ITD-ACD CPR: Move Air and Fluid

Evolution
HEALTH

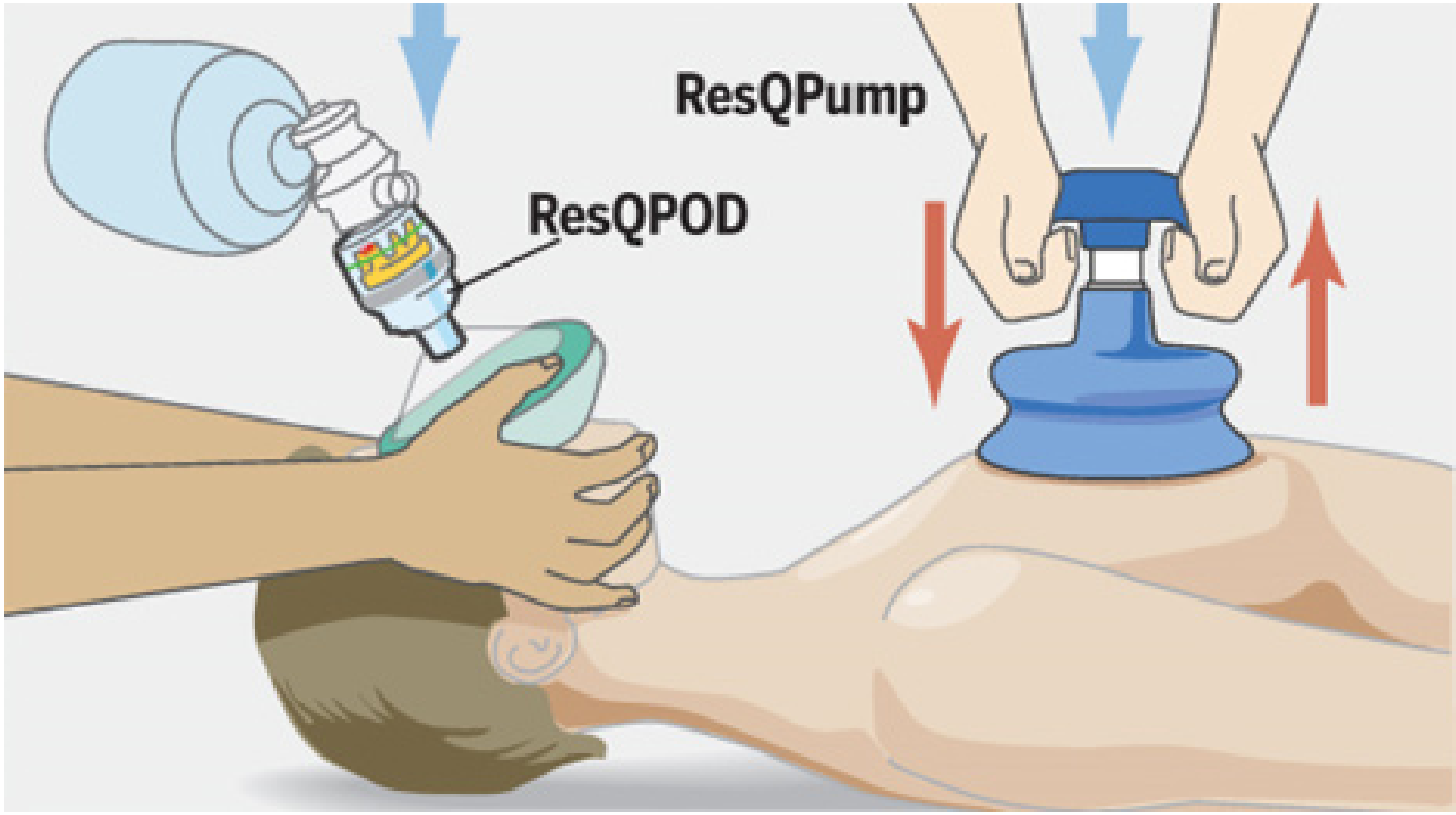
Brent Myers, MD MPH FACEP
CMO and EVP of Medical Operations, Evolution Health
Associate CMO, American Medical Response

Words of the Day

- Efficacy: In the ideal circumstance, does the intervention work?

