The Latest Heads-up on Neuroprotective (Heads Up CPR)

….the News Keeps Getting Better

Who should start Neuroprotective CPR and when?

Does Neuroprotective CPR increase circulation in patients?

What is the Best Position Before, During, and After CPR to Save the Brain?

June 15, 2023

Keith Lurie MD, Kerry Bachista MD, Paul Pepe MD

Disclosures

Dr. Lurie is a professor at the University of Minnesota.

Dr. Lurie is a founder and Chief Medical Officer of AdvancedCPR Solutions, manufacturer of devices that elevate the head and thorax during CPR

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June 14, 2021

Neuroprotective CPR


Jason
Age 51
1st Anniversary

New Data 2022-2023

Should Neuroprotective CPR be Started by First Responders?

RESUSCITATION 170 (2022) 83–89

Available online at ScienceDirect

Resuscitation

journal homepage: www.elsevier.com/locate/resuscitation

Clinical paper

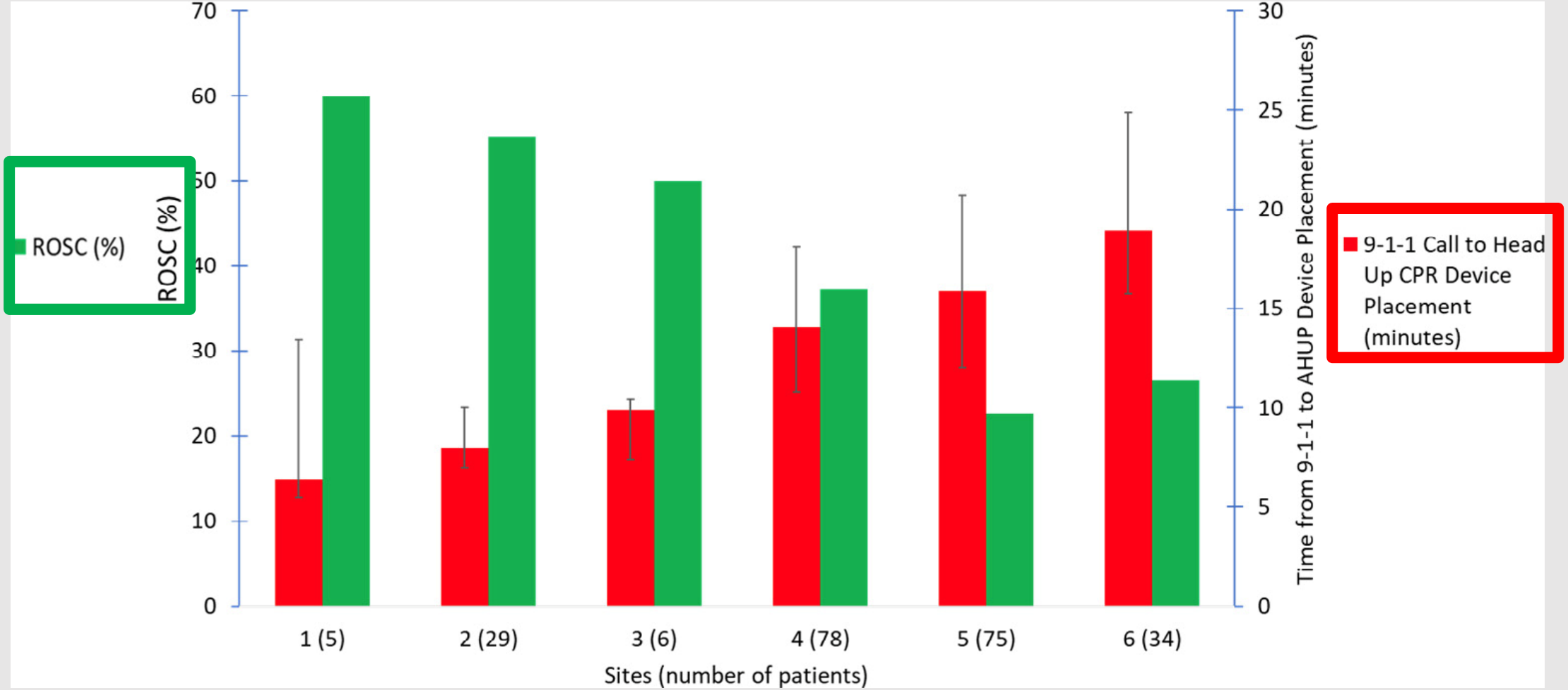
Faster time to automated elevation of the head and thorax during cardiopulmonary resuscitation increases the probability of return of spontaneous circulation

Johanna C. Moore[a], Sue Duval[b], Charles Lick[c], Joseph Holley[d], Kenneth A. Scheppke[e], Bayert Salverda[f], Carolina Rojas-Salvador[b], Michael Jacobs[g], Paul Nystrom[h], Ryan Quinn[i], Paul J. Adams[j], Guillaume P. Debaty[k], Mack Hutchison[l], Charles Mason[l], Eduardo Martinez[j], Steven Mason[j], Armando Clift[j], Peter Antevy[e], Charles Coyle[e], Eric Grizzard[m], Sebastian Garay[e], Keith G. Lurie[a], Paul E. Pepe[n]

[a] Hennepin Healthcare, Hennepin Healthcare Research Institute, University of Minnesota, United States

[b] University of Minnesota, United States

ROSC (GREEN) & time from the 911 call to Automated Head Up CPR (RED), stratified by sites

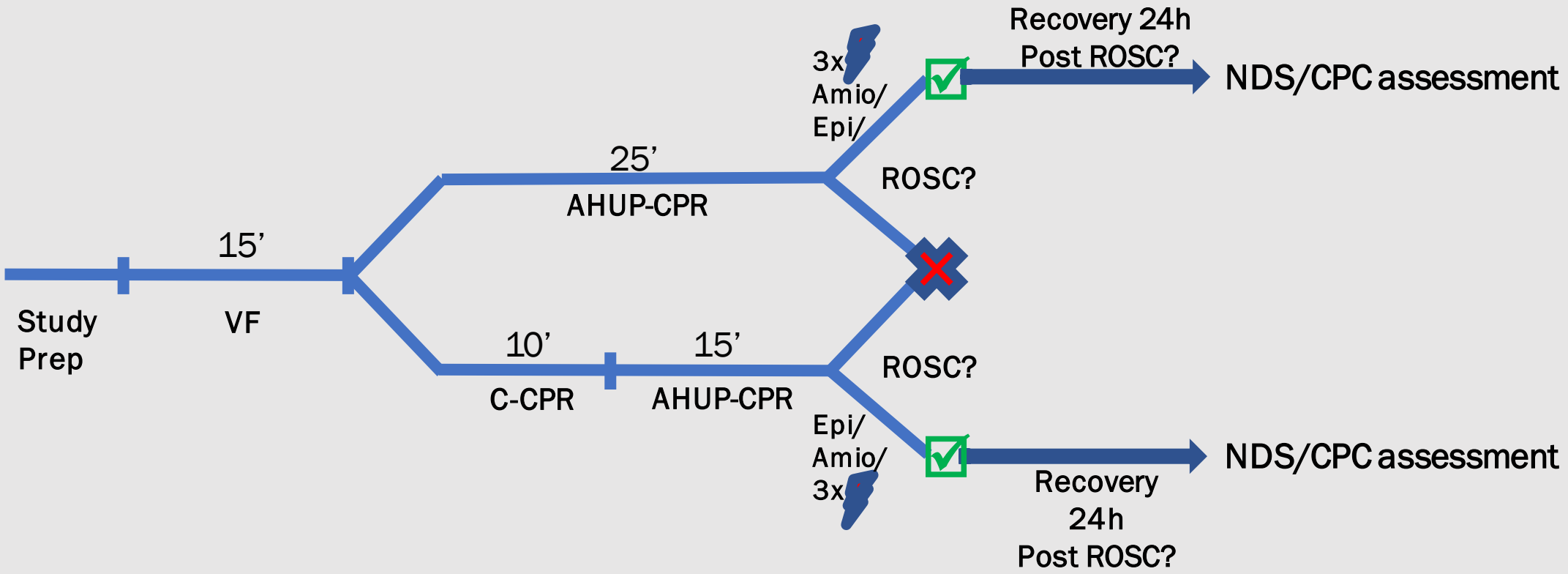


Moore et al. Resuscitation 2022;170 (63-69)

