

## Supplementary Online Content

Belohlavek J, Smalcova J, Rob D, et al; . Effect of intra-arrest transport, extracorporeal cardiopulmonary resuscitation, and immediate invasive assessment and treatment on functional neurologic outcome in refractory out-of-hospital cardiac arrest: a randomized clinical trial. *JAMA*. doi:10.1001/jama.2022.1025

**eTable 1.** Study inclusion and Exclusion Criteria in a Study of Intra-arrest Transport, Extracorporeal Cardiopulmonary Resuscitation, and Immediate Invasive Assessment and Treatment in Refractory Out-of-Hospital Cardiac Arrest

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This supplementary material has been provided by the authors to give readers additional information about their work.

**eTable 1. Study inclusion and exclusion criteria<sup>18</sup> in a Study of Intra-arrest Transport, Extracorporeal Cardiopulmonary Resuscitation, and Immediate Invasive Assessment and Treatment in Refractory Out-of-Hospital Cardiac Arrest**

**Panel A.** Entry criteria for enrollment into the study.

<b>Inclusion criteria</b>	<b>Exclusion criteria</b>
Age $\geq 18$ and $\leq 65$ years	Out of hospital cardiac arrest of presumed non-cardiac cause
Witnessed out of hospital cardiac arrest of presumed cardiac cause	Unwitnessed collapse
Minimum of 5 minutes of advanced cardiac life support performed by emergency medical service team without sustained return of spontaneous circulation	Suspected or confirmed pregnancy
Unconsciousness (Glasgow Coma Score $< 8$ )	Return of spontaneous circulation within 5 minutes of advanced cardiac life support performed by emergency medical service team
Extracorporeal life support team and intensive care unit bed capacity in cardiac center available	Conscious patient
	Known bleeding diathesis or suspected or confirmed acute or recent intracranial bleeding
	Suspected or confirmed acute stroke
	Known severe chronic organ dysfunction or other limitations in therapy
	“Do not resuscitate” order or other circumstances making 180 day survival unlikely
	Known pre-arrest cerebral performance category $\geq 3$

**Panel B.** Criteria for initiation of extracorporeal life support (ECLS).

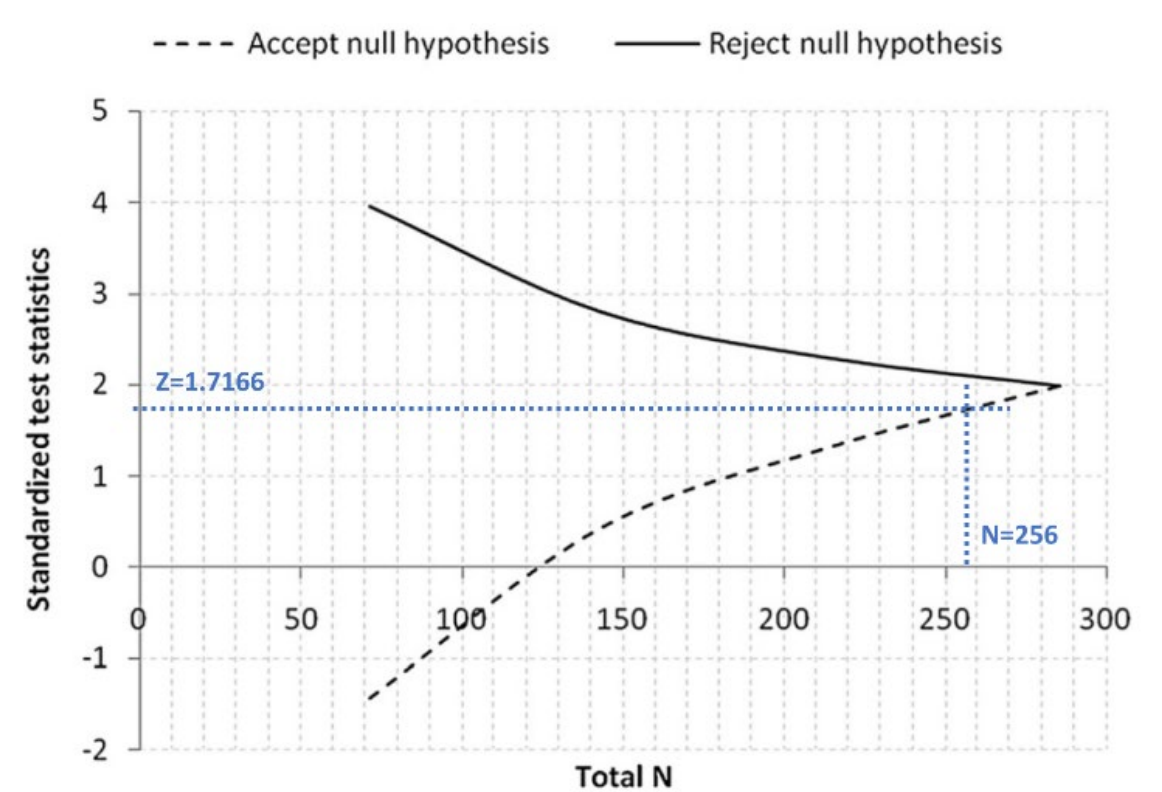
*Footnote:* \*if collapse time was not exactly known, initial call to emergency medical service was considered

