Chirurgie Cardiovasculaire de l'Adulte

EXTRACORPOREAL LIFE SUPPORT FOR REFRACTORY IN-HOSPITAL AND OUT-OF-HOSPITAL CARDIAC ARREST: ARE THE OUTCOMES REALLY DIFFERENT? A 10-YEAR EXPERIENCE

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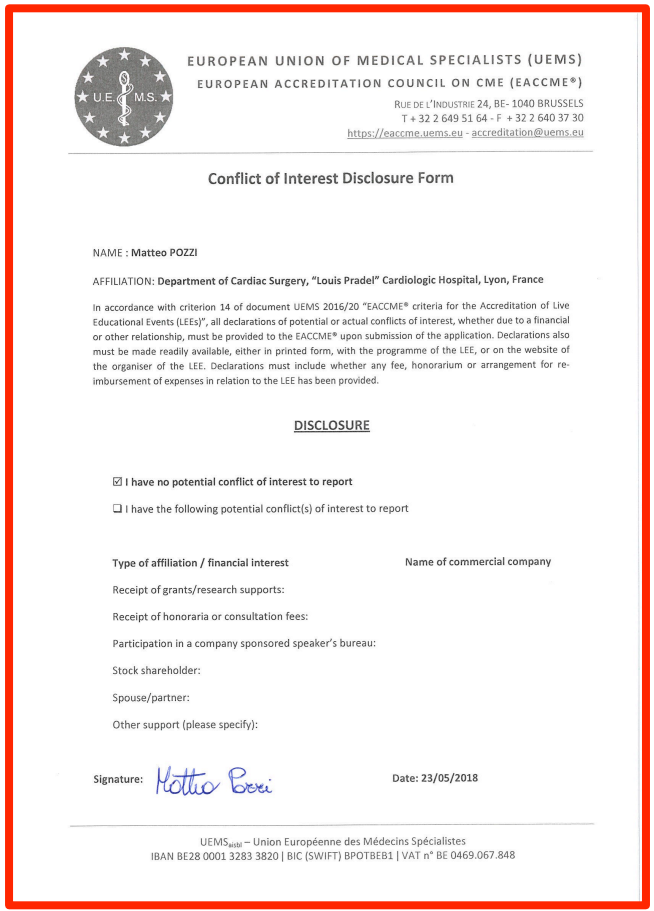

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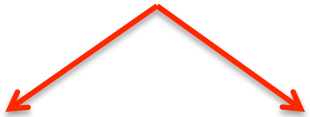
INTRODUCTION

Refractory cardiac arrest **is defined by the lack of return of spontaneous circulation within a period of at least 30 min of CPR under medical direction in the absence of pre-existing hypothermia**

