurse Coordinator).

Cooper University Hospital, Camden, NJ: S Hollenberg (PI), J Cruz (Sub-I), D Ricketti, J Trujillo (Research Coordinators).

Johns Hopkins Hospital, Baltimore, MD: S Schulman (PI), T Metkus (Sub-I), K Ibrahim, F Rahman (Research fellows).

Lehigh Valley Health Network, Allentown, PA: J Burke (PI), F Vikram, A Haleem (Sub-Is), K Cornell (Research Coordinator).

Mayo Clinic, Rochester, MN: G Barsness (PI), J Jentzer, B Ternus (Sub-Is).

Medstar Washington Hospital Center, Washington, DC: C Barnett (PI), S Ahmed, L Barrett, S Pokharel (Research Coordinators).

New York University Langone Health, New York, NY: N Keller (PI), R Roswell (PI), J Ng (Sub-I).

Rush University Medical Center, Chicago, IL: J Snell (PI), I Atallah, N Jahan, K Jones (Research Coordinators).

Toronto General Hospital, University of Toronto, Toronto, ON Canada: P Lawler (PI), K Tsang (Research Coordinator).

University of Alberta, Edmonton, Alberta, Canada: S van Diepen (PI), W Tymchak (Co-PI), N Hogg (Research Coordinator).

University of Florida, Gainesville, FL: C Alviar (PI), G Bhattal, N Gargus, D Leach (Sub-Is), S Long (Primary coordinator), J Bostick, M Mohammed (Research Coordinators).

University of California San Diego, La Jolla, CA: L Daniels (PI), N Phreaner (Sub-I), P Anzenberg, C Belza, T Getz, J Gonzalez, J Marsal R Sedighi, A Toomu, S Toomu (Research Coordinators).

University of Louisville, Louisville, KY: A DeFilippis (PI), S Vincent (Study nurse).

University of North Carolina, Chapel Hill, NC**:** J Katz (PI), C Dangerfield, R Orgel (Sub-Is), Z Ozen, E Prosser (Investigators), T Wade (Research Coordinator).

Virginia Commonwealth University, Richmond, VA: M Kontos (PI), S Dow, C Vo (Sub-Is).

Supplemental Table 2a. Baseline characteristics by general etiology of shock.

	Cardiogenic, % (n)	Distributive, % (n)	Hypovolemic, % (n)	Mixed, % (n)
	N=450	**N=49**	**N=20**	**N=132**
Demographics				
Age, median (IQR), years	64 (55 – 74)	64 (54 – 73)	67 (58 – 75)	65 (54 – 75)
Female sex	36.2 (163)	34.7 (17)	30.0 (6)	37.1 (49)
White race	68.9 (272)	65.1 (28)	63.2 (12)	66.7 (74)
Weight, median (IQR), kg	82 (69 – 96)	80 (64 – 93)	81 (68 – 101)	82 (68 – 98)
BMI, median (IQR), kg/m^2	28 (24 – 32)	26 (23 – 31)	31 (23 – 34)	28 (24 – 34)
Cardiovascular Comorbidities				
Current smoker	16.9 (75)	14.6 (7)	15.0 (3)	11.5 (15)
Diabetes mellitus	40.0 (180)	32.7 (16)	60.0 (12)	44.7 (59)
Hypertension	59.1 (266)	69.4 (34)	65.0 (13)	60.6 (80)
Coronary artery disease	42.7 (192)	49.0 (24)	45.0 (9)	47.0 (62)
Cerebrovascular disease	8.9 (40)	12.2 (6)	10.0 (2)	7.6 (10)
Peripheral artery disease	10.2 (46)	12.2 (6)	15.0 (3)	11.4 (15)
Prior heart failure	51.3 (231)	46.9 (23)	65.0 (13)	54.5 (72)
Historical LVEF				
≥50%	11.1 (25)	19.0 (4)	41.7 (5)	19.7 (13)
40-<50%	7.1 (16)	0.0 (0)	8.3 (1)	4.5 (3)
30-<40%	11.1 (25)	4.8 (1)	8.3 (1)	15.2 (10)
20-<30%	29.6 (67)	47.6 (10)	8.3 (1)	31.8 (21)
<20%	41.2 (93)	28.6 (6)	33.3 (4)	28.8 (19)
Prior heart transplant	0.9 (4)	6.1 (3)	0.0 (0)	3.8 (5)
Atrial fibrillation	23.3 (105)	22.4 (11)	50.0 (10)	27.3 (36)
Ventricular arrhythmia	9.6 (43)	8.2 (4)	5.0 (1)	8.3 (11)
Severe valvular disease	11.6 (52)	10.2 (5)	20.0 (4)	26.5 (35)
Pulmonary hypertension	7.1 (32)	6.1 (3)	5.0 (1)	3.8 (5)
Congenital heart disease	1.3 (6)	4.1 (2)	5.0 (1)	3.0 (4)
Non-cardiovascular comorbidities				
Chronic kidney disease	32.0 (144)	22.4 (11)	45.0 (9)	35.6 (47)
On dialysis	14.6 (21)	36.4 (4)	55.6 (5)	42.6 (20)
Significant pulmonary disease	16.4 (74)	32.7 (16)	20.0 (4)	13.6 (18)
Significant liver disease	4.2 (19)	4.1 (2)	5.0 (1)	6.8 (9)