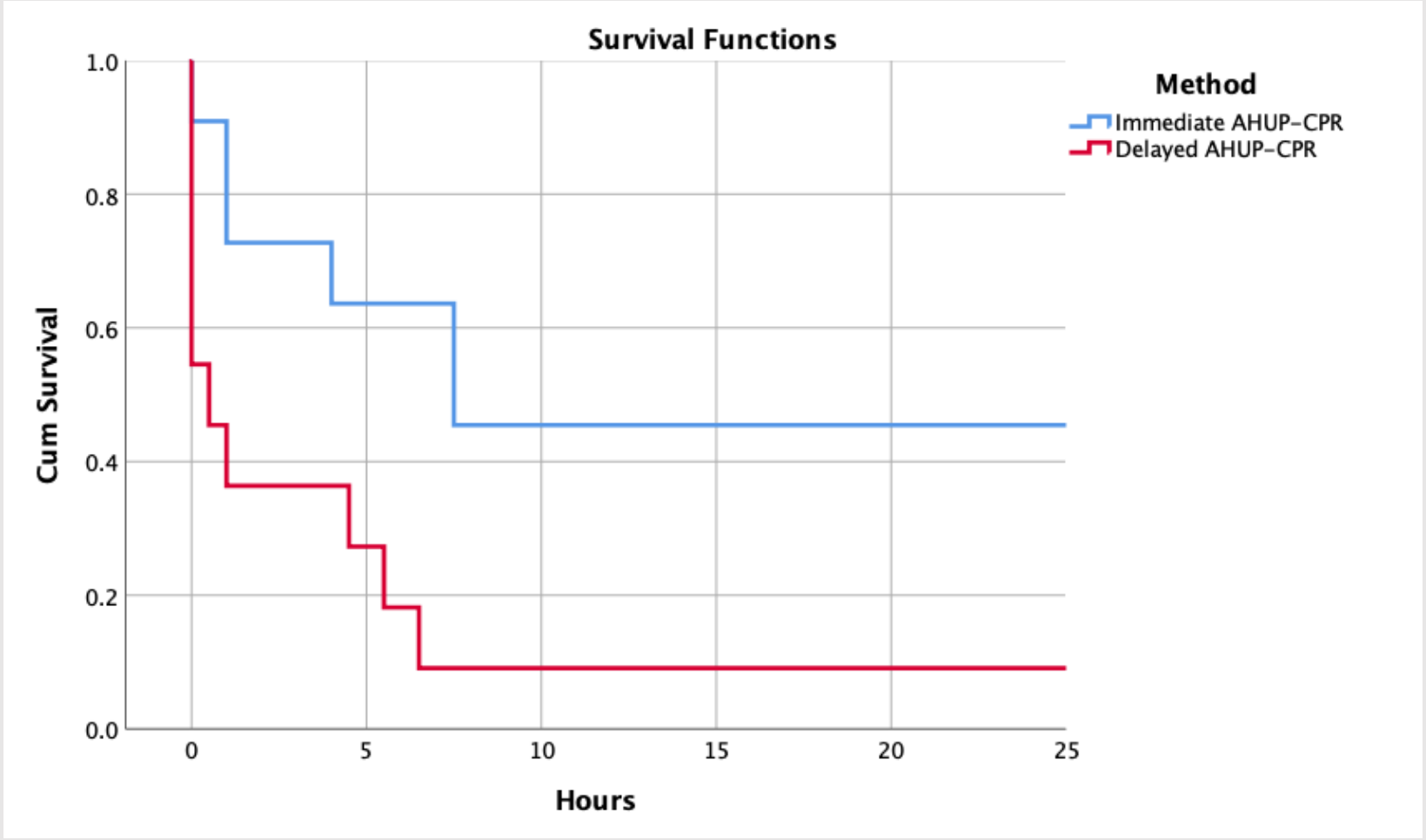
Survival and Neurological Function with Immediate versus Delayed Automated Head-Up CPR in a Porcine Model of Prolonged Cardiac Arrest

Pourzand et al, 2023

Study Design



Comparison of Immediate v Delayed AHUP-CPR



Cumulative Survival Rate
0.455 vs 0.091

Log-rank (Mantel-Cox) test
Chi square = 5.810
Df = 1
P-value = 0.016

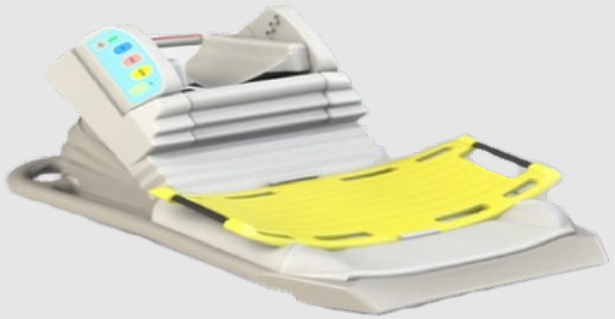
Neuroprotective CPR Should and Can be Started by First Responders, Just like Like an AED

New Human Physiological Data

Data in support for **Better Circulation** during Neuroprotective CPR

Gravity Study Grenoble France

Combination of head-up position, active compression-decompression mechanical cardiopulmonary resuscitation and impedance threshold device to improve outcomes in out-of-hospital cardiac arrest. A prospective controlled trial



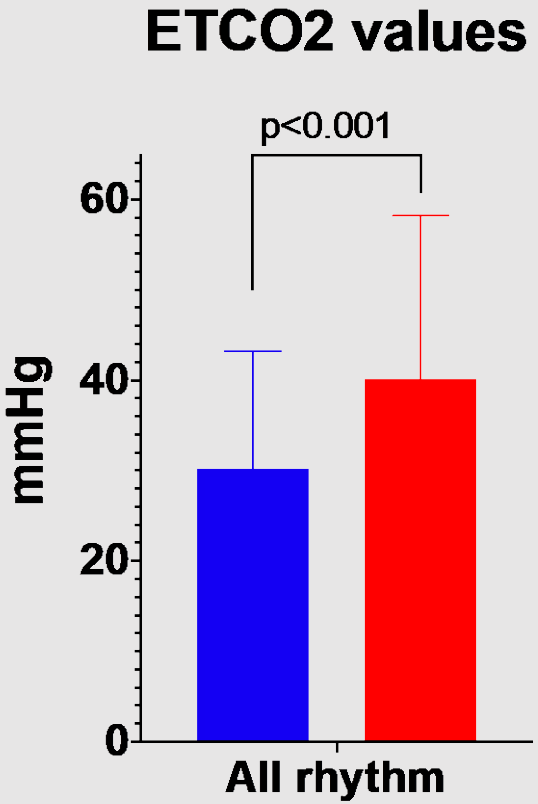
Guillaume Debaty
Professor and Chair - Emergency Medical Services – Mobile Intensive Care Unit - SAMU 38 -University Hospital of Grenoble Alps, France

