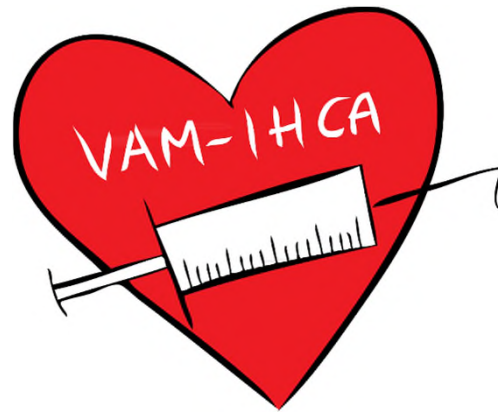


# Vasopressin and Methylprednisolone for In-Hospital Cardiac Arrest



HLR congress  
Göteborg, Sweden  
November 24, 2021



AARHUS UNIVERSITY



Aarhus University Hospital

# Funding and COIs

AARHUS UNIVERSITETS  
**FORSKNINGSFOND**  
AARHUS UNIVERSITY RESEARCH FOUNDATION



AARHUS  
UNIVERSITY  
DEPARTMENT OF CLINICAL MEDICINE

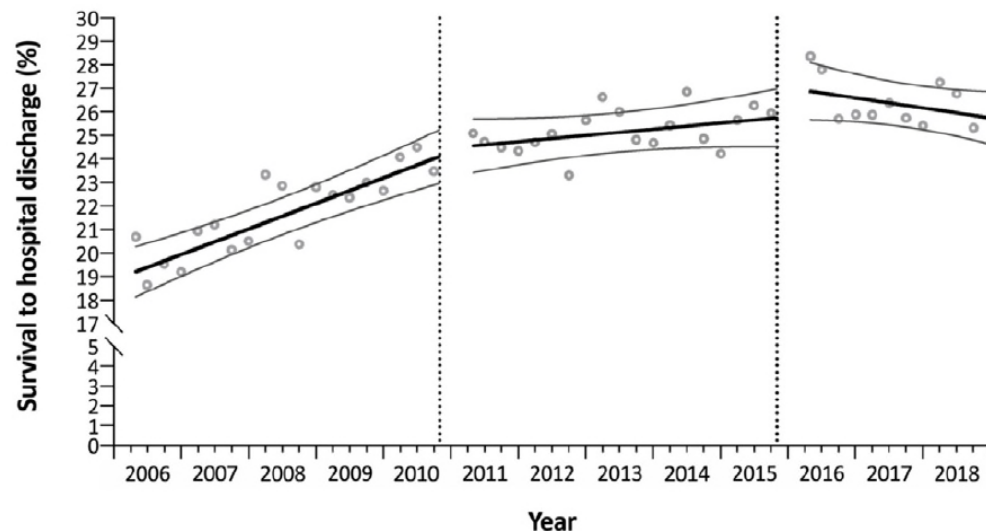


DANMARKS FRIE  
**FORSKNINGSFOND**  
INDEPENDENT RESEARCH  
FUND DENMARK



# Background

- Incidence:
  - US: 290,000
  - Denmark: 2,000
- ROSC  $\approx$  55-60%
- Survival  $\approx$  25-30%



Circulation: Cardiovascular Quality and Outcomes

## ORIGINAL ARTICLE

### Annual Incidence of Adult and Pediatric In-Hospital Cardiac Arrest in the United States



Available online at [www.sciencedirect.com](http://www.sciencedirect.com)

**Resuscitation**

journal homepage: [www.elsevier.com/locate/resuscitation](http://www.elsevier.com/locate/resuscitation)



Clinical paper

#### Adult in-hospital cardiac arrest in Denmark



Lars W. Andersen<sup>a,b,\*</sup>, Mathias J. Holmberg<sup>a</sup>, Bo Løfgren<sup>a,c,d</sup>, Hans Kirkegaard<sup>a</sup>, Asger Granfeldt<sup>e</sup>



Available online at [www.sciencedirect.com](http://www.sciencedirect.com)

**Resuscitation**

journal homepage: [www.elsevier.com/locate/resuscitation](http://www.elsevier.com/locate/resuscitation)



Clinical paper

#### Trends in survival and introduction of the 2010 and 2015 guidelines for adult in-hospital cardiac arrest



Mathias J. Holmberg<sup>a,b,c</sup>, Asger Granfeldt<sup>d,e</sup>, Saket Girotra<sup>f</sup>, Michael W. Donnino<sup>b,g</sup>, Lars W. Andersen<sup>a,b,h,i,\*</sup>, for the American Heart Association's Get With The Guidelines<sup>®</sup>-Resuscitation Investigators<sup>1</sup>

# Background

- Lack of evidence for in-hospital cardiac arrest

**Circulation: Cardiovascular Quality and Outcomes**

Volume 9, Issue 6, November 2016; Pages 749-756

<https://doi.org/10.1161/CIRCOUTCOMES.116.002916>



## ORIGINAL ARTICLE

### Identifying Important Gaps in Randomized Controlled Trials of Adult Cardiac Arrest Treatments

A Systematic Review of the Published Literature

Shashank S. Sinha, MD, MSc, Devraj Sukul, MD, John J. Lazarus, MD, PhD, Vivek Polavarapu, BS, Paul S. Chan, MD, MSc, Robert W. Neumar, MD, PhD, and Brahmajee K. Nallamothu, MD, MPH



ELSEVIER

## Resuscitation

journal homepage: [www.elsevier.com/locate/resuscitation](http://www.elsevier.com/locate/resuscitation)



Short paper

### Adult post-cardiac arrest interventions: An overview of randomized clinical trials

Lars W. Andersen<sup>a,b,\*</sup>, Peter Carøe Lind<sup>c</sup>, Lauge Vammen<sup>d</sup>, Maria Høybye<sup>a</sup>, Mathias J. Holmberg<sup>a,e</sup>, Asger Granfeldt<sup>b,d</sup>