Categorical variables are shown as percentages with counts in parentheses. Continuous variables are shown as medians and interquartile ranges. Patients with unknown etiology of shock (n=26) are not included. BMI indicates body mass index; IQR, interquartile range; kg, kilograms; kg/m^2, kilograms per meter-squared; LVEF, left ventricular ejection fraction.

Supplemental Table 2b. Presenting features, ICU resource utilization, and outcomes by general etiology of shock.

	Cardiogenic, % (n)	Distributive, % (n)	Hypovolemic, % (n)	Mixed, % (n)
	N=450	**N=49**	**N=20**	**N=132**
Clinical features/illness severity				
SOFA score	8 (5 – 11)	9 (6 – 12)	7 (4 – 10)	10 (6 – 13)
"Worst" lab values				
Lactate, median (IQR), mmol/L	3.1 (1.9 – 6.5)	3.8 (2.1 – 6.7)	2.9 (1.9 – 7.0)	4.2 (2.4 – 8.1)
Lactate >2 mmol/L	69.7 (260)	80.0 (36)	68.4 (13)	81.1 (103)
Arterial pH, median (IQR)	7.34 (7.21 – 7.43)	7.31 (7.19 – 7.38)	7.37 (7.04 – 7.38)	7.29 (7.21 – 7.40)
Arterial pH <7.25	31.1 (92)	41.2 (14)	36.4 (4)	35.3 (36)
eGFR, median (IQR), mL/min/1.73 m²	38 (20 – 57)	44 (20 – 71)	45 (14 – 68)	31 (14 – 45)
eGFR <60 mL/min/1.73 m²	77.4 (322)	65.3 (32)	70.0 (14)	83.3 (105)
ALT, median (IQR), U/L	64 (29 – 295)	54 (25 – 182)	23 (14 – 43)	73 (30 – 370)
AST, median (IQR), U/L	113 (37 – 473)	81 (35 – 325)	31 (18 – 115)	112 (40 – 664)
Total bilirubin, median (IQR), mg/dL	1.2 (0.7 – 1.9)	1.0 (0.6 – 1.6)	0.7 (0.4 – 1.0)	1.3 (0.7 – 2.7)
Platelets, median (IQR), K/uL	138 (98 – 200)	127 (98 – 200)	129 (87 – 199)	116 (62 – 174)
INR, median (IQR)	1.4 (1.2 – 2.0)	1.6 (1.3 – 2.4)	1.4 (1.3 – 1.8)	1.7 (1.3 – 2.8)
ICU resource utilization				
Days of ICU care, median (IQR)	4.2 (2.2 – 8.4)	5.3 (2.7 – 10.6)	3.6 (1.7 – 6.6)	5.8 (2.9 – 10.0)
Mechanical ventilation	49.6 (223)	59.2 (29)	50.0 (10)	65.9 (87)
Renal replacement therapy	14.7 (66)	12.2 (6)	15.0 (3)	26.5 (35)
Invasive monitoring	68.9 (310)	63.3 (31)	70.0 (14)	67.4 (89)
Central venous line	46.9 (211)	55.1 (27)	65.0 (13)	54.5 (72)
Pulmonary artery catheter	36.0 (162)	20.4 (10)	30.0 (6)	31.1 (41)
Arterial line	52.4 (236)	51.0 (25)	55.0 (11)	59.8 (79)
Management of shock				
No. of vasoactive medications, median (IQR)	1 (1 – 2)	N/A*	N/A*	2 (1 – 3)
Mechanical circulatory support	36.7 (165)	6.1 (3)	15.0 (3)	22.7 (30)
Outcomes				
CICU mortality	28.9 (24.7 – 33.3)	20.4 (10.2 – 34.3)	15.0 (3.2 – 37.9)	28.8 (21.2 – 37.3)
In-hospital mortality	32.2 (27.9 – 36.8)	30.6 (18.3 – 45.4)	25.0 (8.7 – 49.1)	39.4 (31.0 – 48.3)