Riou et al. Ann Fr Anesth Reanim 2009;28:182-90



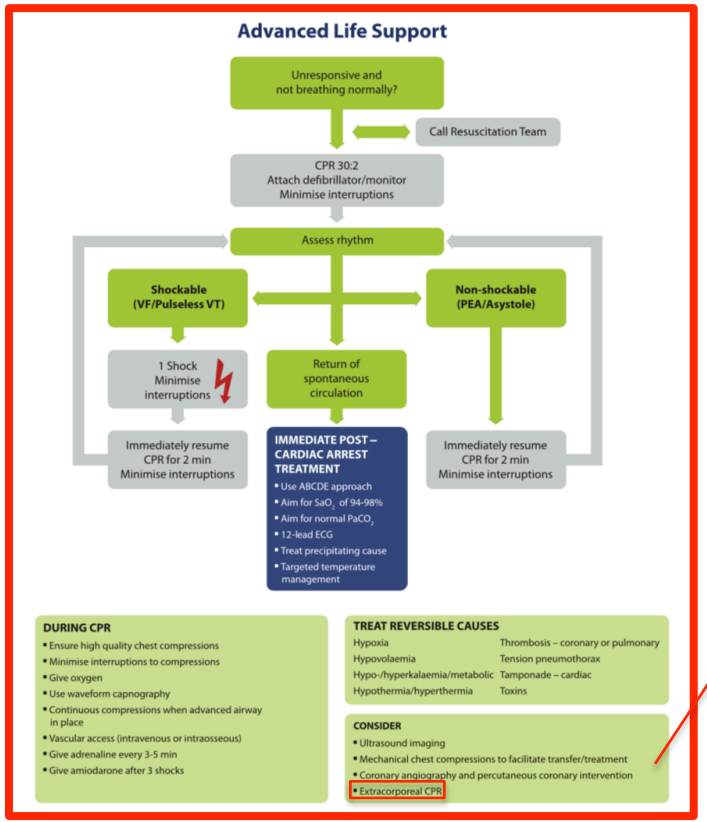
IN-HOSPITAL CARDIAC ARREST

(IHCA)

OUT-OF-HOSPITAL CARDIAC ARREST

(OHCA)

INTRODUCTION



Soar et al. Resuscitation 2015;95:100-47

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Extracorporeal CPR (eCPR) should be considered as a rescue therapy for those patients in whom initial ALS measures are unsuccessful and/or to facilitate specific interventions (e.g. coronary angiography and percutaneous coronary intervention (PCI) or pulmonary thrombectomy for massive pulmonary embolism).

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INTRODUCTION

CONFERENCE REPORTS AND EXPERT PANEL

Position paper for the organization of ECMO programs for cardiac failure in adults

ECPR

Indications
Failure to achieve ROSC despite 15 min of conventional CPR
Cardiac arrest presumed to be of cardiac origin (including pulmonary embolism)
Contraindications
Relative
Advanced age
Prolonged or unknown time from onset of cardiac arrest to initiation of CPR
Absolute
Acute aortic dissection or severe aortic insufficiency
Underlying end-stage heart failure if long-term heart replacement therapies will not be considered
Any non-cardiac condition or organ dysfunction that would limit the likelihood of overall benefit from ECPR, such as severe, irreversible brain injury or untreatable metastatic cancer
Inconsistent with patient's previously expressed goals of care

Abrams et al. Intensive Care Med 2018 [Epub ahead of print]

BACKGROUND

ECLS for IHCA

Author	[Reference]	Patients (n.)	Survival CPC 1-2
Massetti	Ann Thorac Surg 2005;79:178-83	35	20.0%
Chen	Lancet 2008;372:554-61	59	23.7%
Shin	Crit Care Med 2011;39:1-7	85	28.2%
Bednarczyk	Resuscitation 2014;85:1713-9	22	45.4%
Peigh	J Thorac Cardiovasc Surg 2015;150:1344-9	23	30.4%
Ellouze	Artif Organs 2018;42:15-21	43	20.9%

Outcomes of ECLS for IHCA } **Satisfactory**
Encouraging
Homogeneous

Survival CPC 1-2: 20-45%

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BACKGROUND

ECLS for OHCA

Author	[Reference]	Patients (n.)	Survival CPC 1-2
Le Guen	Crit Care 2011;15:R29	51	3.9%
Mégarbane	Resuscitation 2011;82:1154-61	47	2.1%
Maekawa	Crit Care Med 2013;41:1186-96	53	15.1%
SAVE-J Study	Resuscitation 2014;85:762-8	234	13.7%
Pozzi	Int J Cardiol 2016;204:70-6	68	4.4%
CHEER Trial	J Thorac Cardiovasc Surg 2015;150:1344-9	11	45.4%
Choi	Resuscitation 2016;99:26-32	320	9.1%
Rousse	Artif Organs 2016;40:904-9	32	3.1%

Outcomes of ECLS for OHCA

Survival CPC 1-2: Disappointing results

OBJECTIVE

To evaluate the results of ECLS support for refractory cardiac arrest and compare the outcomes between IHCA and OHCA patients at a single-centre experience

