كليفلاند كلينك أبوظبي
Cleveland Clinic Abu Dhabi
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CARDIOGENIC SHOCK TEAM

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Chair Heart and Vascular Institute
Cleveland Clinic Abu Dhabi
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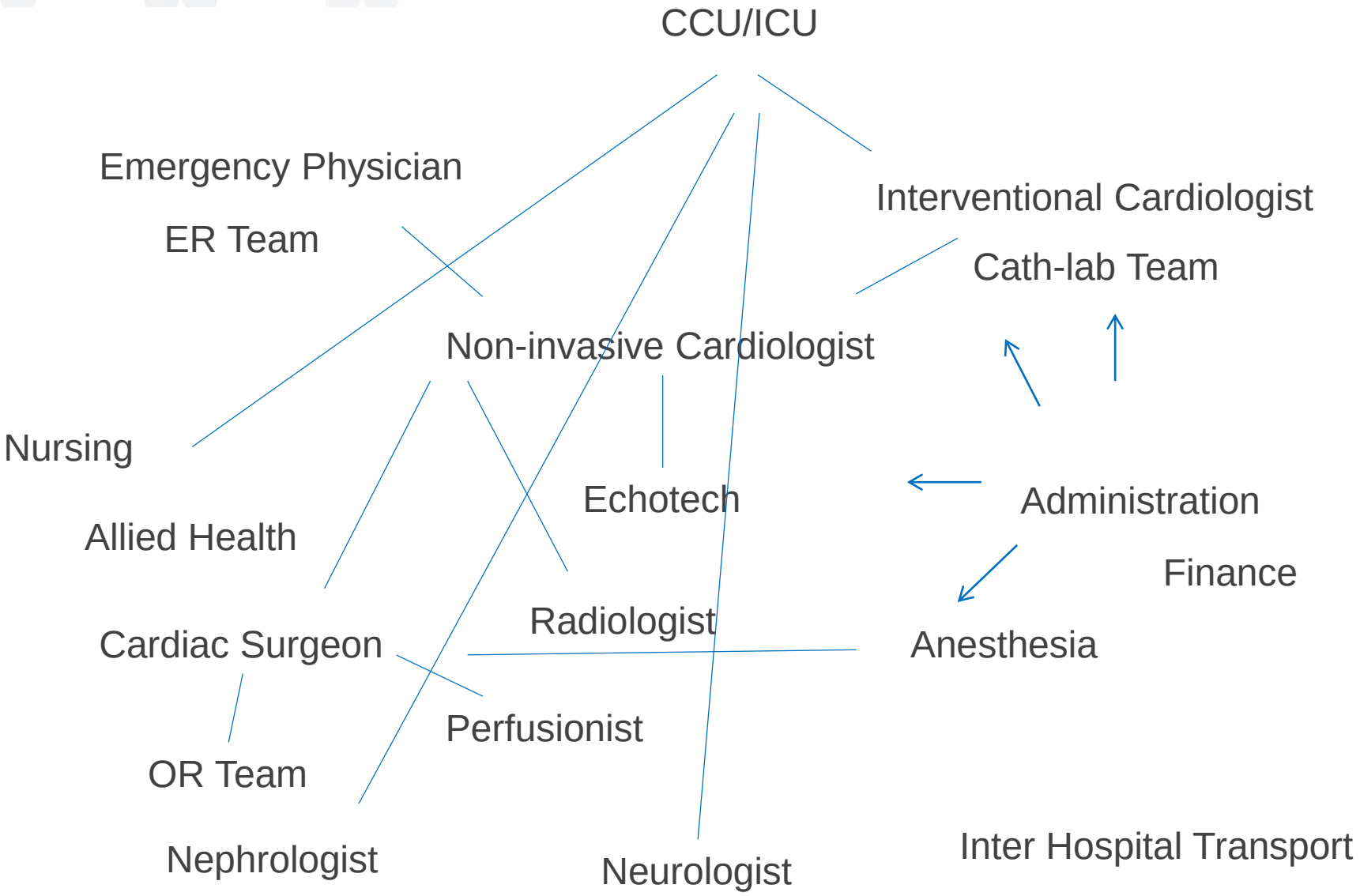
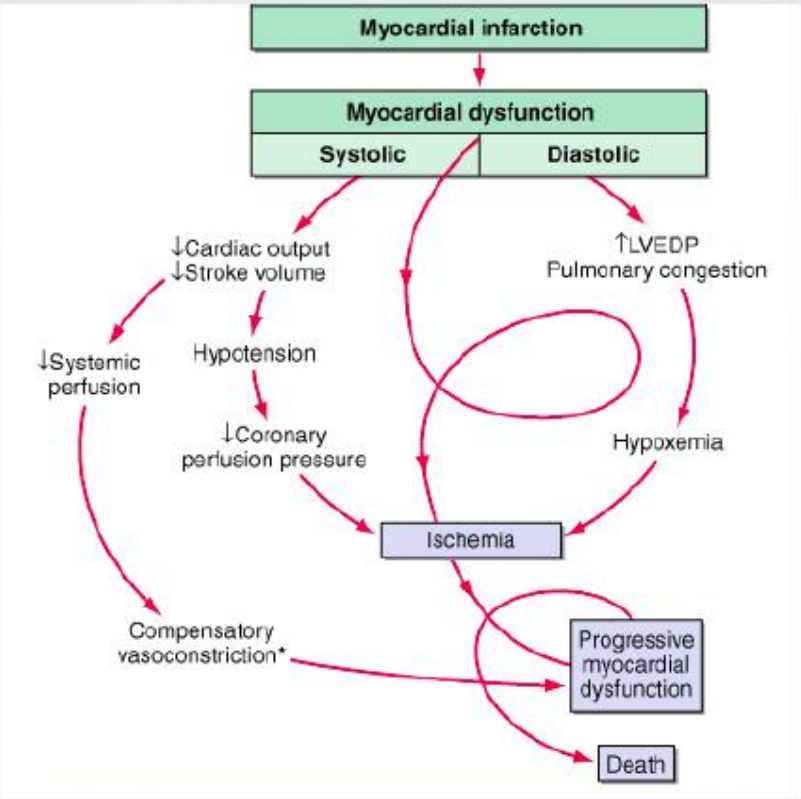
CARDIOGENIC SHOCK TEAM



Cardiogenic shock: decreased cardiac output & evidence of tissue hypo-perfusion in the presence of adequate filling pressures

- Persistent hypotension with SBP<90mmHg
- Reduction in cardiac index (<2.2 L/min/m^2)
- Normal or elevated PCWP (>15mmHg)

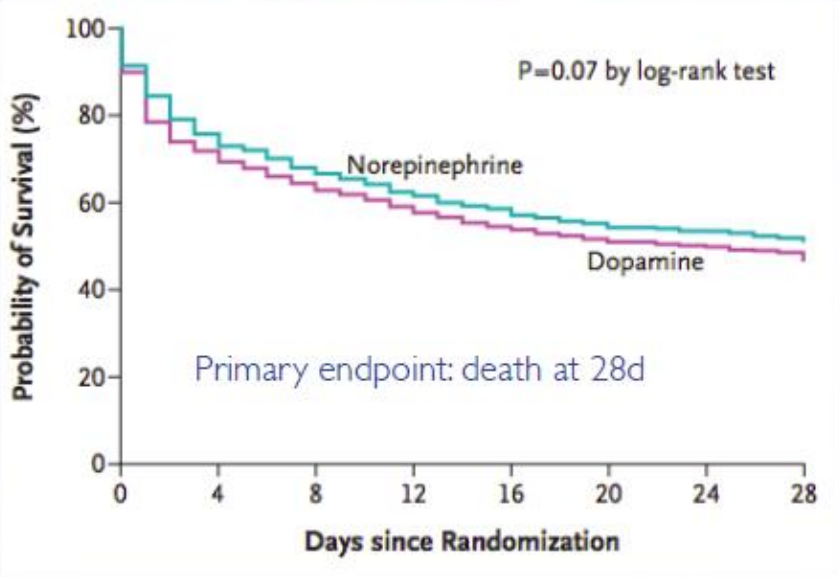
Pathophysiology of Cardiogenic Shock



Hollenberg SM et al. Cardiogenic shock. Ann Int Med 1999; 131:47-59

Inotropes & Vasopressors

1679 patients with shock (sepsis 62%, cardiogenic 17%, Hypovolemia 16%, Other 5%)
Randomized to dopamine or norepinephrine at equal doses



SOAP II

Backer DD et al. Comparison of dopamine and norepinephrine in the treatment of shock. N Engl J Med 2010; 362:779-89

Inotropes/Vasopressors

1679 patients with shock (sepsis 62%, cardiogenic 17%, Hypovolemia 16%, Other 5%)
Randomized to dopamine or norepinephrine at equal doses

Table 3. Secondary Outcomes and Adverse Events.*

Variable	Dopamine (N=858)	Norepinephrine (N=821)	P Value
Adverse events			
Arrhythmias — no. (%)	207 (24.1)	102 (12.4)	<0.001
Atrial fibrillation	176 (20.5)	90 (11.0)	
Ventricular tachycardia	21 (2.4)	8 (1.0)	
Ventricular fibrillation	10 (1.2)	4 (0.5)	

