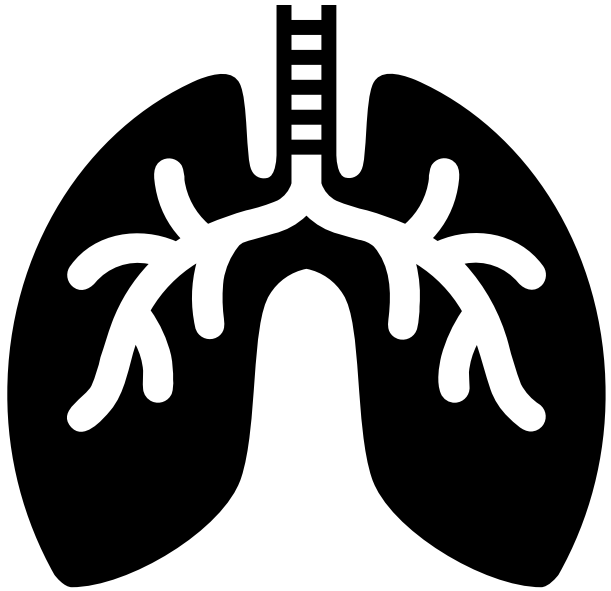


Oxygenation During CPR: BLS Breaths Really Do Matter

Scott T. Youngquist, MD, MS, FACEP, FAHA, FAEMS

Chief Medical Officer, Salt Lake City Fire Department

Professor of Emergency Medicine, University of Utah School of Medicine

DISCLOSURE for Continuing Medical Education Purposes

- This activity has been planned and implemented in accordance with the accreditation requirements and policies of the *Accreditation Council for Continuing Medical Education* (ACCME) through the joint providership of White Coat Institute (d.b.a. *GetMyCME*) and the *Gathering of Eagles* alliance.

- The White Coat Institute is accredited by the ACCME to provide continuing medical education for physicians.

- None of the planners for this educational activity have relevant financial relationship(s) to disclose with ineligible companies whose primary business is producing, marketing, selling, re-selling, or distributing healthcare products used by or on patients.

Additional DISCLOSURE in this case

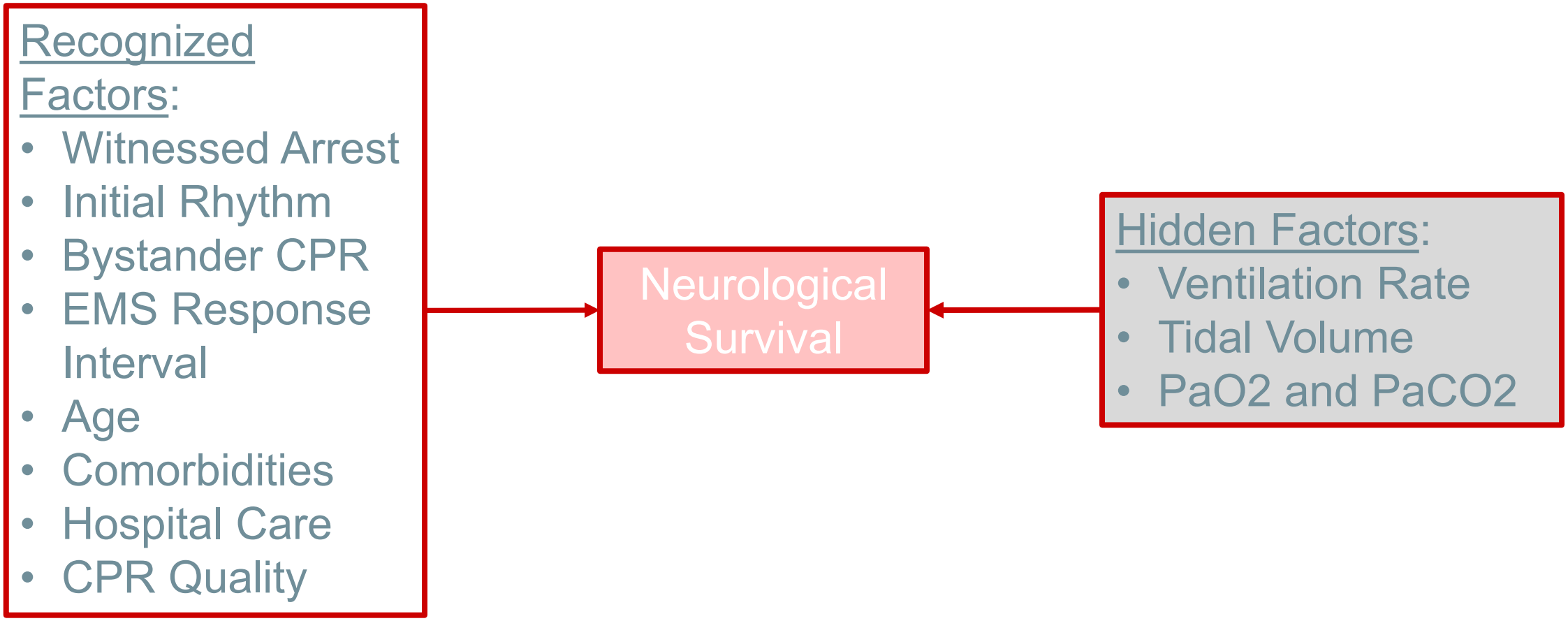
for Continuing Medical Education Purposes …