MATERIALS and METHODS

Study design - Patient population

Observational analysis of our prospective database

↓

Adult patients supported with ECLS for witnessed, refractory IHCA or OHCA

↓

01/01/1997 - 31/12/2016

↓

449 ECLS

↓

131 (29.2%) ECLS for refractory cardiac arrest

↙ ↘

45 (34.4%) IHCA

86 (65.6%) OHCA

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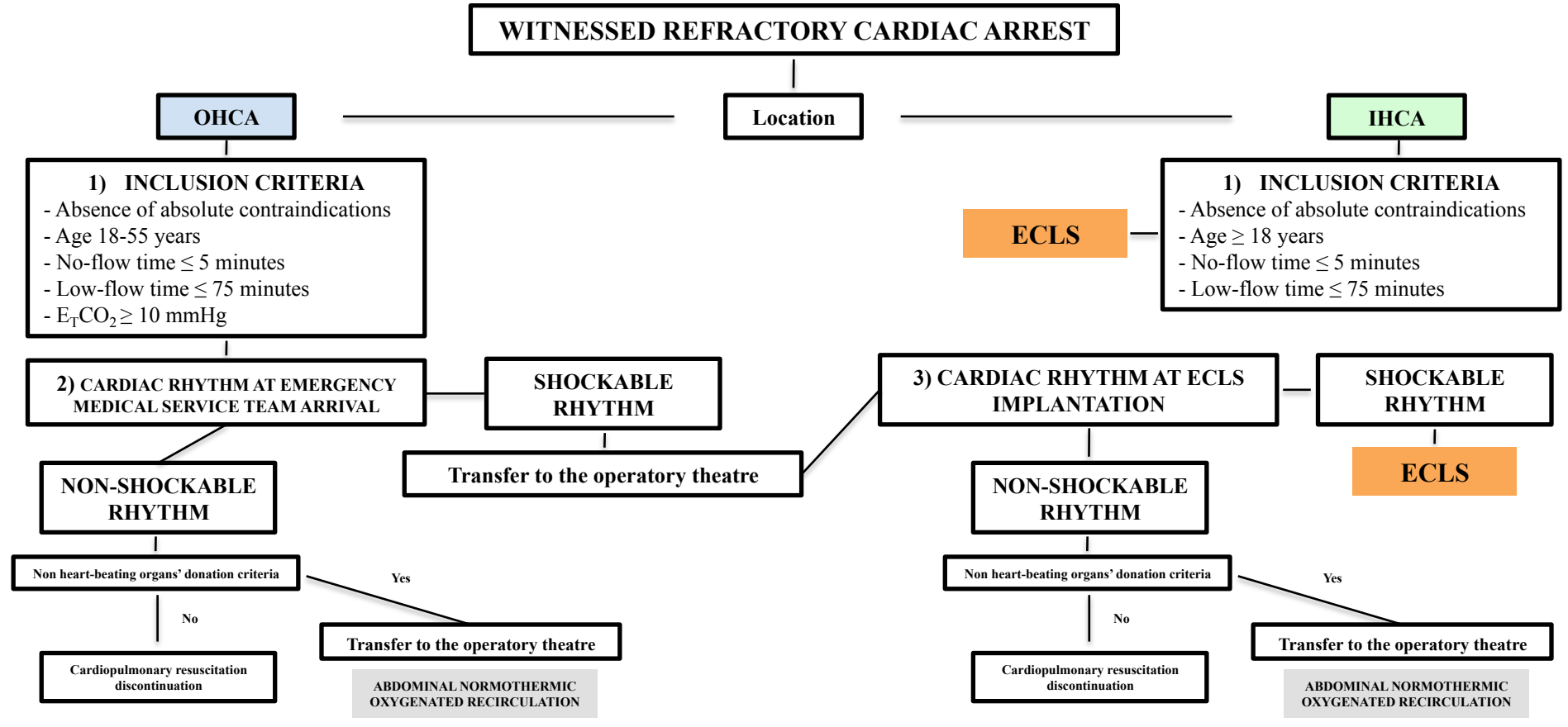
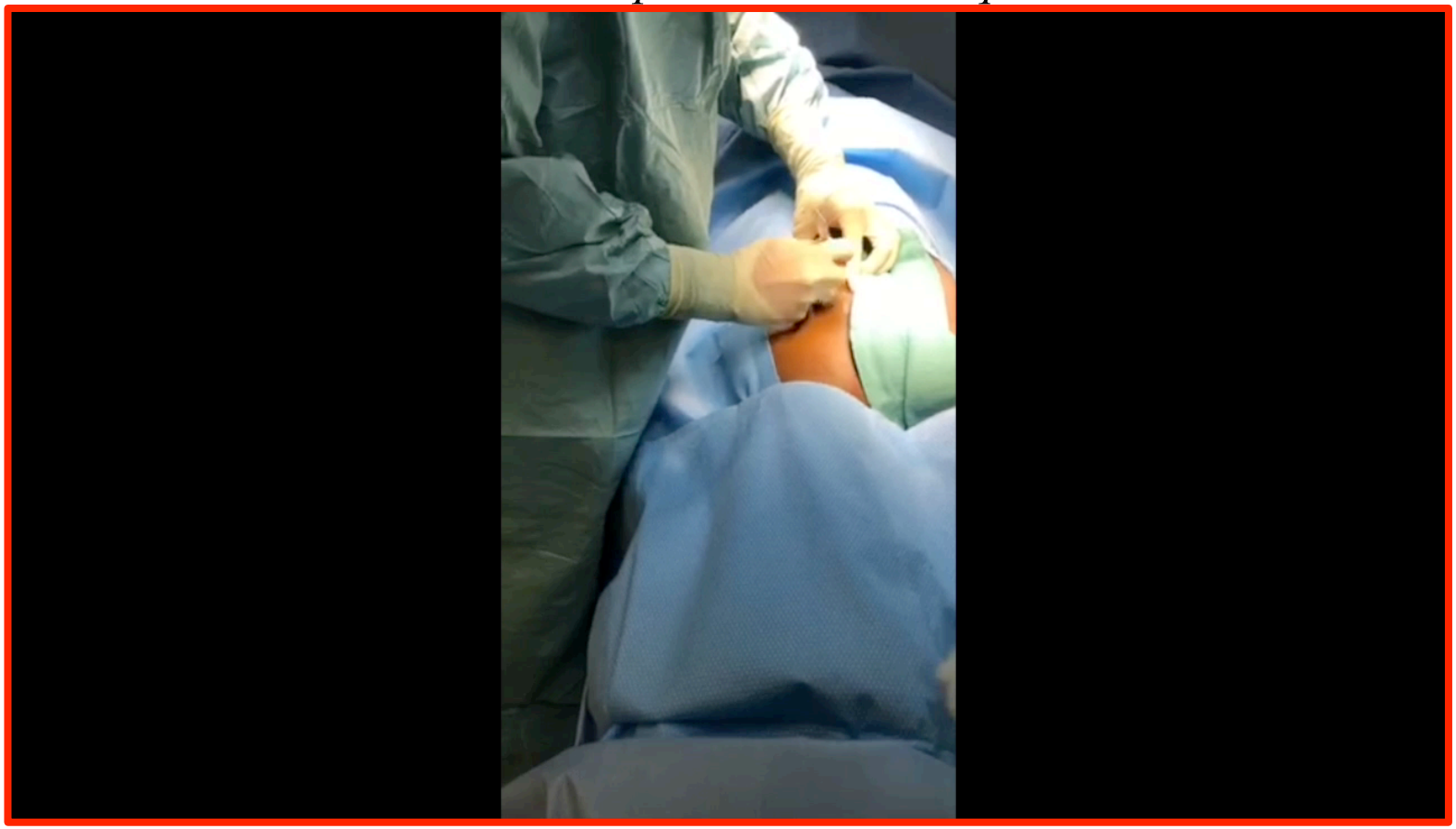
MATERIALS and METHODS