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Inotropes/Vasopressors

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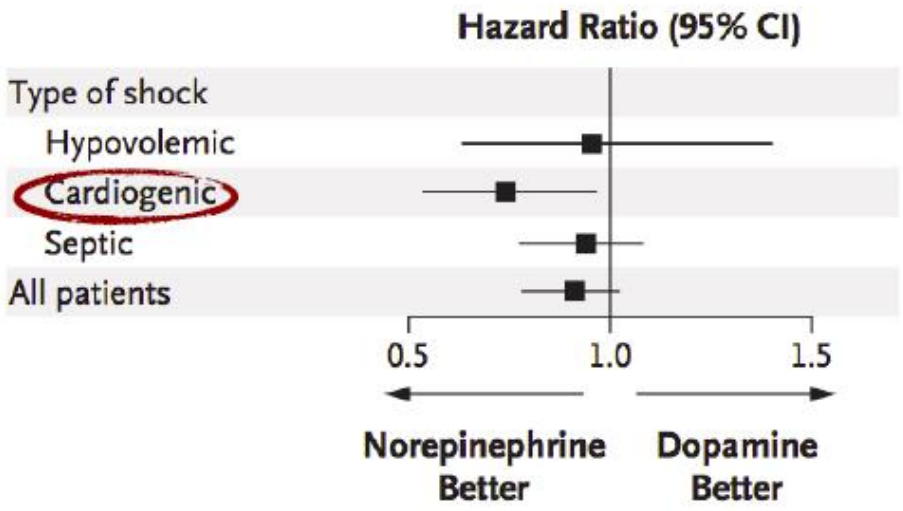

Predefined subgroup analysis according to the type of shock

SOAP II

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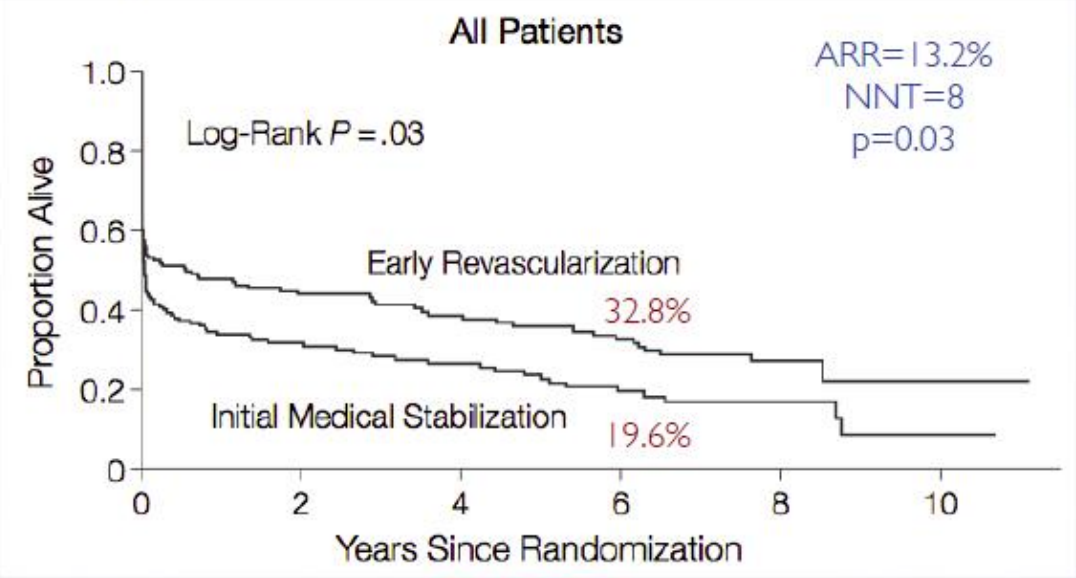
Early Revascularization

302 STEMI patients with cardiogenic shock (CI <2.2L/min/m^2, PCWP>15mmHg) onset within 36h
Randomized to emergency revascularization or medical stabilization

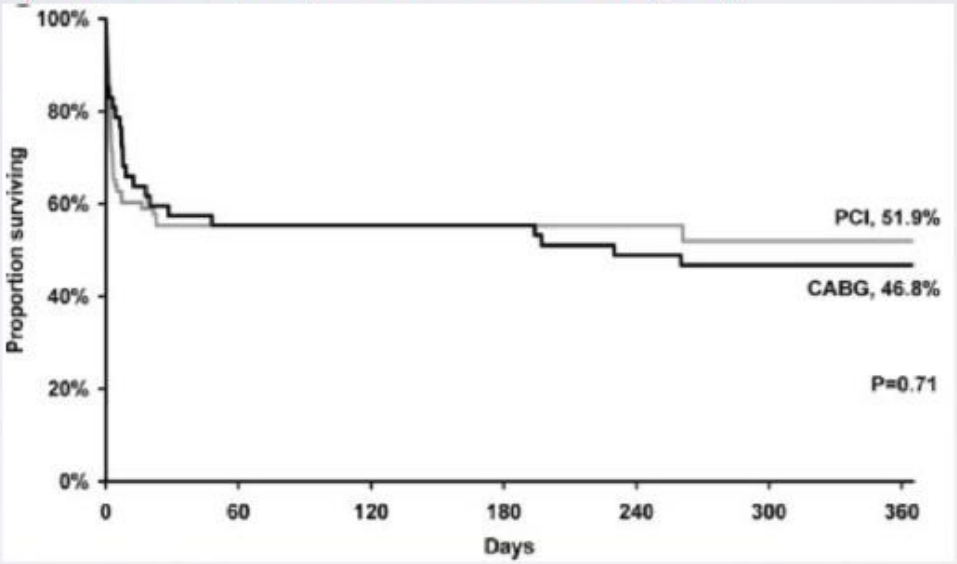


SHOCK

Hochman JS et al. Early revascularization and long-term survival in cardiogenic shock complicating acute myocardial infarction. JAMA 2006; 295:2511-5

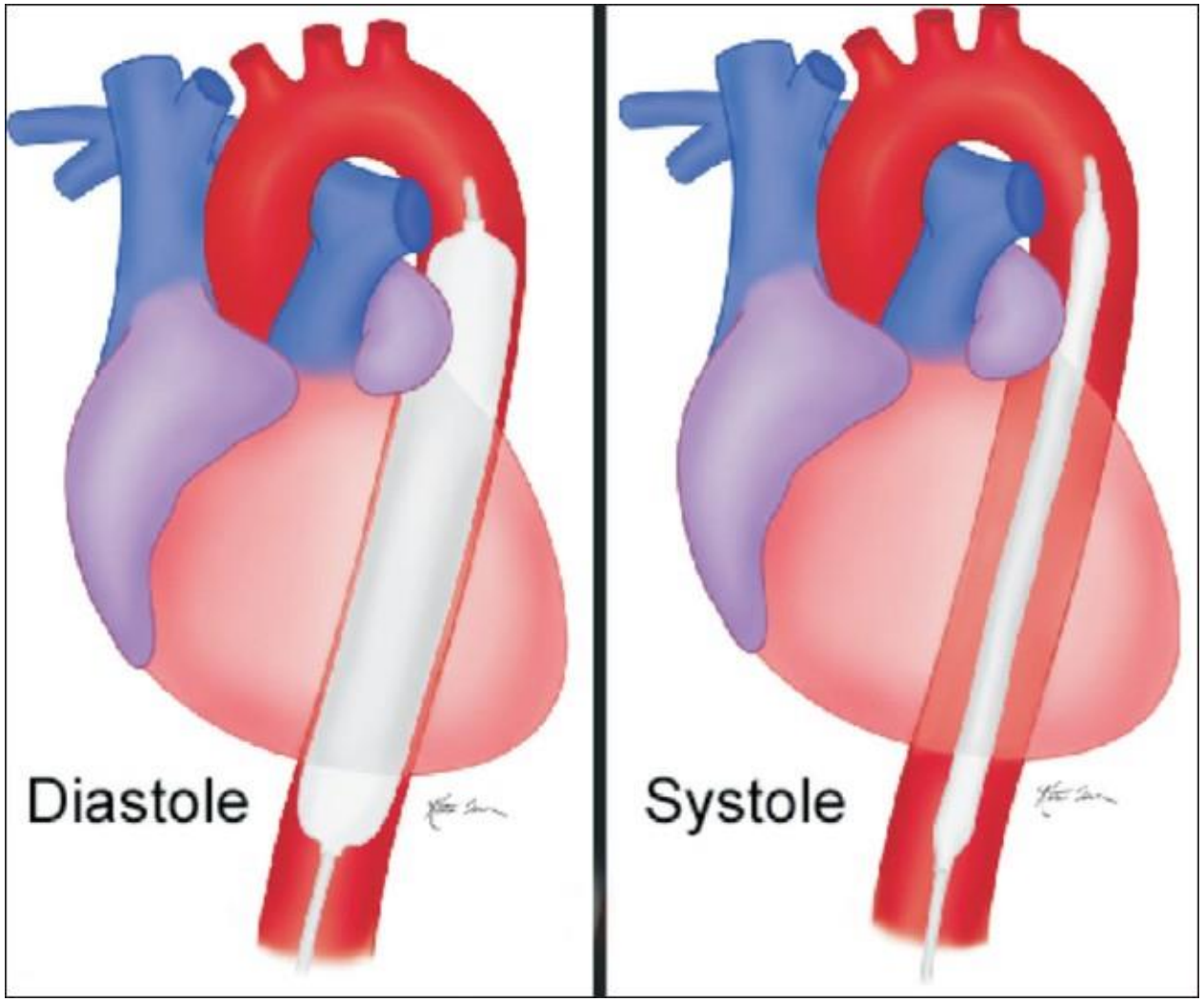
PCI versus CABG

128 of the initial 302 SHOCK trial patients underwent revascularization with either PCI (63.3%) or CABG (36.7%) (more diabetes, 3VD, & LM disease in CABG group)