It should be noted that Dr. Youngquist does have a consulting relationship with CPR Therapeutics

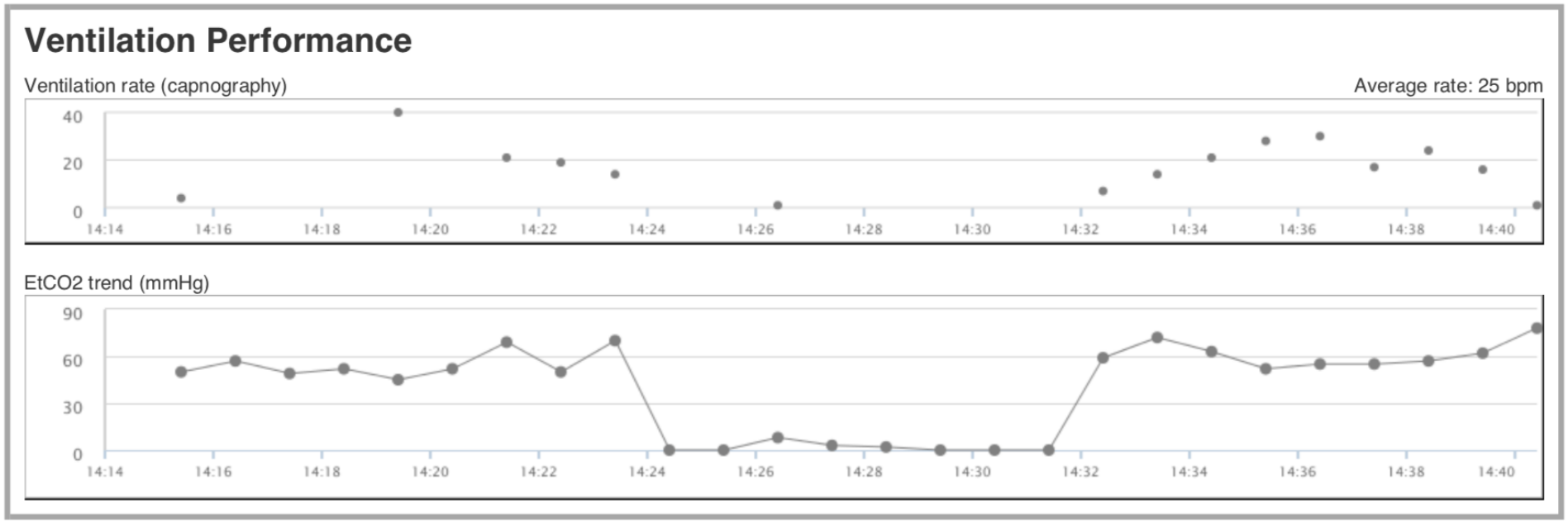
However, this CME activity has been designed and reviewed by an independent committee with no relevant financial ties to ensure that the content is free of commercial bias and evidence-based. Accordingly, all of the relevant financial relationships listed for Dr. Youngquist have been mitigated.

