

TIME TO STOP BEATING A DEAD HORSE: TERMINATION OF RESUSCITATION

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FINANCIAL DISCLOSURE

- None

OBJECTIVES

- Understand the research behind the formulation of the OPALS BLS and ALS TOR criteria.
 - Identify all of the BLS and ALS TOR criteria.
 - Be familiar with the latest research validating the BLS and ALS TOR criteria.
 - Understand why the appropriate duration of resuscitation is yet to be determined.
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PROBLEMS WITH TRANSPORTING ALL CARDIAC ARRESTS

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- CPR quality effected
 - Danger of lights and sirens
 - Depletes resources
 - Cost
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SURVIVAL CHANCES IF NO PREHOSPITAL ROSC

- No prehospital ROSC is characteristic most predictive of death

SURVIVAL CHANCES IF NO PREHOSPITAL ROSC

- Bonnin, et al JAMA 1993
 - Worked on scene for 25 minutes
 - **0.6% survival if no ROSC on scene**
- Goto, et al. Critical Care 2013
 - 495,607 patients in Japan
 - If no pre-hospital ROSC
 - **25.8 times** more likely to **die**
 - **38.4 times** more likely to have **poor neuro outcome**

TERMINATION OF RESUSCITATION (TOR)

- Ontario Prehospital Advanced Life Support (OPALS) study group proposed 2 termination of resuscitation rules
- One rule for BLS providers
- One rule for ALS providers
- Patient must meet ALL the criteria in either rule to qualify for TOR in the field



TERMINATION OF RESUSCITATION (TOR)

- BLS criteria
 - Event not witnessed by EMS personnel
 - No AED used or manual shock applied in out-of-hospital setting
 - No ROSC in out-of-hospital setting

TERMINATION OF RESUSCITATION (TOR)

- Morrison, et al. NEJM 2006
 - Evaluation of 1240 patients treated by EMT-D's
 - 776 (62%) met BLS TOR criteria

TERMINATION OF RESUSCITATION (TOR)

- Morrison, et al. NEJM 2006
 - Would have resulted in a 38% transport rate
 - Would have missed 4 survivors (0.5%)

TERMINATION OF RESUSCITATION (TOR)

- BUT.... 3 of the 4 survivors had a CPC score of 1 or 2!

TERMINATION OF RESUSCITATION (TOR)

- ALS criteria
 - Event not witnessed by EMS personnel
 - No AED used or manual shock applied in out-of-hospital setting
 - No ROSC in out-of-hospital setting
 - Arrest not witnessed by bystander
 - No bystander administered CPR

TERMINATION OF RESUSCITATION (TOR)

- Sasson, et al. JAMA 2008
 - Study to validate OPALS rules
 - Analysis of 5505 cardiac arrest patients
 - Overall survival to hospital discharge was 7%

TERMINATION OF RESUSCITATION (TOR)

- Sasson, et al. JAMA 2008
 - 47% met **BLS TOR**
 - 53% transport rate
 - 5 (0.2%) survivors missed

TERMINATION OF RESUSCITATION (TOR)

- BUT....4 out of 5 who met BLS TOR had CPC score of 1 or 2

TERMINATION OF RESUSCITATION (TOR)

- Sasson, et al. JAMA 2008
 - 22.7% met ALS TOR
 - 78.3% transport rate
 - 0 survivors missed

TERMINATION OF RESUSCITATION (TOR)

- Diskin, et al. Resus 2014
 - Review of 322 patients
 - Intra-arrest cold saline, mechanical CPR, comprehensive post resus care

TERMINATION OF RESUSCITATION (TOR)

- Diskin, et al. Resus 2014
 - 75 (23%) patients met ALS TOR
 - 0 survived
 - Would have resulted in a 77% transport rate
 - 208/283 of those that did not meet ALS TOR died

TERMINATION OF RESUSCITATION (TOR)

- Morrison, et al. Resuscitation 2014
 - Evaluation of **implementation** of BLS TOR
 - 953 patients eligible
 - 199 (20%) met BLS TOR and terminated in the field
 - **80% transport rate**

TERMINATION OF RESUSCITATION (TOR)

- Morrison, et al. Resuscitation 2014
 - 198 (20.7%) met BLS TOR but transported anyway
 - Transport rate would have been 60%
 - All died
 - Common reasons: Family distress, public place, younger age, short transport time, on-line med control said no

ALS VS. BLS TOR

- BLS TOR
 - Lower transport rates (40-60%)
 - Possible risk of missing neuro intact survivors (0-0.5%)
- ALS TOR
 - Higher transport rates (70-80%)
 - Likely will not miss any survivors

FAMILY PERCEPTION

FAMILY PERCEPTION

- Studies indicate that non-transport approved by family
 - Delbridge, et al. Annal of emerg med 1996
 - Schmidt, et al. Acad of emerg med 1995
 - Edwardsen, et al. Prehosp Emerg Care 2002

HOW LONG SHOULD WE WORK THEM?