*Abbreviations:* ACLS: advanced cardiac life support; CPC: cerebral performance category; ECLS: extracorporeal life support; ICU: intensive care unit; OHCA: out-of hospital cardiac arrest; ROSC: return of spontaneous circulation; EMS: emergency medical service.

<b>Inclusion criteria</b>	<b>Exclusion criteria</b>
No return of spontaneous circulation or return of spontaneous circulation with ongoing shock (defined as sustained hypotension below 90 mmHg of systolic pressure or need for moderate to high doses of vasopressors)	Signs of death or irreversible organ damage
Admission to cathlab not later than 60 minutes after the collapse/initial call to emergency medical service*	Known bleeding diathesis
Consensus of cardiac center team members on extracorporeal life support initiation	Inadequate arterial and/or venous access for femoro-femoral cannulation

**eFigure 1. Stopping rule in a Study of Intra-arrest Transport, Extracorporeal Cardiopulmonary Resuscitation, and Immediate Invasive Assessment and Treatment in Refractory Out-of-Hospital Cardiac Arrest**

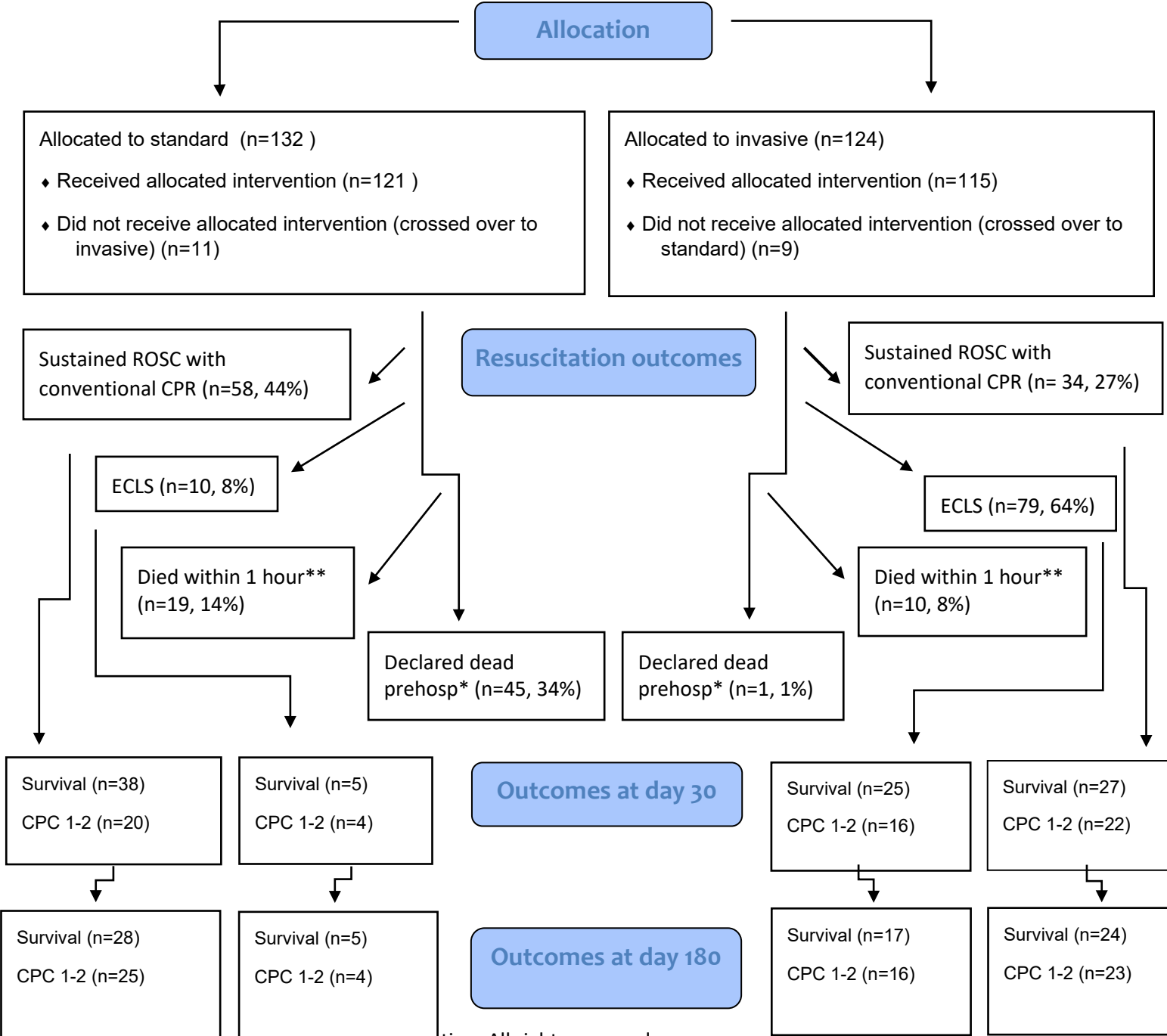
*Footnote:* Graphical delineation for scenario 2, estimated 15% increase of primary outcome in invasive (25%) vs. standard (10%) groups.