Key Takeaways

- Human variability in ventilation is a likely source of outcomes variability
- 30:2 compression to ventilation ratio appears superior to asynchronous BVM during the BLS phase of resuscitation
- A high number of BVM ventilations fail to produce chest rise and are ineffective
- Blood oxygen levels are a critical determinant of neurologic outcome
- New technologies, such as ventilation meters, offer the ability to standardize ventilation in cardiac arrest


Recognized Factors:
• Witnessed Arrest
• Initial Rhythm
• Bystander CPR
• EMS Response Interval
• Age
• Comorbidities
• Hospital Care
• CPR Quality
Neurological Survival
Hidden Factors:
• Ventilation Rate
• Tidal Volume
• PaO2 and PaCO2

CASE START: 1/31/2020 14:12:25 DURATION: 00:28:21 GENDER: MALE AGE GROUP: ADULT



Within Patient Variation in Ventilation Practice

"Ventilation Should Match Perfusion”

Source: https://www.medicalexamprep.co.uk/understanding-the-ventilation-perfusion-relationship/

What is Your Local EMS System's BLS Approach to Ventilation in Cardiac Arrest?

- Passive Ventilation
- 30:2 Ventilation
- Asynchronous Ventilations

BLS Ventilation 30:2 vs Asynchronous

The NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812 DECEMBER 3, 2015 VOL. 373 NO. 23

Trial of Continuous or Interrupted Chest Compressions during CPR

Graham Nichol, M.D., M.P.H., Brian Leroux, Ph.D., Henry Wang, M.D., Clifton W. Callaway, M.D., Ph.D., George Sopko, M.D., Myron Weisfeldt, M.D., Ian Stiell, M.D., Laurie J. Morrison, M.D., Tom P. Aufderheide, M.D., Sheldon Cheskes, M.D., Jim Christenson, M.D., Peter Kudenchuk, M.D., Christian Vaillancourt, M.D., Thomas D. Rea, M.D., Ahamed H. Idris, M.D., Riccardo Colella, D.O., M.P.H., Marshal Isaacs, M.D., Ron Straight, Shannon Stephens, Joe Richardson, Joe Condle, Robert H. Schmicker, M.S., Debra Egan, M.P.H., B.S.N., Susanne May, Ph.D., and Joseph P. Ornato, M.D., for the ROC Investigators*

ABSTRACT

~13 min of Resuscitation occurs prior to advanced airway placement

What Matters More?

Pausing CPR to give full tidal volume breaths

V.S.

High compression fraction (don't stop!)

Overall outcomes similar in intention-to-treat analysis

30:2 harder to do but better outcomes when done correctly!