HOW LONG SHOULD WE WORK THEM?

- Bonnin, et al JAMA 1993
 - Prospective evaluation of 1471 OHCA
 - 370 achieved ROSC on scene
 - All achieved ROSC **within 25 minutes**
 - 6/952 that didn't achieve ROSC on scene survived
 - All 6 had persistent V. fib

HOW LONG SHOULD WE WORK THEM?

- Levine, et al. NEJM 1997
 - Observational study of 150 cardiac arrests
 - 115 nonsurvivors to hospital admission
 - All had **end tidal CO₂ of 10mmHg** or less **after 20 minutes of ACLS**
- Kolar, et al. Crit Care 2008
 - Observational study of 737 cardiac arrests
 - No ROSC in 335
 - All had **end tidal CO₂ 14.3 mmHg** or less **after 20 minutes of ACLS**

HOW LONG SHOULD WE WORK THEM?

- AHA 2015 Guidelines
 - ETCO₂ 10mmHg or less after 20 minutes of ACLS care
 - Above criteria should not be used in isolation



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Duration of Prehospital Resuscitation For Adult Out-of-Hospital Cardiac Arrest: Neurologically Intact Survival Approaches Overall Survival Despite Extended Efforts

OBJECTIVE

- Out-of-hospital cardiac arrest (OHCA) guidelines suggest resuscitation beyond 30 minutes may be futile.
- Few studies address neurologic outcome for survivors of extended duration OHCA.
- The duration of prehospital resuscitation (DOR) that yields a reasonable probability of neurologically intact survival (NIS) is unknown.
- We assess whether DOR affects NIS from OHCA.

METHODS

- We conducted a retrospective cohort study of all OHCA patients in our urban/suburban advanced life support EMS system (pop 950,000) from 2005–2012.
- Excluded were resuscitations not attempted, age < 16, trauma patients, and EMS-witnessed arrests.
- DOR was measured from time of dispatch to end of prehospital resuscitation, defined by first return of spontaneous circulation, en-route hospital, or death.
- Primary outcome was NIS, defined as cerebral performance category (CPC) 1 or 2 at hospital discharge.
- Multivariate logistic regression determined the odds ratios with 95% confidence intervals (CI) for both survival and NIS adjusted for DOR and factors determined to have a significant relationship with NIS at the univariate level.

Fig 1. All Survivors and Neurologically Intact Survivors by DOR, with 90th Percentile DOR (40 minutes) Highlighted

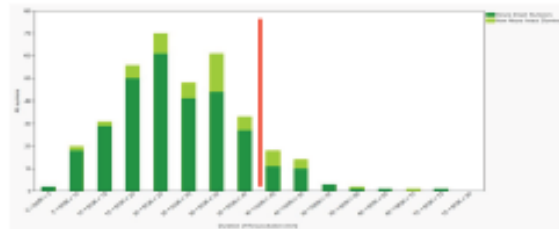


Fig 2. Predicted Probability of Survival with CPC 1 or 2 across Duration of Resuscitation, by Initial Rhythm (unadjusted)

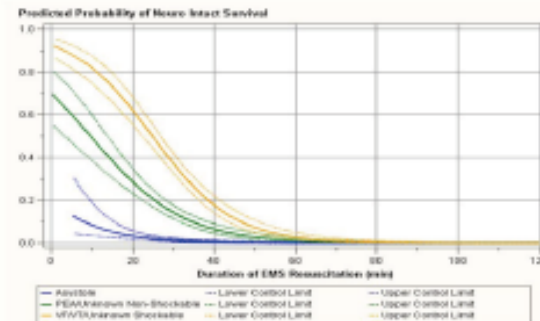
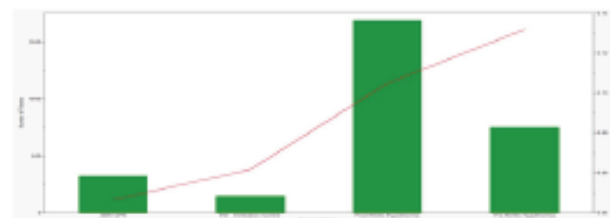


Fig 3. Wake County EMS OHCA cases by protocol phase, with rate of Neurologically Intact Survival