## Vasopressin, Epinephrine, and Corticosteroids for In-Hospital Cardiac Arrest

*Spyros D. Mentzelopoulos, MD, PhD; Spyros G. Zakynthinos, MD, PhD; Maria Tzoufi, MD, PhD; Nikos Katsios, MD; Androula Papastylianou, MD; Sotiria Gkisioti, MD; Anastasios Stathopoulos, MD; Androniki Kollintza, PhD; Elissavet Stamataki, MD, PhD; Charis Roussos, MD, PhD*

Arch Intern Med. 2009

Single-center

Randomized, double-blind

**100 patients** with IHCA and  $\geq 1$  adrenaline dose

## Vasopressin, Steroids, and Epinephrine and Neurologically Favorable Survival After In-Hospital Cardiac Arrest A Randomized Clinical Trial

*Spyros D. Mentzelopoulos, MD, PhD; Sotirios Malachias, MD; Christos Chamos, MD; Demetrios Konstantopoulos, MD; Theodora Ntaidou, MD; Androula Papastylianou, MD, PhD; Iosifinia Kolliantzaki, MD; Maria Theodoridi, MD; Helen Ischaki, MD, PhD; Demosthenes Makris, MD, PhD; Epaminondas Zakynthinos, MD, PhD; Elias Zintzaras, MD, PhD; Sotirios Sourlas, MD; Stavros Aloizos, MD; Spyros G. Zakynthinos, MD, PhD*

JAMA 2013

3-center

Randomized, double-blind

**268 patients** with IHCA and  $\geq 1$  adrenaline dose

### Intervention:

- Vasopressin (20 IU) + methylprednisolone (40 mg) after the first adrenaline dose
- Vasopressin (20 IU) after each adrenaline dose (max. 100 IU)
- If in shock 4 hours after the cardiac arrest, hydrocortisone (300 mg daily)



# Vasopressin, Epinephrine, and Corticosteroids for In-Hospital Cardiac Arrest

Spyros D. Mentzelopoulos, MD, PhD; Spyros G. Zakynthinos, MD, PhD; Maria Tzoufi, MD, PhD; Nikos Katsios, MD; Androula Papastylianou, MD; Sotiria Gkisioti, MD; Anastasios Stathopoulos, MD; Androniki Kollintza, PhD; Elissavet Stamataki, MD, PhD; Charis Roussos, MD, PhD

Arch Intern Med. 2009

Single-center

Randomized, double-blind

**100 patients** with IHCA and  $\geq 1$  adrenaline dose

	ROSC	Survival
Intervention:	<b>39/48 (81%)</b>	9/48 (19%)
Placebo:	<b>27/52 (52%)</b>	2/52 (4%)

# Vasopressin, Steroids, and Epinephrine and Neurologically Favorable Survival After In-Hospital Cardiac Arrest A Randomized Clinical Trial

Spyros D. Mentzelopoulos, MD, PhD; Sotirios Malachias, MD; Christos Chamos, MD; Demetrios Konstantopoulos, MD; Theodora Ntaidou, MD; Androula Papastylianou, MD, PhD; Iosifinia Kolliantzi, MD; Maria Theodoridi, MD; Helen Ischaki, MD, PhD; Demosthenes Makris, MD, PhD; Epaminondas Zakynthinos, MD, PhD; Elias Zintzaras, MD, PhD; Sotirios Sourlas, MD; Stavros Aloizos, MD; Spyros G. Zakynthinos, MD, PhD

JAMA 2013

3-center

Randomized, double-blind

**268 patients** with IHCA and  $\geq 1$  adrenaline dose

	ROSC	CPC 1-2
Intervention:	<b>109/130 (84%)</b>	18/130 (14%)
Placebo:	<b>91/138 (66%)</b>	7/138 (5%)

# Vasopressin, Epinephrine, and Corticosteroids for In-Hospital Cardiac Arrest

Spyros D. Mentzelopoulos, MD, PhD; Spyros G. Zakynthinos, MD, PhD; Maria Tzoufi, MD, PhD; Nikos Katsios, MD; Androula Papastylianou, MD; Sotiria Gkisioti, MD; Anastasios Stathopoulos, MD; Androniki Kollintza, PhD; Elissavet Stamataki, MD, PhD; Charis Roussos, MD, PhD

Arch Intern Med. 2009

Single-center

Randomized, double-blind

**100 patients** with IHCA and  $\geq 1$  adrenaline dose

	ROSC	Survival
Intervention:	39/48 (81%)	<b>9/48 (19%)</b>
Placebo:	27/52 (52%)	<b>2/52 (4%)</b>

# Vasopressin, Steroids, and Epinephrine and Neurologically Favorable Survival After In-Hospital Cardiac Arrest A Randomized Clinical Trial

Spyros D. Mentzelopoulos, MD, PhD; Sotirios Malachias, MD; Christos Chamos, MD; Demetrios Konstantopoulos, MD; Theodora Ntaidou, MD; Androula Papastylianou, MD, PhD; Iosifinia Kolliantzaki, MD; Maria Theodoridi, MD; Helen Ischaki, MD, PhD; Demosthenes Makris, MD, PhD; Epaminondas Zakynthinos, MD, PhD; Elias Zintzaras, MD, PhD; Sotirios Sourlas, MD; Stavros Aloizos, MD; Spyros G. Zakynthinos, MD, PhD

JAMA 2013

3-center

Randomized, double-blind

**268 patients** with IHCA and  $\geq 1$  adrenaline dose

	ROSC	CPC 1-2
Intervention:	109/130 (84%)	<b>18/130 (14%)</b>
Placebo:	91/138 (66%)	<b>7/138 (5%)</b>

