Decision Rules for Termination of Resuscitation

Spark of Life
Australian Resuscitation Council
May 1, 2009
Tasmanian Employment Agency
Tag Line

We never give up....

We need to know when to give up......
Medical Futility Research

Objectives

– Why a termination of resuscitation rule was needed
– Derivation of the rule
– Validation of the rule
– Comfort with the rule
– External Validation of the rule
– Implementation of the rule
Alternate hypothesis

How to stretch a single concept into 9 years of work and a few publications!
Conflict of Interest

• None to declare on this subject
• Funded by CIHR
Network Statistics in Cardiac Arrest

- 9 million people
- >5000 OHCA/yr
- 50% are legally dead
- 50% receive treatment
- OH Survival to discharge
  - 2.6% 2005
  - 8.0% 2008
- IH survival to discharge
  - Varies 0-50%
Why transport when it is futile to continue?

• Legislation
  – Mandatory treatment and transport – BLS paramedics
  – Mandatory treatment – ALS paramedics
    • Option to call for termination of resuscitation
    • May leave the patient at scene for the coroner
  – 60% of Canada served by BLS
What is there to gain from transporting to an ED for pronouncement?

- Physician intervention, care and family comfort provided within 16 mins.
- Perception that all that could be done was done
- Social support
What is there to lose from transporting to an ED?

• Life and limb – provider and patient
  – 17-18% risk of MVA
  – Blood borne pathogen transfer through interventions enroute - hepatitis
  – Poor quality CPR
  – Delay to defibrillation

• Opportunity for family to watch the resuscitation

• Quiet familiar surroundings to say goodbye
What does the literature say? Is there any difference?

- 95% of family members were satisfied
- 90% of family felt everything was done to save their loved one
- Paramedics stayed 88 minutes to perform the resuscitation and deliver the bad news and comfort the family
- Grief reaction at one year was better with out of hospital termination compared to ED
- Cheaper for the system to terminate in the field
Any Guidelines?

• National Association of EMS Physicians 2000
  – “resuscitative efforts could be terminated after 30 minutes of unsuccessful ALS treatment”

• American Heart Association 2005
  – “termination should follow system specific criteria and under medical direction as continued ALS resuscitation in the ED offers no advantage over similar care in the field”
How well do we apply the guidelines?

• Inconsistently
• Eckstein et al
  – Rates of termination varied from 5% to 37% depending on which physician took the call

Eckstein Acad Emerg Med 2005:12; 65-70
Current ALS Practice
Termination of Resuscitation

• ALS TOR practice guidelines
  – Retrospective data
  – Survival rate when guidelines = terminate
    • 0.4 – 1.7%
  – Deemed medically futile to continue if no response
How to define medical futility?

- Schneider et al
  - Any drug or device that has less than 1% survival is deemed medically futile
What about BLS?

• Nothing to guide us

• Drive fast and pump and blow…….
To Derive a Rule

Rigorous methodology

Refined

• Derivation
• Prospective Validation
• External Validation
• Implementation Evaluation
Derivation of the Rule

- 700 OHCA
  - Defib only paramedics (BLS)
- Abstracted Utstein predictors
- Multivariate Analysis
- Found three predictors of death with a 0.3% survival rate

Figure 2. Odds ratios and 95% confidence intervals for cardiac arrest characteristics associated with survival to discharge. CPR = cardiopulmonary resuscitation; EMS = emergency medical services; ROSC = return of spontaneous circulation.
Prehospital Cardiac Arrest Patients may be considered for Termination of Resuscitation in the Field following completion of EMT-D resuscitation attempts when:

1) There has been no return of spontaneous circulation,

AND

2) No Shock has been given,

AND

3) The arrest was not witnessed by EMS personnel.

All other patients require continued resuscitation and emergent transport to the nearest Emergency Department.