Study protocol



MATERIALS and METHODS

Implantation technique



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RESULTS

Baseline characteristics

131 patients

Mean age: 43.2 ± 12.8 (18 - 76) years

Male sex: 71.8%

	OVERALL	IHCA	OHCA	*p-value*
Age, years	43.2 ± 12.8	46.2 ± 13.5	41.7 ± 12.2	0.054
Male sex, n (%)	84 (71.8)	29 (64.4)	65 (75.6)	0.179
Cardiovascular risk factors, n (%)				
Hypertension	16 (12.2)	5 (11.1)	11 (12.8)	0.780
Diabetes	10 (7.6)	6 (13.3)	4 (4.7)	0.091
Dyslipidemia	10 (7.6)	5 (11.1)	5 (5.8)	0.278
Active smoking	36 (27.5)	11 (24.4)	25 (29.1)	0.573
[a]Rhythm at ECLS implantation, n (%)				0.493
Shockable rhythm	38 (29.0)	11 (26.2)	27 (32.1)	
Non-shockable rhythm	88 (67.2)	31 (73.8)	57 (67.9)	

[a]Cardiac rhythm at ECLS implantation was not recorded in 5 patients

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RESULTS

Baseline biological profile

	IHCA	**OHCA**	***p-value***
BUN, mmol/l	**11.2±6.9**	6.3±2.3	**0.001**
Bilirubin, µmol/l	**30.8±36.2**	9.5±6.5	**0.034**
ASAT, U/l	**1353.3±2537.0**	821.8±788.8	**<0.001**
ALAT, U/l	**851.3±1462.7**	459.5±456.2	**<0.001**
Low-flow time, min	46.9±19.0	**85.3±23.0**	<**0.001**
Lactates	7.1±5.2	**16.0±5.5**	**<0.001**
pH	7.32±0.13	**7.08±0.21**	**<0.001**