Emergency CABG is an important complementary treatment option in patients with extensive coronary disease

White HD et al. Comparison of percutaneous coronary intervention and coronary artery bypass grafting after acute myocardial infarction complicated by cardiogenic shock. Circulation 2005; 112:1992-2001

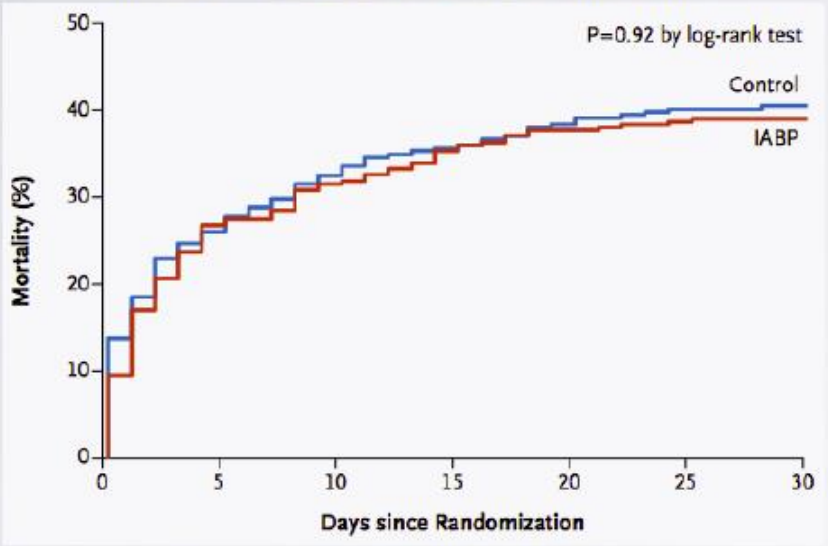

Diastole
Systole

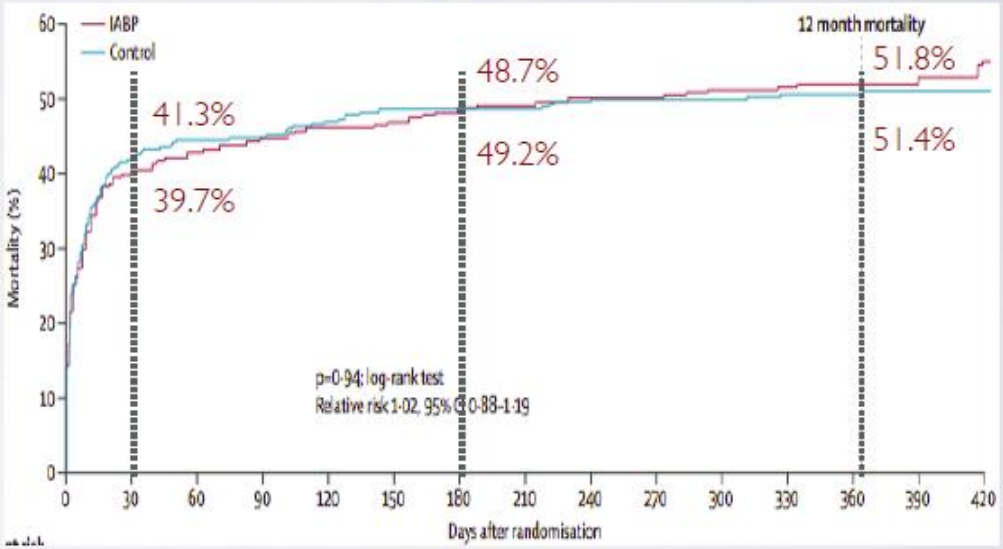
Hemodynamic Support: IABP

Advantages	Disadvantages
Well known technology	Requires a minimum of cardiac function
Increases coronary perfusion	Requires a stable rhythm
Mild increase in cardiac output	Modest unloading
Relatively inexpensive	Negative studies

Routine Use of IABP in Cardiogenic Shock

600 AMI (69% STEMI) patients with cardiogenic shock (median BP=90/55mmHg, range 79-107/46-67)(90% on pressors)
Randomized to IABP or medical stabilization





IABP-SHOCK II

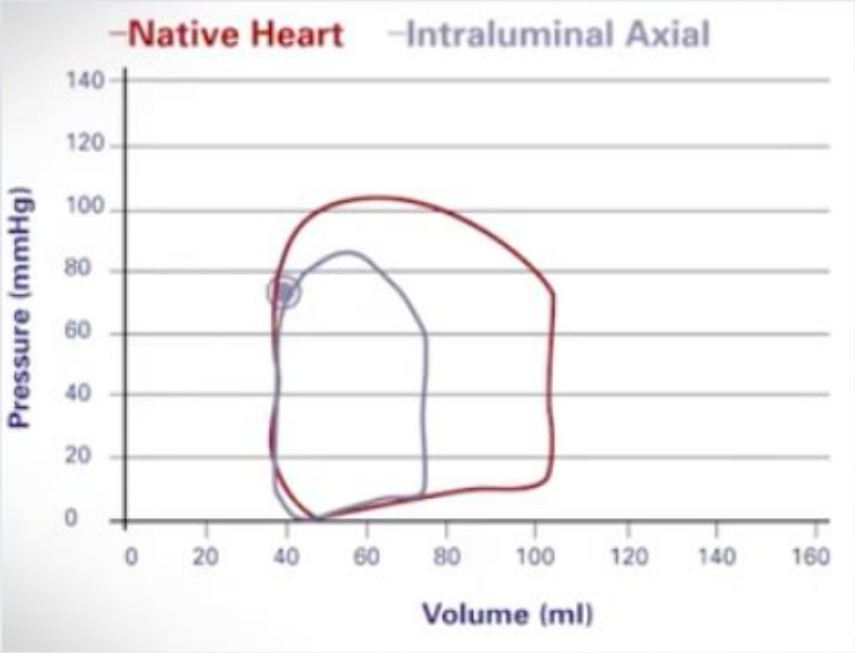
Thiele H et al. Intraaortic balloon support for myocardial infarction with cardiogenic shock. N Engl J Med 2012; 367:1287-96
Thiele H et al. Intra-aortic balloon counterpulsation in acute myocardial infarction complicated by cardiogenic shock (IABP-SHOCK II). Lancet 2013; 382:1638-45

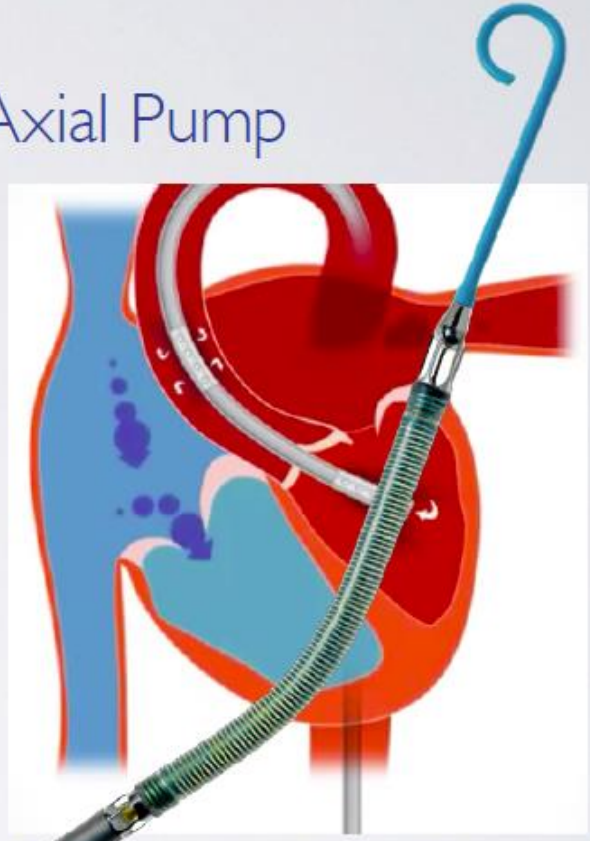
IABP-SHOCK II Trial

Possible reasons for negative IABP-SHOCK II trial findings:

- Clinical rather than hemodynamic definition of shock
- IABP may be insufficient mechanical support
- Definition of refractory cardiogenic shock: median BP=90/55mmHg, range 79-107/46-67 on pressors
- IABP was inserted following (not before) PCI in 84% of patients
- Selection bias as patients with severe cardiogenic shock would be difficult group to recruit into study

Impella Intraluminal Axial Pump



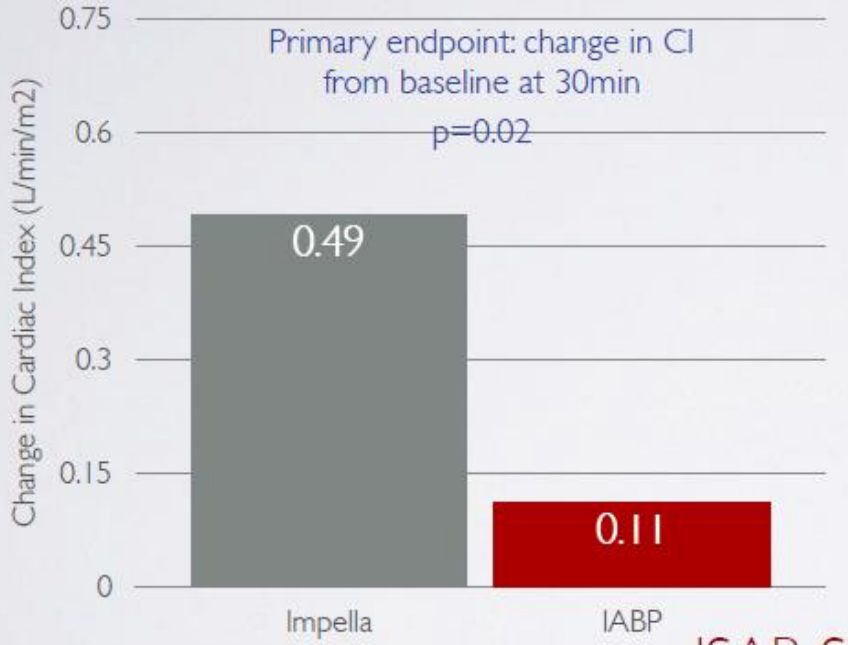


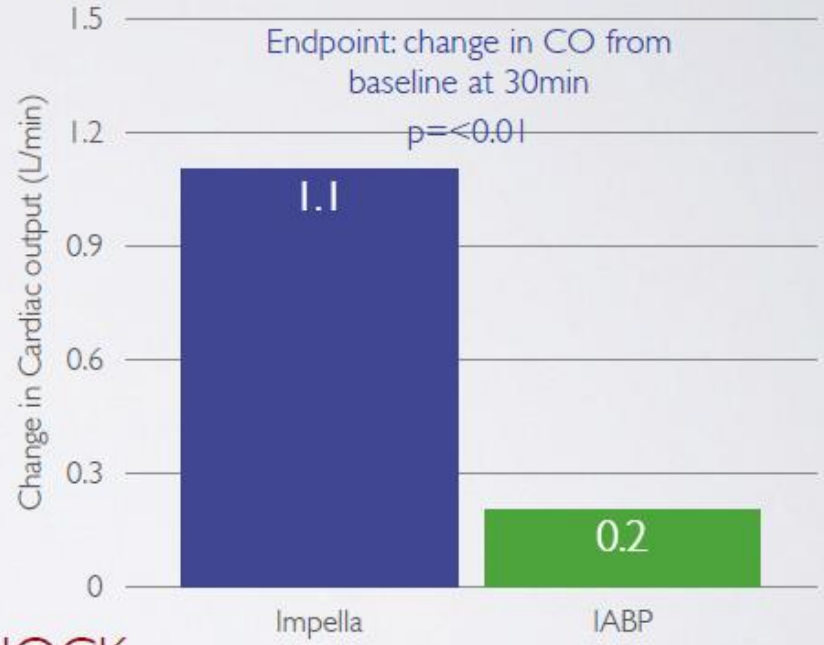
Miniaturized 12-14F pump actively unloads the LV requiring single femoral access; forward flow up to 4.0L/min but requires adequate LV pressure/volume to function


Impella Controller
Impella Position
OK
MUTE
ALARM
P-Level
P-8
DISPLAY
PURGE
SYSTEM
MENU
Impella Flow
2.5 L/min
Purge System
Purge Flow: 20 ml/hr
System Power
100%
ABIOMED

Impella LP 2.5 Compared to IABP

26 AMI patients with cardiogenic shock (88% on pressor support)
Randomized to Impella LP 2.5 versus IABP



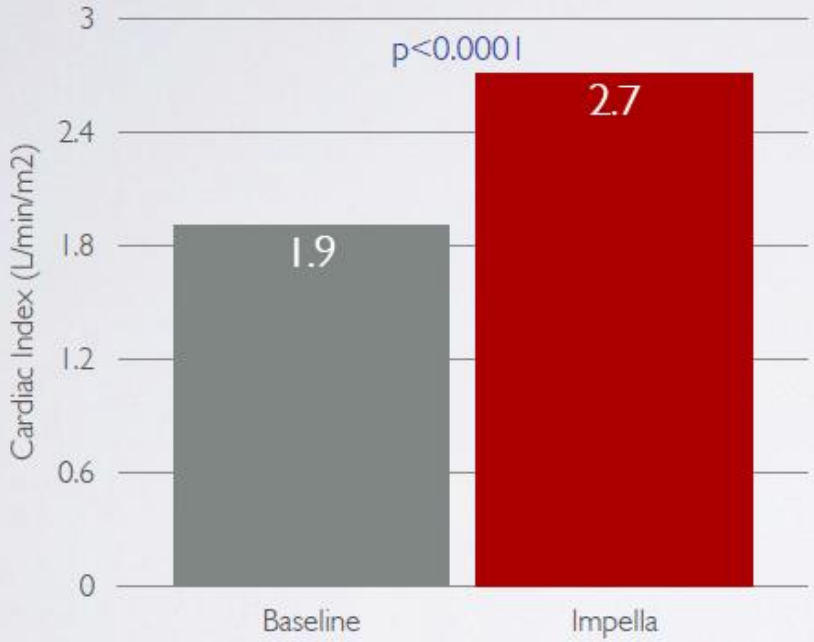


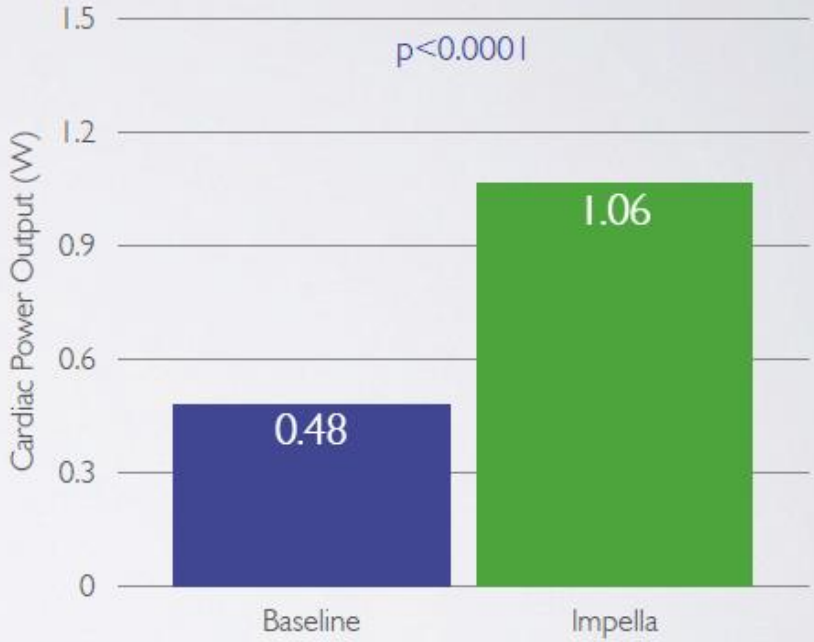
ISAR-SHOCK

Seyfarth M et al. A randomized clinical trial to evaluate the safety and efficacy of a percutaneous left ventricular assist device versus intra-aortic balloon pumping for treatment of cardiogenic shock caused by myocardial infarction. J Am Coll Cardiol 2008; 52:1584-8

Impella LP 2.5 in Cardiogenic Shock

154 AMI (74.7% STEMI) patients with cardiogenic shock (88% documented on pressors)
Registry data collected from patients who received Impella pre-PCI compared to post-PCI





USpella Registry

O'neill WW et al. The current use of Impella 2.5 in acute myocardial infarction complicated by cardiogenic shock: results from the USpella Registry. J Interv Card 2014 27:1-11