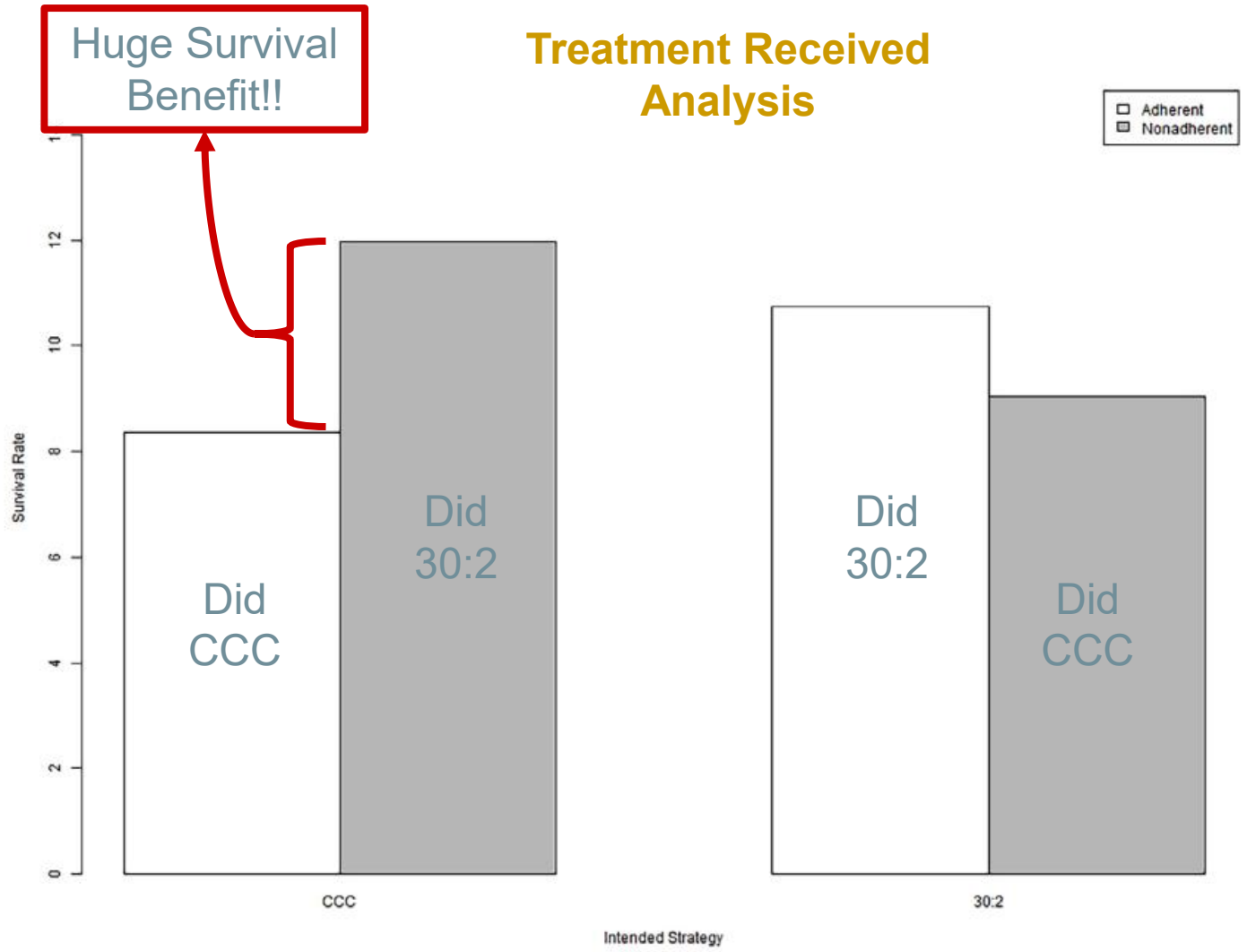


Fig. 2 – Survival estimates by strategy and adherence.

https://doi.org/10.1016/j.resuscitation.2021.05.027

Resuscitation. 2019 August ; 141: 174–181. doi:10.1016/j.resuscitation.2019.05.006.

Association of Ventilation with Outcomes from Out-of-Hospital Cardiac Arrest

Mary P. Chang [Assistant Professor],
Department of Emergency Medicine, University of Texas Southwestern Medical Center, 5323 Harry Hines Blvd, Dallas, TX 75390-8579

Yuanzheng Lu,
Emergency and Disaster Medicine Center, The Seventh Affiliated Hospital, Sun Yat-sen University. Shenzhen,China 518107

Brian Leroux [Professor],
Department of Biostatistics and Oral Health Sciences, University of Washington, Seattle, WA

Elisabete Aramendi Ecenarro,
Dpto. Ingeniería de Comunicaciones, University of the Basque Country, Bilbao, Spain

Pamela Owens,
Department of Emergency Medicine, University of Texas Southwestern Medical Center, 5323 Harry Hines Blvd, Dallas, TX 75390-8579

Henry E. Wang [Professor and Vice Chair for Research],
University of Texas Health Science Center at Houston, Department of Emergency Medicine, Houston, TX

Ahamed H. Idris [Professor]
Department of Emergency Medicine, University of Texas Southwestern Medical Center, 5323 Harry Hines Blvd, Dallas, TX 75390-8579