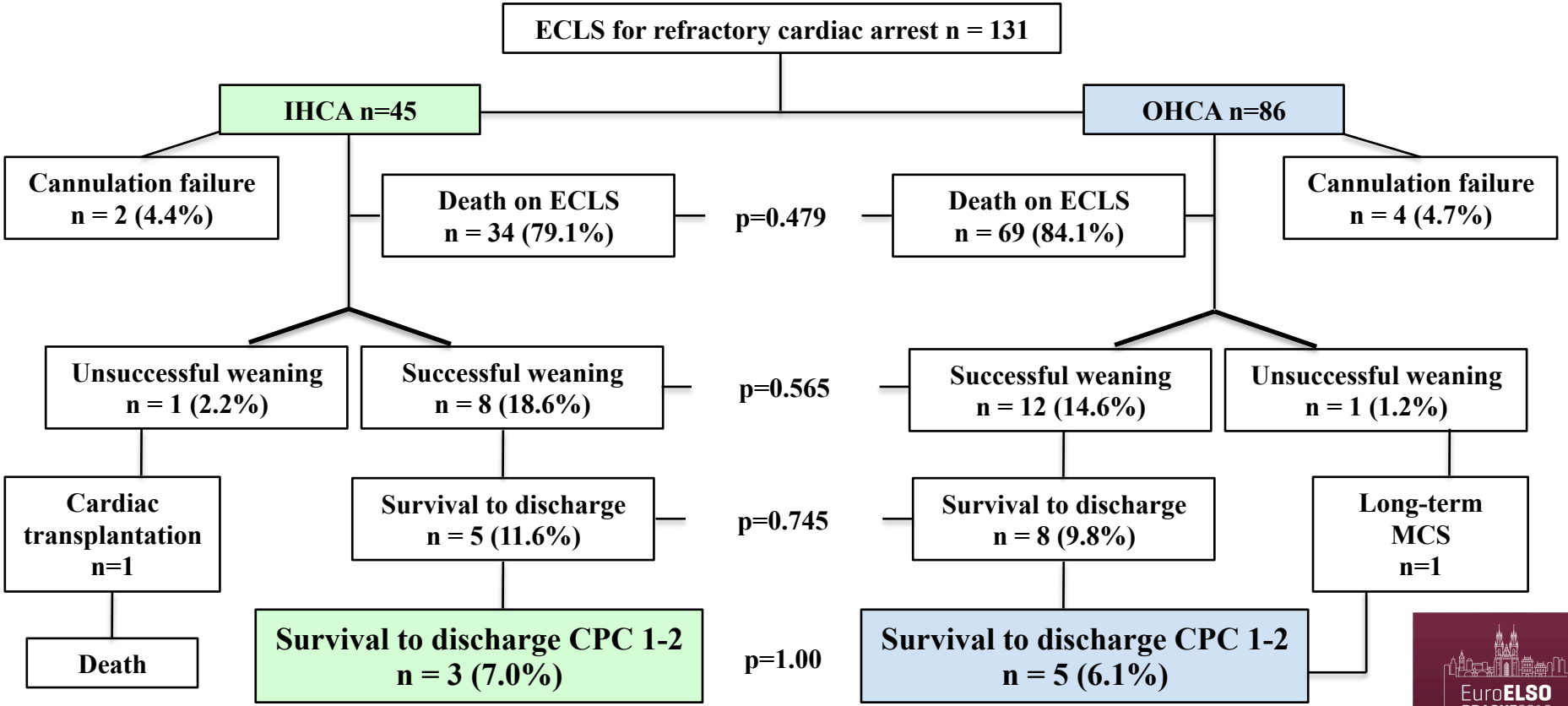
RESULTS

Cause of cardiac arrest

	OVERALL	IHCA	OHCA	*p-value*
Cause of cardiac arrest, n (%)				0.005
Acute coronary syndrome	38 (29.0)	7 (15.6)	31 (36.0)	
Cardiomyopathy	18 (13.7)	7 (15.6)	11 (12.8)	
Pulmonary embolism	5 (3.8)	2 (4.4)	3 (3.5)	
Drug intoxication	4 (3.1)	2 (4.4)	2 (2.3)	
Aortic dissection	6 (4.6)	1 (2.2)	5 (5.8)	
Postcardiotomy	9 (6.9)	9 (20)	0	
Various	15 (11.5)	10 (22.2)	5 (5.8)	
Unknown	36 (27.5)	7 (15.6)	29 (33.7)	