First Responders in Grenoble France

All witnessed non-traumatic OHCA

16 month before and after study

Primary endpoint - Max ETCO2 during CPR



59 patients

63 patients

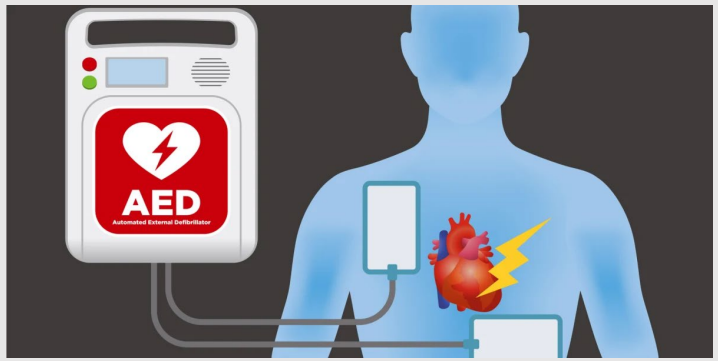
30±13 mmHg

41 ±18 mmHg

P<0.001

Debaty et al, Acad Emerg Med 2023;30: 120

Max ETCO2 during CPR – Initial Shockable Rhythm



22 patients

34 ±12 mmHg

16 patients

45 ±12 mmHg

P=0.03

Does Rapid Deployment of NP-CPR improve neurological survival?

RESUSCITATION 179 (2022) 9–17

Available online at ScienceDirect

Resuscitation

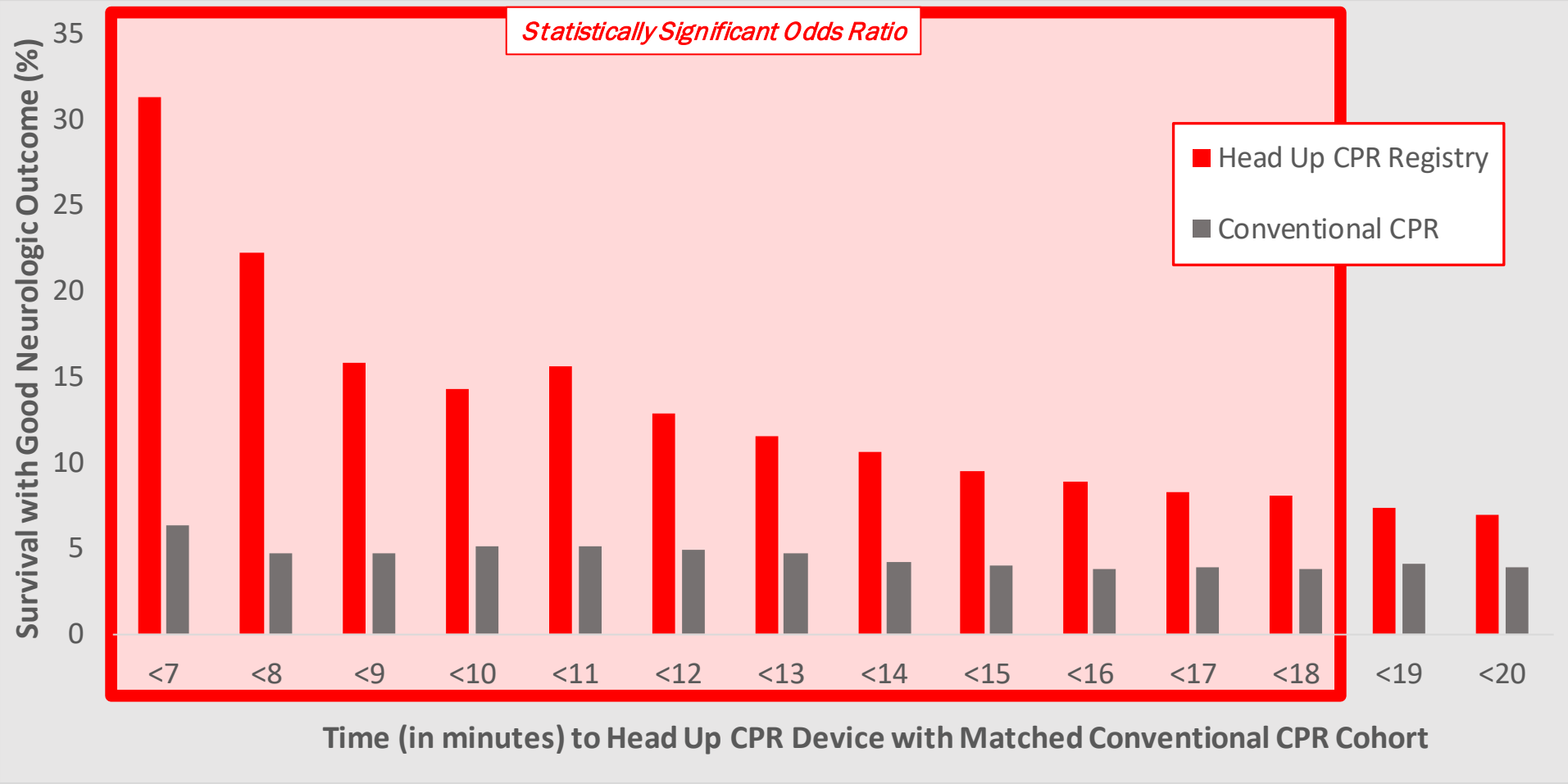
journal homepage: www.elsevier.com/locate/resuscitation

Clinical paper

Head and thorax elevation during cardiopulmonary resuscitation using circulatory adjuncts is associated with improved survival

Johanna C. Moore[a,b,c,*], Paul E Pepe[d], Kenneth A. Scheppke[e], Charles Lick[f], Sue Duval[b], Joseph Holley[g], Bayert Salverda[c], Michael Jacobs[h], Paul Nystrom[a,i], Ryan Quinn[i], Paul J. Adams[j], Mack Hutchison[k], Charles Mason[k], Eduardo Martinez[j], Steven Mason[j], Armando Clift[j], Peter M. Antevy[e], Charles Coyle[e], Eric Grizzard[l], Sebastian Garay[e], Remle P. Crowe[m], Keith G Lurie[a,b,c], Guillaume P. Debaty[n], José Labarère[o]