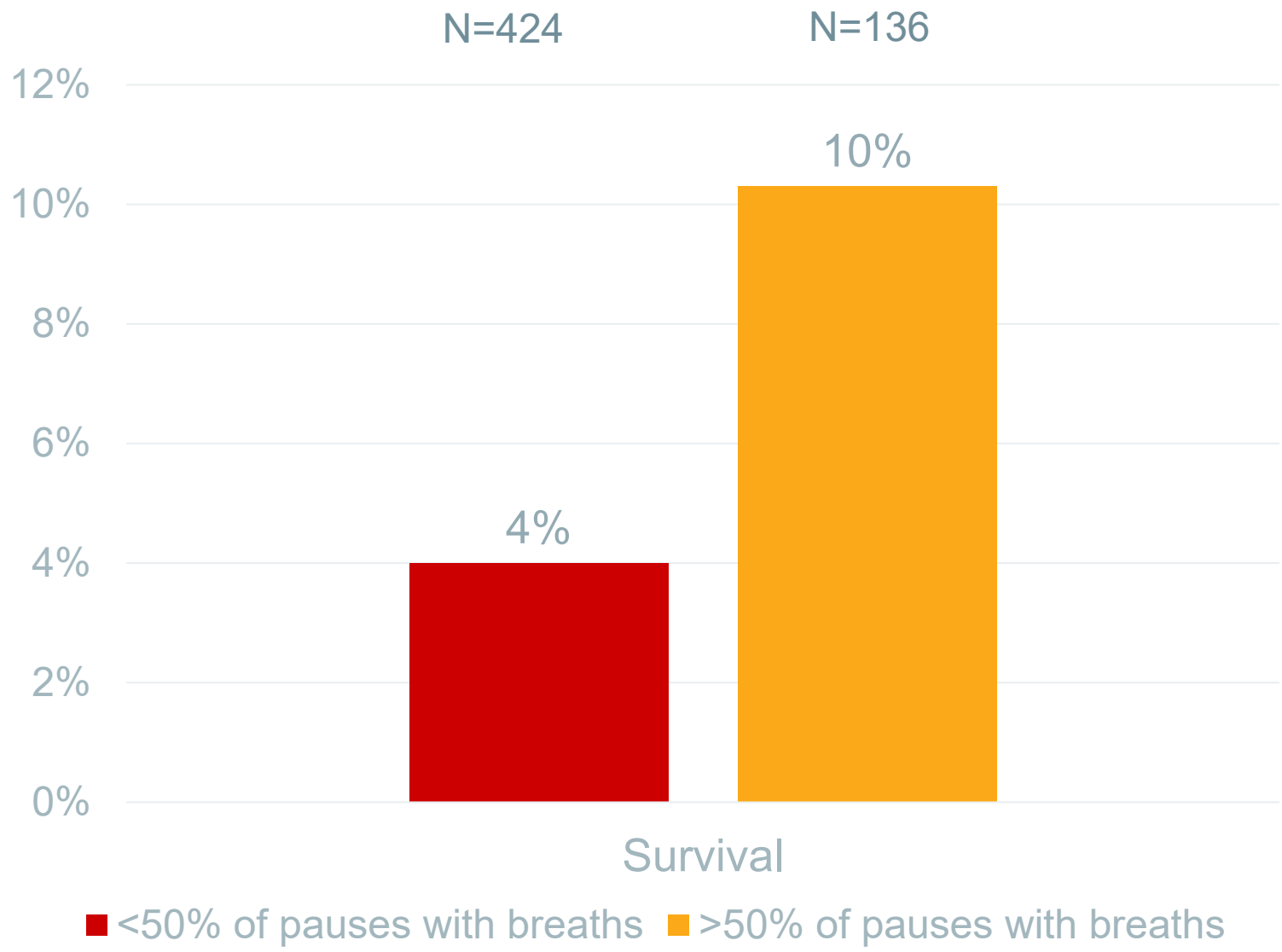
BVM Frequently Fails to Ventilate

DOI: 10.1016/j.resuscitation.2019.05.006

Source: https://www.jems.com/patient-care/dos-and-don-ts-bag-valve-mask-ventilatio/

Source: https://www.jems.com/patient-care/dos-and-don-ts-bag-valve-mask-ventilatio/

Observed Survival



DOI: 10.1016/j.resuscitation.2019.05.006

The Bottom Line

30:2 saves lives, but only when breaths are delivered!

It is harder to do but worth figuring out.

MAYBE SUPRAGLOTTICS SHOULD BE USED…

WHY DON'T WE LET EMT'S USE A SUPRAGLOTTIC FOR THIS?

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

EUROPEAN RESUSCITATION COUNCIL

Short paper

Emergency medical technician vs. paramedic-placed supraglottic airways for out-of-hospital cardiac arrests

Ryan Huebinger[a,b,*], *Tatsuya Norii*[a], *Darren Braude*[a,b], *Michelle MJ Nassal*[c], *Benjamin Fisher*[d], *Henry E. Wang*[c]