- Effectiveness: In the real world, does the efficacious intervention produce the same or similar results as in the ideal circumstance?

The Hypothesis



The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

A Trial of an Impedance Threshold Device in Out-of-Hospital Cardiac Arrest

Tom P. Aufderheide, M.D., Graham Nichol, M.D., Thomas D. Rea, M.D., Siobhan P. Brown, Ph.D., Brian G. Leroux, Ph.D., Paul E. Pepe, M.D., Peter J. Kudenchuk, M.D., Jim Christenson, M.D., Mohamud R. Daya, M.D., Paul Dorian, M.D., Clifton W. Callaway, M.D., Ph.D., Ahamed H. Idris, M.D., Douglas Andrusiek, M.Sc., Shannon W. Stephens, E.M.T.-P., David Hostler, Ph.D., Daniel P. Davis, M.D., James V. Dunford, M.D., Ronald G. Pirrallo, M.D., M.H.S.A., Ian G. Stiell, M.D., Catherine M. Clement, R.N., Alan Craig, M.S., Lois Van Ottingham, B.S.N., Terri A. Schmidt, M.D., Henry E. Wang, M.D., Myron L. Weisfeldt, M.D., Joseph P. Ornato, M.D., and George Sopko, M.D., M.P.H., for the Resuscitation Outcomes Consortium (ROC) Investigators

< Previous Article Volume 377, No. 9762, p301–311, 22 January 2011 Next Article >

Articles

Standard cardiopulmonary resuscitation versus active compression-decompression cardiopulmonary resuscitation with augmentation of negative intrathoracic pressure for out-of-hospital cardiac arrest: a randomised trial

Prof Tom P Aufderheide, MD, Ralph J Frascone, MD, Marvin A Wayne, MD, Brian D Mahoney, MD, Prof Robert A Swor, DO, Robert M Domeier, MD, Prof Michael L Olinger, MD, Richard G Holcomb, PhD, Prof David E Tupper, PhD, Demetris Yannopoulos, MD, Prof Keith G Lurie, MD

Published: 19 January 2011

The NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812 SEPTEMBER 1, 2011 VOL. 365 NO. 9

Early versus Later Rhythm Analysis in Patients with Out-of-Hospital Cardiac Arrest

Ian G. Stiell, M.D., Graham Nichol, M.D., M.P.H., Brian G. Leroux, Ph.D., Thomas D. Rea, M.D., M.P.H., Joseph P. Ornato, M.D., Judy Powell, B.S.N., James Christenson, M.D., Clifton W. Callaway, M.D., Ph.D., Peter J. Kudenchuk, M.D., Tom P. Aufderheide, M.D., Ahamed H. Idris, M.D., Mohamud R. Daya, M.D., Henry E. Wang, M.D., Laurie J. Morrison, M.D., Daniel Davis, M.D., Douglas Andrusiek, M.Sc., Shannon Stephens, E.M.T.-P., Sheldon Cheskes, M.D., Robert H. Schmicker, M.S., Ray Fowler, M.D., Christian Vaillancourt, M.D., David Hostler, Ph.D., E.M.T.-P., Dana Zive, M.P.H., Ronald G. Pirrallo, M.D., M.H.S.A., Gary M. Vilke, M.D., George Sopko, M.D., and Myron Weisfeldt, M.D., for the ROC Investigators*

Original Investigation

Effect of Prehospital Induction of Mild Hypothermia on Survival and Neurological Status Among Adults With Cardiac Arrest
A Randomized Clinical Trial

Francis Kim, MD; Graham Nichol, MD, MPH; Charles Maynard, PhD; Al Hallstrom, PhD; Peter J. Kudenchuk, MD; Thomas Rea, MD, MPH; Michael K. Copass, MD; David Carlbom, MD; Steven Deem, MD; W. T. Longstreth Jr, MD; Michele Olsufka, RN; Leonard A. Cobb, MD

The JAMA Network

From: **Effect of Prehospital Induction of Mild Hypothermia on Survival and Neurological Status Among Adults With Cardiac Arrest: A Randomized Clinical Trial**