Mortality & Cardiac Power Output

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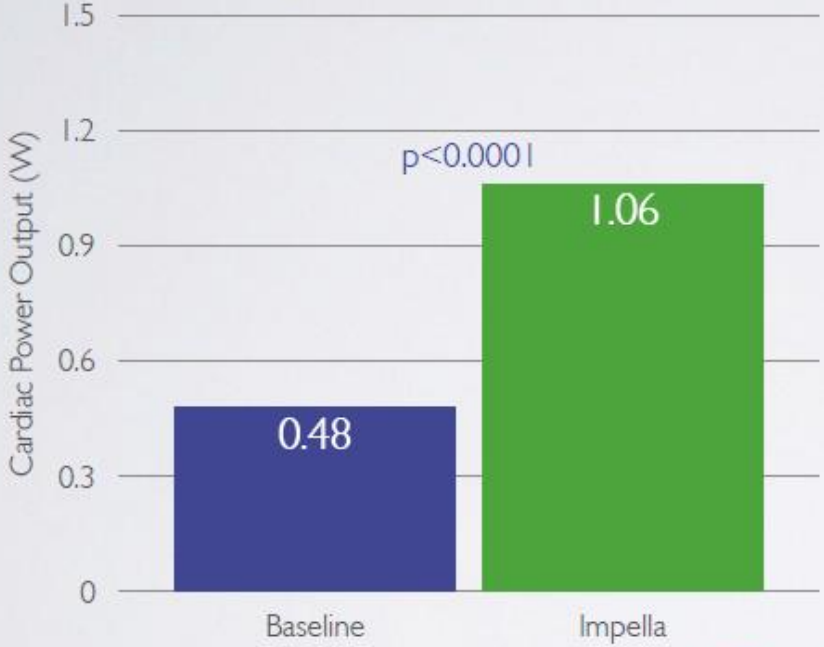

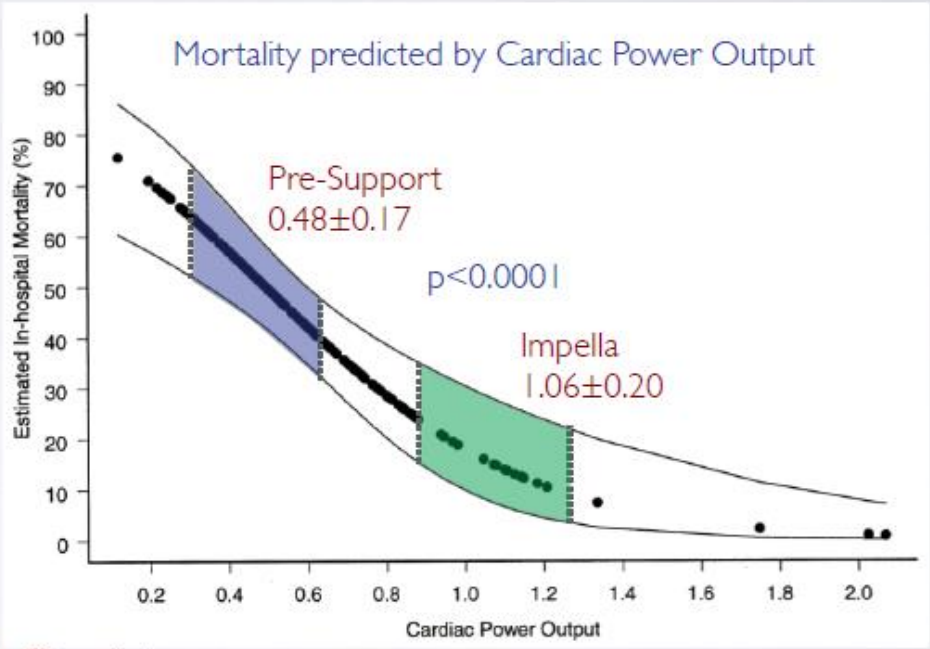

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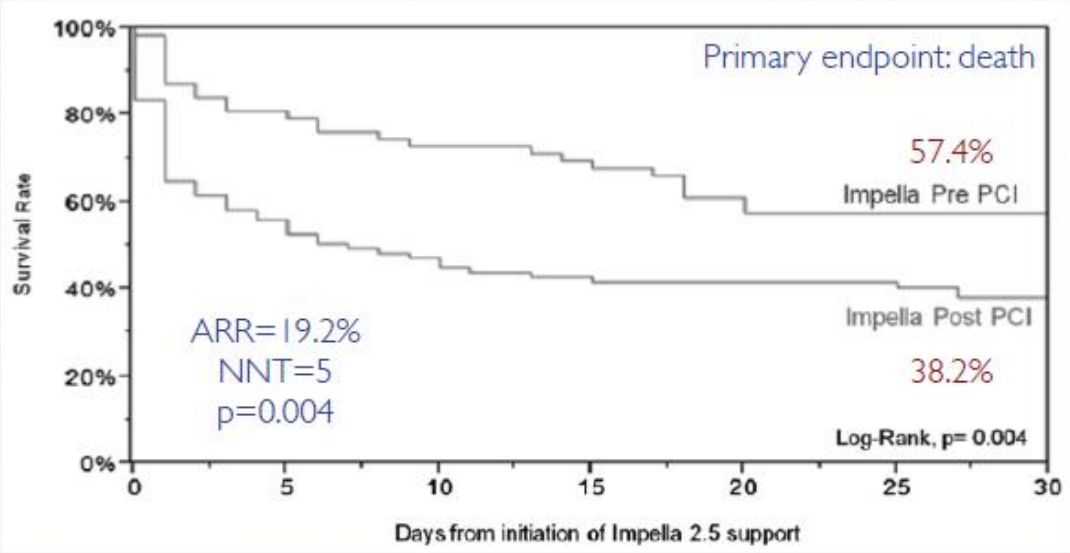

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Impella LP 2.5 in Cardiogenic Shock

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Table 5. In-Hospital Outcomes

	All (N = 154), %	Impella Pre-PCI (N = 63), %	Impella Post-PCI (N = 91), %	P-Value
Survival to discharge	50.7	65.1	40.7	0.003
In-hospital adverse events				
Stroke	1.9	1.6	2.2	0.79
Reinfarction	0.7	0.0	1.1	0.4
Acute renal dysfunction/failure	18.1	12.7	22.0	0.14
Infection	12.9	17.5	9.9	0.17
Limb ischemia	3.9	3.2	4.4	0.7
Repeat revascularization	2.6	3.2	2.2	0.71
Vascular complication with surgical repair	9.7	9.5	9.9	0.94
Hemolysis	10.3	11.1	9.9	0.81
Bleeding requiring transfusion	17.5	12.7	20.8	0.14
Bleeding requiring surgery	2.6	1.6	3.3	0.51

USpella Registry

O'neill WW et al. The current use of Impella 2.5 in acute myocardial infarction complicated by cardiogenic shock: results from the USpella Registry. J Interv Card 2014 27:1-11


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ClearStent live
FL(-) Card
836 mGy
8642.01 µGym²
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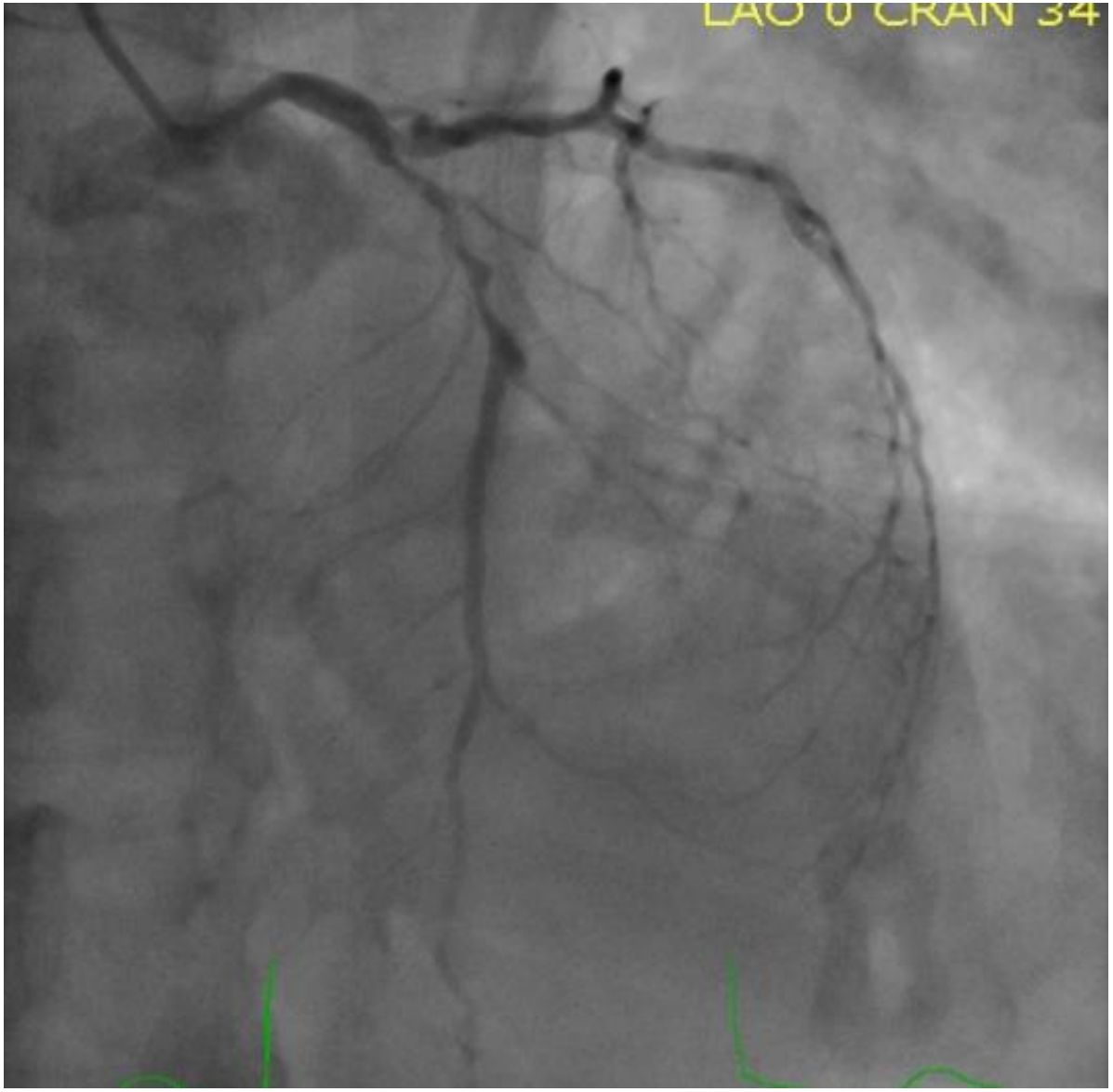
Store Reference
HVI OR 207

