

Feasibility and Effectiveness of a Multidisciplinary Team Approach in Refractory Cardiogenic Shock: A Prospective Pilot Study

Byung-Soo Ko, Iosif Taleb, Ryan Larsen, Anwar Tandar, Tae Soo Kang, Stephen McKellar, Josef Stehlik, Greg Stoddard, Antigone Koliopoulou, Edward M. Gilbert, Jose Nativi-Nicolau, James Fang, Craig Selzman, Frederick Welt, Stavros G. Drakos

University of Utah School of Medicine, Salt Lake City, UT



BACKGROUND	RESULTS	RESULTS																																																																																																																																																
<ul style="list-style-type: none"> Clinical outcomes of refractory cardiogenic shock (RCS) remain poor Diversity in both etiology and clinical course makes management of this condition challenging Multidisciplinary team approach has been recommended, but not widely adopted 	<table border="1"> <thead> <tr> <th colspan="4">Baseline characteristics</th> </tr> <tr> <th>Variables</th> <th>Shock Team n=18</th> <th>Control n=40</th> <th>p-value</th> </tr> </thead> <tbody> <tr> <td>Age, yrs</td> <td>56±14</td> <td>55±17</td> <td>0.82</td> </tr> <tr> <td>Male (%)</td> <td>16 (88.9)</td> <td>26 (65.0)</td> <td>0.05</td> </tr> <tr> <td>BMI, kg/m²</td> <td>29.2±5.6</td> <td>28.2±5.1</td> <td>0.53</td> </tr> <tr> <th colspan="4">Etiology of shock</th> </tr> <tr> <td>Ischemic (%)</td> <td>11 (61.1)</td> <td>16 (40.0)</td> <td>0.11</td> </tr> <tr> <td>Non-ischemic (%)</td> <td>7 (38.9)</td> <td>24 (60.0)</td> <td>0.11</td> </tr> <tr> <td>Cardiopulmonary Resuscitation (%)</td> <td>9 (50.0)</td> <td>9 (22.5)</td> <td>0.04</td> </tr> <tr> <td>Mechanical ventilation (%)</td> <td>17 (94.4)</td> <td>34 (85.0)</td> <td>0.29</td> </tr> <tr> <td>Number of pressors</td> <td>2.8±1.0</td> <td>2.5±1.1</td> <td>0.37</td> </tr> <tr> <th colspan="4">Presenting Hemodynamics</th> </tr> <tr> <td>Systolic blood pressure, mmHg</td> <td>81.3±17.3</td> <td>82.1±15.1</td> <td>0.87</td> </tr> <tr> <td>Heart rate, bpm</td> <td>103.2±16.0</td> <td>117.0±20.0</td> <td>0.01</td> </tr> <tr> <td>LV Ejection Fraction, %</td> <td>24.6±12.5</td> <td>33.6±16.5</td> <td>0.05</td> </tr> <tr> <th colspan="4">End-organ damage</th> </tr> <tr> <td>Abnormal liver function (%)</td> <td>14 (77.8)</td> <td>16 (40.0)</td> <td><0.01</td> </tr> <tr> <td>Acute renal failure (%)</td> <td>12 (66.7)</td> <td>19 (47.5)</td> <td>0.14</td> </tr> <tr> <td>Lactic acid level, mmol/L</td> <td>7.9±6.0</td> <td>6.7±4.9</td> <td>0.42</td> </tr> <tr> <td>Anoxic brain injury (%)</td> <td>2 (11.1)</td> <td>4 (10.0)</td> <td>0.61</td> </tr> <tr> <th colspan="4">Comorbidities</th> </tr> <tr> <td>Diabetes Mellitus (%)</td> <td>4 (22.2)</td> <td>10 (25.0)</td> <td>0.55</td> </tr> <tr> <td>Smoking (%)</td> <td>12 (66.7)</td> <td>13 (32.5)</td> <td>0.02</td> </tr> <tr> <td>Hypertension (%)</td> <td>7 (38.9)</td> <td>16 (40.0)</td> <td>0.58</td> </tr> <tr> <td>Chronic obstructive lung disease (%)</td> <td>2 (11.1)</td> <td>4 (10.0)</td> <td>0.61</td> </tr> <tr> <td>Chronic kidney disease (%)</td> <td>2 (11.1)</td> <td>4 (10.0)</td> <td>0.61</td> </tr> <tr> <td>Myocardial Infarction (%)</td> <td>2 (11.1)</td> <td>1 (2.5)</td> <td>0.23</td> </tr> <tr> <td>Heart failure with reduced EF (%)</td> <td>5 (27.8)</td> <td>9 (22.5)</td> <td>0.45</td> </tr> <tr> <td>Stroke (%)</td> <td>0 (0)</td> <td>4 (10)</td> <td>0.22</td> </tr> <tr> <td>Transfer from outside facility (%)</td> <td>13 (72.2)</td> <td>22 (55.0)</td> <td>0.17</td> </tr> <tr> <th colspan="4">Outcomes</th> </tr> <tr> <th>Outcomes</th> <th>Shock Team n=18</th> <th>Control n=40</th> <th>P value</th> </tr> <tr> <td>ICU stay, d</td> <td>12.8±13.2</td> <td>26.7±58.9</td> <td>0.33</td> </tr> <tr> <td>Hospital stay, d</td> <td>16.1±15.2</td> <td>30.9±58.9</td> <td>0.30</td> </tr> <tr> <td>30-day mortality, %</td> <td>38.9</td> <td>60</td> <td>0.07</td> </tr> <tr> <td>Time to MCS, hr</td> <td>18.6±48.7</td> <td>25.1±60.0</td> <td>0.69</td> </tr> </tbody> </table>	Baseline characteristics				Variables	Shock Team n=18	Control n=40	p-value	Age, yrs	56±14	55±17	0.82	Male (%)	16 (88.9)	26 (65.0)	0.05	BMI, kg/m ²	29.2±5.6	28.2±5.1	0.53	Etiology of shock				Ischemic (%)	11 (61.1)	16 (40.0)	0.11	Non-ischemic (%)	7 (38.9)	24 (60.0)	0.11	Cardiopulmonary Resuscitation (%)	9 (50.0)	9 (22.5)	0.04	Mechanical ventilation (%)	17 (94.4)	34 (85.0)	0.29	Number of pressors	2.8±1.0	2.5±1.1	0.37	Presenting Hemodynamics				Systolic blood pressure, mmHg	81.3±17.3	82.1±15.1	0.87	Heart rate, bpm	103.2±16.0	117.0±20.0	0.01	LV Ejection Fraction, %	24.6±12.5	33.6±16.5	0.05	End-organ damage				Abnormal