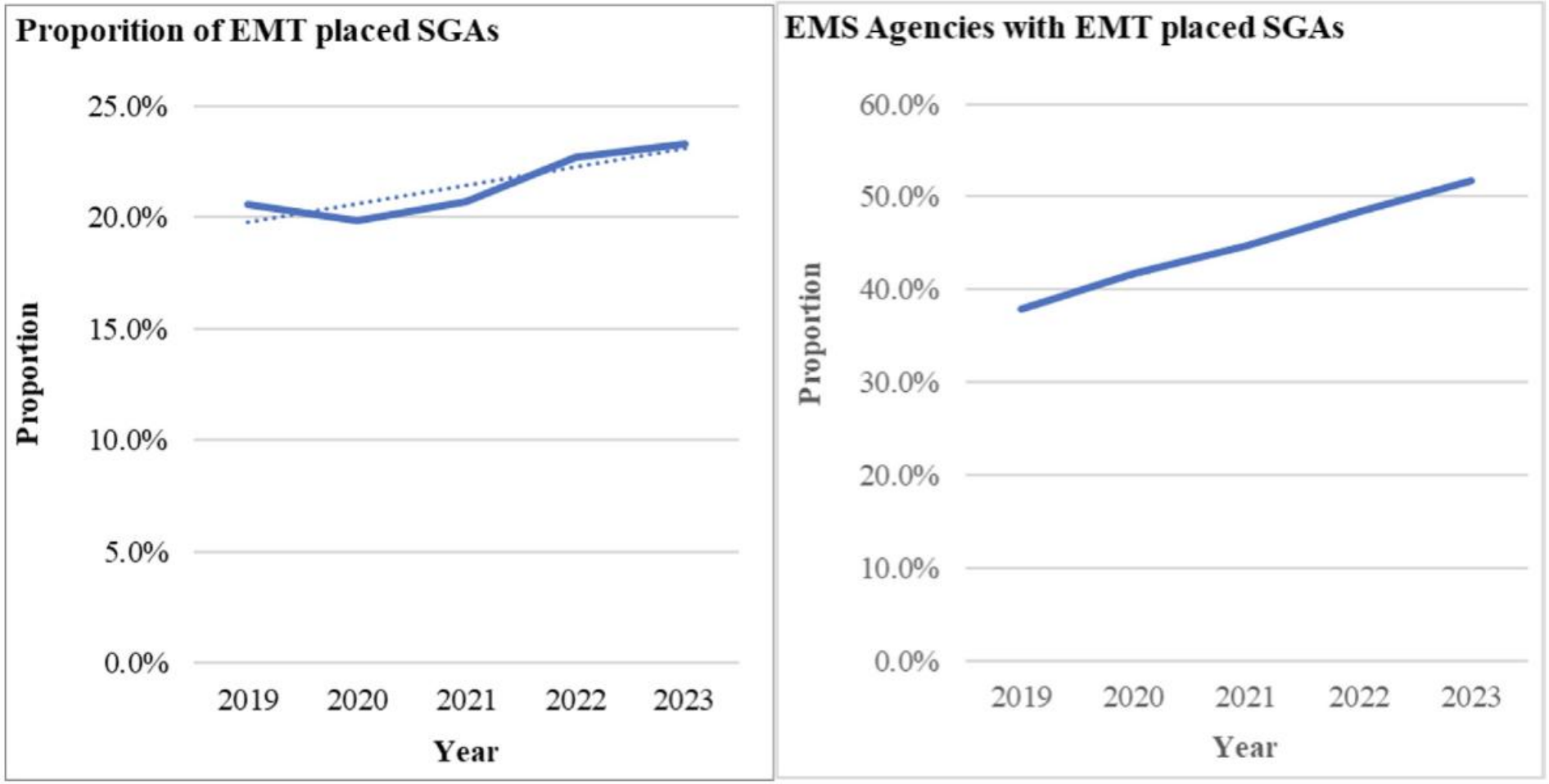


Fig. 1 – Left pane – proportion of SGAs placed by EMT each year with best fit linear line. Right pane – EMS agencies with EMT placed SGAs each year.