CASE

75 y.o. female

Recent NSTEMI, CHF, CAD diagnosed (95% long, LAD stenosis)
Echo LVEF 35%
refuses CABG

Decision for high risk PCI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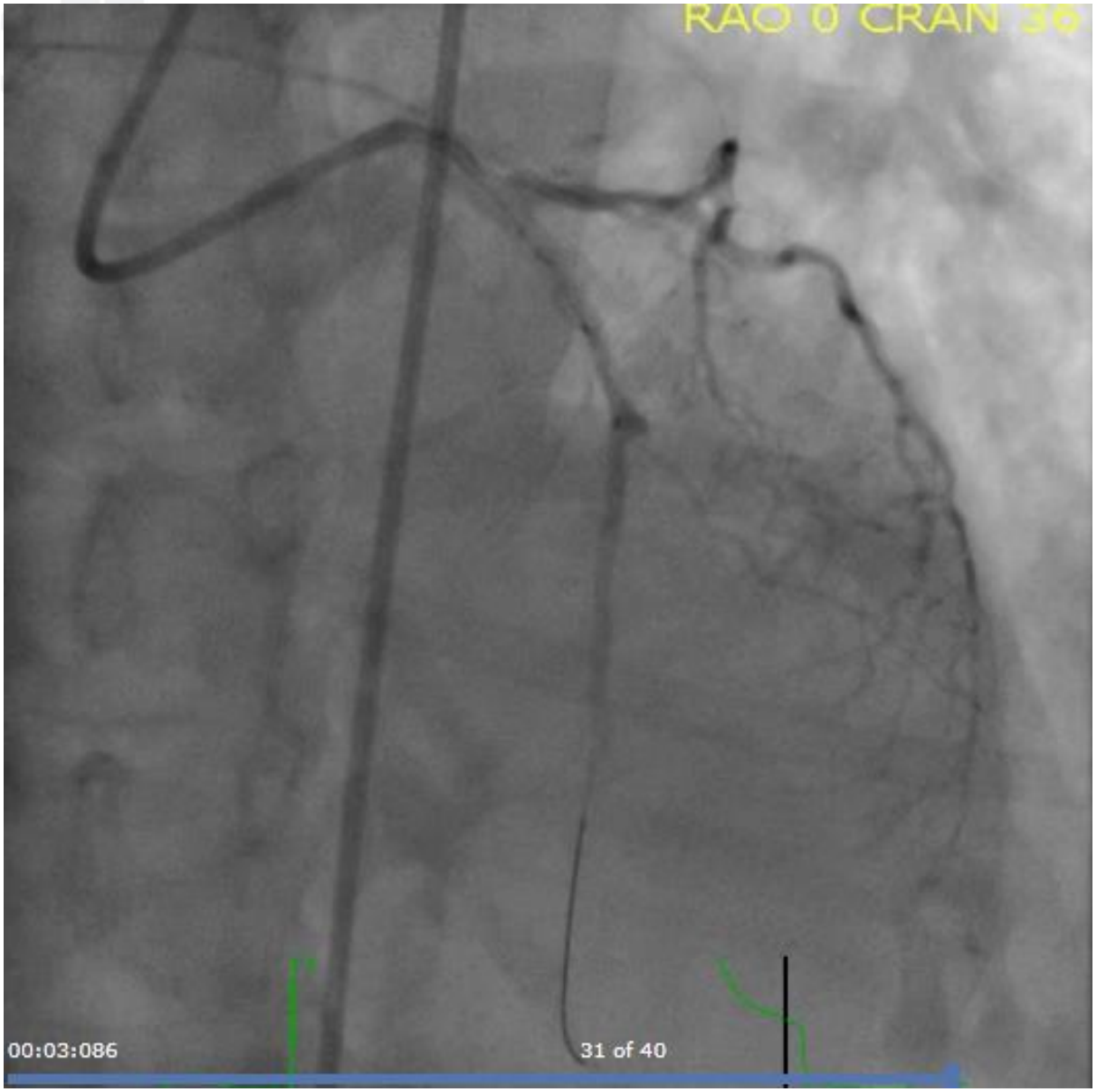
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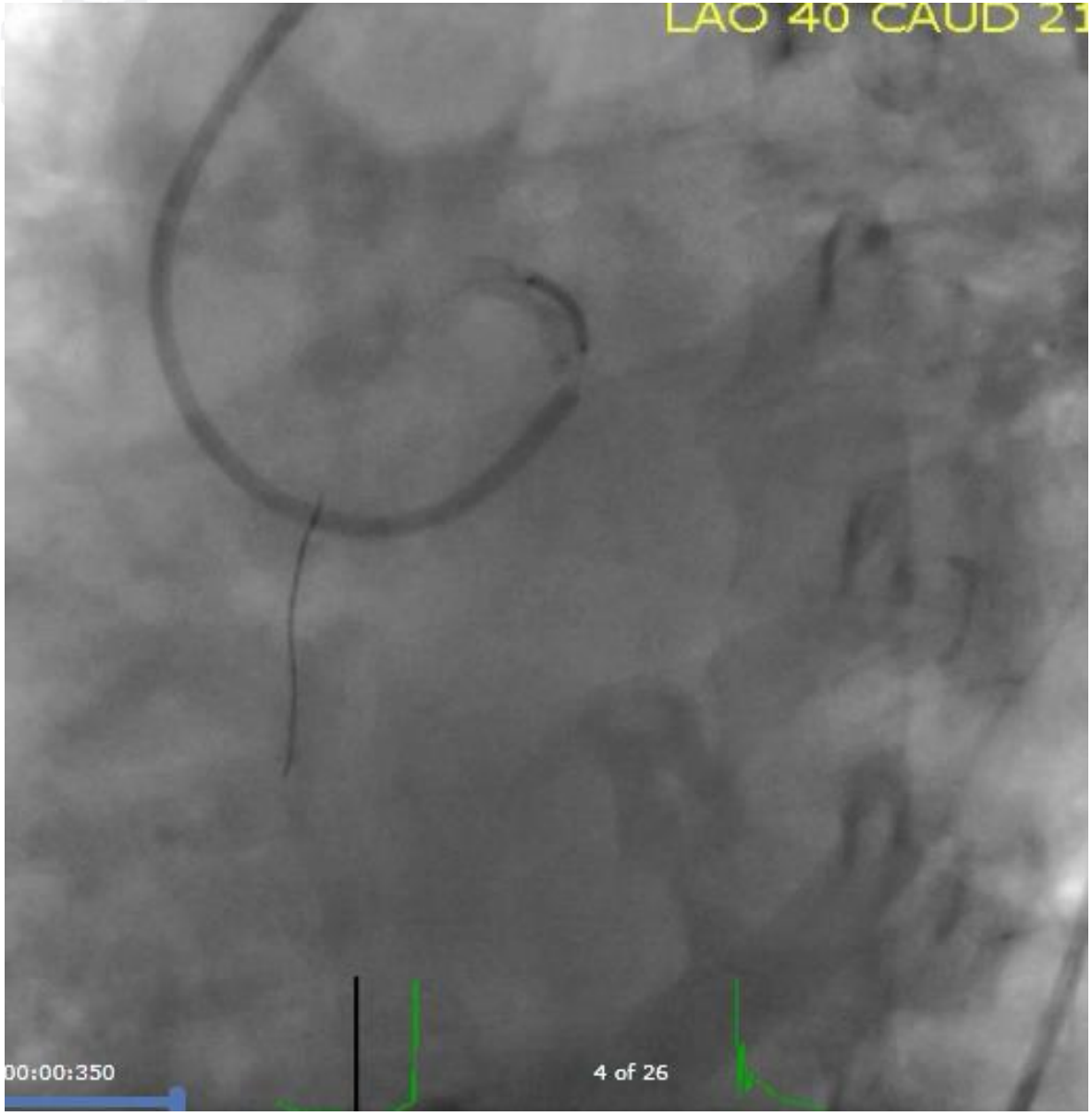
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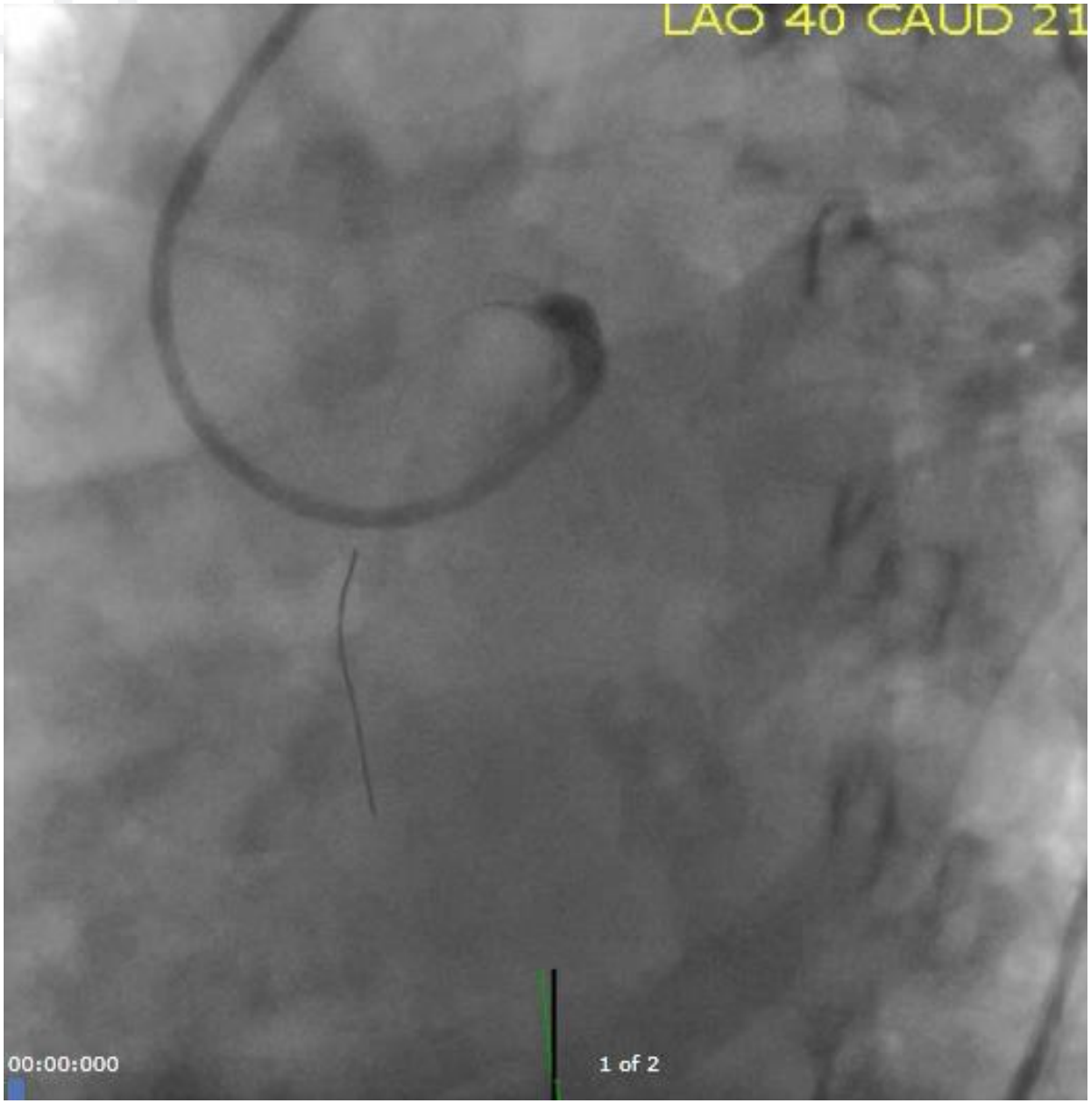
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1 of 2