# Background

## European Resuscitation Council Guidelines for Resuscitation 2015 Section 3. Adult advanced life support

Jasmeet Soar<sup>a,\*</sup>, Jerry P. Nolan<sup>b,c</sup>, Bernd W. Böttiger<sup>d</sup>, Gavin D. Perkins<sup>e,f</sup>, Carsten Lott<sup>g</sup>, Pierre Carli<sup>h</sup>, Tommaso Pellis<sup>i</sup>, Claudio Sandroni<sup>j</sup>, Markus B. Skrifvars<sup>k</sup>, Gary B. Smith<sup>l</sup>, Kjetil Sunde<sup>m,n</sup>, Charles D. Deakin<sup>o</sup>, on behalf of the Adult advanced life support section Collaborators<sup>1</sup>

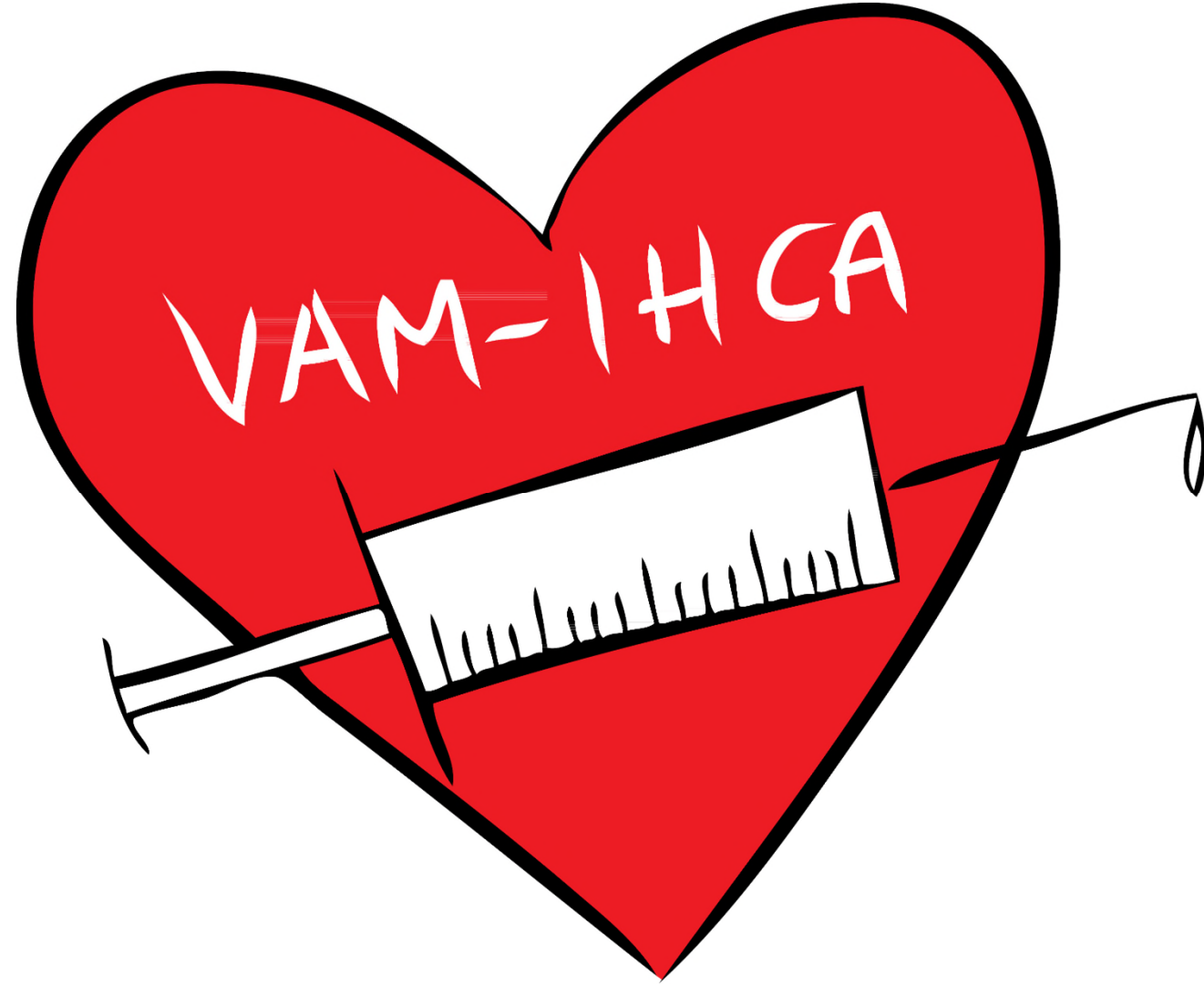
“... these studies are **not generalisable** to all cardiac arrests and **we suggest that steroids are not used routinely for cardiac arrest.**”

## Part 7: Adult Advanced Cardiovascular Life Support 2015 American Heart Association Guidelines Update for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care

Mark S. Link, Chair; Lauren C. Berkow; Peter J. Kudenchuk; Henry R. Halperin; Erik P. Hess; Vivek K. Moitra; Robert W. Neumar; Brian J. O'Neil; James H. Paxton; Scott M. Silvers; Roger D. White; Demetris Yannopoulos; Michael W. Donnino

“... the combination of intra-arrest vasopressin, epinephrine, and methylprednisolone and post-arrest hydrocortisone ... **may be considered**; however, **further studies are needed** before recommending the routine use of this therapeutic strategy.”





