Improving Outcome from In-Hospital Cardiac Arrest

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Objectives

1. Discuss the AHA in-hospital cardiac arrest consensus statement
2. Describe feedback devices such as waveform Capnography, diastolic pressure readings, CPR performance devices that can be used intra-arrest to evaluate the quality of compressions
3. Discuss the benefits of post-event review by downloading data from defibrillators to provide feedback on CPR quality
2010 ACLS Guidelines

- Bigger emphasis on compressions
  - “Push fast, push hard”
- Early defibrillation
- Waveform Capnography
  - Quality of compressions
- Post resuscitation algorithm
  - Temperature management

2010 AHA ACLS Guidelines

Coming October 15, 2015...
New ACLS Guidelines!!!
In-Hospital Consensus Recommendations

According to the GWTG database, the survival rate from in-hospital cardiac arrest is:

A. 5%
B. 18%
C. 30%
D. 50%
Chances of surviving an In-Hospital Cardiac Arrest?

Defined by ICD-9 code for Cardiac Arrest - Including those admitted through the ED with CA

| Table 2. Published Incidence and Outcome Estimates of ICHA (Adult and Pediatric) |
|-------------------------------------------------|-----------------|-------------------------------|
| | Incidence | Outcome | Reference |
|-------------------|-------------|------------|
| Adult | 6,67/1,000 | 200,000 | Chan et al* |
| Pediatric | 3,26/1,000 | 6,000 | Radhakrishnan et al* |
| Outcome | Adult | Survival to discharge | 15% | Radhakrishnan et al* |
| | OPC good | 25% | Booth et al** |
| | Survival at 1 year | 6.69% | Radhakrishnan et al* and Fourie** |
| | Survival at 3 years | 5.20% | Booth et al** |
| Pediatric | Survival to discharge | 22% | Radhakrishnan et al* |
| | OPC good | 39% | Radhakrishnan et al* and Fourie** |

Circulation (2013); Morrison, et al.

What is the most common type of in-hospital cardiac arrest?

A. PEA and Asystole 😊
B. Vfib and PEA
C. Vtach and Vfib
D. Asystole and Vfib

Asystole and PEA make up 67% of all adult in-hospital cardiac arrests

Circulation (2013); Morrison, et al.
What can we do to improve?

- Prevent the arrest!
- Resuscitate those who are resuscitatable!

#1 CPR Quality
#2 Early & effective defibrillation
#3 Feedback to teams on performance
#4 Post-Arrest care & Targeted Temperature Management
#5 Measure, practice & improve!!!
#1 CPR Quality

Quality of compressions

**Current AHA recommendations:**
- Rate = at LEAST 100/min
- Depth 2 inches (50 mm)
- Allow for full recoil of the chest

Compressions provide 25-33% of normal cardiac output
Optimal Rate?

- ROC PRIMED Study
- Prospective observational study
- OHCA
- After adjusting for
  - chest compression fraction &
  - depth

highest survival to discharge was found when the rate was...

100 – 119 per minute!

**Compression rate**

“Push fast, push hard”

**Too Slow**
(Before 2010)

**Too Fast**
(current)

100 – 120 /min

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**Optimal chest compression depth?**

**ROC PRIMED Trial**

- Out of hospital cardiac arrest
- Current depth recommendation is 50 mm
- 2005 rec. 38 – 50 mm
- No upper limit
- Highest survival depth interval of 40.3 mm – 55.3 mm
- Peak survival 45.6 mm (~1.8 inches)

Compression Fraction

- The amount of time spent providing compressions
- May also be called “compression ratio”
- Goal: At least 80%!

Is it acceptable to be off the chest for 20% of an arrest?

An increased chest compression fraction is independently predictive of better survival in patients who experience a pre-hospital ventricular fibrillation/tachycardia cardiac arrest.
Disco Lives!!!

