

Table S1. ICD-9-CM codes used for the diagnosis or treatment in the current study

Variable	Source	Code
Diabetes	ICD-9 CM	250
Hypertension	ICD-9 CM	401–405
Dyslipidemia	ICD-9 CM	272
Chronic obstructive pulmonary disease	ICD-9 CM	490–496
Ventricular tachycardia/fibrillation	ICD-9 CM	427.1, 427.4
High-degree atrioventricular block	ICD-9 CM	426.0, 426.12, 426.13
Acute renal failure	ICD-9 CM	584
Dialysis	1. ICD-9 CM in files of registry for catastrophic illness patients 2. Order code	1. 585 2. 58001C, 58027C
Stroke	ICD-9 CM	430–436
Pneumonia	ICD-9 CM	480–486, 5070
Sepsis	ICD-9 CM	038, 5990, 7854, 99662, 99762, 7070, 44024, 6826, 73027, 72886, 7907, 59010
Heart failure	ICD-9 CM	428

Table S2. Intensive management and resuscitation strategies

Variable	Non-MCS	IABP	ECMO	<i>P</i>
Patient number	851	99	195	—
Ventilator support	170 (20.0)	45 (45.5)	113 (57.9)	<0.001
Ventilator days	2.5±8.2	7.4±12.6	16.9±17.8	<0.001
Electrical Cardioversion	62 (7.3)	22 (22.2)	98 (50.3)	<0.001
CPR	57 (6.7)	17 (17.2)	62 (31.8)	<0.001
CPR time (minutes)				0.015
<10	40 (70.2)	8 (47.1)	28 (45.2)	
10~30	7 (12.3)	6 (35.3)	11 (17.7)	
>30	10 (17.5)	3 (17.6)	23 (37.1)	
Temporal PPM	63 (7.4)	18 (18.2)	50 (25.6)	<0.001
CVVHD	4 (0.5)	4 (4.0)	50 (25.6)	<0.001
Heart transplantation	0 (0.0)	0 (0.0)	6 (3.1)	<0.001
ICU stays (days)	6.3±9.7	10.3±11.6	18.9±19.0	<0.001
Length of stay (days)	10.3±17.7	14.6±15.2	21.5±23.2	<0.001
Follow up (years)	4.3±4.1	3.9±4.1	2.3±3.3	<0.001

CPR: cardiopulmonary resuscitation; CVVHD: continue venovenous hemofiltration, ICU: intensive care unit; ECMO: extracorporeal membrane oxygenation; IABP: intra-aortic balloon pump; MCS: mechanical circulation support

Table S3. Baseline characteristics and management on admission between Non-MCS with inotropic agents, IABP and ECMO groups

Variable	Non-MCS with inotropic agents			<i>P</i>
	IABP	ECMO		
Number of patients	328	99	195	—
Male gender	179 (55.1)	59 (59.6)	88 (45.1)	0.029
Age (years)	41.8±15.0	44.8±15.6	40.5±13.1	
Age group (years)				0.018
18~39	153 (46.6)	45 (45.5)	99 (50.8)	
40~59	128 (39.0)	30 (30.3)	77 (39.5)	
≥60	47 (14.3)	24 (24.2)	19 (9.7)	
Underlying disease				
Hypertension	26 (7.9)	12 (12.1)	12 (6.2)	0.204
Diabetes	31 (9.5)	13 (13.1)	10 (5.1)	0.054
Dyslipidemia	6 (1.8)	5 (5.1)	1 (0.5)	0.028
COPD	10 (3.0)	6 (6.1)	8 (4.1)	0.386
Examination during the admission				
Heart MRI	18 (5.5)	4 (4.0)	7 (3.6)	0.579
Cardiac biopsy	14 (4.3)	8 (8.1)	45 (23.1)	<0.001
Serum virus detection	217 (66.2)	65 (65.7)	166 (85.1)	<0.001
Intravenous medications during the admission				
Dobutamine	108 (32.9)	57 (57.6)	105 (53.8)	<0.001
Milrinone	1 (0.3)	3 (3.0)	29 (14.9)	<0.001
Dopamine	312 (95.1)	73 (73.7)	172 (88.2)	<0.001
Norepinephrine	85 (25.9)	39 (39.4)	119 (61.0)	<0.001
Epinephrine	84 (25.6)	37 (37.4)	154 (79.0)	<0.001
High dose steroids	14 (4.3)	5 (5.1)	26 (13.3)	<0.001
IVIg	3 (0.9)	2 (2.0)	21 (10.8)	<0.001
Heparin	119 (36.3)	73 (73.7)	181 (92.8)	<0.001
Enoxaparin	34 (10.4)	12 (12.1)	12 (6.2)	0.161
Oral medication for maintenance				
ACEi/ARB	128 (39.0)	48 (48.5)	69 (35.4)	0.093
Beta blocker	78 (23.8)	39 (39.4)	53 (27.2)	0.009