# Methods

- Investigator-initiated, multicenter, randomized, placebo-controlled, double-blind, trial of vasopressin and methylprednisolone during adult in-hospital cardiac arrest



Clinical paper

## **Vasopressin and methylprednisolone for in-hospital cardiac arrest — Protocol for a randomized, double-blind, placebo-controlled trial**



Lars W. Andersen<sup>a,b,c,\*</sup>, Birthe Sindberg<sup>a</sup>, Mathias Holmberg<sup>a,d</sup>, Dan Isbye<sup>e</sup>,  
Jesper Kjærgaard<sup>f</sup>, Stine T. Zwisler<sup>g</sup>, Søren Darling<sup>g</sup>, Jacob Moesgaard Larsen<sup>h,i</sup>,  
Bodil S. Rasmussen<sup>i,j</sup>, Bo Løfgren<sup>a,k</sup>, Kasper Glerup Lauridsen<sup>a,k</sup>, Kim B. Pælestik<sup>l</sup>,  
Christoffer Sølling<sup>l</sup>, Anders G. Kjærgaard<sup>m</sup>, Dorte Due-Rasmussen<sup>m</sup>,  
Fredrik Folke<sup>n,o</sup>, Mette Gitz Charlot<sup>o</sup>, Kasper Iversen<sup>p</sup>, Martin Schultz<sup>q</sup>,  
Sebastian Wiberg<sup>r</sup>, Rikke Malene H.G. Jepsen<sup>r</sup>, Tobias Kurth<sup>s</sup>, Michael Donnino<sup>t,u</sup>,  
Hans Kirkegaard<sup>a,c</sup>, Asger Granfeldt<sup>b</sup>

# Methods

- 10 hospitals in Denmark
  - 4 large university hospitals
  - 6 middle-sized hospitals



# Methods

- **Inclusion criteria**

- In-hospital cardiac arrest
- Age  $\geq 18$  years
- Received at least one dose of adrenaline during CPR

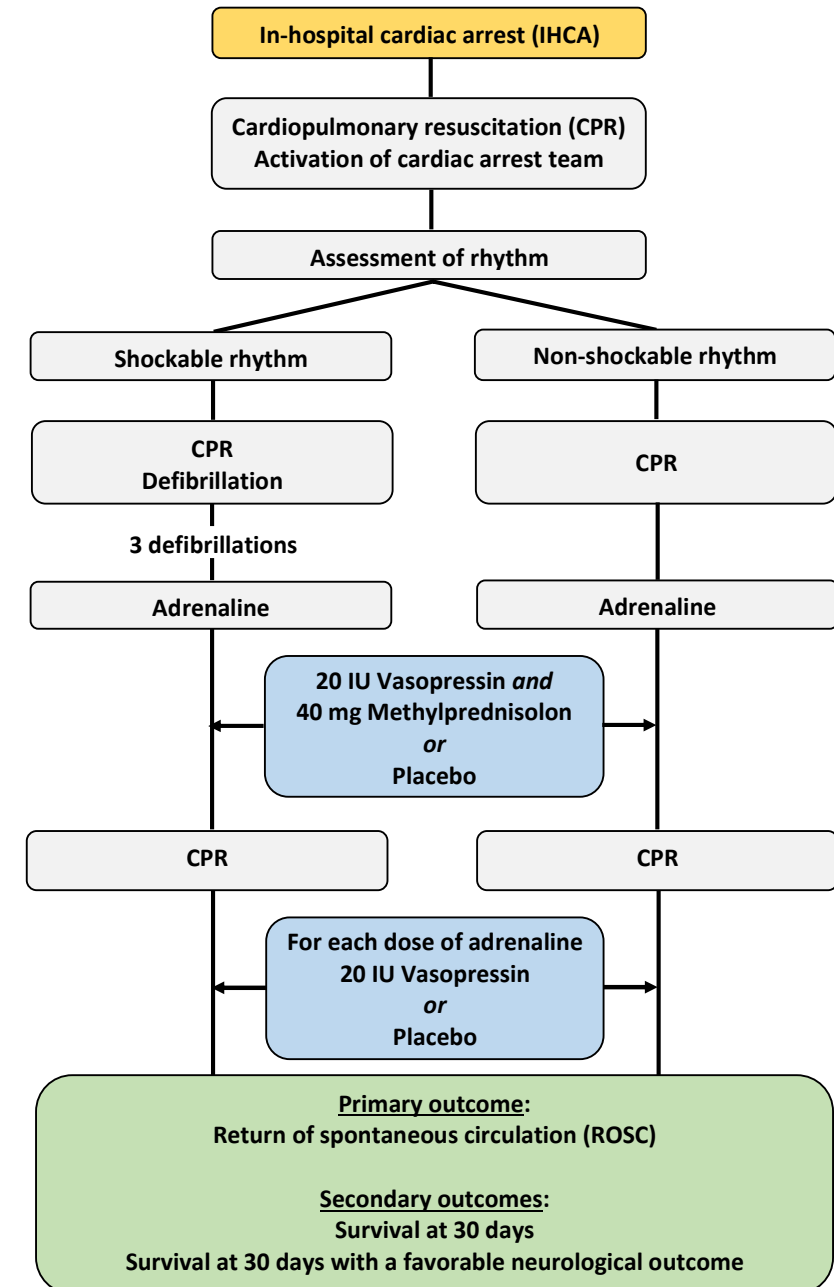
- **Exclusion criteria**

- Clearly documented “do-not-resuscitate” order prior to the cardiac arrest
- Prior enrollment in the trial
- Extracorporeal circulation at the time of the cardiac arrest
- Known or suspected pregnancy