- 5 Medical students & 10 MDs
- With beat avg. 103 /minute
- 5 weeks later repeated

*Use a metronome!!!*
Chest compressions with metronome

Positioning

Leaning & recoil
Waveform Capnography

- Used as a marker of perfusion
- Normal is 35 – 40 mmHg
- Goal with compressions is at least 10 mmHg
- Will see increase with ROSC

Waveform Capnography

- Attaches to ET tube, measures CO2
AVOID Over-ventilation!!!

- If patient does not have an advanced airway:

  **30:2**

  Do you stop compressions for ventilations? **YES**

- If the patient has an advanced airway:

  **8 - 10 breaths / min**
  
  (1 breath every 6 – 8 seconds)

  Do you stop compressions for ventilations? **NO**

  -2010 ACLS Guidelines

Other adjuncts

- **Coronary Perfusion Pressure (CPP)**
  - Diastolic pressure
  - Goal > 20 mmHg

- **Central venous saturation**
  - $\text{ScvO}_2$ – normal 60 – 80%
  - Goal > 30%
  - If < 30%, assess quality of compressions
#2 Defibrillation

Ventricular fibrillation

- Most successful treatment for v-fib is defibrillation!
- For every minute delay, survival decreases by 10%!!!
The 2nd most cited paper in *Resuscitation* in the 5-year period after it was published!

**Conclusion:**
Pause duration does affect VF termination rate.
AEDs in non-critical care areas

- 439 patients evaluated in non-monitored areas:
- 73 with VT/VF: 63 (86%) ROSC; 34 (47%) discharged from hospital
#3 Feedback

Real time CPR Feedback:

- Real-time feedback
  - Rate, Depth, CCF
- Metronome
- Ventilation prompts
- Post-event data:
  - Immediate
  - Reports
AHA Consensus Recommendation

2013 Consensus Recommendation:
“...resuscitation data from the defibrillator or any other device or source documentation that captures data at the scene should be used for feedback to the team”
Circulation, 2013
Intra-arrest review: Compression fraction

Goal: at least 80%!

2 months after giving feedback to teams

- ED patient with STEMI
- PEA Arrest
- What do you think about the rate?
- Compression fraction?
Intra-Arrest Data Report

1 Second

Vfib – No Shock, but stopped to assess?

Vfib – No Shock, but stopped to assess?

#4 Post-Arrest
**Temperature Management**

- Decrease temperature to 32 – 34 degrees C for 12 – 24 hours
- Studied in v-fib & v-tach arrests

- New study showing 36 degrees may also be effective  
  Nielsen (2013)

- Closely monitor hemodynamics
  - Consider using PetCO2

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**#5 Measure, Practice & Improve**
Response teams

- Dedicated team with defined, clear roles
- Practice, practice, practice!
- Team Debriefing

The Code Team & Defined Roles

- Anesthesiologist stands at the head of the bed
  - Coordinates with or orders
  - Monitors and administers

- ICU Nurse or STAT Nurse (code crew)
  - Stands on side of bed nearest to the code crew
  - Coordinates medications
  - Huddles with code crew
  - Instructs the code crew on the order of medications

- Respiratory Therapist
  - Stands at the head of the bed
  - Provides ventilating
  - Transports patient if needed

- Compression Provider
  - Stands on side of bed
  - Monitors and administers

- Medial Telemetry Nurse
  - Stands at the head of the bed
  - Monitors patient

- Pharmacist
  - Stands at the head of the bed
  - Monitors and administers
  - Coordinates medication

- Bedside Nurse
  - Stands at the head of the bed
  - Monitors patient

- Attending or Senior ICU Resident
  - Stands at the head of the bed
  - Monitors and administers

- Intensive Care Unit Staff
  - Monitors and administers

- 1st Year Resident
  - Monitors and administers

Other Code Blue Team Members:
- Lab: Monitors laboratory work during resuscitation
- Nursing Supervisor: Monitors and administers during resuscitation
- Emergency Resuscitation Team: Monitors and administers during resuscitation
In conclusion:

- Provide good quality compressions
- Minimize interruptions in compression
- Defibrillate early with minimal pre/post shock pauses
- Avoid over-ventilation
- Practice! Give feedback on performance
- Identify roles and establish clear expectations
- Post-resuscitation care
- Control the temperature post arrest