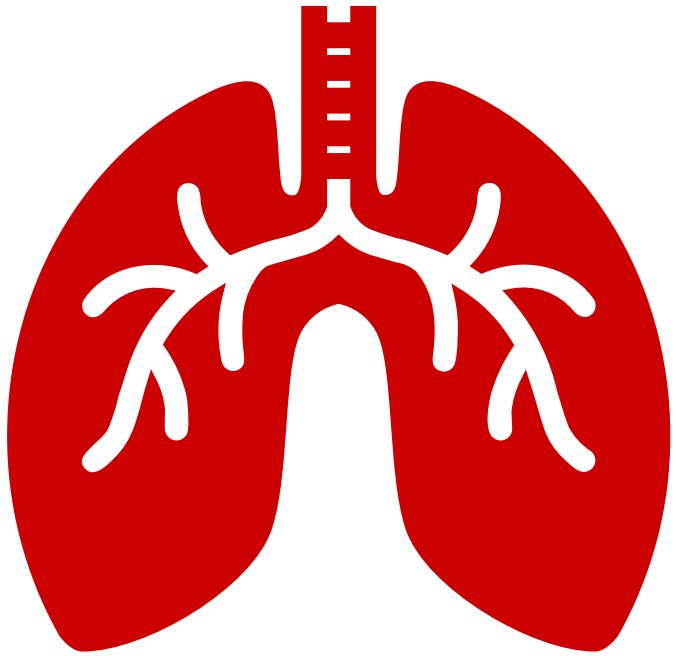
Tidal Volume Needed for Gas Exchange

>250 mL to get gas exchange

1. Serpa Neto A, Cardoso SO, Manetta JA, et al. Association between use of lung-protective ventilation with lower tidal volumes and clinical outcomes among patients without acute respiratory distress syndrome: a meta-analysis. *JAMA* 2012;308(16):1651–1659.

2. Galva V, Serpa Neto A, Cardoso SO, et al. Association Between Use of Lung-Protective Ventilation With Lower Tidal Volumes. *Jama*. 2012;308(16):1651–1659. doi: 10.1001/jama.2012.13730.eTable

3. Aramendi E, Lu Y, Chang MP, et al. A novel technique to assess the quality of ventilation during pre-hospital cardiopulmonary resuscitation. *Resuscitation*. 2018;132(May):41–46.



Tidal Volumes Achieved with Passive Ventilation with ETT

156 mL

(less with no advanced airway)

Safar P, Brown TC, Holtey WJ, Wilder RJ. Ventilation and circulation with closed-chest cardiac massage in man. *JAMA*. 1961;176:574- 576

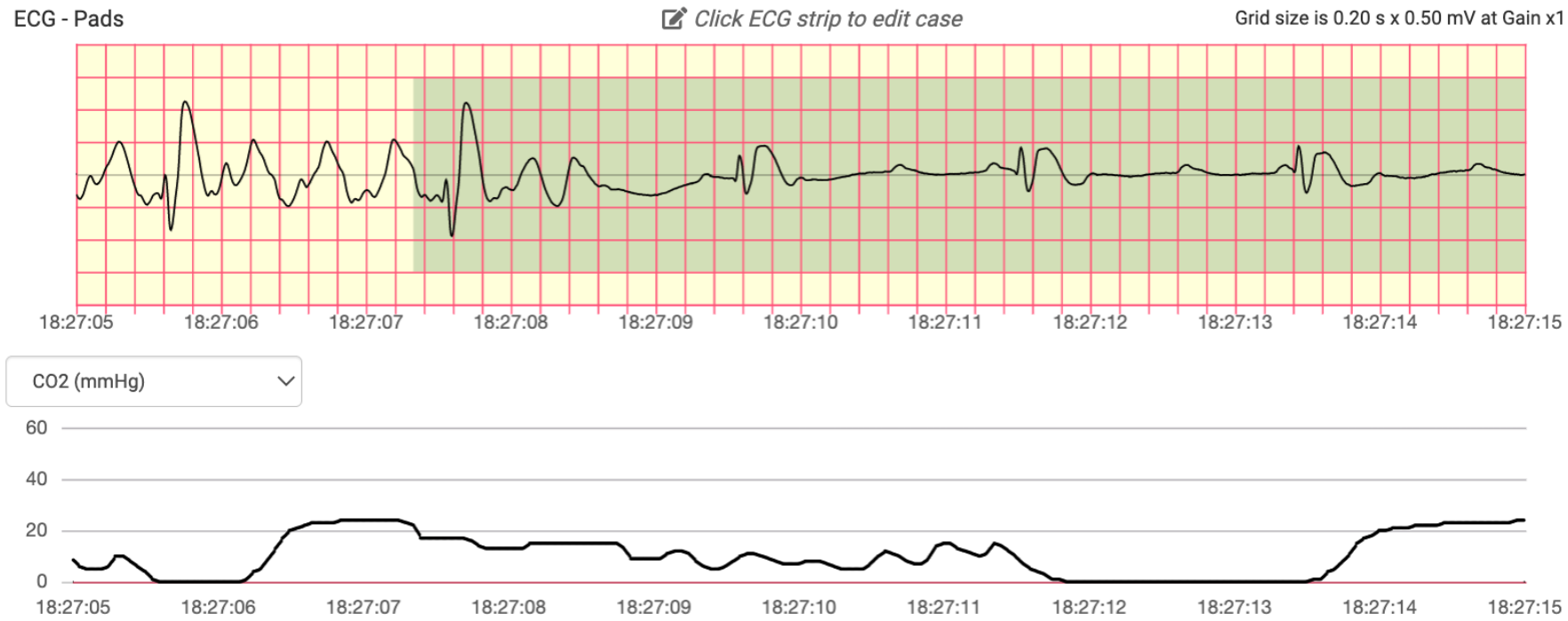
Passive Ventilation is Mostly Deferred Ventilation