# Methods

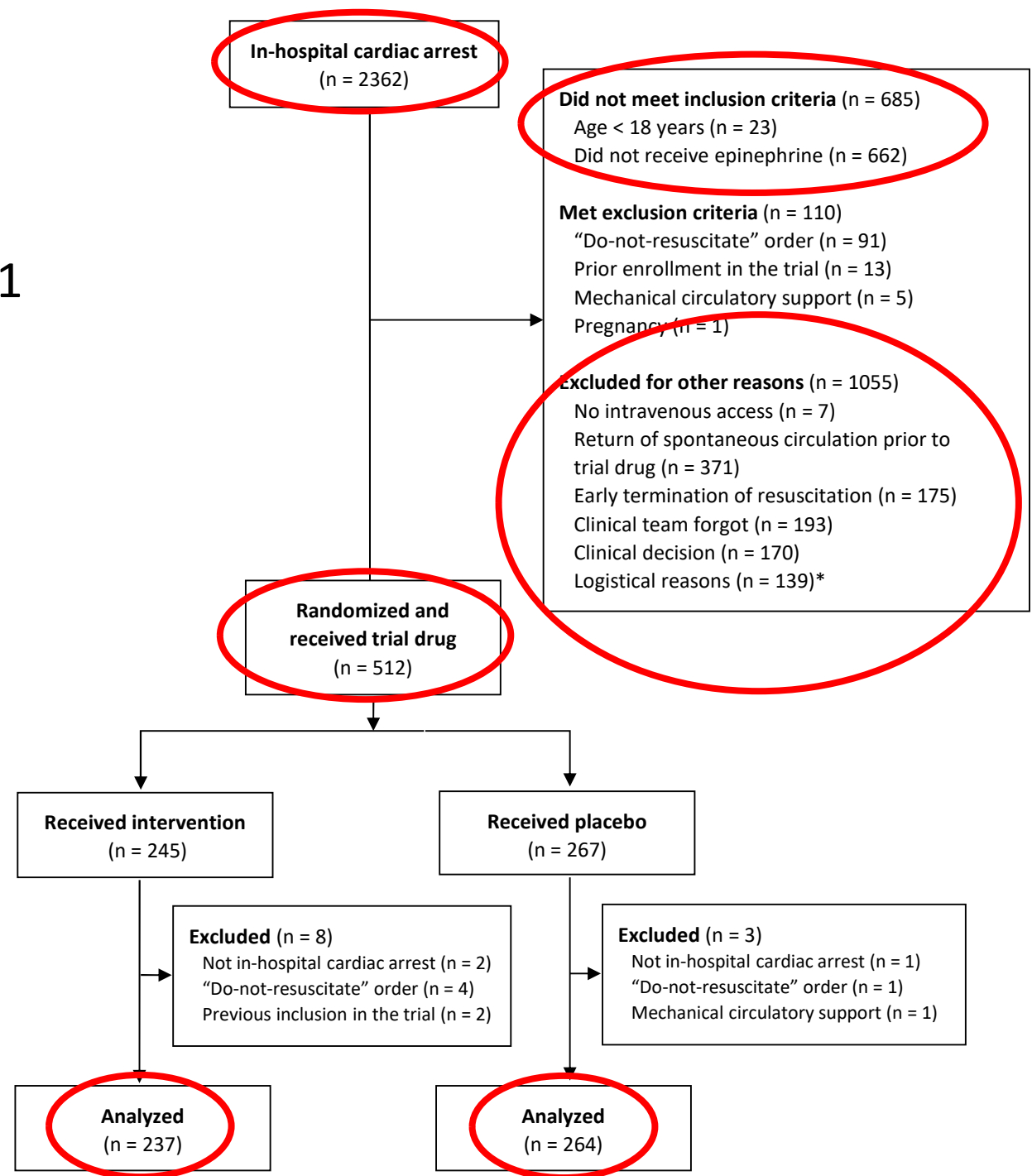
- Interventions:
  - **20 IU vasopressin** after each dose of adrenaline (max 80 IU)
  - **40 mg methylprednisolon** after the first dose of adrenaline



# Results

# Results

October 15, 2018 to January 21, 2021



- 501 patients included
- Age: 71 years
- 64% male
- Mostly ward patients (66%)
- Mostly non-shockable (90%)
- Time to epinephrine: 5 min.
- Time to drug: 8 min.
- No loss to follow-up

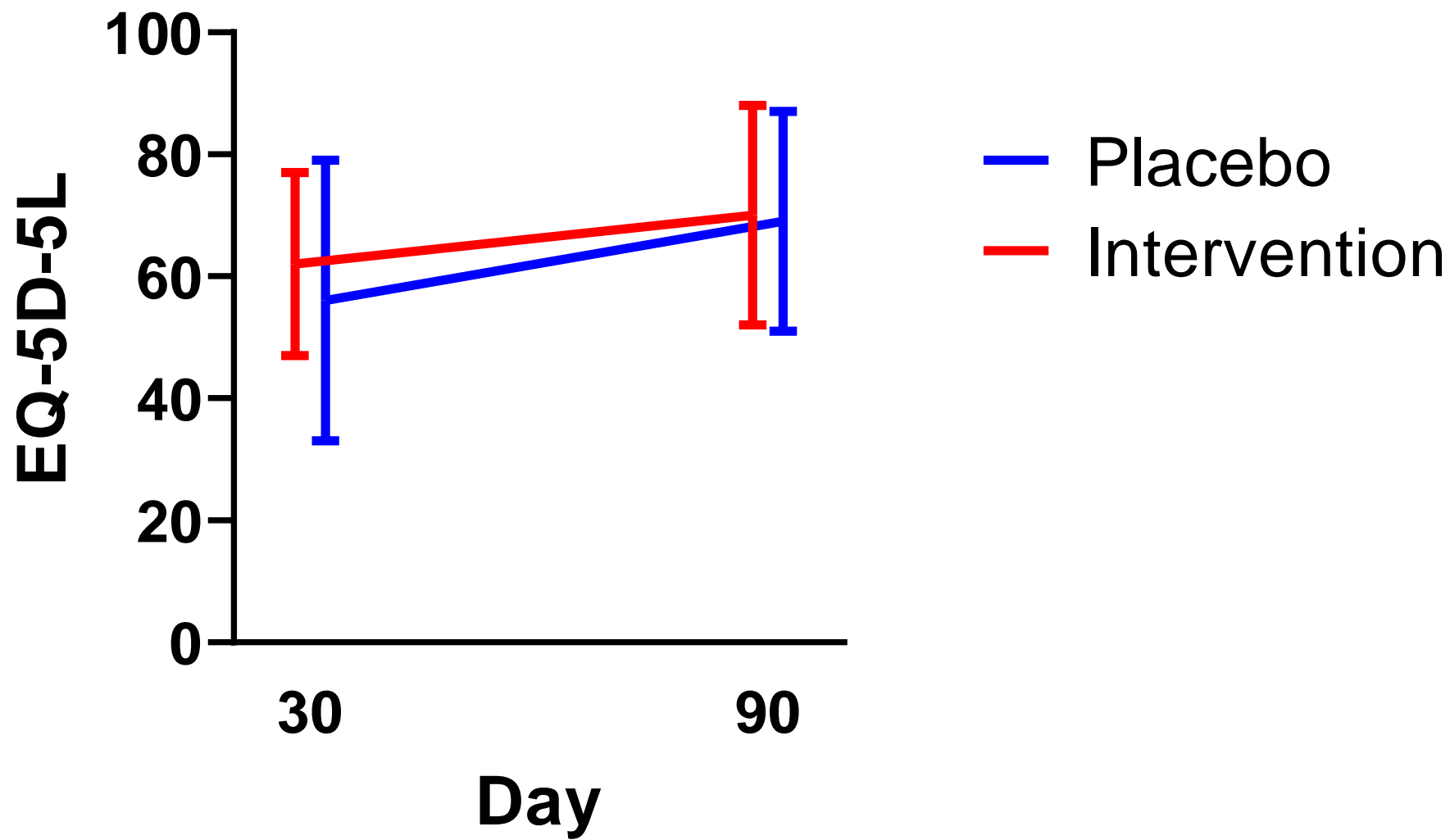
	<b>Vasopressin and Methylprednisolone (n = 237)</b>	<b>Placebo (n = 264)</b>
<b>Patient Characteristics</b>		
Age – years	71 (13)	70 (12)
Male sex – no. (%)	148 (62)	174 (66)
Past medical history – no. (%)*		
Coronary artery disease	76 (32)	92 (35)
Chronic heart failure	47 (20)	56 (21)
Atrial fibrillation	69 (29)	66 (25)
Stroke	46 (19)	40 (15)
Venous thromboembolism	15 (6)	14 (5)
Arterial hypertension	148 (62)	167 (63)
Diabetes	69 (29)	78 (30)
Pulmonary disease	67 (28)	82 (31)
Renal disease	54 (23)	49 (19)
Liver disease	8 (3)	11 (4)
Cancer	55 (23)	49 (19)
Dementia	5 (2)	3 (1)
<b>Cardiac Arrest Characteristics</b>		
Location – no. (%)		
Emergency department	19 (8)	38 (14)
Hospital ward	163 (69)	168 (64)
Intensive care unit	23 (10)	18 (7)
Operating room	4 (2)	3 (1)
Cardiac catheterization laboratory	12 (5)	23 (9)
Other	16 (7)	14 (5)
Monitored – no. (%)	87 (37)	121 (46)
Witnessed – no. (%)	168 (71)	202 (77)
Initial rhythm – no. (%)		
Asystole	82 (35)	95 (36)
Pulseless electrical activity	134 (57)	138 (52)
Ventricular fibrillation	17 (7)	22 (8)
Ventricular tachycardia	4 (2)	9 (3)
Time to epinephrine administration - minutes	5 (3, 7)	5 (3, 8)
Time to trial drug administration - minutes	8 (6, 12)	9 (6, 12)