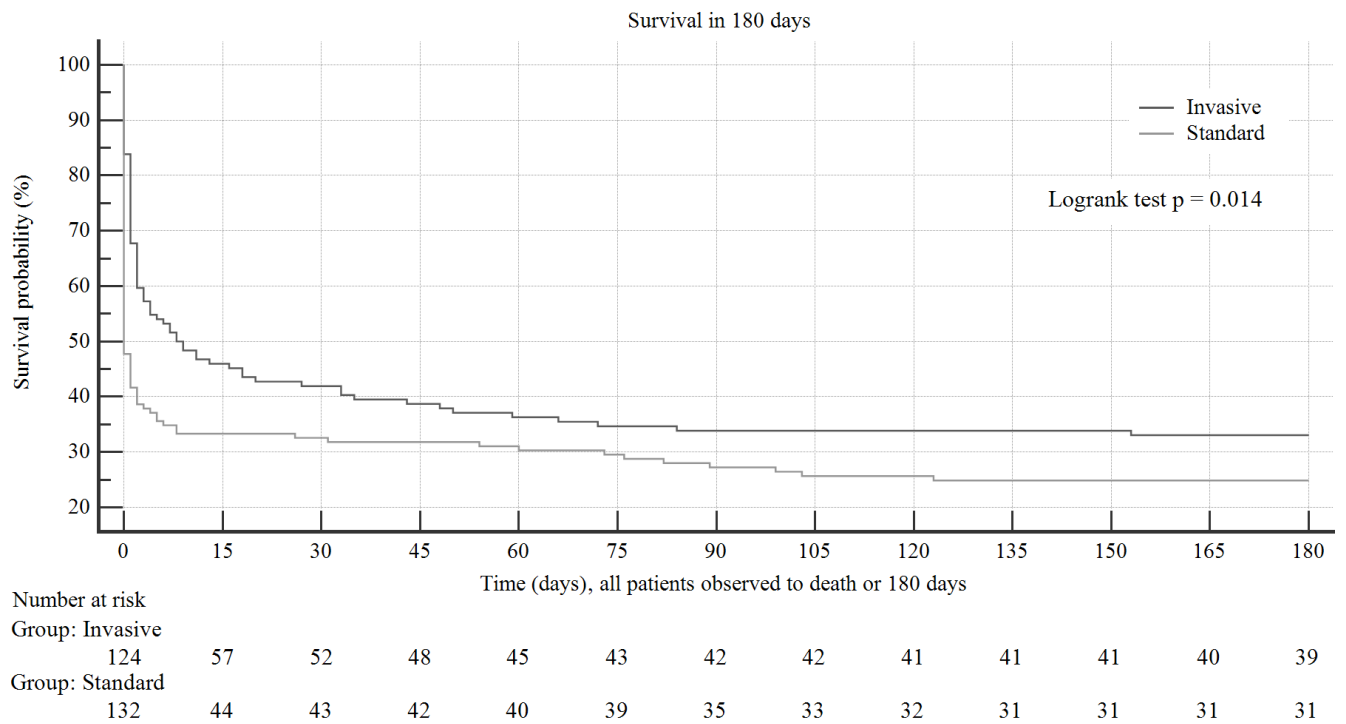
**eFigure 2. Allocation and resuscitation outcomes flow chart in a Study of Intra-arrest Transport, Extracorporeal Cardiopulmonary Resuscitation, and Immediate Invasive Assessment and Treatment in Refractory Out-of-Hospital Cardiac Arrest**

*Footnotes:* \*Declared dead pre hosp – declared dead prehospitally or on admission. \*\*Died within 1 hour – pronounced dead within one hour after admission. Three patients allocated to invasive group and implanted with ECLS died within 1 hour after admission, therefore number of ECLS patients 79.

*Abbreviations:* CPC: cerebral performance category; ECLS: extracorporeal life support; ICU: intensive care unit; OHCA: out-of hospital cardiac arrest; ROSC: return of spontaneous circulation; EMS: emergency medical service.