JAMA. 2014;311(1):45-52. doi:10.1001/jama.2013.282173

Table 3. Prehospital, Emergency Department, and In-Hospital Safety Data

	Intervention	Control	P Value
Rearrest postrandomization[a]	(n = 686) 176 (26) [22 to 29]	(n = 671) 138 (21) [18 to 24]	.008
Use of pressors postrandomization[a]	(n = 686) 62 (9) [7 to 11]	(n = 671) 59 (9) [7 to 11]	.82
Prehospital deaths[a]	(n = 688) 9 (1.3) [0.7 to 2.5]	(n = 671) 11 (1.6) [0.9 to 2.5]	.61
Time from first dispatch to hospital arrival, min[b]	(n = 654) 51 (50 to 52) [13]	(n = 629) 49 (48 to 50) [14]	.006
First heart rate on ED arrival, beats/min[b]	(n = 665) 89 (86 to 92) [39]	(n = 632) 93 (90 to 96) [40]	.07
First systolic blood pressure on ED arrival, mm Hg[b]	(n = 666) 116 (112 to 120) [54]	(n = 637) 116 (112 to 120) [51]	.84
Difference from randomization to ED arrival			
Heart rate, beats/min[b]	(n = 651) −21 (−24 to −18) [40]	(n = 616) −17 (−20 to −14) [40]	.09
Systolic blood pressure, mm Hg[b]	(n = 624) −18 (−22 to −14) [56]	(n = 647) −20 (−24 to −16) [56]	.47
Deaths in emergency department[a]	(n = 688) 88 (12.8) [10.5 to 15.5]	(n = 671) 85 (12.7) [10.4 to 15.4]	.95
Use within first 12 h of arrival			
Pressors[a]	(n = 674) 374 (56) [52 to 59]	(n = 647) 365 (56) [53 to 60]	.93
Diuretics[a]	(n = 674) 119 (18) [15 to 21]	(n = 648) 81 (13) [10 to 15]	.009
Use of diuretics within 12-48 h of arrival[a]	(n = 667) 151 (23) [20 to 26]	(n = 640) 109 (17) [14 to 20]	.01
First arterial blood gas			
pH[b]	(n = 612) 7.16 (7.14 to 7.18) [0.23]	(n = 590) 7.20 (7.18 to 7.22) [0.29]	.005
Pao_2, mm Hg[b]	(n = 609) 189 (178 to 200) [135]	(n = 585) 218 (206 to 230) [144]	<.001
$Paco_2$, mm Hg[b]	(n = 670) 59 (57 to 61) [28]	(n = 641) 58 (55 to 61) [34]	.36
First Sao_2 on ED arrival, %[b]	(n = 601) 94 (93 to 95) [10]	(n = 573) 96 (95 to 97) [8]	.02
Pulmonary edema			
First chest film[a]	(n = 631) 256 (41) [37 to 44]	(n = 609) 184 (30) [27 to 34]	<.001
Second chest film[a]	(n = 498) 133 (27) [23 to 31]	(n = 464) 123 (27) [23 to 31]	.95
Third chest film[a]	(n = 420) 104 (25) [21 to 29]	(n = 392) 81 (21) [17 to 25]	.23
Antibiotic use[a]	(n = 673) 434 (64) [61 to 68]	(n = 649) 418 (64) [61 to 68]	.98
Glucose >300 mg/dL[a]	(n = 674) 168 (25) [22 to 28]	(n = 648) 208 (32) [29 to 36]	.004

Abbreviations: ED, emergency department; Sao_2, oxygen saturation.

[a] Indicates values are expressed as No. (%) [95% CI].

[b] Indicates values are expressed as mean (95% CI) [SD].

Figure Legend:

Prehospital, Emergency Department, and In-Hospital Safety Data

Table 3 – Readable ☺

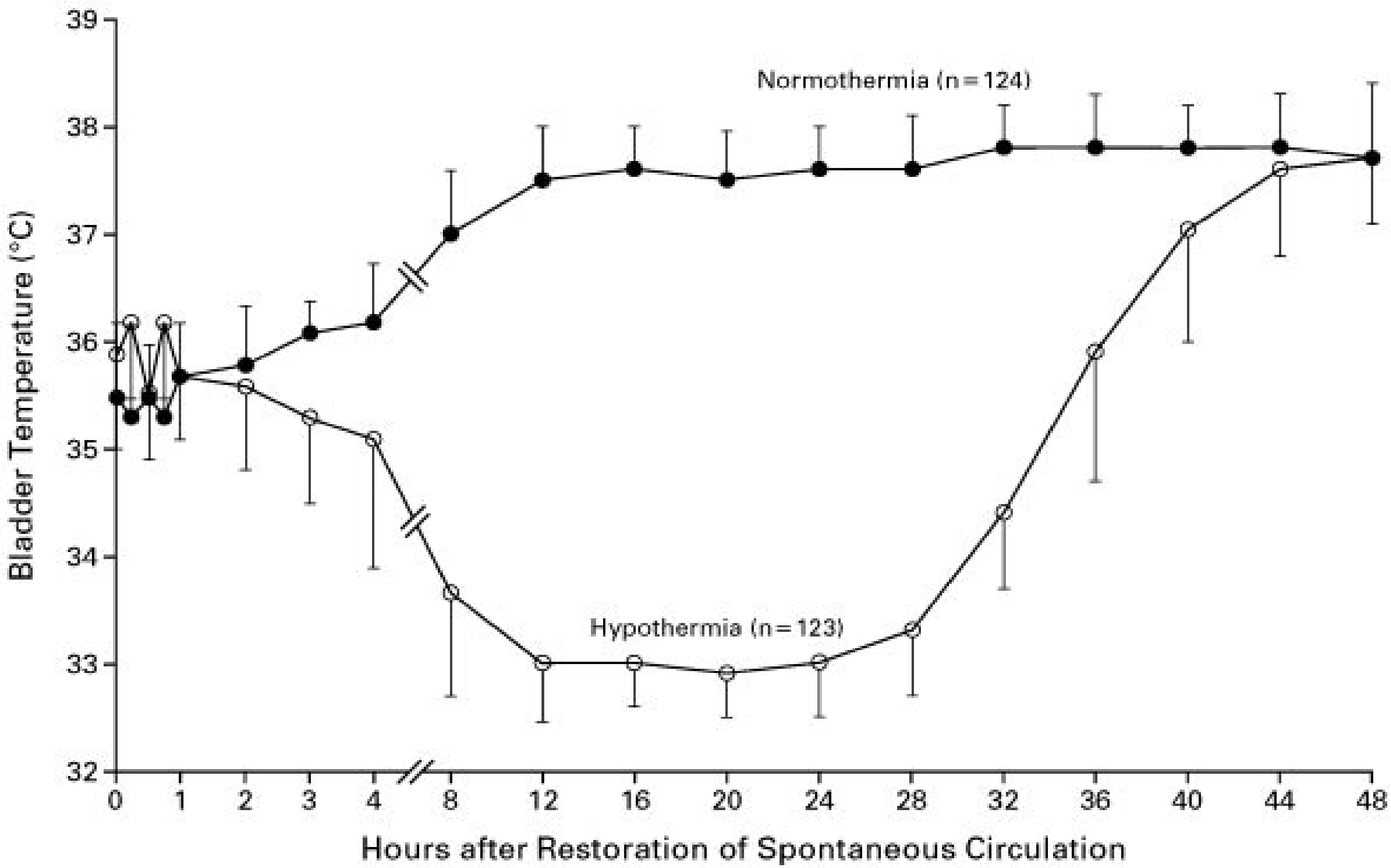
Factor	Experimental	Control
pH	7.16	7.20
pA02	199	208
SaO2	94	96
Pulm Edema #1	41%	30%
Pulm Edema #3	25%	21%
Rearrest	26%	21%

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Targeted Temperature Management at 33°C versus 36°C after Cardiac Arrest