Physiologic Consequences of Passive Ventilation in Animal Studies

Decreased PaO_2	Elevated $PaCO_2$	Increased atelectasis
Increased pulmonary vascular resistance	Decreased MAP	Mostly dead space ventilation
	Decreased survival	

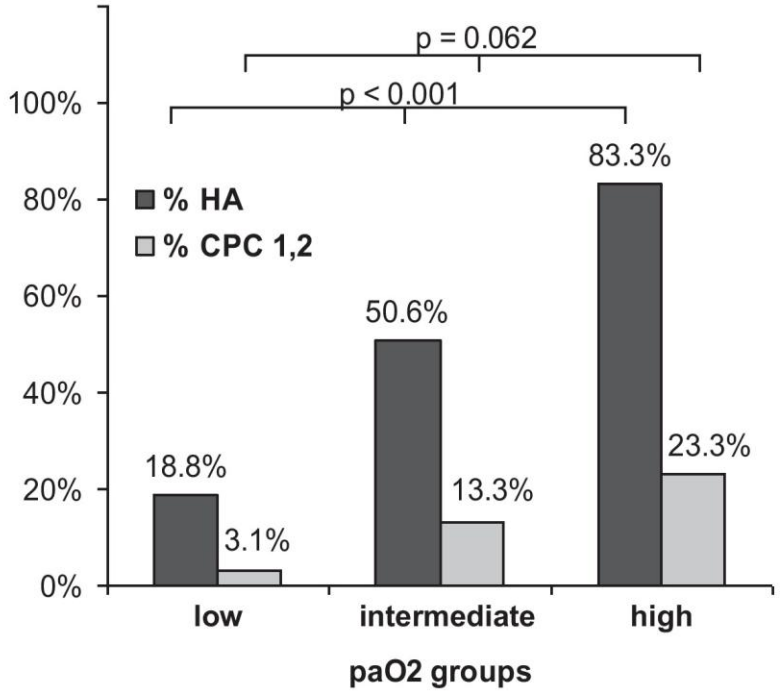
https://doi.org/10.1016/j.resuscitation.2008.03.228
doi: 10.1016/j.resuscitation.2007.04.002
doi: 10.1097/CCM.0b013e3181b42f6c

Real Time Monitoring Devices


ECG - Pads
Click ECG strip to edit case
Grid size is 0.20 s x 0.50 mV at Gain x1
18:27:05
18:27:06
18:27:07
18:27:08
18:27:09
18:27:10
18:27:11
18:27:12
18:27:13
18:27:14
18:27:15
CO2 (mmHg)
60
40
20
0
18:27:05
18:27:06
18:27:07
18:27:08
18:27:09
18:27:10
18:27:11
18:27:12
18:27:13
18:27:14
18:27:15

Is too much oxygen a bad thing?

Oxygen is a Life-Saving Medication During CPR



Oxygen Group	paO2 (mmHg)	paO2 (kPa)	n	Died in the field	Any ROSC	Survived to HA	Survived with CPC 1 or 2
Low	0-60	0-8	32	26	7	6	1
Intermediate	61-300	8.1-40	83	41	47	42	11
High	>300	>40	30	5	25	25	7

Cerebral performance category

Key Takeaways

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- 30:2 compression to ventilation ratio appears superior to asynchronous BVM during the BLS phase of resuscitation
- A high number of BVM ventilations fail to produce chest rise and are ineffective
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