Immediate drop in BP, development of cardiogenic shock
Intermittent CPR, defibrillation

Intubation, ventilation, epinephrine according to ACLS

Cardiac surgery called

Interventionist placed additional arterial sheath + venous

Perfusionist filled ECMO device, cannulae sent to cath-lab
Cardiac surgeon placed 15 F arterial and 19 F venous cannula after heparinization

During cannula placement second heart surgeon prepared ECMO circuit together with perfusionist, connection – start of ECMO perfusion


MAQUET
4.25
3250
-46
125
-19
36.5
CARDIOHELP
MAQUET
HLS MODULE
ADVANCED 7.0
Heart-Lung Support
BIOLINE COATING

4 days on ECMO

VT runs treated with multiple antiarrhythmics

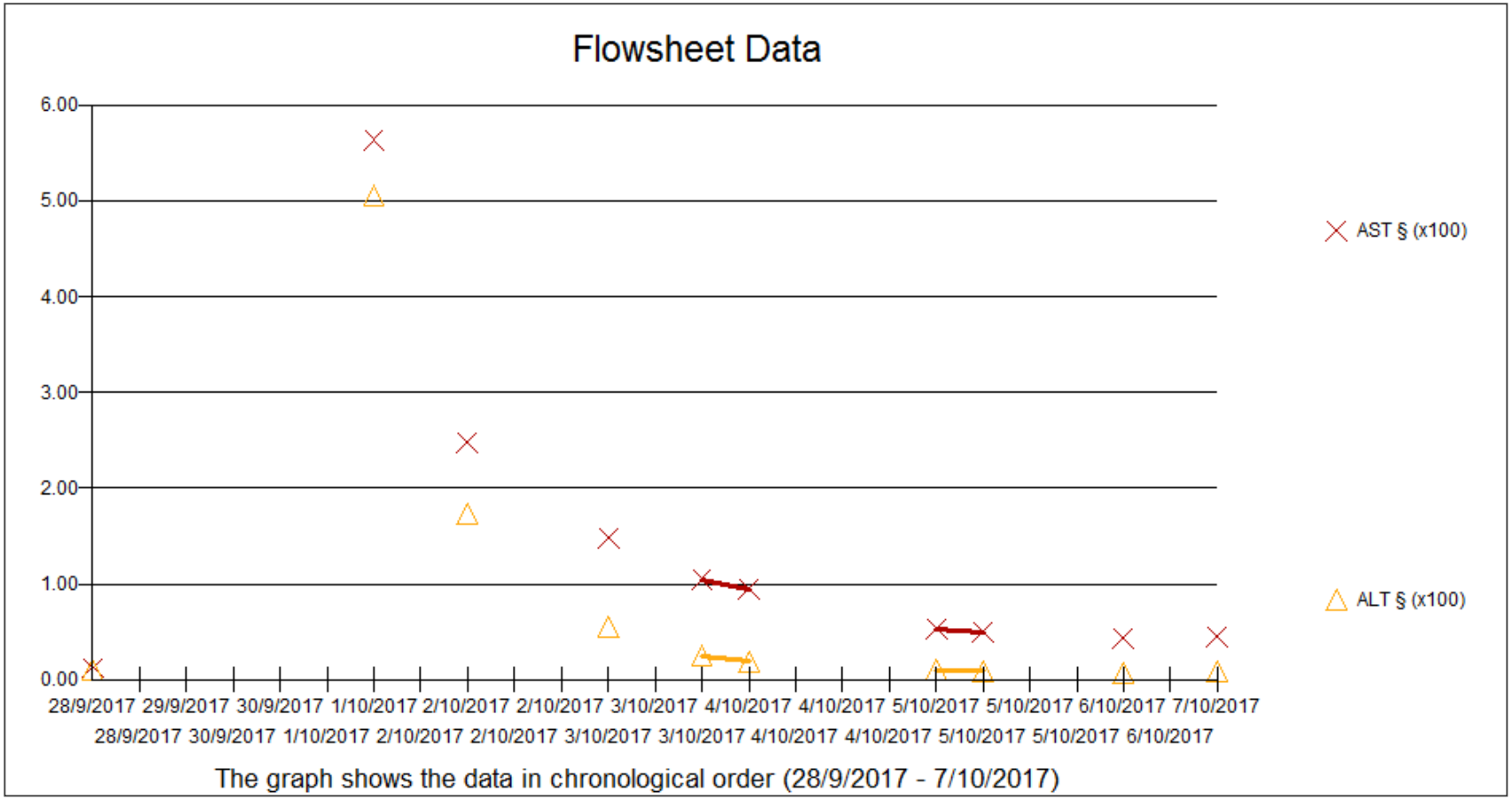
CRRT

Recovery of multiorgan function LFT, renal function