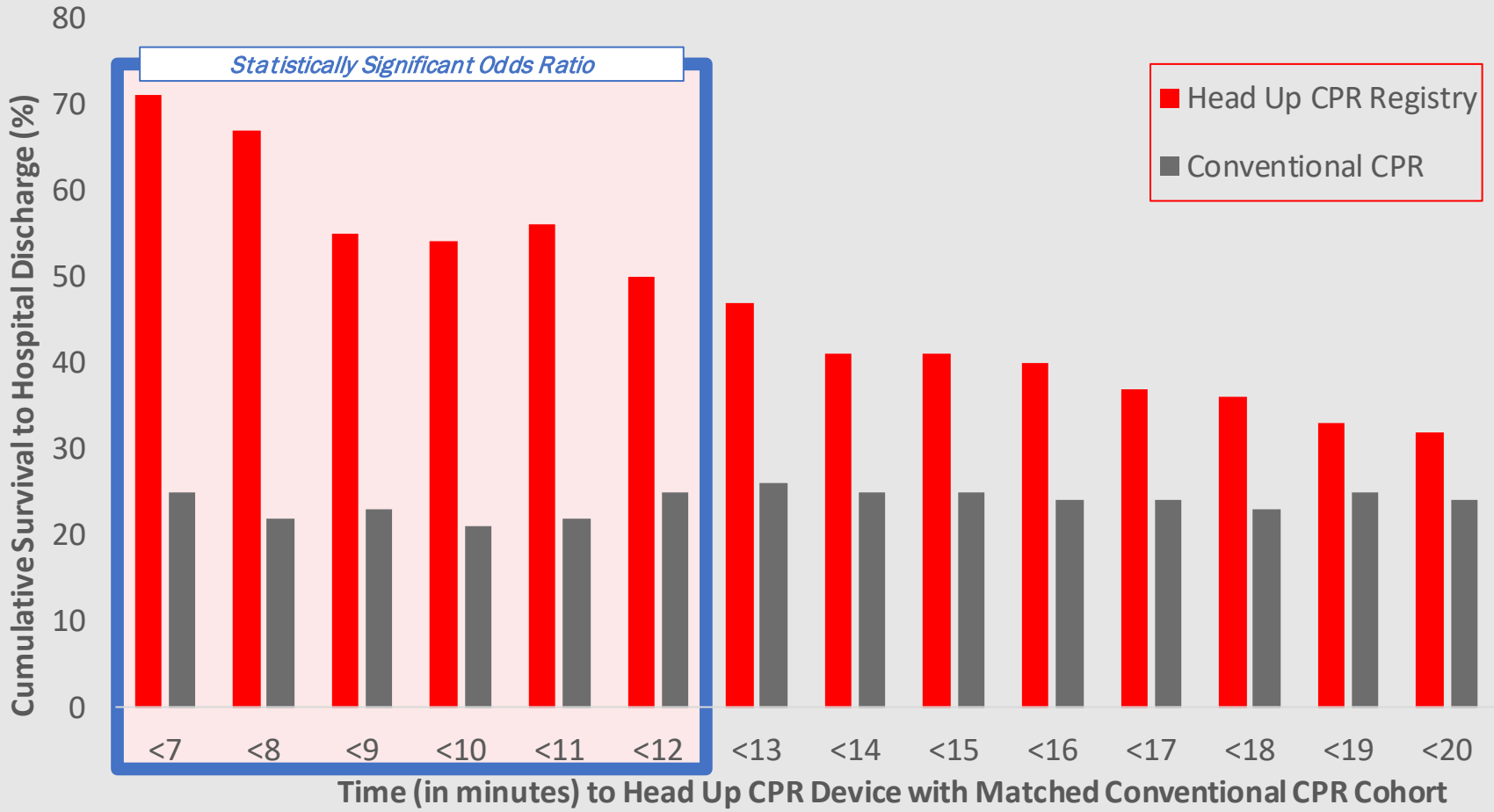
Cumulative Survival with Good Neurologic Function Comparing Neuroprotective CPR with Propensity-Matched Conventional CPR



Moore et al. National Association of EMS Physicians January 2022 . Prehospital Emergency Care 2022:26;108-163. Full manuscript under review.

Cumulative Survival to Hospital Discharge: Shockable Rhythms

Time to head up CPR device placement compared to a propensity matched conventional CPR cohort



Moore et al. National Association of EMS Physicians January 2022 . Prehospital Emergency Care 2022:26;108-163. Full manuscript under review.

What about Non-shockable Rhythm Subgroup

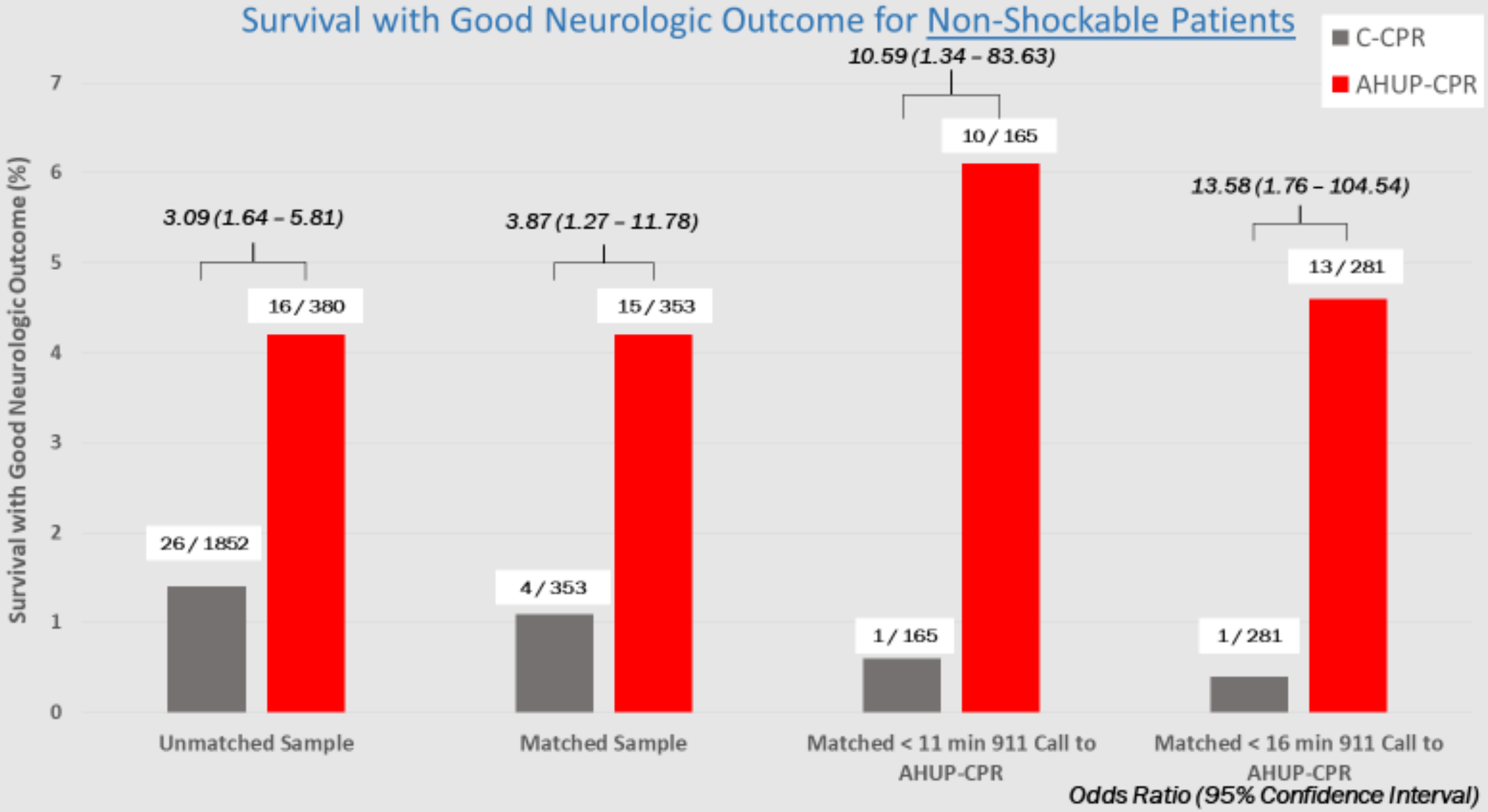
Neuroprotective CPR Registry patients (n=380) from 2020-2021 enrolled from 5 US EMS Systems focused on early Automated Head Up CPR

Conventional CPR patients from 2-NIH funded trials (ROC PRIMED, ResQTrial): n= 1852

Presenting rhythm ratio in both study populations: 61% asystole; 39% PEA

Analyses: Unmatched and propensity score matched for: age, sex, bystander CPR, witnessed arrest, time from 9-1-1 to EMS CPR

Bachista et al,
Circulation 2022; 146:A234



Bachista et al. *Circulation* 2022;146(2):A234.

