Regional Approach to Cardiovascular Emergencies
Cardiac Arrest Resuscitation System

Team Resuscitation and High Quality CPR

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Objectives:

• Discuss team basics
• Discuss where we resuscitate
• Update on science behind CPR
• Building a team in your system
• Strategies for Improved Survival
Si’s First Rule of Resuscitation

Live Where You Have a Better Chance of Survival

Jack!

Si’s Rules of Resuscitation
Careful with Words / Phrases

- Team Focused
- Pit Crew
- High Quality
- Uninterrupted
- Controlled ventilations

≠ SUCCESS
Make Up / Building a Team

- Leader
- Awareness of how you work
- Clearly define roles and responsibilities
- Feedback
Where Do You Start

• First you must know where you are
  – Many believe their success is far greater than actual

• CARES is one place to start

• Establish a goal
CARES Survival Report

Utstein Survival Report
Agency Group: North Carolina | Service Date: From 1/1/10 Through 12/31/10

Bystander Intervention (924)
AED %: 1.3% (12)
CPR %: 23.5% (217)

Cardiac Etiology Survival Rates
Overall: 11.8% (1096)
Bystander Wit’d: 18.7% (396)
Utstein: 31.7% (164)
Utstein Bystander: 28.7% (80)
EMS Witnessed: 19.8% (172)
Unwitnessed: 4.0% (528)
Shockable/Bystand: 41.4% (396)

Non-Cardiac Etiology 108

Cardiac Etiology 1096

Unwitnessed Arrest 528 *see page 2

Initial Rhythm Asystole 107

Resuscitations Attempted 1204

No ROSC 68

ROSC in Field 48

ROSC in Hospital 103

Expired in Field 3

Expired in ED 9

Admitted to Hospital 22 (1 incomplete)

Discharged Alive 2

Neurological Status CPC 3 or 2 48

CPC 3 or 4 14

Unknown – 0

Witnessed Arrest (Bystanders) 196

Initial Rhythm VF/VT 164

No ROSC 60

ROSC in Field 48

ROSC in Hospital 103

Expired in Field 3

Expired in ED 9

Admitted to Hospital 82 (0 incomplete)

Discharged Alive 2

Neurological Status CPC 1 or 2 48

CPC 3 or 4 14

Unknown – 1

Witnessed Arrest by EMS 172 *see page 3

Other Initial Rhythm 175

No ROSC 62

ROSC in Field 48

ROSC in Hospital 103

Expired in Field 3

Expired in ED 9

Admitted to Hospital 38 (2 incomplete)

Discharged Alive 2

Neurological Status CPC 1 or 2 48

CPC 3 or 4 14

Unknown – 0

Expire in Hospital 21

Discharged Alive 13

June 01, 2011
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1 of 3
Would you do this?
Would you do this?
ACLS: De-emphasis of Devices, Drugs and other Distracters

- Focus on high-quality CPR and defibrillation
- Atropine no longer recommended for routine use in
PREHOSPITAL HIGH QUALITY COMPRESSIONS

- Goal: High quality means continuous chest compressions with *limited interruptions*
  - Rate: 100 – 120/min
  - Depth: 2 inches
  - Allow for complete chest recoil
  - Change every 2 minutes with pulse check
    - not to exceed 5 seconds
  - Address airway 2 cycles unless indicated earlier
Why 100 – 120 Rate?

• Study measured rates from 2005 – 2007
• 3098 patients enrolled
• Mean compression rate 112
• ROSC peaked at 120
• ROSC declined markedly < 75
  – In this study ROSC not associated with hospital discharge

Why 100 – 120 Rate?