RESULTS

Outcomes



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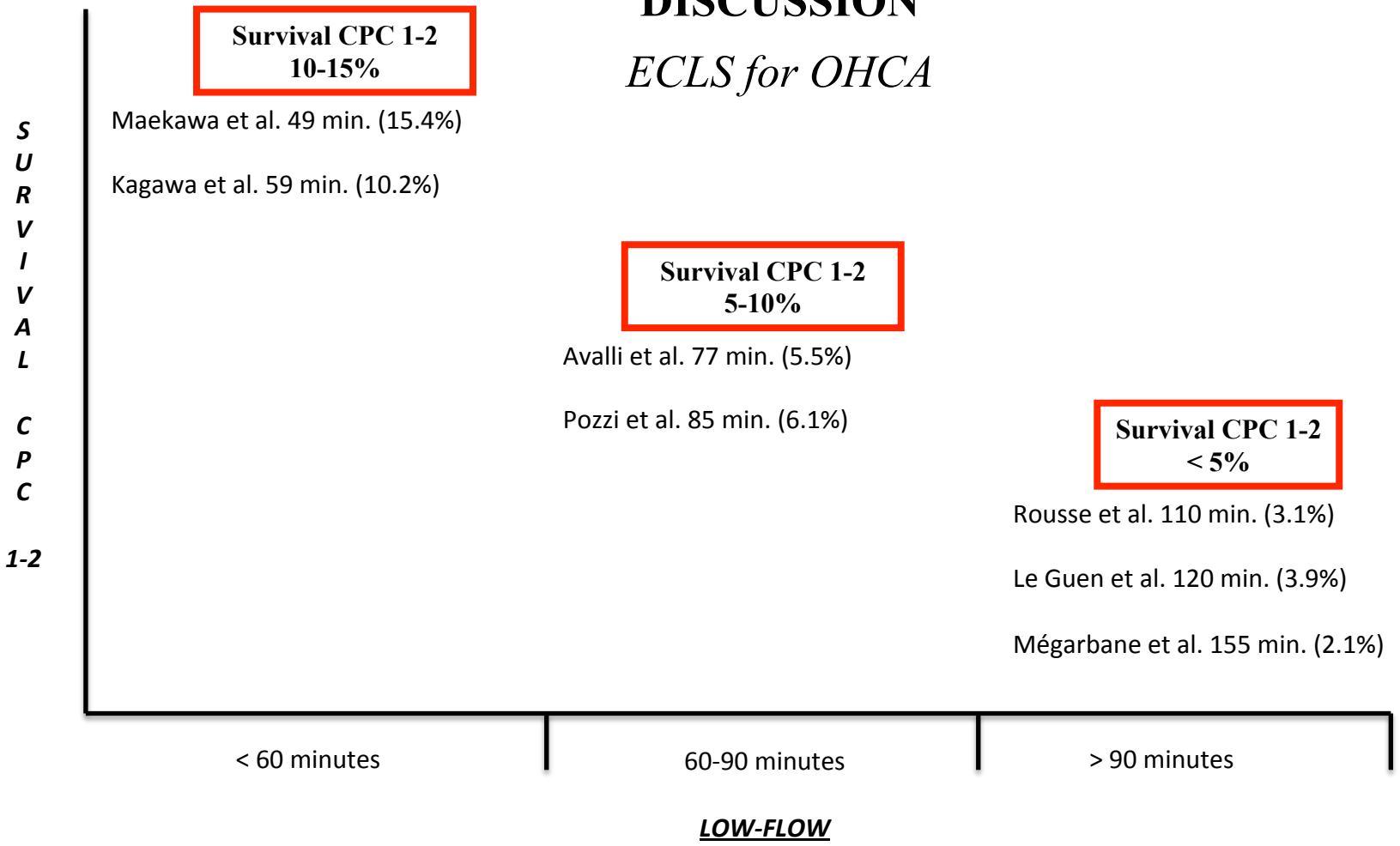
DISCUSSION

ECLS for OHCA



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DISCUSSION

ECLS for IHCA

Lower survival to hospital discharge CPC 1-2 than previous published series

Severe impairment of the renal and hepatic functions

Underlying long-standing illness

Heterogeneous cardiac arrest etiologies

Drug intoxication (4.4%)
Acute coronary syndrome (15.6%)

Cardiomyopathies (15.6%)
PCS with unclear cause (13.3%)

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DISCUSSION

ECLS for IHCA vs. OHCA

Author	[Reference]	Survival CPC 1-2 IHCA vs. OHCA	p-value
Kagawa	Resuscitation 2010;81:968-73	26.3% vs. 10.2%	0.07
Wang	Resuscitation 2014;85:1219-24	25.1% vs. 25.8%	>0.05
Dennis	Int J Cardiol 2017;231:131-6	69% vs. 31%	0.87
Ellouze	Artif Organs 2018;42:15-21	20.9% vs. 27.2%	0.76
Avalli	Resuscitation 2012;83:579-83	45.8% vs. 5.5%	**0.005**

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CONCLUSION

ECLS could be considered an ultimate solution in refractory cardiac arrest patients who failed conventional cardiopulmonary resuscitation

IHCA and OHCA patients experienced the same survival to hospital discharge with good neurological outcome after ECLS support

The results of ECLS for refractory OHCA are mainly limited by the low-flow duration

In the setting of refractory IHCA, a better selection of patients is mandatory to improve outcomes and avoid futile support