Categorical variables are shown as percentages with counts in parentheses. Continuous variables are shown as medians with interquartile ranges. For lactate, ALT, AST, total bilirubin, and INR, the "worst values" were the highest laboratory values; for arterial pH, eGFR, and platelets, the "worst values" were the lowest laboratory values. Mortality outcomes are shown with absolute binomial 95% confidence intervals. Patients with unknown etiology of shock (n=26) are not included. (*) Vasoactive medication use was not systematically collected for patients with distributive and hypovolemic shock. ALT indicates alanine aminotransferase; AST, aspartate aminotransferase; eGFR, estimated glomerular filtration rate;

ICU, intensive care unit; IQR, interquartile range; K/uL, thousand per microliter; LVEF, left ventricular ejection fraction; mg/dL, milligrams per deciliter; mmol/L, millimoles per liter; N/A, not applicable; No., number; U/L, units per liter.

Supplemental Table 3a. Baseline characteristics of CICU patients without shock.

	CICU Patients Without Shock, % (n)
	N=2372
Demographics	
Age, median (IQR), years	65 (55 – 75)
Female sex	37.3 (884)
White race	69.0 (1342)
Weight, median (IQR), kg	83 (68 – 98)
BMI, median (IQR), kg/m^2	28 (24 – 33)
Cardiovascular Comorbidities	
Current smoker	20.0 (468)
Diabetes mellitus	33.2 (787)
Hypertension	67.3 (1597)
Coronary artery disease	41.0 (973)
Cerebrovascular disease	10.0 (238)
Peripheral artery disease	9.1 (215)
Prior heart failure	31.9 (757)
Historical LVEF	
≥50%	29.1 (212)
40-<50%	14.0 (102)
30-<40%	16.6 (121)
20-<30%	22.5 (164)
<20%	17.8 (130)
Prior heart transplant	1.4 (33)
Atrial fibrillation	22.9 (544)
Ventricular arrhythmia	5.1 (121)
Severe valvular disease	14.0 (332)
Pulmonary hypertension	3.6 (85)
Congenital heart disease	1.8 (43)
Non-cardiovascular comorbidities	
Chronic kidney disease	21.8 (518)
On dialysis	22.6 (117)
Significant pulmonary disease	13.4 (317)
Significant liver disease	2.7 (63)

Categorical variables are shown as percentages with counts in parentheses. Continuous variables are shown as medians with interquartile ranges. BMI indicates body mass index; CICU, cardiac intensive care unit; IQR, interquartile range; kg, kilograms; kg/m^2, kilograms per meter-squared; LVEF, left ventricular ejection fraction.

Supplemental Table 3b. Presenting features, ICU resource utilization, and outcomes in CICU patients without shock.