	<b>Vasopressin and Methylprednisolone (n = 237)</b>	<b>Placebo (n = 264)</b>	<b>Risk Difference (95%CI)</b>	<b>Risk ratio (95%CI)</b>	<b>P value</b>
<b>Primary Outcome</b>					
Return of spontaneous circulation	100 (42%)	86 (33%)	9.6% (1.1, 18.0)	1.30 (1.03, 1.63)	0.03

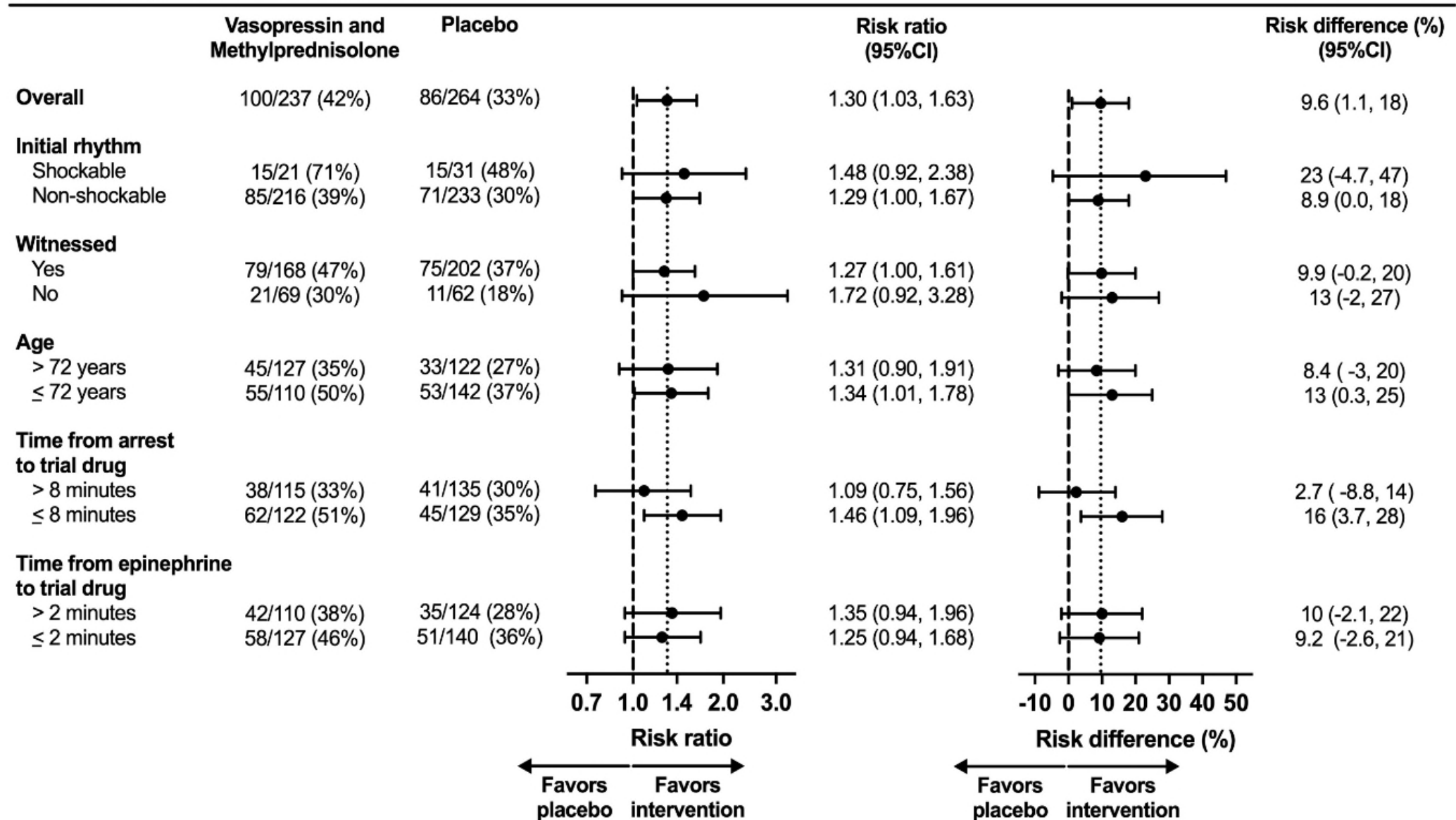
	<b>Vasopressin and Methylprednisolone (n = 237)</b>	<b>Placebo (n = 264)</b>	<b>Risk Difference (95%CI)</b>	<b>Risk ratio (95%CI)</b>	<b>P value</b>
<b>Primary Outcome</b>					
Return of spontaneous circulation	100 (42%)	86 (33%)	9.6% (1.1, 18.0)	1.30 (1.03, 1.63)	0.03
<b>Secondary Outcomes</b>					
<b>30-Day Outcomes</b>					
Survival	23 (9.7%)	31 (12%)	-2.0% (-7.5, 3.5)	0.83 (0.50, 1.37)	0.48
Favorable neurologic outcome (CPC 1-2)	18 (7.6%)	20 (7.6%)	0.0% (-4.7, 4.9)	1.00 (0.55, 1.83)	> 0.99