Niklas Nielsen, M.D., Ph.D., Jørn Wetterslev, M.D., Ph.D., Tobias Cronberg, M.D., Ph.D., David Erlinge, M.D., Ph.D., Yvan Gasche, M.D., Christian Hassager, M.D., D.M.Sci., Janneke Horn, M.D., Ph.D., Jan Hovdenes, M.D., Ph.D., Jesper Kjaergaard, M.D., D.M.Sci., Michael Kuiper, M.D., Ph.D., Tommaso Pellis, M.D., Pascal Stammet, M.D., Michael Wanscher, M.D., Ph.D., Matt P. Wise, M.D., D.Phil., Anders Åneman, M.D., Ph.D., Nawaf Al-Subaie, M.D., Søren Boesgaard, M.D., D.M.Sci., John Bro-Jeppesen, M.D., Iole Brunetti, M.D., Jan Frederik Bugge, M.D., Ph.D., Christopher D. Hingston, M.D., Nicole P. Juffermans, M.D., Ph.D., Matty Koopmans, R.N., M.Sc., Lars Køber, M.D., D.M.Sci., Jørund Langørgen, M.D., Gisela Lilja, O.T., Jacob Eifer Møller, M.D., D.M.Sci., Malin Rundgren, M.D., Ph.D., Christian Rylander, M.D., Ph.D., Ondrej Smid, M.D., Christophe Werer, M.D., Per Winkel, M.D., D.M.Sci., and Hans Friberg, M.D., Ph.D., for the TTM Trial Investigators*



The Hypothermia After Cardiac Arrest Study Group. N Engl J Med 2002;346:549-556.

Original Investigation

Mechanical Chest Compressions and Simultaneous Defibrillation vs Conventional Cardiopulmonary Resuscitation in Out-of-Hospital Cardiac Arrest

The LINC Randomized Trial

Sten Rubertsson, MD, PhD; Erik Lindgren, MD; David Smekal, MD, PhD; Ollie Östlund, PhD; Johan Silfverstolpe, MD; Robert A. Lichtveld, MD, PhD; Rene Boomars, MPA; Björn Ahlstedt, MD; Gunnar Skoog, MD; Robert Kastberg, MD; David Halliwell, RN; Martyn Box, RN; Johan Herlitz, MD, PhD; Rolf Karlsten, MD, PhD

The NEW ENGLAND JOURNAL of MEDICINE

EDITORIALS

Cardiac Arrest and the Limitations of Clinical Trials

Arthur B. Sanders, M.D., M.H.A.

EDITORIAL

Randomized Clinical Trial Progress to Inform Care for Out-of-Hospital Cardiac Arrest

Christopher B. Granger, MD; Lance B. Becker, MD

AHA 2015 Guidelines

Impedance Threshold Devices

2015 (Updated): The routine use of the ITD as an adjunct during conventional CPR is not recommended. The combination of ITD with active compression-decompression CPR may be a reasonable alternative to conventional CPR in settings with available equipment and properly trained personnel.

Why: Two large randomized controlled trials have provided new information about the use of the ITD in OHCA. One large multicenter randomized clinical trial failed to demonstrate any improvement associated with the use of an ITD (compared with a sham device) as an adjunct to conventional CPR. Another clinical trial demonstrated a benefit with the use of active compression-decompression CPR plus an ITD when compared with conventional CPR and no ITD. However, confidence intervals around the primary outcome point estimate were very broad, and there is a high risk of bias on the basis of co-intervention (the group receiving active compression-decompression CPR plus the ITD also had CPR delivered using CPR quality feedback devices, while the control arm did not have the use of such feedback devices).

Society for Critical Care Anesthesiologists
Section Editor: **Avery Tung**
REVIEW ARTICLE

CME The Physiology of Cardiopulmonary Resuscitation

Keith G. Lurie, MD,* Edward C. Nemergut, MD,† Demetris Yannopoulos, MD,‡
and Michael Sweeney, MD§

Outcomes after cardiac arrest remain poor more than a half a century after closed chest cardiopulmonary resuscitation (CPR) was first described. This review article is focused on recent insights into the physiology of blood flow to the heart and brain during CPR. Over the past 20 years, a greater understanding of heart–brain–lung interactions has resulted in novel resuscitation methods and technologies that significantly improve outcomes from cardiac arrest. This article highlights the importance of attention to CPR quality, recent approaches to regulate intrathoracic pressure to improve cerebral and systemic perfusion, and ongoing research related to the ways to mitigate reperfusion injury during CPR. Taken together, these new approaches in adult and pediatric patients provide an innovative, physiologically based road map to increase survival and quality of life after cardiac arrest. (Anesth Analg 2016;122:767–83)