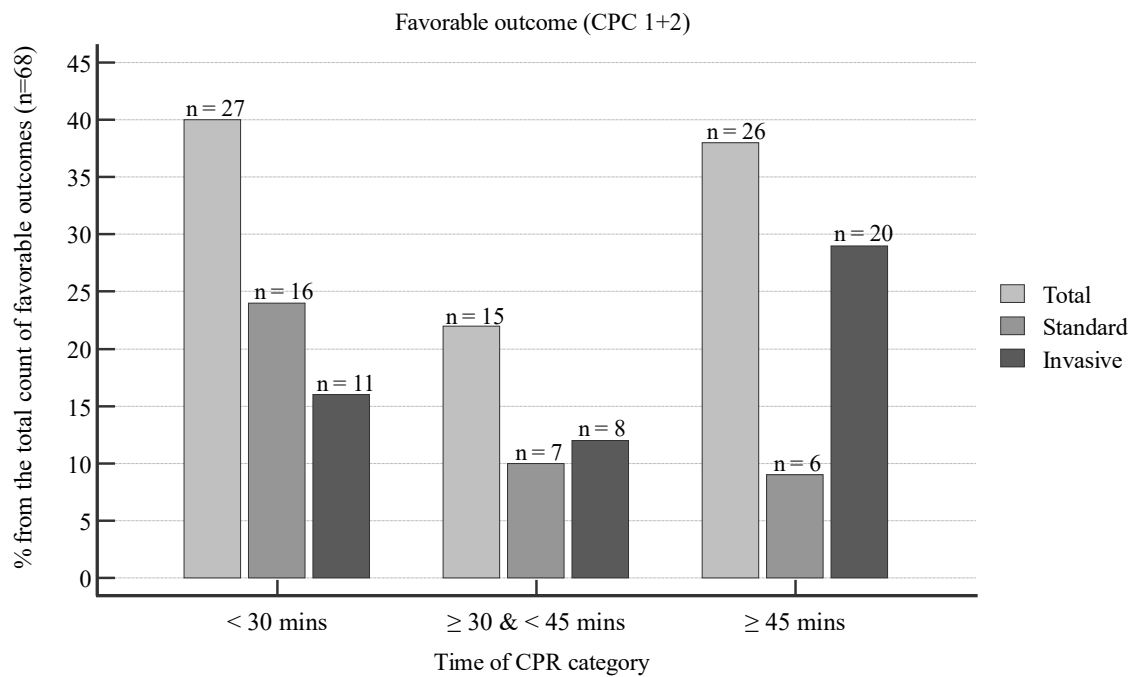
**eFigure 3. Kaplan-Meier survival analysis in a Study of Intra-arrest Transport, Extracorporeal Cardiopulmonary Resuscitation, and Immediate Invasive Assessment and Treatment in Refractory Out-of-Hospital Cardiac Arrest**



**eFigure 4. Favorable neurological outcome after 180 days in time of CPR subgroups in a Study of Intra-arrest Transport, Extracorporeal Cardiopulmonary Resuscitation, and Immediate Invasive Assessment and Treatment in Refractory Out-of-Hospital Cardiac Arrest**

*Footnote:* Numbers above the bars represent number of patients in respective groups. Six patients surviving with a favorable neurological outcome in  $\geq 45$  mins standard group include 4 patients crossed over from standard to invasive group.

*Abbreviations:* CPC: cerebral performance category; CPR: cardiopulmonary resuscitation.



**eTable 2. Causes of target temperature management exclusion in a Study of Intra-arrest Transport, Extracorporeal Cardiopulmonary Resuscitation, and Immediate Invasive Assessment and Treatment in Refractory Out-of-Hospital Cardiac Arrest**

<b>Patient number</b>	<b>Cause of target temperature management exclusion</b>
4	early death, instability, time to death since admission 26min
15	early death, instability, time to death since admission 17min
24	bleeding
31	instability, time to death since admission 6h 49min
40	early death, instability, time to death since admission 62min
57	early death, instability, time to death since admission 50min
98	instability, time to death since admission 3h 9min
104	early death, instability, time to death since admission 15min
110	early death, instability, time to death since admission 18min
123	early death, instability, time to death since admission 17min
125	early death, instability, time to death since admission 65min
129	bleeding
132	early death, instability, time to death since admission 22min
133	early death, instability, time to death since admission 20min
138	early death, instability, time to death since admission 47min
141	early death, instability, time to death since admission 32min
146	early death, instability, time to death since admission 18min
152	instability, time to death since admission 5h 39min
157	early death, instability, time to death since admission 33min
160	bleeding
169	early death, instability, time to death since admission 40min
179	early death, instability, time to death since admission 17min
180	early death, instability, time to death since admission 1min
193	early death, instability, time to death since admission 51min
209	early death, instability, time to death since admission 22min
222	early death, instability, time to death since admission 36min
227	bleeding
236	early death, instability, time to death since admission 26min
237	early death, instability, time to death since admission 30min
248	early death, instability, time to death since admission 64min
255	early death, instability, time to death since admission 23min
261	early death, instability, time to death since admission 28min