	<b>Vasopressin and Methylprednisolone (n = 237)</b>	<b>Placebo (n = 264)</b>	<b>Risk Difference (95%CI)</b>	<b>Risk ratio (95%CI)</b>	<b>P value</b>
<b>Primary Outcome</b>					
Return of spontaneous circulation	100 (42%)	86 (33%)	9.6% (1.1, 18.0)	1.30 (1.03, 1.63)	0.03
<b>Secondary Outcomes</b>					
<b>30-Day Outcomes</b>					
Survival	23 (9.7%)	31 (12%)	-2.0% (-7.5, 3.5)	0.83 (0.50, 1.37)	0.48
Favorable neurologic outcome (CPC 1-2)	18 (7.6%)	20 (7.6%)	0.0% (-4.7, 4.9)	1.00 (0.55, 1.83)	> 0.99
<b>90-Day Outcomes</b>					
Survival	20 (8.4%)	24 (9.1%)	-0.7% (-5.7, 4.5)	0.93 (0.53, 1.62)	-
Favorable neurologic outcome (CPC 1-2)	18 (7.6%)	20 (7.6%)	0.0% (-4.7, 4.9)	1.00 (0.55, 1.83)	-





## Return of spontaneous circulation



# Discussion

- Improvement in return of spontaneous circulation (42% vs. 33%)
- No difference in survival (10% vs. 12%)
- No difference in neurologic outcome (8% vs. 8%)

# Discussion

Intervention characteristics of included trials			
	2009-trial	2013-trial	2021-trial
Vasopressin dose	20 IU	20 IU	20 IU
Max. number of doses	5	5	4
Methylprednisolone dose	40 mg	40 mg	40 mg
Post-cardiac arrest steroid	Yes	Yes	No
Time to trial drug – min.	3 (2, 5)	5 (3, 6)	8 (6, 12)

# Discussion

Patient characteristics of included trials			
	2009-trial	2013-trial	2021-trial
Patients	100	268	501
Centers	1	3	10
Patient characteristics			
Age – years	73 (58, 79)	68 (54, 76)	72 (64, 79)
Sex – male	59 (59)	183 (68)	322 (64)
Cardiac arrest characteristics			
Location			
Intensive care unit	31 (31)	101 (38)	41 (8)
Not intensive care unit	69 (69)	167 (24)	460 (92)
Initial rhythm			
Asystole	61 (61)	180 (67)	177 (35)
PEA	25 (25)	43 (16)	272 (54)
VF/VT	14 (14)	45 (17)	52 (10)
Witnessed	81 (81)	247 (92)	370 (74)
Monitored	35 (35)	111 (41)	208 (42)

# Discussion

- Strengths

- Relatively large, multicenter trial
- Time to drug delivery = 8 minutes
- Long-term outcomes with no loss to follow-up

- Limitations

- Many potentially eligible patients not included
- Time to drug delivery = 8 minutes
- Low survival (8-9%)?
- Not powered for 30-day outcomes

# Discussion

- Recommend for/against vasopressin + steroids?
- More trials?
  - Example
    - 8 vs. 12% (RR: 1.50, RD: 4%) = 2362 patients
    - 8 vs. 10% (RR: 1.25, RD: 2%) = 8602 patients



# Effect of Vasopressin and Methylprednisolone vs Placebo on Return of Spontaneous Circulation in Patients With In-Hospital Cardiac Arrest A Randomized Clinical Trial