	CICU Patients Without Shock, % (n)
	N=2372
Illness severity	
SOFA score	2 (1 – 4)
"Worst" lab values	
Lactate, median (IQR), mmol/L	1.6 (1.1 – 2.6)
Lactate >2.0 mmol/L	36.4 (411)
Arterial pH, median (IQR)	7.37 (7.30 – 7.42)
Arterial pH <7.25	10.8 (69)
eGFR, median (IQR), mL/min/1.73 m²	63 (39 – 85)
eGFR <60 mL/min/1.73 m²	47.0 (961)
ALT, median (IQR), U/L	27 (18 - 46)
AST, median (IQR), U/L	34 (22 – 69)
Total bilirubin, median (IQR), mg/dL	0.7 (0.5 – 1.0)
Platelets, median (IQR), K/uL	183 (135 – 230)
INR, median (IQR)	1.2 (1.1 – 1.4)
ICU resource utilization	
Days of ICU care, median (IQR)	1.9 (1.0 – 3.6)
Mechanical ventilation	12.1 (287)
Renal replacement therapy	2.7 (65)
Invasive monitoring	21.2 (504)
Central venous line	12.3 (292)
Pulmonary artery catheter	5.1 (120)
Arterial line	13.5 (320)
Outcomes	
CICU mortality	2.7 (2.1 – 3.5)
In-hospital mortality	4.6 (3.8 – 5.5)

Categorical variables are shown as percentages with counts in parentheses. Continuous variables are shown as medians with interquartile ranges. For lactate, ALT, AST, total bilirubin, and INR, the "worst values" were the highest laboratory values; for arterial pH, eGFR, and platelets, the "worst values" were the lowest laboratory values. Mortality outcomes are shown with absolute binomial 95% confidence intervals. ALT indicates alanine aminotransferase; AST, aspartate aminotransferase; CICU, cardiac intensive care unit; eGFR, estimated glomerular filtration rate; ICU, intensive care unit; IQR, interquartile range; K/uL, thousand per microliter; LVEF, left ventricular ejection fraction; mg/dL, milligrams per deciliter; mmol/L, millimoles per liter; No., number; U/L, units per liter.

Supplemental Table 4. Mortality by shock type excluding patients with initial cardiac arrest.

	AMICS, % (95% CI)	CS Without AMI, % (95% CI)	Mixed, % (95% CI)
	N=94	**N=244**	**N=98**
Outcomes			
CICU mortality	28.7 (19.9 – 39.0)	17.6 (13.1 – 23.0)	23.5 (15.5 – 33.1)
In-hospital mortality	30.9 (21.7 – 41.2)	20.9 (16.0 – 26.5)	36.7 (27.2 – 47.1)

Mortality outcomes are shown with absolute binomial 95% confidence intervals. AMI indicates acute myocardial infarction; AMICS, acute myocardial infarction cardiogenic shock; CICU, cardiac intensive care unit; CS, cardiogenic shock.

Supplemental Table 5a. Baseline characteristics of cardiogenic shock (CS) patients treated vs. not treated with mechanical circulatory support (MCS).

	MCS Patients, % (n)	Non-MCS Patients, % (n)
	N=165	**N=285**
Demographics		
Age, median (IQR), years	63 (54 – 72)	65 (55 – 74)
Female sex	35.8 (59)	36.5 (104)
White race	77.6 (114)	63.7 (158)
Weight, median (IQR), kg	85 (72 – 95)	80 (68 – 97)
BMI, median (IQR), kg/m^2	28 (24 – 32)	28 (23 – 32)
Cardiovascular Comorbidities		
Current smoker	20.7 (34)	14.6 (41)
Diabetes mellitus	44.2 (73)	37.5 (107)
Hypertension	58.2 (96)	59.6 (170)
Coronary artery disease	43.0 (71)	42.5 (121)
Cerebrovascular disease	12.1 (20)	7.0 (20)
Peripheral artery disease	9.1 (15)	10.9 (31)
Prior heart failure	38.2 (63)	58.9 (168)
Historical LVEF		
≥50%	12.7 (8)	10.4 (17)
40-<50%	6.3 (4)	7.4 (12)
30-<40%	6.3 (4)	12.9 (21)
20-<30%	38.1 (24)	26.4 (43)
<20%	36.5 (23)	42.9 (70)
Prior heart transplant	1.2 (2)	0.7 (2)
Atrial fibrillation	17.0 (28)	27.0 (77)
Ventricular arrhythmia	10.3 (17)	9.1 (26)
Severe valvular disease	7.3 (12)	14.0 (40)
Pulmonary hypertension	4.8 (8)	8.4 (24)
Congenital heart disease	0.6 (1)	1.8 (5)
Non-cardiovascular comorbidities		
Chronic kidney disease	22.4 (37)	37.5 (107)
On dialysis	21.6 (8)	12.1 (13)
Significant pulmonary disease	12.7 (21)	18.6 (53)
Significant liver disease	3.6 (6)	4.6 (13)