![Graph showing survival to discharge rates for different chest compression rates. The graph compares 'Sham' and 'Active' groups with rates ranging from <90 to ≥130. The highest survival rates are seen in the 100-109 range for both groups.](image-url)
Increased chest compression fraction is independently predictive of better survival.
Chest Compression only CPR:

- Bystanders more willing to initiate
- Arterial blood is adequately oxygenated at onset of *primary cardiac arrest*
- Less likely to cause regurgitation of stomach contents
- Rescue breathing interrupts critical chest compressions
- Easier to teach
- Observational evidence of improved survival

Depth and Speed Matter

- ROC Study
- 1029 Adult patients including 58 EMS agencies
- Median compression rate is 106
- Median compression depth is 37.5 mm
- 53 % with compression depth < 38 mm
- 92 % with compression depth < 50 mm
  - Faster compression rate = less depth
- Survival improved with depth > 38 mm

Why 2 Minutes?

- 45 Providers, single rescuer CPR – 10 minutes
- Child and Adult manikins with AV feedback
- Mean compression rate remained > 100
- Adequate compressions
  - Fell from 85 % to < 40 % over 10 minutes
  - < 70 % after 90 seconds in child
  - < 70 % after 120 seconds in adult
- Self reported fatigue low by 2 minutes

Si’s First Rule of Resuscitation

Pump Hard and Pump Fast
Jack!
WHY CAN’T WE LET GO OF THE AIRWAY
One, two three, BREATHE

He's dead, Jim
Why De-emphasis of Airway?

• Nationwide Japanese Registry 649,654

• ETT or BIAD Good Neurological Outcome 1%

• BVM Good Neurological Outcome 3%

Kohei Hasegawa, MD, MPH; Atsushi Hiraide, MD, PhD; Yuchiao Chang, PhD; David F. M. Brown, MD JAMA. 2013;309(3):257-266. doi:10.1001/jama.2012.187612.
Advanced Airway Placement

Interruptions in CCC

- 100 cases reviewed
- Median 2 intubation attempts
- Median duration of interruption for 1st attempt = 46.5 sec.
- Median total interruptions for all attempts = 109.5 sec

Interruptions in Cardiopulmonary Resuscitation From Paramedic Endotracheal Intubation (WANG 2009)
PREHOSPITAL HIGH QUALITY VENTILATIONS

Goal: High quality means NO hyperventilation / hyperoxygenation

– Don’t interrupt chest compression for insertion
  • Adult takes 10 – 15 minutes to de-saturate
  • Ventilate 8 – 10 / minute
  • Maintain SpO2 ≥ 94 %
  • Do NOT Hyperventilate
Si’s First Rule of Resuscitation

Forget about the airway initially... Jack!
Easy

DEFIBRILLATION
Study showed that odds of survival were significantly lower for patients with:
1. Pre-shock pause > 20 seconds
2. Peri-shock pause > 40 seconds

Perishock Pause = interruption in chest compressions before and after defibrillatory shock

Optimal Pre-Shock Pause: < 5 seconds, max of 10 seconds

Perishock Pause
Independent Predictor of Survival

Resuscitation Science

Perishock Pause
An Independent Predictor of Survival From Out-of-Hospital Shockable Cardiac Arrest

Sheldon Cheskes, MD; Robert H. Schmicker, MS; Jim Christenson, MD; David D. Salcido, MPH;
Tom Rea, MD; Judy Powell, RN; Dana P. Edelson, MD; Rebecca Sell, MD; Susanne May, PhD;
James J. Menegazzi, PhD; Lois Van Ottingham, RN, BSN; Michele Olauska, BSN;
Sarah Pennington, RN; Jacob Simonini, ACP; Robert A. Berg, MD; Ian Stiell, MD, MSc;
Ahamed Idris, MD; Blair Bigham, MSc; Laurie Morrison, MD, MSc;
on behalf of the Resuscitation Outcomes Consortium (ROC) Investigators
TEAM APPROACH TO RESUSCITATION
Define Your Team

- First Responders with ALS
  - Define roles as responders arrive on scene
  - Define team leader and when this is established
First Responders with ALS