liver function (%)	14 (77.8)	16 (40.0)	<0.01	Acute renal failure (%)	12 (66.7)	19 (47.5)	0.14	Lactic acid level, mmol/L	7.9±6.0	6.7±4.9	0.42	Anoxic brain injury (%)	2 (11.1)	4 (10.0)	0.61	Comorbidities				Diabetes Mellitus (%)	4 (22.2)	10 (25.0)	0.55	Smoking (%)	12 (66.7)	13 (32.5)	0.02	Hypertension (%)	7 (38.9)	16 (40.0)	0.58	Chronic obstructive lung disease (%)	2 (11.1)	4 (10.0)	0.61	Chronic kidney disease (%)	2 (11.1)	4 (10.0)	0.61	Myocardial Infarction (%)	2 (11.1)	1 (2.5)	0.23	Heart failure with reduced EF (%)	5 (27.8)	9 (22.5)	0.45	Stroke (%)	0 (0)	4 (10)	0.22	Transfer from outside facility (%)	13 (72.2)	22 (55.0)	0.17	Outcomes				Outcomes	Shock Team n=18	Control n=40	P value	ICU stay, d	12.8±13.2	26.7±58.9	0.33	Hospital stay, d	16.1±15.2	30.9±58.9	0.30	30-day mortality, %	38.9	60	0.07	Time to MCS, hr	18.6±48.7	25.1±60.0	0.69	<p>Survival Probability</p> <p>30-Day Survival</p> <p>30-D HR=0.65, p=0.07</p> <ul style="list-style-type: none"> Marginally significant lower 30-day mortality in SHOCK TEAM group in Cox regression model (38.9% vs. 60%; HR, 0.65, 95% CI [0.40-1.03]) ICU stay and hospital stay also shorter in SHOCK TEAM group No significant delay in management with SHOCK TEAM approach ("Time to MCS" similar between the two groups)
Baseline characteristics																																																																																																																																																		
Variables	Shock Team n=18	Control n=40	p-value																																																																																																																																															
Age, yrs	56±14	55±17	0.82																																																																																																																																															
Male (%)	16 (88.9)	26 (65.0)	0.05																																																																																																																																															
BMI, kg/m ²	29.2±5.6	28.2±5.1	0.53																																																																																																																																															
Etiology of shock																																																																																																																																																		
Ischemic (%)	11 (61.1)	16 (40.0)	0.11																																																																																																																																															
Non-ischemic (%)	7 (38.9)	24 (60.0)	0.11																																																																																																																																															
Cardiopulmonary Resuscitation (%)	9 (50.0)	9 (22.5)	0.04																																																																																																																																															
Mechanical ventilation (%)	17 (94.4)	34 (85.0)	0.29																																																																																																																																															
Number of pressors	2.8±1.0	2.5±1.1	0.37																																																																																																																																															
Presenting Hemodynamics																																																																																																																																																		
Systolic blood pressure, mmHg	81.3±17.3	82.1±15.1	0.87																																																																																																																																															
Heart rate, bpm	103.2±16.0	117.0±20.0	0.01																																																																																																																																															
LV Ejection Fraction, %	24.6±12.5	33.6±16.5	0.05																																																																																																																																															
End-organ damage																																																																																																																																																		
Abnormal liver function (%)	14 (77.8)	16 (40.0)	<0.01																																																																																																																																															
Acute renal failure (%)	12 (66.7)	19 (47.5)	0.14																																																																																																																																															