Lars W. Andersen, MD, MPH, PhD, DMSc; Dan Isbye, MD, PhD; Jesper Kjærgaard, MD, PhD, DMSc; Camilla M. Kristensen, BS; Søren Darling, MD; Stine T. Zwisler, MD, PhD; Stine Fisker, CRNA; Jens Christian Schmidt, MD; Hans Kirkegaard, MD, PhD, DMSc; Anders M. Grejs, MD, PhD; Jørgen R. G. Rossau, MD; Jacob M. Larsen, MD, PhD; Bodil S. Rasmussen, MD, PhD; Signe Riddersholm, MD, PhD; Kasper Iversen, MD, DMSc; Martin Schultz, MD, PhD; Jakob L. Nielsen, CRNA; Bo Løfgren, MD, PhD; Kasper G. Lauridsen, MD, PhD; Christoffer Sølling, MD, PhD; Kim Pælestik, MD; Anders G. Kjærgaard, MD, PhD; Dorte Due-Rasmussen, MD; Fredrik Folke, MD, PhD; Mette G. Charlot, MD, PhD; Rikke Malene H. G. Jepsen, MD, PhD; Sebastian Wiberg, MD, PhD; Michael Donnino, MD; Tobias Kurth, MD, PhD; Maria Høybye, BS; Birthe Sindberg, RN; Mathias J. Holmberg, MD, MPH, PhD; Asger Granfeldt, MD, PhD, DMSc

**IMPORTANCE** Previous trials have suggested that vasopressin and methylprednisolone administered during in-hospital cardiac arrest might improve outcomes.

**OBJECTIVE** To determine whether the combination of vasopressin and methylprednisolone administered during in-hospital cardiac arrest improves return of spontaneous circulation.

**DESIGN, SETTING, AND PARTICIPANTS** Multicenter, randomized, double-blind, placebo-controlled trial conducted at 10 hospitals in Denmark. A total of 512 adult patients with in-hospital cardiac arrest were included between October 15, 2018, and January 21, 2021. The last 90-day follow-up was on April 21, 2021.

**INTERVENTION** Patients were randomized to receive a combination of vasopressin and methylprednisolone (n = 245) or placebo (n = 267). The first dose of vasopressin (20 IU) and methylprednisolone (40 mg), or corresponding placebo, was administered after the first dose of epinephrine. Additional doses of vasopressin or corresponding placebo were administered after each additional dose of epinephrine for a maximum of 4 doses.

**MAIN OUTCOMES AND MEASURES** The primary outcome was return of spontaneous circulation. Secondary outcomes included survival and favorable neurologic outcome at 30 days (Cerebral Performance Category score of 1 or 2).

**RESULTS** Among 512 patients who were randomized, 501 met all inclusion and no exclusion criteria and were included in the analysis (mean [SD] age, 71 [13] years; 322 men [64%]). One hundred of 237 patients (42%) in the vasopressin and methylprednisolone group and 86 of 264 patients (33%) in the placebo group achieved return of spontaneous circulation (risk ratio, 1.30 [95% CI, 1.03-1.63]; risk difference, 9.6% [95% CI, 1.1%-18.0%]; P = .03). At 30 days, 23 patients (9.7%) in the intervention group and 31 patients (12%) in the placebo group were alive (risk ratio, 0.83 [95% CI, 0.50-1.37]; risk difference: -2.0% [95% CI, -7.5% to 3.5%]; P = .48). A favorable neurologic outcome was observed in 18 patients (7.6%) in the intervention group and 20 patients (7.6%) in the placebo group at 30 days (risk ratio, 1.00 [95% CI, 0.55-1.83]; risk difference, 0.0% [95% CI, -4.7% to 4.9%]; P > .99). In patients with return of spontaneous circulation, hyperglycemia occurred in 77 (77%) in the intervention group and 63 (73%) in the placebo group. Hyponatremia occurred in 28 (28%) and 27 (31%), in the intervention and placebo groups, respectively.

**CONCLUSIONS AND RELEVANCE** Among patients with in-hospital cardiac arrest, administration of vasopressin and methylprednisolone, compared with placebo, significantly increased the likelihood of return of spontaneous circulation. However, there is uncertainty whether this treatment results in benefit or harm for long-term survival.

**TRIAL REGISTRATION** ClinicalTrials.gov Identifier: NCT03640949

[Visual Abstract](#)  
[Editorial](#)  
[Supplemental content](#)  
[CME Quiz at jama.melookup.com](#)

**Author Affiliations:** Author affiliations are listed at the end of this article.

**Corresponding Author:** Lars W. Andersen, MD, MPH, PhD, DMSc, Research Center for Emergency Medicine, Department of Clinical Medicine and Emergency

# JAMA<sup>®</sup>

Lars W. Andersen, MD, MPH, PhD, DMSc; Dan Isbye, MD, PhD; Jesper Kjærgaard, MD, PhD, DMSc; Camilla M. Kristensen, BS; Søren Darling, MD; Stine T. Zwisler, MD, PhD; Stine Fisker, CRNA; Jens Christian Schmidt, MD; Hans Kirkegaard, MD, PhD, DMSc; Anders M. Grejs, MD, PhD; Jørgen R. G. Rossau, MD; Jacob M. Larsen, MD, PhD; Bodil S. Rasmussen, MD, PhD; Signe Riddersholm, MD, PhD; Kasper Iversen, MD, DMSc; Martin Schultz, MD, PhD; Jakob L. Nielsen, CRNA; Bo Løfgren, MD, PhD; Kasper G. Lauridsen, MD, PhD; Christoffer Sølling, MD, PhD; Kim Pælestik, MD; Anders G. Kjærgaard, MD, PhD; Dorte Due-Rasmussen, MD; Fredrik Folke, MD, PhD; Mette G. Charlot, MD, PhD; Rikke Malene H. G. Jepsen, MD, PhD; Sebastian Wiberg, MD, PhD; Michael Donnino, MD; Tobias Kurth, MD, PhD; Maria Høybye, BS; Birthe Sindberg, RN; Mathias J. Holmberg, MD, MPH, PhD; Asger Granfeldt, MD, PhD, DMSc

## Effect of Vasopressin and Methylprednisolone vs Placebo on Return of Spontaneous Circulation in Patients With In-Hospital Cardiac Arrest A Randomized Clinical Trial

Published September 29, 2021

Available at [jama.com](https://www.jama.com)

CALCIUM FOR OUT OF HOSPITAL

COCA



CARDIAC ARREST



Critical Care Reviews

November 30<sup>th</sup>