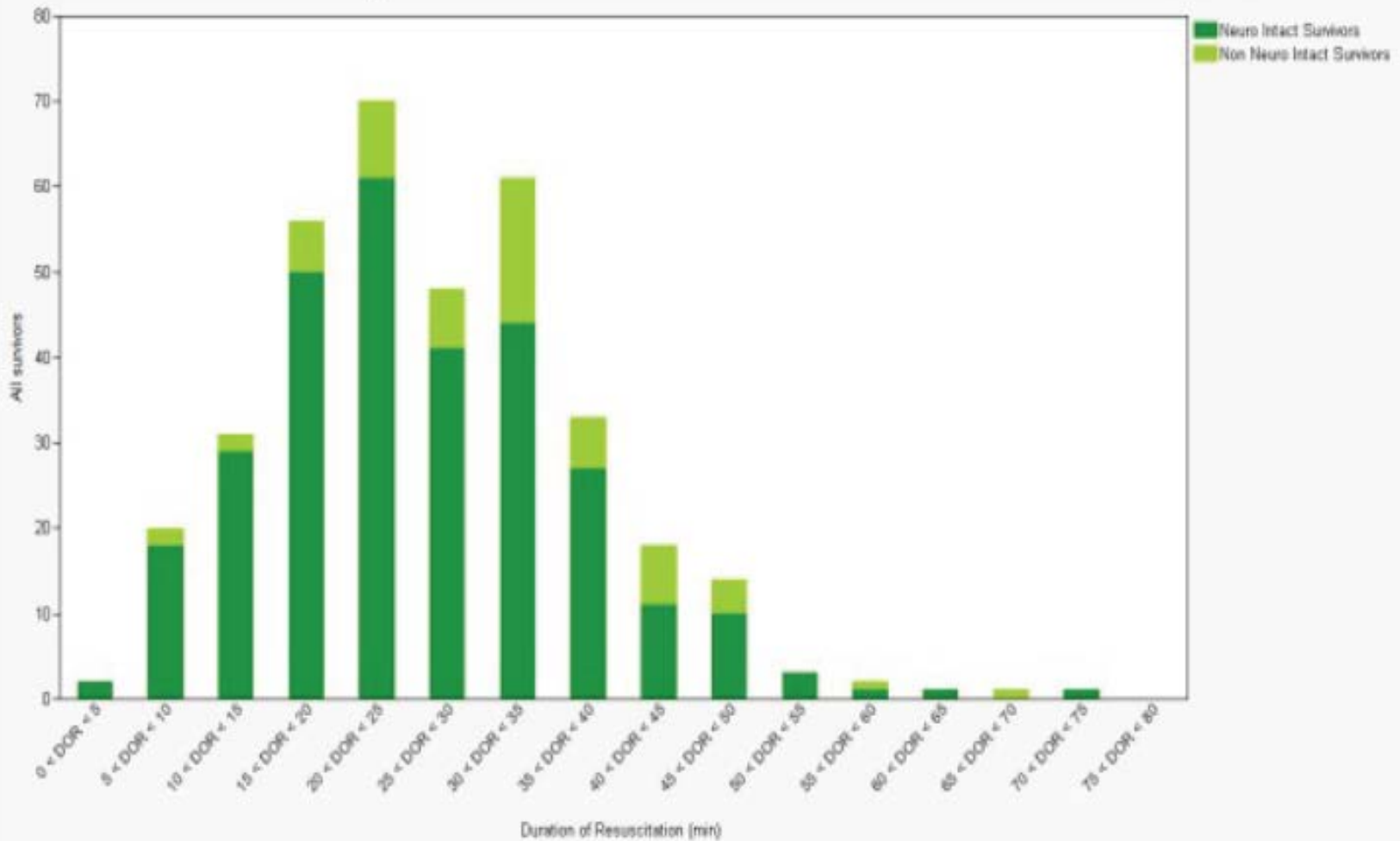
RESULTS

- Of 2905 eligible OHCA, patients were: mean age 64.6 years (sd=17.0) male 60.1%, bystander witnessed 38.9% and had bystander CPR 37.2%. Overall, 362 survived (12.5%) and 300 had NIS (82.9% of survivors). Median defibrillator to scene was 7 minutes (IQR 5-9).
- Overall median DOR was 38 min (IQR 29–48), with median DOR for NIS of 24 min (IQR 18–32). **The 90th percentile for NIS was 40 min.** Beyond 40 min, 29/42 survivors (69%, 95% CI 54–81%) were neurologically intact. The longest resuscitation that achieved NIS was 73 min.
- Controlling for OHCA protocol changes over time (“protocol phase”), adjusted OR (95% CI) was 0.91 (0.90–0.92) for both survival and NIS. Other predictors of NIS across models were initial rhythm, age, bystander witness, therapeutic hypothermia, and absence of advanced airway.

CONCLUSIONS

- In a retrospective analysis of OHCA, DOR is associated with declining survival and NIS, with NIS approximating the overall survival curve. DOR was within 40 minutes from time of dispatch for 90% of NIS. A large number of patients survived neurologically intact with DORs greater than previous guidelines would suggest. Further study should examine factors predictive of NIS in longer resuscitations.

DURATION OF RESUSCITATION AND NIT VS NNIT SURVIVAL



CONCLUSION

- Termination of resuscitation in the field supported by research, EMS experts, and family
 - TOR guidelines need to be constantly re-evaluated as new cardiac arrest therapies arise
 - Duration of resuscitation needs to be studied further
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