Unadjusted Analysis

PEA Unadjusted Neuro Intact Survival was 9.8%

9.8% vs 2.8% (p= 0.002)

Asystole Unadjusted Survival to Discharge was 4.1%

7 / 169 (4%) VS 10 / 668 (1.5%) (p=0.03)

even though 73% of NP-CPR were unwitnessed Asystole vs 59% for C-CPR controls

SJCFR - 2022

CARES Summary Report

Demographic and Survival Characteristics of OHCA

Non-Traumatic Etiology | Arrest Witness Status: All | Date of Arrest: 01/01/22 - 12/31/22

Data	St Johns County N=187	Florida N=9482	National N=147736
Sustained ROSC (%)	**N=187**	**N=9479**	**N=147704**
Yes	82 (43.9)	2755 (29.1)	39408 (26.7)
No	105 (56.1)	6724 (70.9)	108296 (73.3)
Was hypothermia care provided in the field? (%)	**N=187**	**N=9482**	**N=147735**
Yes	2 (1.1)	462 (4.9)	3703 (2.5)
No	185 (98.9)	9020 (95.1)	144032 (97.5)
Pre-hospital Outcome (%)	**N=187**	**N=9482**	**N=147736**
Pronounced in the Field	9 (4.8)	2109 (22.2)	64995 (44.0)
Pronounced in ED	5 (2.7)	1363 (14.4)	13764 (9.3)
Ongoing Resuscitation in ED	173 (92.5)	6010 (63.4)	68977 (46.7)
Overall Survival (%)	**N=187**	**N=9482**	**N=147736**
Overall Survival to Hospital Admission	64 (34.2)	2497 (26.3)	36782 (24.9)
Overall Survival to Hospital Discharge	38 (20.3)	1032 (10.9)	13794 (9.3)
With Good or Moderate Cerebral Performance	23 (12.3)	669 (7.1)	11110 (7.5)
Missing hospital outcome	0	44	331
Utstein[1] Survival (%)	**N=20**	**N=969**	**N=15087**
	55.0%	28.9%	30.7%
Utstein Bystander[2] Survival (%)	**N=14**	**N=538**	**N=8856**
	50.0%	30.5%	34.3%

What is the best position of the body after ROSC?

Available online at www.sciencedirect.com

Resuscitation

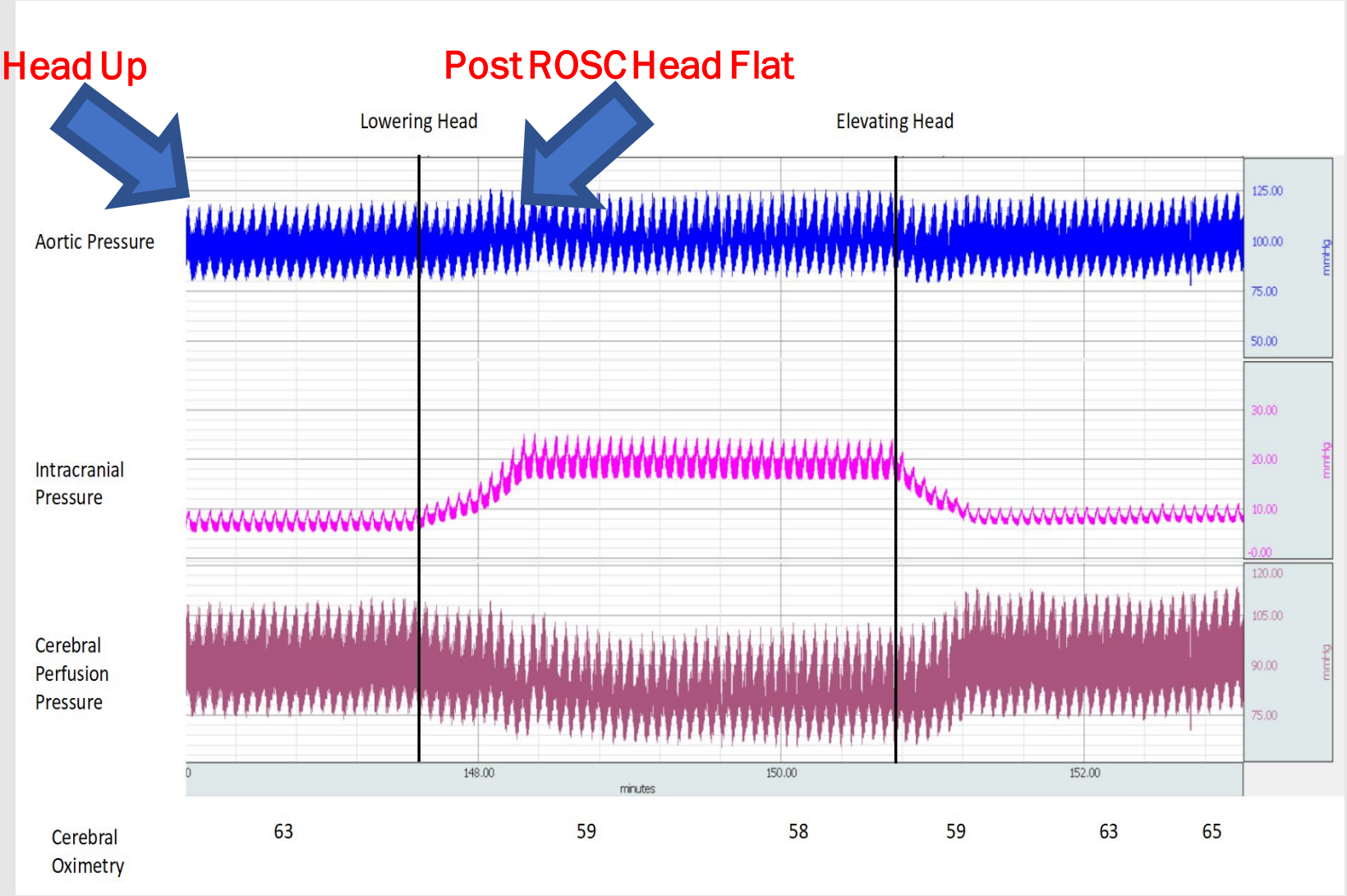
journal homepage: www.elsevier.com/locate/resuscitation

Experimental paper

Improving post-cardiac arrest cerebral perfusion pressure by elevating the head and thorax

Helene Duhem[a], Johanna C. Moore[b,c], Carolina Rojas-Salvador[d], Bayert Salverda[c], Michael Lick[c], Paul Pepe[e,f], Jose Labarere[a], Guillaume Debaty[a,*], Keith G. Lurie[c,d]

Post ROSC Head Up and Flat



After ROSC – if MAP >70mmHg, elevation of the head and thorax is best (animal and indirect human data from TBI patients)

Best Position of the Head and Thorax Before CPR?