Categorical variables are shown as percentages with counts in parentheses. Continuous variables are shown as medians with interquartile ranges. BMI indicates body mass index; IQR, interquartile range; kg, kilograms; kg/m^2, kilograms per meter-squared; LVEF, left ventricular ejection fraction; MCS, mechanical circulatory support.

Supplemental Table 5b. Management, resource utilization, and outcomes in cardiogenic shock (CS) patients treated vs. not treated with mechanical circulatory support (MCS).

	MCS Patients, % (n)	Non-MCS Patients, % (n)
	N=165	**N=286**
Illness severity		
SOFA score	9 (5 – 12)	7 (5 – 10)
"Worst" lab values		
Lactate, median (IQR), mmol/L	3.7 (2.0 – 9.3)	2.9 (1.8 – 5.7)
Lactate >2.0 mmol/L	73.2 (104)	67.5 (156)
Arterial pH, median (IQR)	7.32 (7.19 – 7.40)	7.37 (7.23 – 7.44)
Arterial pH <7.25	35.7 (45)	27.6 (47)
eGFR, median (IQR), mL/min/1.73 m²	40 (22 – 61)	38 (20 – 55)
eGFR <60 mL/min/1.73 m²	73.3 (110)	79.7 (212)
ALT, median (IQR), U/L	83 (38 – 426)	58 (25 – 231)
AST, median (IQR), U/L	183 (65 – 797)	82 (30 – 321)
Total bilirubin, median (IQR), mg/dL	1.2 (0.8 – 2.0)	1.2 (0.7 – 1.8)
Platelets, median (IQR), K/uL	121 (77 – 172)	150 (109 – 216)
INR, median (IQR)	1.5 (1.2 – 2.0)	1.4 (1.2 – 2.0)
ICU resource utilization		
Days of ICU care, median (IQR)	5.5 (2.9 – 10.5)	3.7 (2.1 – 7.1)
Mechanical ventilation	64.8 (107)	40.6 (116)
Renal replacement therapy	18.8 (31)	12.2 (35)
Invasive monitoring	81.2 (134)	61.5 (176)
Central venous line	61.2 (101)	38.5 (110)
Pulmonary artery catheter	43.0 (71)	31.8 (91)
Arterial line	64.8 (107)	45.3 (129)
Management of shock		
No. of vasoactive medications, median (IQR)	2 (1 – 3)	1 (1 – 2)
Mechanical circulatory support	100.0 (165)	0.0 (0)
Outcomes		
CICU mortality	34.5 (27.3 – 42.3)	25.6 (20.6 – 31.1)
In-hospital mortality	40.0 (32.5 – 47.9)	27.7 (22.6 – 33.3)

Categorical variables are shown as percentages with counts in parentheses. Continuous variables are shown as medians with interquartile ranges. For lactate, ALT, AST, total bilirubin, and INR, the "worst values" were the highest laboratory values; for arterial pH, eGFR, and platelets, the "worst values" were the lowest laboratory values. Mortality outcomes are shown with absolute binomial 95% confidence intervals. ALT indicates alanine aminotransferase; AST, aspartate aminotransferase; CICU, cardiac intensive care unit; CS, cardiogenic shock; ICU, intensive care unit; IQR, interquartile range; K/uL, thousand per microliter; LVEF, left ventricular ejection fraction; mg/dL, milligrams per deciliter; mmol/L, millimoles per liter; No., number; U/L, units per liter.