Figure 3. Termination of resuscitation guideline for defibrillation-trained emergency medical technicians (EMT-Ds). EMS = emergency medical services.
Prospective Validation

• 24 EMS Services in Ontario

• Inclusion criteria
  – 18 years or older
  – OHCA - no obvious cause
  – No ALS response

• Intervention
  – Clinical decision tool
  – Comfort and Sensibility
Prospective Validation

- 1240 patients enrolled
  - 776 met the criteria for termination
  - Of these, 4 survived
  - Specificity to recommend transport of potential survivors – 90.2%
  - Positive predictive value for death of 99.5% when termination was recommended
  - Reduces the transport rate from 100 to 37%

Morrison et al NEJM 355:5 2006
Outcome when the guideline recommended termination

- 4 survivors out of 776 – guideline termination
  0.5% 95% CI (0.1 - 0.9%)

- Below the threshold rate of 1% p = 0.04

- ALS guidelines rate of: 0.4 - 1.9% *
4 Survivors

• Discharged to a private residence
  – CPC score of good (3)
  – CPC score of moderate disability (1)

• All were bystander witnessed events
Diagnostic Test Measures

Sensitivity
• 37 of the 41 survivors identified by the rule
• 90% (95% CI 88, 92%)

Specificity
• Of the 1199 patients who died, 772 identified by the rule
• 64% (95% CI 62, 67%)

Negative predictive value of 99%
• (95% CI 99, 100)
Did the two providers agree on their interpretation of the rule?

- 95% two forms for each OHCA
- Kappa for agreement on the same OHCA
  - 0.90 between driver and attendant
  - 0.88 between correct interpretation of the rule

How comfortable were they applying the rule?

- Comfortable or very comfortable applying the rule
  - 72-74%
  - Extreme discordance between the two paramedics treating the same patient occurred in 150 cases (12%)
ALS TOR Rule

• Derivation
  – Ontario data collected for another study from 21 urban and rural sites
  – 4673 non obvious cause adult cardiac arrests
    • <1% loss to follow up
    • independent predictors of survival were identified and modelled into a clinical prediction rule

Morrison et al Resuscitation 74; 2007
ALS TOR Rule

1- Arrest witnessed by emergency medical services personnel
2- A shock was delivered
3- There was a return of spontaneous circulation at any point during the resuscitation
4- Bystander cardiopulmonary resuscitation performed
5- Arrest witnessed by bystander

If ANY criteria are present
- Transport to local ED

If NONE of the criteria are present
- Terminate Resuscitation
Transport Rates were different

BLS 37%
ALS 70%
External Validation

• Sasoon et al \textit{Sasoon et al JAMA 2008:300, 12}
  – CARES data set
    • ALS of 1192 none survived and 79\% rate of transport
    • BLS of 2592 only 5 survived (0.2\%) and 53\% rate of transport

• Skrifvars et al \textit{60 minutes ago at SOL in Hobart}
  – Swedish OHCA registry
    • ALS of 5465 only 5 survived (0.09\%) and 74\% rate of transport
    • BLS – not evaluated
Two Rules
Same System is problematic
Universal Rule

• ROC Data set U of T data
  – 2415 cardiac arrest patients, adult no obvious cause
  – ALS rule recommended termination in 743 pts
    • No survivors
    • Transport rate 69%
  – BLS rule recommended termination in 1302 pts
    • No survivors
    • Transport rate of 46%

  *Morrison et al Resuscitation 80: 2009*
Universal Rule

1- There was a return of spontaneous circulation (prior to transport)
2- Arrest witnessed by emergency medical services personnel
3- A shock was delivered

If ANY criteria are present:
Transport to local ED

If NONE of the criteria are present:
Terminate Resuscitation
Pre and Post 2005 AHA guidelines

• Diagnostic test characteristics unchanged
• Transport rates increased
  – ALS up to 76%
  – BLS up to 51%
  – More survivors
Ongoing Implementation Trial

• Currently just completed enrolment
  – 2500 OHCA
  – 8 rural communities – BLS providers
  – Evaluating accuracy of application
  – Logistical issues
    • Police, coroner, family, EDs
  – Comfort of the MD and the provider
  – Psychological comfort of the provider
Importance of the work

• Transport of the medical futile patient
  – Limits availability of EMS
• Increases ED workload
• Diverts care and resources from potentially more salvageable patients
• Costly (1 billion annually USA)
• Increases risk to personnel and public (MVCs, biomedical hazards)
• Satisfaction and grief response similar
• Single rule limits misapplication by services with BLS and ALS
Thank you