Variable	Non-MCS with inotropic agents			<i>P</i>
		IABP	ECMO	
Digoxin	62 (18.9)	24 (24.2)	37 (19.0)	0.477
K sparing diuretics	42 (12.8)	28 (28.3)	27 (13.8)	0.001
Lipidemia	13 (4.0)	8 (8.1)	6 (3.1)	0.123
Anti-platelets	132 (40.2)	50 (50.5)	57 (29.2)	0.001

Abbreviations:

ACEi/ARB: angiotensin converting enzyme inhibitors/angiotensin receptor blocker;

COPD: chronic obstructive pulmonary disease; ECMO: extracorporeal membrane

oxygenation; IABP: intra-aortic balloon pump; IVIG: intravenous immunoglobulin;

MCS: mechanical circulation support; MRI: magnetic resonance imaging;

Table S4. Intensive management and resuscitation strategies between Non-MCS with inotropic agents, IABP and ECMO groups

Variable	Non-MCS with inotropic agents			<i>P</i>
		IABP	ECMO	
Number of patients	328	99	195	—
Ventilator support	121 (36.9)	45 (45.5)	113 (57.9)	<0.001
Ventilator days	4.9±11.0	7.4±12.6	16.9±17.8	<0.001
Electrical cardioversion	45 (13.7)	22 (22.2)	98 (50.3)	<0.001
CPR	47 (14.3)	17 (17.2)	62 (31.8)	<0.001
CPR time				0.012
<10 minutes	34 (72.3)	8 (47.1)	28 (45.2)	
10~30 minutes	6 (12.8)	6 (35.3)	11 (17.7)	
>30 minutes	7 (14.9)	3 (17.6)	23 (37.1)	
Temporal pacemaker	37 (11.3)	18 (18.2)	50 (25.6)	<0.001
CVVHD	4 (1.2)	4 (4.0)	50 (25.6)	<0.001
Heart transplantation	0 (0.0)	0 (0.0)	6 (3.1)	0.001
ICU stay (days)	8.8±12.7	10.3±11.6	18.9±19.0	<0.001
Length of stay (days)	13.0±18.3	14.6±15.2	21.5±23.2	<0.001
Follow up (years)	4.2±4.4	3.9±4.1	2.3±3.3	<0.001

Abbreviations:

CPR: cardiopulmonary resuscitation; CVVHD: continuous venovenous hemofiltration, ICU: intensive care unit; ECMO: extracorporeal membrane oxygenation; IABP: intra-aortic balloon pump; MCS: mechanical circulation support

Table S5. In-hospital complications between Non-MCS with inotropic agents, IABP and ECMO groups

Variable	Number of events (%)			Adjusted odds ratios and 95% confidence intervals‡					
				IABP vs. Non-MCS with		ECMO vs. Non-MCS with		ECMO vs. IABP	
	Non-MCS	IABP	ECMO	inotropic agents		inotropic agents			
	with inotropic agents (n = 328)	(n = 99)	(n = 195)	OR (95% CI)	P	OR (95% CI)	P	OR (95% CI)	P
VT/VF	30 (9.1)	12 (12.1)	34 (17.4)	1.46 (0.71–2.99)	0.305	1.91 (1.12–3.27)	0.017	1.36 (0.66–2.80)	0.405
High-degree AV block	28 (8.5)	8 (8.1)	11 (5.6)	1.00 (0.43–2.28)	0.994	0.62 (0.30–1.28)	0.196	0.70 (0.27–1.83)	0.471
Acute renal failure	46 (14.0)	13 (13.1)	50 (25.6)	0.90 (0.46–1.77)	0.767	2.32 (1.46–3.68)	<0.001	2.54 (1.28–5.03)	0.007
New use of dialysis	17 (5.2)	6 (6.1)	24 (12.3)	1.12 (0.42–2.97)	0.816	2.68 (1.39–5.19)	0.003	2.29 (0.88–5.92)	0.088
New onset of stroke	5 (1.5)	1 (1.0)	13 (6.7)	0.70 (0.08–6.08)	0.742	4.81 (1.65–13.98)	0.004	6.95 (0.89–54.5)	0.065
In-hospital death	60 (18.3)	19 (19.2)	76 (39.0)	1.07 (0.60–1.93)	0.809	3.03 (2.00–4.58)	<0.001	2.78 (1.53–5.05)	0.001