**eTable 3. Organ lacerations in a Study of Intra-arrest Transport, Extracorporeal Cardiopulmonary Resuscitation, and Immediate Invasive Assessment and Treatment in Refractory Out-of-Hospital Cardiac Arrest**

<b>Pt. Number 90</b>	right lung perforation by broken ribs, ipsilateral hemothorax
<b>Pt. Number 94</b>	right atrium tear by sharp piece of broken rib, hemopericardium
<b>Pt. Number 106</b>	liver tear, hemoperitoneum
<b>Pt. Number 139</b>	liver tear, omental bleed
<b>Pt. Number 155</b>	liver tear, hemoperitoneum
<b>Pt. Number 160</b>	liver tear, hemoperitoneum
<b>Pt. Number 248</b>	liver tear, hemoperitoneum

**eTable 4. Technical complications in a Study of Intra-arrest Transport, Extracorporeal Cardiopulmonary Resuscitation, and Immediate Invasive Assessment and Treatment in Refractory Out-of-Hospital Cardiac Arrest**

<p><b>Pt. Number: 99</b> – oxygenator failure</p>	<p>A patient on inotropic and vasopressor therapy, an episode of hypotension and hypoxia for less than 5 mins observed, attributed to oxygenator failure, corrected by perfusionist intervention.</p>
<p><b>Pt. Number 148</b> – cathlab angiography failure</p>	<p>Patient admitted to the cathlab, uncomplicated ECMO cannulation, later angiography device failure, change of the cathlab room needed, 15 mins delay in coronary angiography which revealed nonsignificant CAD.</p>
<p><b>Pt. Number 240</b> – ventilator failure</p>	<p>During coronary angiography suddenly hypoxia attributed to ventilator failure, switched to bag ventilation, changed ventilator.</p>

**eTable 5. Summary of all protocol deviations in a Study of Intra-arrest Transport, Extracorporeal Cardiopulmonary Resuscitation, and Immediate Invasive Assessment and Treatment in Refractory Out-of-Hospital Cardiac Arrest**

*Footnotes:*

**Age:** 63 enrolled patients were older than 65 years due to a poor estimate during the initial resuscitation on the scene. All patients remained in the analysis, this fact became obvious later on during the admission to hospital.

**Other institution referral:** Three patients were transported to other institution based on a decision of treating emergency physician. All patients remained in the analysis and the data were retrieved.

**Crossovers:** Crossovers were allowed both from standard to invasive arm and from invasive to standard arm, see the methods section. Overall, 20 patients were crossed, 11 from standard to invasive and 9 from invasive to standard arm.

**Transport to hospital in standard arm despite no return of spontaneous circulation (ROSC):** In standard arm, 15 patients have been transported to hospital by emergency crews without sustained ROSC and without approval for crossover to invasive arm. After admission, standard advanced cardiac life support was continued according to guidelines.

**ECLS time:** In invasive arm, 11 patients were implanted with ECLS despite the fact of being admitted to hospital after 60 mins of cardiac arrest. All patients remained in the analysis.

**Witnessed arrest:** All cardiac arrest cases enrolled in the study were witnessed with the exception of 4 patients, see below, all patients remained in the analysis, because this fact became obvious later on during the admission to hospital.

**No target temperature management (TTM):** No TTM was provided in 32 patients due to below reasons, see supplementary table 2.

**Normothermia in the invasive arm:** In 57 patients in invasive arm, normothermia of 36°C was used instead of hypothermia and this was allowed after the publication of TTM trial.<sup>19</sup> This occurred in early awaking patients or in patients with complications of hypothermia.

*Eplanation for the table abbreviations:* **age:** age over 65 years; **other institution:** transported to other cardiac center, a decision of a treating emergency physician; **cross:** crossovers in both arms; **noROSC transport in S arm:** patients being transported to hospital without sustained return of spontaneous circulation and without approval for a crossover; **noTTM:** all admitted to hospital not receiving target temperature management; **ecmo-time:** patients in invasive arm who received ECMO despite being admitted after 60 mins of cardiac arrest; **NW:** not witnessed cardiac arrest; **normo-i:** normothermia in invasive arm.