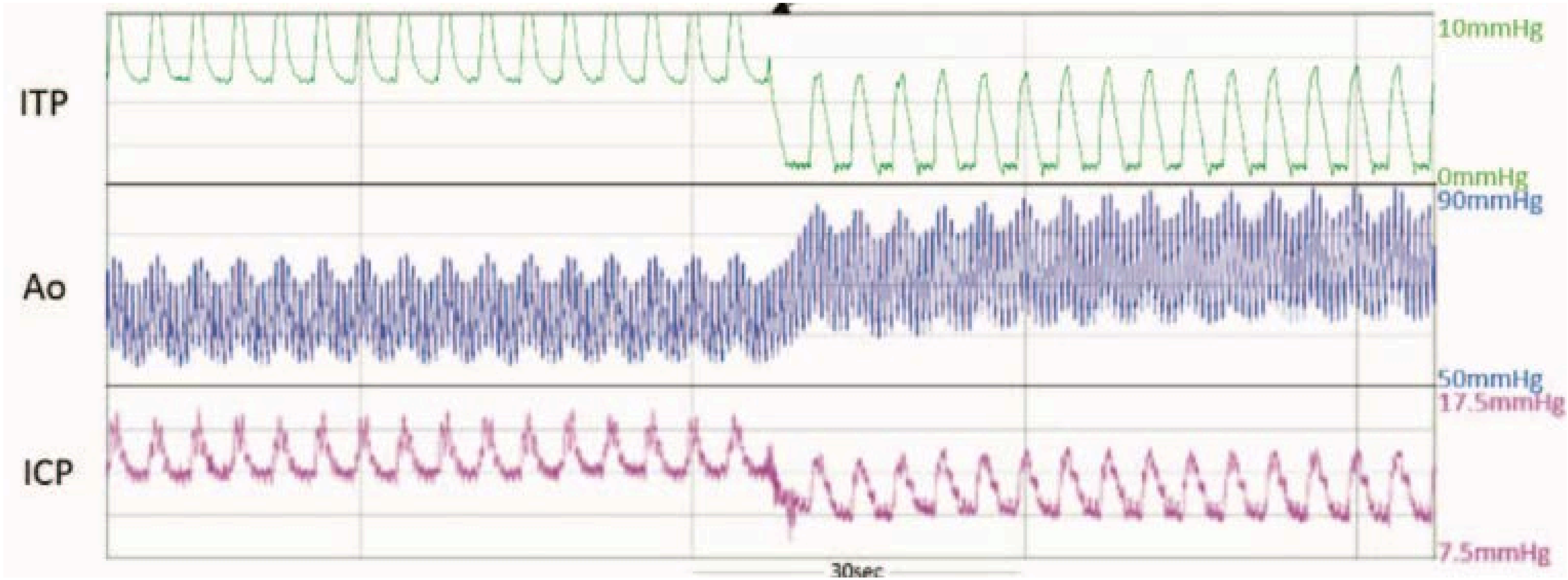

ITP
Ao
ICP
10mmHg
0mmHg
90mmHg
50mmHg
17.5mmHg
7.5mmHg
30sec

Table 1. Survival for Patients Receiving Acceptable Quality of CPR (Rate 80–120 per min, Depth 4–6 cm, Fraction ≥50%[a]) in the National Institutes of Health Resuscitation Outcomes Consortium PRIMED Study

	Sham (n = 827), n (%)	Active (n = 848), n (%)	P	Relative Increase (%)
Survival to hospital discharge	53/827 (6.4)	81/848 (9.6)	0.018	50
Discharge alive with mRS ≤3	34/827 (4.1)	61/484 (7.2)	0.0064	76
Witnessed arrest and discharge alive with mRS ≤3	25/421 (5.9)	50/419 (11.9)	0.0024	102

Table 2. One-Year Survival with Good Neurologic Function, Defined as CPC ≤ 2, for All Patients in the ResQTrial[3]

	S-CPR, *n* (%)	ACD + ITD, *n* (%)	*P*	Relative Increase (%)
mITT (*n* = 1655)	48/794 (6.0)	74/822 (9.0)	0.030	49
ITT (*n* = 2470)	68/1171 (5.8)	96/1233 (7.8)	0.062	34

Summary

- In the animal lab, physiologic parameters and neuro intact survival is enhanced by the ITD/ACD technique
- Large, randomized trial showed equivalence for ITD alone (post hoc with ideal CPR rates seemed to show benefit)
- Another trial with combo ITD/ACD demonstrated benefit, but had some methodological flaws
- Were we too quick to condemn?