Case Study

Tuscaloosa Fire Rescue
Patient Care Record

Name: GRACE, KENNEDY **Incident #:** 230123010 **Date:** 01/23/2023 Patient 1 of 1

Patient Information			
Last	GRACE	**Address**	
First	KENNEDY	**Address 2**	
Middle		**City**	
Gender	Female	**State**	
DOB		**Zip**	
Age	20 Years (estimated)	**Country**	
Weight	140.0lbs - 63.5kg	**Tel**	
Pedi Color		**Physician**	
SSN		**Ethnicity**	Not Hispanic or Latino
Race	White		
Advance Directives			
Resident Status		NON UA STUDENT	
Patient Resides in Service Area			
Temporary Residence Type			

Clinical Impression			
Primary Impression	Cardiac arrest		
Secondary Impression			
Protocols Used	Cardiac Arrest - Adult Only		
Local Protocol Provided Care Level			
Anatomic Position	General/Global		
Onset Time			
Last Known Well			
Chief Complaint	CARDIAC ARREST		
Duration	10	**Units**	Minutes
Secondary Complaint			
Duration		**Units**	
Patient's Level of Distress			
Signs & Symptoms	Cardiovascular - Cardiac arrest		
Injury	- -		
Additional Injury			
Mechanism of Injury			
Medical/Trauma	Medical		
Barriers of Care	None Noted		
Alcohol/Drugs	None Reported		
Pregnancy	No		
Initial Patient Acuity			
Final Patient Acuity			
Patient Activity			

Narrative

DISPATCHED FOR SEIZURE. CPR WAS BEING DONE BY BYSTANDERS ON SCENE. FRIENDS OF THE PT STATED THEY WERE GOING TO GO FOR A RUN AND LEFT THE PT FOR APPROX 3 MINUTES AND CAME TO FIND HER UNRESPONSIVE. UNKNOWN HX. FULL ACLS PROTOCOLS USED. PT WOULD INTERMITTENTLY START BREATHING INNEFFECTIVELY. PT TRANSPORTED TO DCH BY NSPS WITH EMT-P KIRKPATRICK AND EMT-B GARRIGAN RIDING IN

9-1-1 call received:	7:25 AM
Head cradled in lap	7:27 AM
Bystander CPR	7:30 AM
Arrived at patient:	7:33 AM
CPR by EMS	7:34 AM
First defibrillation	7:34 AM
Head and thorax elevated	7:35 AM
ROSC	7:58 AM

Does anyone think elevating the head on a pillow or two (or a lap) before CPR could be of benefit?


EDMOND FIRE & RESCUE
TRUCK
2
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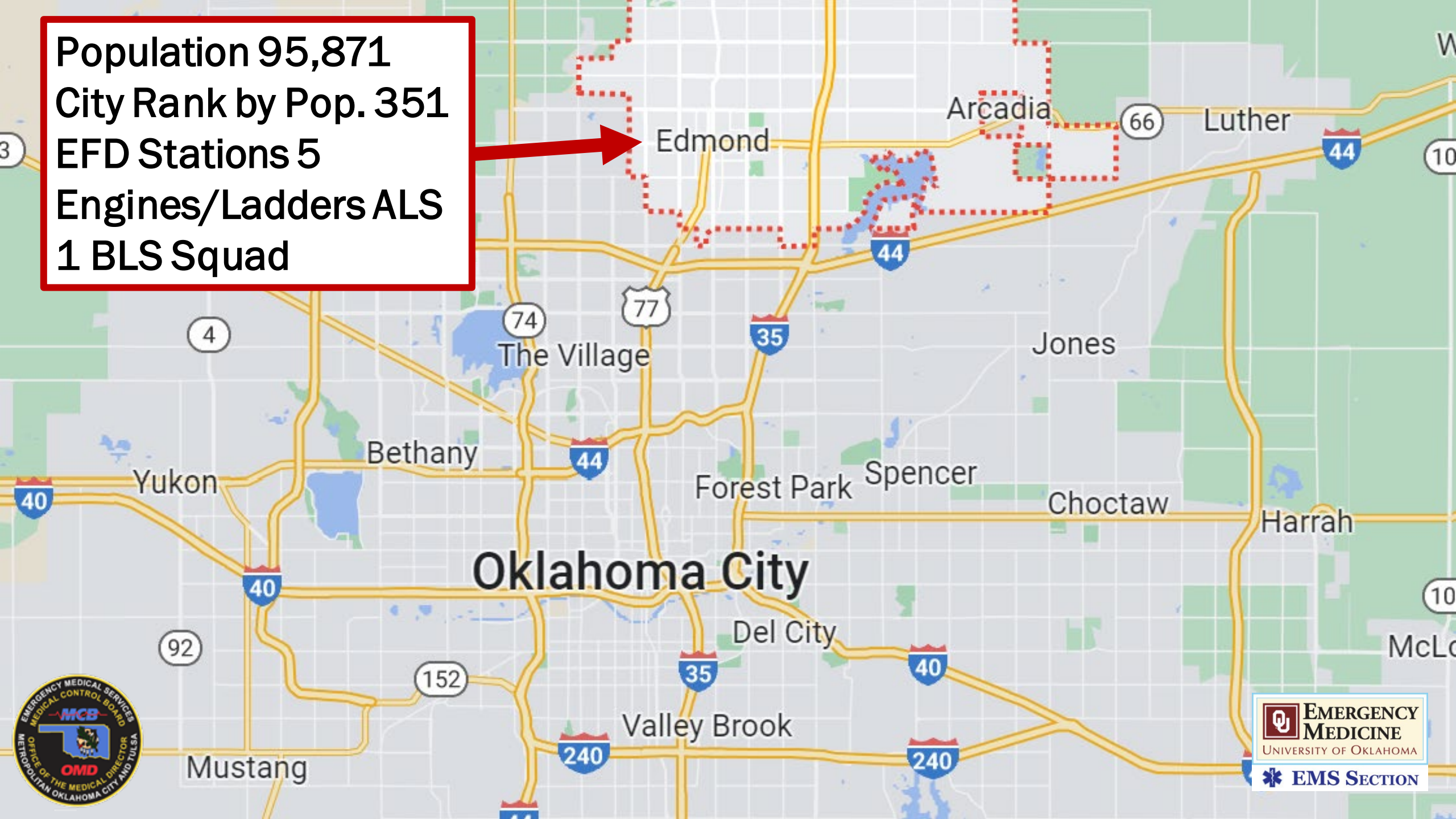
Population 95,871
City Rank by Pop. 351
EFD Stations 5
Engines/Ladders ALS
1 BLS Squad
Edmond
Arcadia
Luther
The Village
Jones
Bethany
Yukon
Forest Park
Spencer
Choctaw
Harrah
Oklahoma City
Del City
Valley Brook
Mustang
McL
66
44
77
74
35
4
40
92
152
240
10
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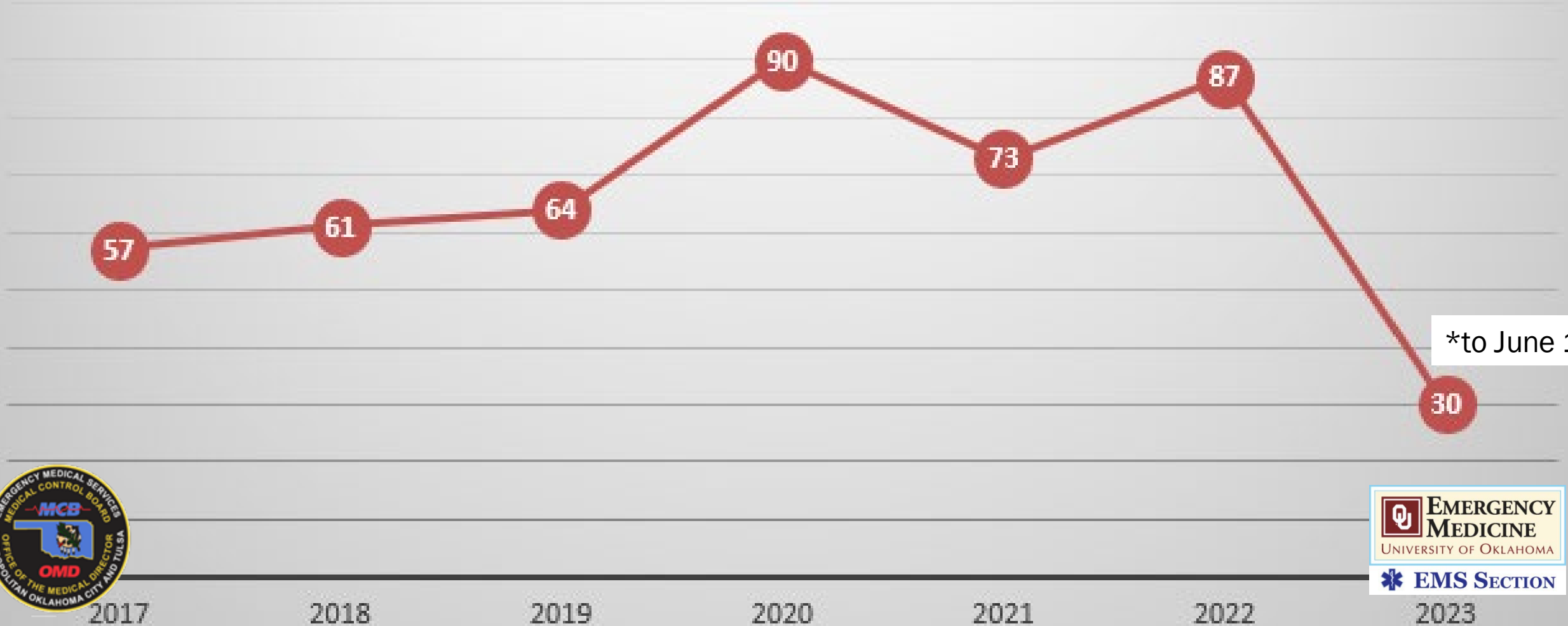
Edmond Fire Department
Total Resuscitations
2017-2023