Lactic acid level, mmol/L	7.9±6.0	6.7±4.9	0.42																																																																																																																																															
Anoxic brain injury (%)	2 (11.1)	4 (10.0)	0.61																																																																																																																																															
Comorbidities																																																																																																																																																		
Diabetes Mellitus (%)	4 (22.2)	10 (25.0)	0.55																																																																																																																																															
Smoking (%)	12 (66.7)	13 (32.5)	0.02																																																																																																																																															
Hypertension (%)	7 (38.9)	16 (40.0)	0.58																																																																																																																																															
Chronic obstructive lung disease (%)	2 (11.1)	4 (10.0)	0.61																																																																																																																																															
Chronic kidney disease (%)	2 (11.1)	4 (10.0)	0.61																																																																																																																																															
Myocardial Infarction (%)	2 (11.1)	1 (2.5)	0.23																																																																																																																																															
Heart failure with reduced EF (%)	5 (27.8)	9 (22.5)	0.45																																																																																																																																															
Stroke (%)	0 (0)	4 (10)	0.22																																																																																																																																															
Transfer from outside facility (%)	13 (72.2)	22 (55.0)	0.17																																																																																																																																															
Outcomes																																																																																																																																																		
Outcomes	Shock Team n=18	Control n=40	P value																																																																																																																																															
ICU stay, d	12.8±13.2	26.7±58.9	0.33																																																																																																																																															
Hospital stay, d	16.1±15.2	30.9±58.9	0.30																																																																																																																																															
30-day mortality, %	38.9	60	0.07																																																																																																																																															
Time to MCS, hr	18.6±48.7	25.1±60.0	0.69																																																																																																																																															
OBJECTIVE	<p>We sought to investigate feasibility and effectiveness of multidisciplinary team approach in patients with RCS</p>	<th style="background-color: #800000; color: white;">CONCLUSIONS</th>	CONCLUSIONS																																																																																																																																															
METHODS	<ul style="list-style-type: none"> Multidisciplinary "SHOCK TEAM", comprised of heart failure cardiologist, interventional cardiologist, intensivist, and cardiothoracic surgeon, was established in April 2015 as part of Utah Cardiac Recovery-SHOCK program Program prospectively investigates management and outcomes of consecutive RCS patients who: <ol style="list-style-type: none"> require temporary percutaneous mechanical circulatory support (MCS) based on predefined criteria and clinical protocol, and being managed by SHOCK TEAM 18 patients enrolled since launch of program were compared with immediately preceding 40 consecutive patients with RCS requiring MCS (control group) 	<ul style="list-style-type: none"> Multidisciplinary shock team approach seems feasible and practical May improve outcomes in patients with RCS 																																																																																																																																																