<b>OHCA study</b>	<b>Protocol deviations</b>					
<b>Patient number</b>	<b>Age criteria</b>	<b>Crossover/noROSC transport</b>	<b>noTTM</b>	<b>normo-i</b>	<b>ecmo-time</b>	<b>NW</b>
1	age					
2	age					
4		cross	noTTM			
5	age					
10		cross				
12		cross				
13		cross				
15	age	noROSC transport in S arm	noTTM			
16				normo-i		
17	age			normo-i		
20		cross				
21		cross				
22				normo-i		
23				normo-i		
24	other institution		noTTM			
26		cross				
27				normo-i		
28					ecmo-time	
29		cross				
30				normo-i		
31	age		noTTM			
33	age			normo-i	ecmo-time	
34				normo-i		
35		cross				
37				normo-i		
38				normo-i		
40	other institution	noROSC transport in S arm	noTTM			NW
43				normo-i		
44		cross				
45	age			normo-i		
46		cross				
47				normo-i		
48				normo-i		
52		cross				
53	age					
54		cross				
56	age					
57		cross	noTTM			
62					ecmo-time	
63				normo-i		
68				normo-i		
72				normo-i		
73	age	cross				
76	age					
77				normo-i	ecmo-time	

78				normo-i		
80	age					
81	age					
89		cross				
90	age			normo-i		
93	age					
94	age					
96					ecmo-time	
98			noTTM			
99	age			normo-i		
100	age					
103	age			normo-i		
104		noROSC transport in S arm	noTTM			
105	age					
106				normo-i		
107					ecmo-time	
108					ecmo-time	
109	age					
110			noTTM			
114				normo-i		
117	age					
121	age			normo-i		
122				normo-i		
123	age	cross	noTTM			
124	age					
125	other institution	noROSC transport in S arm	noTTM			
126	age			normo-i		
127	age					
129			noTTM			
130	age			normo-i		
132		noROSC transport in S arm	noTTM			
133		noROSC transport in S arm	noTTM			
134	age					
136	age			normo-i		
138			noTTM			
139	age			normo-i		
140	age			normo-i		
141	age	noROSC transport in S arm	noTTM			
142				normo-i		
143	age					
146			noTTM			
147	age			normo-i		
148					ecmo-time	

149				normo-i		
151	age					
152			noTTM			
153					ecmo-time	
155				normo-i		
156				normo-i		
157			noTTM			
159				normo-i		
160			noTTM			
163						
164		cross				NW
165	age					
167	age					
169	age		noTTM			
171				normo-i		
173	age					
176	age					
178	age					
179		noROSC transport in S arm	noTTM			
180	age	noROSC transport in S arm	noTTM			
181				normo-i		
185				normo-i		
186	age					
187	age					
188	age					
190	age					
193		noROSC transport in S arm	noTTM			
194	age					
196	age					
197	age					
199				normo-i		
200	age					
201	age					
203				normo-i		
204					ecmo-time	
206				normo-i		
208				normo-i	ecmo-time	
209			noTTM			
210	age			normo-i		
211				normo-i		
213	age					
218	age			normo-i		
221				normo-i		

222		noROSC transport in S arm	noTTM			
224	age					
225				normo-i		
226						NW
227			noTTM			
228				normo-i		
229	age					
230				normo-i		NW
233				normo-i		
236		cross	noTTM			
237			noTTM			
238	age					
239						
240	age					
241		noROSC transport in S arm				
242				normo-i		
245	age					
248		noROSC transport in S arm	noTTM			
251	age					
252		cross				
254				normo-i		
255		noROSC transport in S arm	noTTM			
256				normo-i		
257				normo-i		
258				normo-i		
261	age	noROSC transport in S arm	noTTM			