Supplemental Table 6a. Sensitivity analysis restricted to cardiogenic shock (CS) patients with invasive hemodynamic assessment: clinical characteristics.

	CS Patients with PA Catheters, % (n)	All CS Patients, % (n)	Mixed Shock Patients with PA Catheters, % (n)	All Mixed Shock Patients, % (n)
	N=214	**N=450**	**N=55**	**N=132**
Demographics				
Age, median (IQR), years	63 (55 – 72)	64 (55 – 74)	65 (55 – 69)	65 (54 – 75)
Female sex	32.7 (70)	36.2 (163)	38.2 (21)	37.1 (49)
White race	72.3 (138)	68.9 (272)	67.4 (31)	66.7 (74)
Weight, median (IQR), kg	84 (71 – 94)	82 (69 – 96)	83.0 (71 – 98)	82 (68 – 98)
BMI, median (IQR), kg/m^2	28 (24 – 32)	28 (24 – 32)	29 (25 – 35)	28 (24 – 34)
Cardiovascular Comorbidities				
Current smoker	14.7 (31)	16.9 (75)	11.1 (6)	11.5 (15)
Diabetes mellitus	43.0 (92)	40.0 (180)	50.9 (28)	44.7 (59)
Hypertension	58.4 (125)	59.1 (266)	60.0 (33)	60.6 (80)
Coronary artery disease	42.5 (91)	42.7 (192)	56.4 (31)	47.0 (62)
Cerebrovascular disease	8.9 (19)	8.9 (40)	9.1 (5)	7.6 (10)
Peripheral artery disease	8.4 (18)	10.2 (46)	16.4 (9)	11.4 (15)
Prior heart failure	58.4 (125)	51.3 (231)	58.2 (32)	54.5 (72)
Historical LVEF				
≥50%	12.1 (15)	11.1 (25)	22.6 (7)	19.7 (13)
40-<50%	6.5 (8)	7.1 (16)	3.2 (1)	4.5 (3)
30-<40%	5.6 (7)	11.1 (25)	16.1 (5)	15.2 (10)
20-<30%	33.9 (42)	29.6 (67)	29.0 (9)	31.8 (21)
<20%	41.9 (52)	41.2 (93)	29.0 (9)	28.8 (19)
Prior heart transplant	1.9 (4)	0.9 (4)	7.3 (4)	3.8 (5)
Atrial fibrillation	26.2 (56)	23.3 (105)	25.5 (14)	27.3 (36)
Ventricular arrhythmia	11.7 (25)	9.6 (43)	9.1 (5)	8.3 (11)
Severe valvular disease	14.5 (31)	11.6 (52)	32.7 (18)	26.5 (35)
Pulmonary hypertension	6.1 (13)	7.1 (32)	3.6 (2)	3.8 (5)
Congenital heart disease	0.9 (2)	1.3 (6)	1.8 (1)	3.0 (4)
Non-cardiovascular comorbidities				
Chronic kidney disease	36.4 (78)	32.0 (144)	41.8 (23)	35.6 (47)
On dialysis	12.8 (10)	14.6 (21)	26.1 (6)	42.6 (20)
Significant pulmonary disease	14.5 (31)	16.4 (74)	12.7 (7)	13.6 (18)
Significant liver disease	2.8 (6)	4.2 (19)	5.5 (3)	6.8 (9)

Categorical variables are shown as percentages with counts in parentheses. Continuous variables are shown as medians with interquartile ranges. BMI indicates body mass index; IQR, interquartile range; kg, kilograms; kg/m^2, kilograms per meter-squared; LVEF, left ventricular ejection fraction.

Supplemental Table 6b. Sensitivity analysis restricted to cardiogenic shock (CS) patients with invasive hemodynamic assessment: management, resource utilization, and outcomes.