Removal in OR open/pericardial patch femoral artery

Extubated, mobilized

Transfer to regular floor 13 days after event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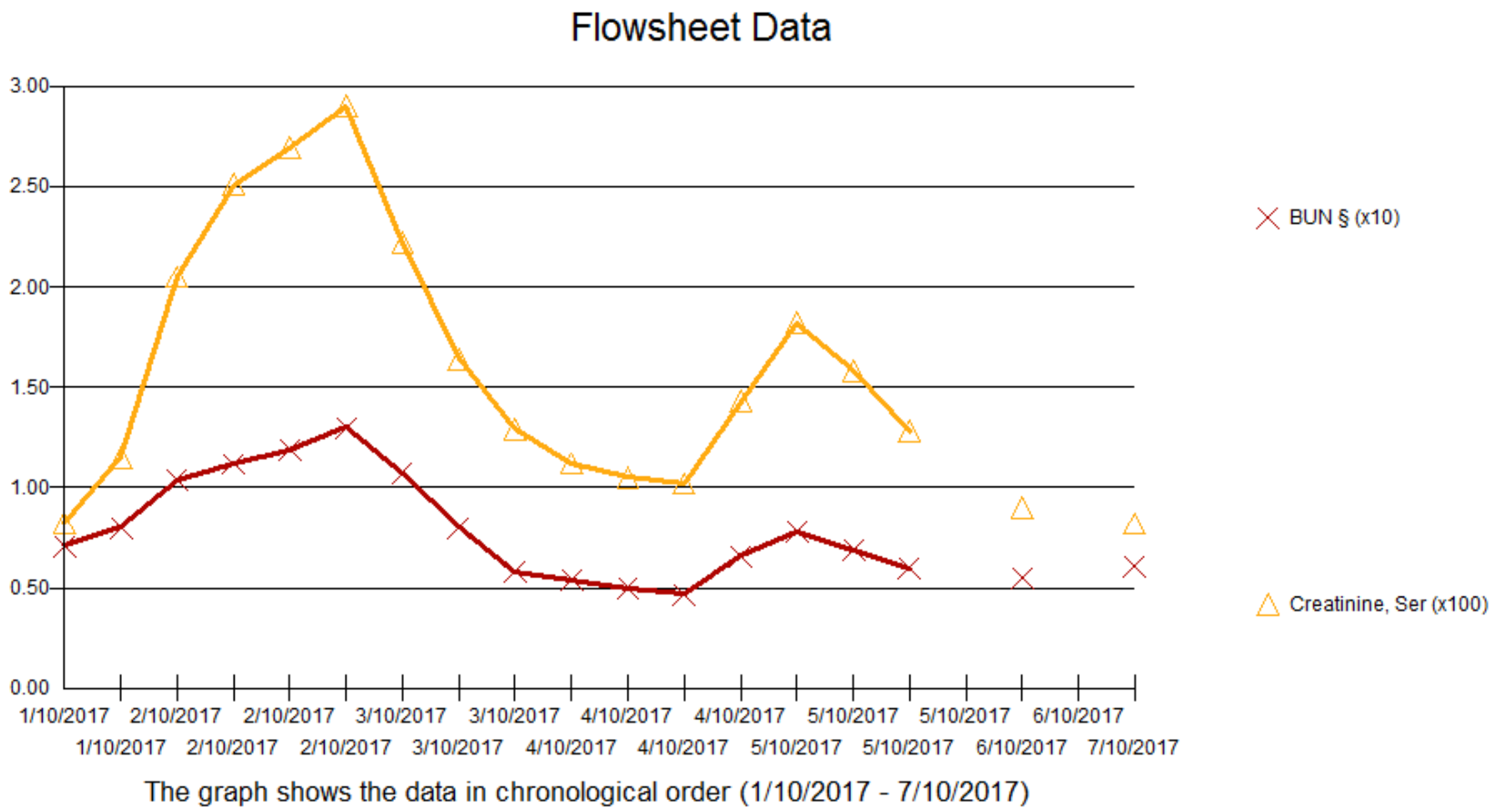
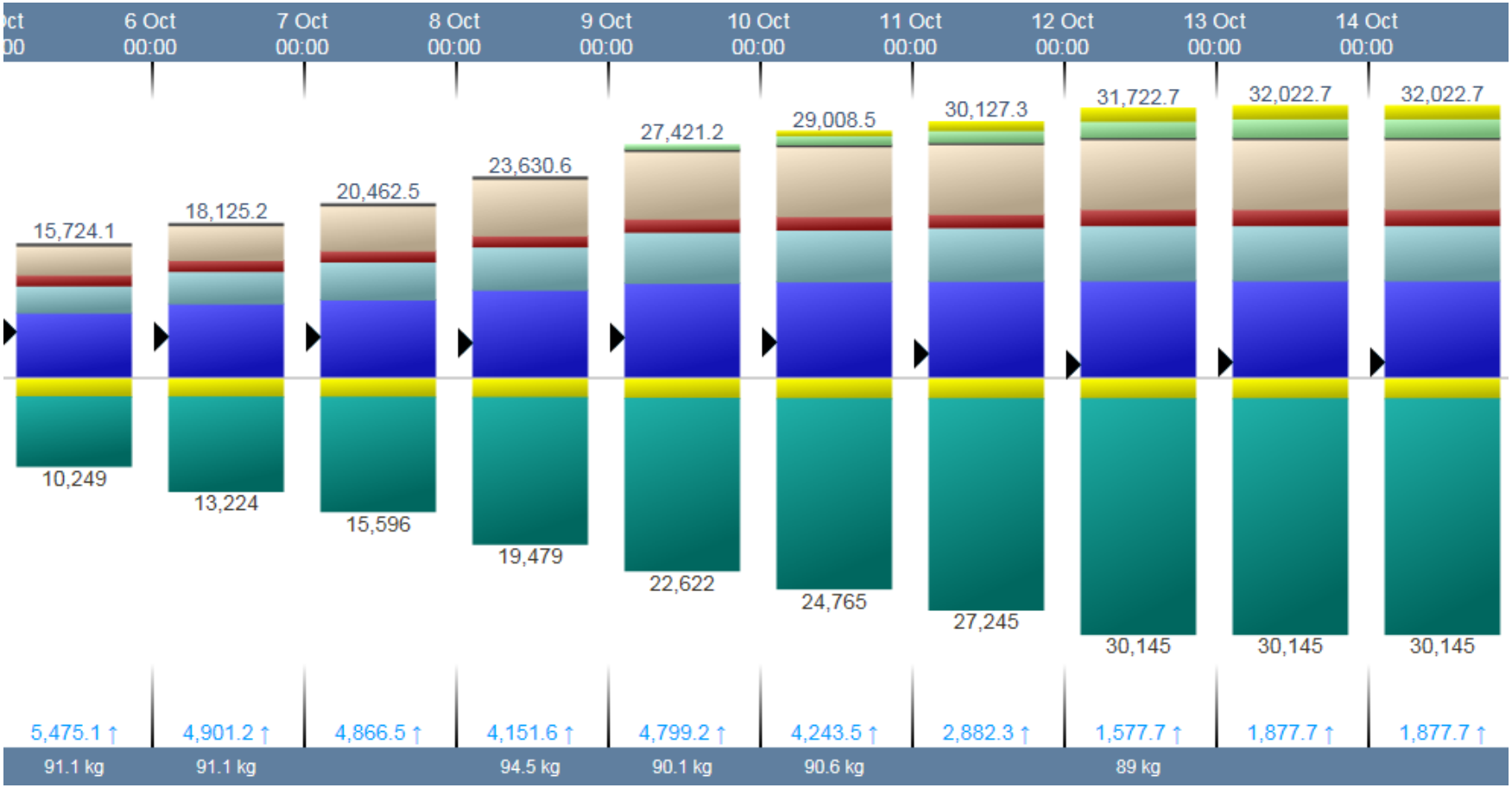
The graph shows the data in chronological order (28/9/2017 - 7/10/2017)



The graph shows the data in chronological order (1/10/2017 - 7/10/2017)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15,596
19,479
22,622
24,765
27,245
30,145
30,145
30,145
5,475.1 ↑
4,901.2 ↑
4,866.5 ↑
4,151.6 ↑
4,799.2 ↑
4,243.5 ↑
2,882.3 ↑
1,577.7 ↑
1,877.7 ↑
1,877.7 ↑
91.1 kg
91.1 kg
94.5 kg
90.1 kg
90.6 kg
89 kg

CARDIOGENIC SHOCK TEAM

EXAMPLE FOR (EXTENDED) “HEART TEAM”

COMPLEX BUT EFFECTIVE

EARLY INVOLVEMENT OF SURGERY FOR ADVANCED INVASIVE TREATMENT IMPORTANT