*to June 1

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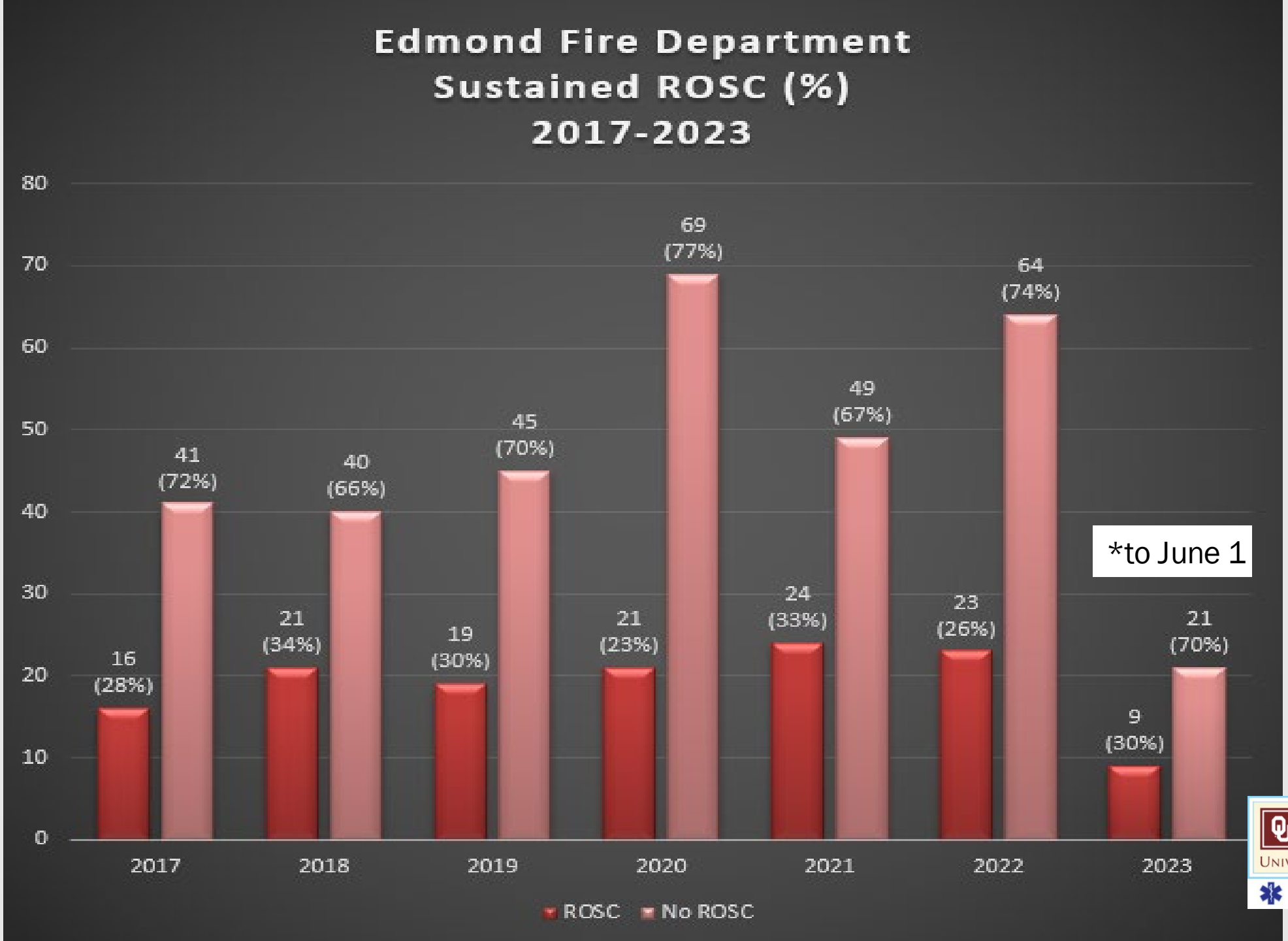
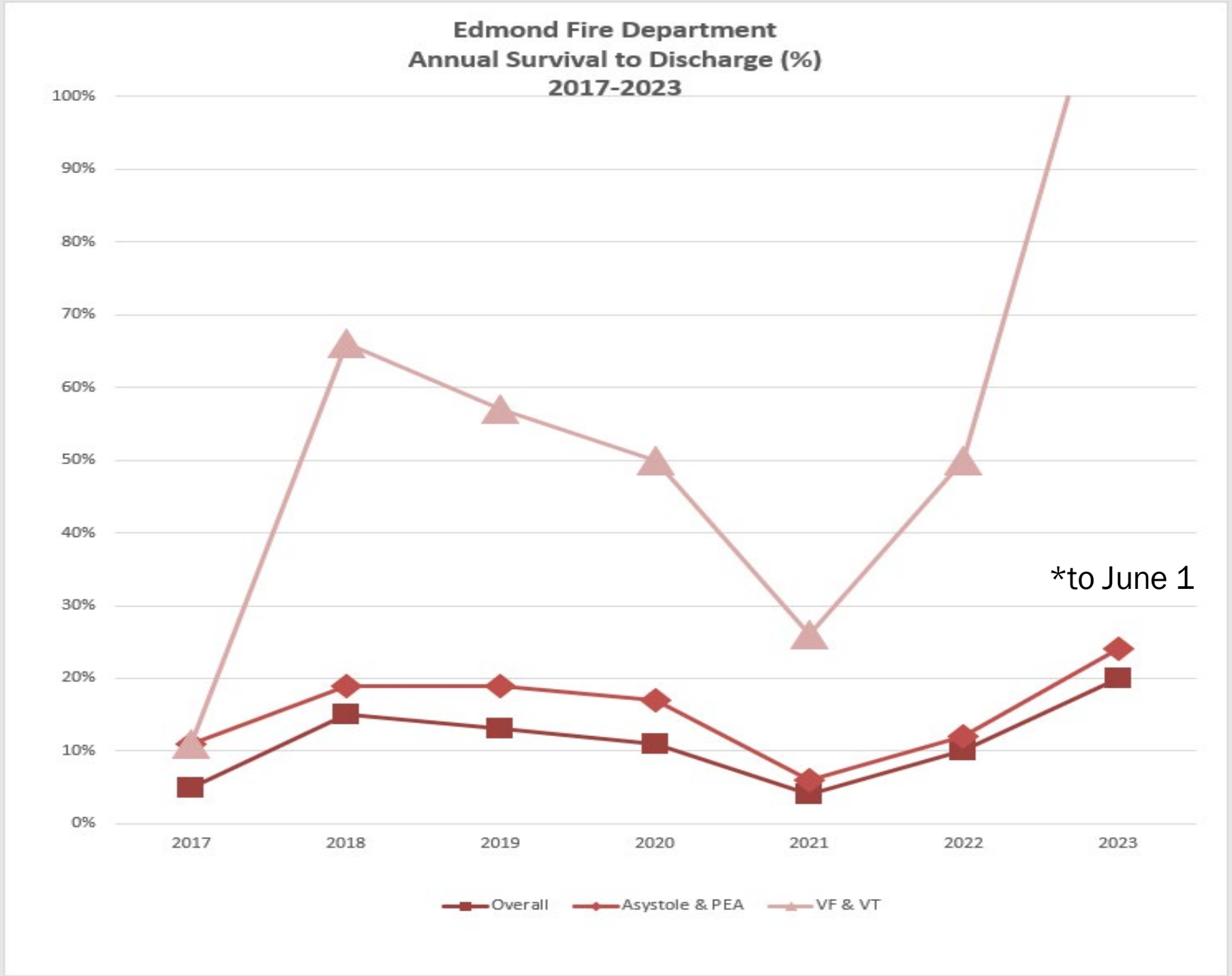
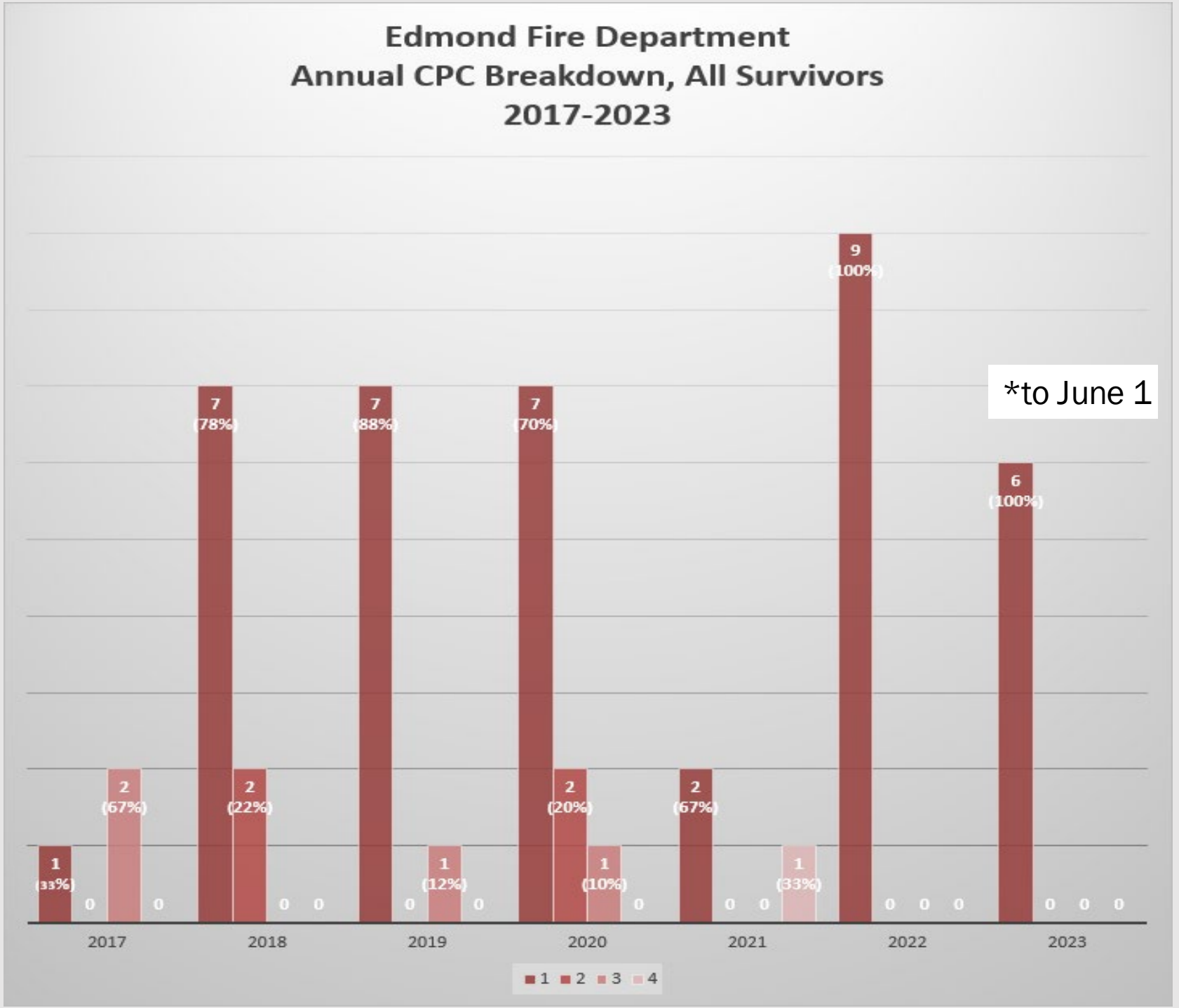

Edmond Fire Department
Sustained ROSC (%)
2017-2023
80
70
60
50
40
30
20
10
0
16 (28%)
41 (72%)
21 (34%)
40 (66%)
19 (30%)
45 (70%)
21 (23%)
69 (77%)
24 (33%)
49 (67%)
23 (26%)
64 (74%)
9 (30%)
21 (70%)
2017
2018
2019
2020
2021
2022
2023
ROSC
No ROSC
*to June 1


Edmond Fire Department
Annual Survival to Discharge (%)
2017-2023
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
2017
2018
2019
2020
2021
2022
2023
*to June 1
Overall
Asystole & PEA
VF & VT

Edmond Fire Department
Annual CPC Breakdown, All Survivors
2017-2023



*to June 1

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Thank you for your attention