- First responder: Compressions
- Second responder: AED, Airway, cycle with compressor
- Third responder: Team leader, cycle with compressor
- Fourth responder: Team leader
Career agency with ALS

• Fire department / squad
  – Firefighter 1: Compressions
  – Firefighter 2: AED
  – Engineer 3: Airway
  – Captain: Team Leader
Pit Crew Approach

- Each person has assigned role
  - Providers focus on their assigned job expertly and efficiently
- Practice in each role
- Helps minimize interruptions

Pre-assigned Roles
1. Pit Crew Leader
2. Airway Leader
3. IV/IO & Medications
4. CPR Chief
5. CPR Duty Chief
6. Variable Player
Pit Crew Approach to Resuscitation

• Focus on:
  – Leadership, team approach, skills & competencies, communication & teamwork, best practices, and rehearsal

• Emphasis on:
  – Minimally interrupted CPR
  – Controlled ventilations
  – Defibrillation
  – Appropriate timing of interventions
Henderson EMS, Nevada

• Created Team Based Method
• Developed 4 roles with specific responsibilities
  1. Compression Tech
  2. Monitor Tech
  3. Ventilation Tech
  4. Medication Tech

Identified which roles would be filled in what order as providers arrived to scene
Pittsburg EMS, PA

- Developed the **375E5 Program**
  
  375 Compressions & Epinephrine in 5 minutes

- Re-tasked the first 5 minutes of cardiac arrest management to:
  - Maximize hands on compression time

**Goal:** Maximize coronary & cerebral perfusion pressures
<table>
<thead>
<tr>
<th>Problem</th>
<th>Mitigation</th>
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<tbody>
<tr>
<td>Delay in initiating CCC</td>
<td>Rapid ABC assessment and initiation of CCC; one rescuer CCC while monitor placed</td>
</tr>
<tr>
<td>Pauses of CCC for rhythm analysis and defibrillation</td>
<td>Brief pause for rhythm analysis; continue CPR until ready for shock, clear and then resume CCC immediately</td>
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<tr>
<td>Pauses of CCC for advanced airway placement</td>
<td>Defer until later in the arrest unless clinically indicated to do earlier or placement with interruption of CCC</td>
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Wait a minute: I am not Wake, Mecklenburg or Durham County. My response times are longer, transport times are longer, I have limited resources and I don’t have a major medical center.

CAN THIS MAKE A DIFFERENCE IN MY COUNTY?
Stokes EMS System Overview
Stokes EMS System Overview

- 5 ALS credentialed Ambulances supported by 1–3ALS Quick Response Vehicles.
- 57 FT/PT employees.

- Approximately 8000 call responses per year.
  - 67% ALS responses (Based on 2011 figures)
  - 31% BLS responses (Based on 2011 figures)
Stokes EMS Interpretation of the 2010 AHA Changes

- High Quality, Uninterrupted, Continuous Chest Compressions
  - CPR where patient is found

- BIAD vs. Intubation
  - BIAD

- Avoiding excessive Hyperventilation
  - ITD

- Team Focused Approach

- Post-Resuscitation Care
- Therapeutic Hypothermia

TERMINATION ON SCENE
Assignment of On-Scene Responsibilities

- Fire Department / Squad Assignments (Career/Volunteer).
- Build upon the team as more personnel arrive.
- On scene command
  - Fire Department (manager of the scene)
  - EMS (manager of patient Care)
On shift Scenarios

Everyone on scene is responsible for the quality of CPR (Not just the Team Leader)

Role playing

- Team Leader
- Airway management
- Chest Compressions/AED Placement
- EMS interventions
- Family Interactions (included in this explanation of discontinuation of efforts)
  
  Beginning care of a new patient
Summary

• Define your team your way
• Practice with all responders
  – Ensure knowledge of roles
  – Ensure all knowledgeable of the science
• Immediate feedback during event
• Debrief following event
• Gather data if possible
  – Partner with another agency for data