Abbreviations: AV block: atrioventricular block, VT/VF: ventricular tachycardia/ventricular fibrillation

OR = odds ratio; CI = confidence interval; ECMO: extracorporeal membrane oxygenation; IABP: intra-aortic balloon pump; MCS: mechanical circulation support

‡ adjusted for age, gender, and baseline characteristics listed in supplemental Table 2

Table S6. Long-term outcomes in survivors from acute myocarditis between Non-MCS with inotropic agents, IABP and ECMO groups

Variable	Number of events (%)			Adjusted hazard ratios and 95% confidence intervals‡					
	Non-MCS			IABP vs. Non-MCS with		ECMO vs. Non-MCS with		ECMO vs. IABP	
	with inotropic agents (n = 268)	IABP (n = 80)	ECMO (n = 119)	inotropic agents		inotropic agents			
			HR (95% CI)	P	HR (95% CI)	P	HR (95% CI)	P	
Primary outcomes									
HF hospitalization*	19 (7.1)	5 (6.3)	10 (8.4)	0.70 (0.24, 2.03)	0.509	1.14 (0.48, 2.67)	0.767	1.63 (0.52, 5.16)	0.406
HF hospitalization within 3 months*	8 (3.0)	3 (3.8)	2 (1.7)	1.11 (0.26, 4.87)	0.886	0.51 (0.08, 3.20)	0.470	0.46 (0.07, 3.00)	0.413
HF hospitalization after 3 months*	11 (4.1)	2 (2.5)	8 (6.7)	0.40 (0.08, 2.11)	0.282	1.74 (0.60, 5.11)	0.310	4.34 (0.81, 23.34)	0.088
CV death	39 (14.6)	8 (10.0)	26 (21.8)	0.75 (0.34, 1.65)	0.475	2.03 (1.20, 3.46)	0.009	2.71 (1.19, 6.16)	0.018
CV death within 3 months	19 (7.1)	4 (5.0)	19 (16.0)	1.01 (0.34, 3.02)	0.986	3.00 (1.53, 5.89)	0.001	2.97 (0.98, 8.95)	0.053
CV death after 3 months	20 (7.5)	4 (5.0)	7 (5.9)	0.59 (0.19, 1.81)	0.358	0.91 (0.35, 2.38)	0.851	1.55 (0.42, 5.64)	0.510
All-cause mortality	77 (28.7)	12 (15.0)	32 (26.9)	0.47 (0.25, 0.89)	0.019	1.26 (0.82, 1.95)	0.294	2.67 (1.35, 5.30)	0.005
Mortality within 3 months	36 (13.4)	4 (5.0)	22 (18.5)	0.45 (0.16, 1.29)	0.138	1.76 (1.01, 3.07)	0.046	3.90 (1.32, 11.47)	0.014
Mortality after 3 months	41 (15.3)	8 (10.0)	10 (8.4)	0.40 (0.18, 0.91)	0.029	0.69 (0.32, 1.50)	0.352	1.72 (0.64, 4.64)	0.282
Secondary outcomes									
New dialysis	3 (1.1)	0 (0.0)	0 (0.0)	NA	NA	NA	NA	NA	NA
VT/VF	3 (1.1)	0 (0.0)	1 (0.8)	NA	NA	0.68 (0.05–9.96)	0.781	NA	NA
Stroke	8 (3.0)	0 (0.0)	1 (0.8)	NA	NA	0.30 (0.03–3.32)	0.326	NA	NA

Abbreviations: CV death: cardiovascular death; HF: heart failure, VT/VF: ventricular tachycardia/ventricular fibrillation

HR = hazard ratio; CI = confidence interval; ECMO: extracorporeal membrane oxygenation; IABP: intra-aortic balloon pump; MCS: mechanical circulation support;

* Fine and Gray's sub-distribution hazard model using all-cause mortality as a competing risk;

‡ Adjusted for age, gender, baseline characteristics and medications listed in supplemental Table S2 and in-hospital complications including high-degree atrioventricular block, ventricular tachycardia/ventricular fibrillation and acute renal failure.