	CS Patients with PA Catheters, % (n)	All CS Patients, % (n)	Mixed Shock Patients with PA Catheters, % (n)	Mixed, % (n)
	N=214	N=450	N=55	N=132
Illness severity				
SOFA score	7 (5 – 11)	8 (5 – 11)	9 (7 – 13)	10 (6 – 13)
"Worst" lab values				
Lactate, median (IQR), mmol/L	2.8 (1.9 – 5.9)	3.1 (1.9 – 6.5)	4.5 (2.7 – 8.1)	4.2 (2.4 – 8.1)
Lactate >2.0 mmol/L	66.7 (124)	69.7 (260)	88.2 (45)	81.1 (103)
Arterial pH, median (IQR)	7.36 (7.24 – 7.42)	7.34 (7.21 – 7.43)	7.27 (7.21 – 7.38)	7.29 (7.21 – 7.40)
Arterial pH <7.25	26.8 (41)	31.1 (92)	33.3 (15)	35.3 (36)
eGFR, median (IQR), mL/min/1.73 m²	37 (19 – 53)	38 (20 – 57)	27 (15 – 38)	31 (14 – 45)
eGFR <60 mL/min/1.73 m²	81.3 (165)	77.4 (322)	94.3 (50)	83.3 (105)
ALT, median (IQR), U/L	65 (31 – 295)	64 (29 – 295)	114 (39 – 708)	73 (30 – 370)
AST, median (IQR), U/L	101 (37 – 524)	113 (37 – 473)	164 (41 – 1053)	112 (40 – 664)
Total bilirubin, median (IQR), mg/dL	1.2 (0.8 – 2.1)	1.2 (0.7 – 1.9)	1.6 (0.9 – 3.3)	1.3 (0.7 – 2.7)
Platelets, median (IQR), K/uL	129 (94 – 189)	138 (98 – 200)	103 (58 – 148)	116 (62 – 174)
INR, median (IQR)	1.5 (1.2 – 1.9)	1.4 (1.2 – 2.0)	1.8 (1.3 – 3.1)	1.7 (1.3 – 2.8)
ICU resource utilization				
Days of ICU care, median (IQR)	5.5 (2.6 – 10.4)	4.2 (2.2 – 8.4)	7.2 (4.5 – 15.2)	5.8 (2.9 – 10.0)
Mechanical ventilation	48.6 (104)	49.6 (223)	70.9 (39)	65.9 (87)
Renal replacement therapy	15.9 (34)	14.7 (66)	34.5 (19)	26.5 (35)
Invasive monitoring	86.9 (186)	68.9 (310)	89.1 (49)	67.4 (89)
Central venous line	53.7 (115)	46.9 (211)	70.9 (39)	54.5 (72)
Pulmonary artery catheter	75.7 (162)	36.0 (162)	74.5 (41)	31.1 (41)
Arterial line	63.6 (136)	52.4 (236)	85.5 (47)	59.8 (79)
Management of shock				
No. of vasoactive medications, median (IQR)	2 (1 – 2)	1 (1 – 2)	2 (2 – 3)	2 (1 – 3)
Mechanical circulatory support	45.3 (97)	36.7 (165)	41.8 (23)	22.7 (30)
Outcomes				
CICU mortality	26.6 (20.8 – 33.1)	28.9 (24.7 – 33.3)	27.3 (16.1 – 41.0)	28.8 (21.2 – 37.3)
In-hospital mortality	30.4 (24.3 – 37.0)	32.2 (27.9 – 36.8)	38.2 (25.4 – 52.3)	39.4 (31.0 – 48.3)

Categorical variables are shown as percentages with counts in parentheses. Continuous variables are shown as medians with interquartile ranges. For lactate, ALT, AST, total bilirubin, and INR, the "worst values" were the highest laboratory values; for arterial pH, eGFR, and platelets, the "worst values" were the lowest laboratory values. Mortality outcomes are shown with absolute binomial 95% confidence intervals. ALT indicates alanine aminotransferase; AST, aspartate aminotransferase; CICU, cardiac intensive care unit; CS, cardiogenic shock; ICU, intensive care unit; IQR, interquartile range; K/uL, thousand per microliter; LVEF, left ventricular ejection fraction; mg/dL, milligrams per deciliter; mmol/L, millimoles per liter; No., number; PA, pulmonary artery; U/L, units per liter.