Table S7. Primary outcomes of acute myocarditis by examination

Outcome	Heart MRI			Cardiac biopsy			Virus detection		
	Yes	No	<i>P</i> value§	Yes	No	<i>P</i> value§	Yes	No	<i>P</i> value§
Number of patients	49	930	—	62	917	—	642	337	—
Heart failure	3 (6.1)	77 (8.3)	0.561	3 (4.8)	77 (8.4)	0.234	56 (8.7)	24 (7.1)	0.316
CV death	6 (12.2)	129 (13.9)	0.944	7 (11.3)	128 (14.0)	0.381	81 (12.6)	54 (16.0)	0.232
All cause mortality	12 (24.5)	229 (24.6)	0.823	13 (21.0)	228 (24.9)	0.914	148 (23.1)	93 (27.6)	0.529

Abbreviations: CV death: cardiovascular death; MRI: magnetic resonance imaging

§ Obtained from multivariable Cox regression which was adjusted for age, gender, hypertension, diabetes, dyslipidemia, COPD, high-degree AV block, VT/VF, acute renal failure, ACEi/ARB, beta blockers, K sparing diuretics, and study groups.

Supplemental Figure Legends

Fig. S1: Kaplan–Meier estimates of the cumulative incidence of heart failure between three groups: non-MCS group; IABP group and ECMO group. MCS: mechanical circulatory support; ECMO: extracorporeal membrane oxygenation; IABP: intra-aortic balloon pump.

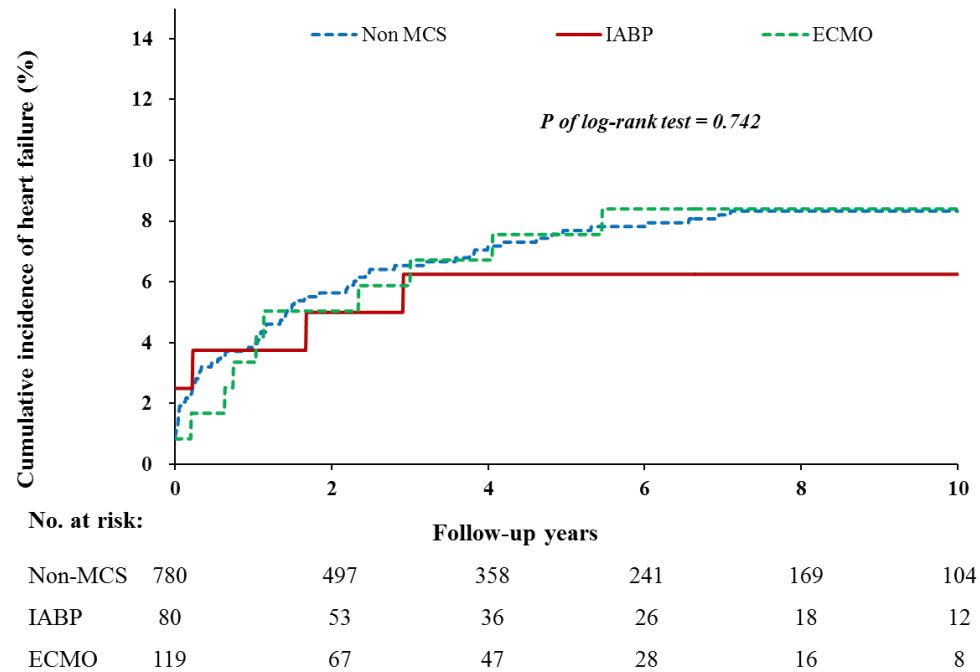


Fig. S2: Kaplan–Meier estimates of the cumulative incidence of accumulative incidence between three groups: non-MCS with inotropic agent group. **(A)** The cumulative incidence of cardiovascular death after index admission, **(B)** The cumulative incidence of all-cause mortality after index admission IABP group and ECMO group. MCS: mechanical circulatory support; ECMO: extracorporeal membrane oxygenation; IABP: intra-aortic balloon pump.

