INTRODUCTION TO PIT-CREW STYLE CARDIOPULMONARY RESUSCITATION (CPR)

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Preparedness?!?
Disclosures & Conflicts

- Nothing to disclose
- No conflicts of interest
The Master Plan

• Introduction and overview
• Cardiac arrest
  – Define and review
• Challenges in care of cardiac arrest victims
  – Current challenges expanded
• New and revised changes
  – Methods to improve challenges and potentially outcomes of cardiac arrest patients
Challenges in Care

- **System access**
  - Early activation of EMS
    - Landline
    - Cellular
    - Radio

- **System response**
  - Distance to respond from EMS location to patient
  - Availability of MFR’s for initial response
  - PSAP → EMD → MFR & EMS Response → Arrival at patient
Cardiac Arrest Etiology

- Presumed Cardiac Etiology: 73%
- Trauma: 11%
- Respiratory: 7%
- Other: 9%
Cardiac Arrest Location

- Home/Residence: 85%
- Street or Highway: 1
- Healthcare Facility: 3
- Public Building: 1
- Nursing Home: 4
- Not Available: 0
- Blank: 1
• Initial bystander CPR implementation
  – Self initiated
    • Small number of patients actually receive bystander CPR
    • 62% of cardiac arrests are unwitnessed
  – Dispatch guided
    • Usually related to the inability to “recognize” cardiac arrest
    • Caller may not give enough or the right information to ascertain the patients condition
– Hands-only approach
  • Now incorporated into all non-professional courses through AHA and other CPR programs
– Initial rescuer CPR
  • Limitation of resources
  • Tasks for completion
    – CPR-compressions
    – CPR-ventilations
      Oral Airway, BVM, oxygen
    – AED application
    – Movement of patient
    – Obtaining initial history
Team CPR that doesn’t work

Focusing on Other things and not CPR

Resuscitations in the wrong place

Lack of effective CPR during transport
1st Steps

- Initiate new and revised changes to management of cardiac arrest patients
- Best way is to understand where in cardiac arrest patients we can make differences
- Let's start with the basics
Physiology of Cardiac Arrest

Cardiac

Trauma

Respiratory

Other

Cardiac Arrest
Inability to ventilate

- Hypoxia
- Hypercarbia
- Anxiety
- Release of Catecholamines

Myocardial and end-organ dysfunction

- Altered mental status
- Cardiac irritability

Lethal cardiac arrhythmias

- Ventricular fibrillation
- Ventricular tachycardia
- Bradycardia
- Asystole
Cardiac Insufficiency
- Coronary artery blockage
- Generalized hypoxia
- Cardiac tissue disease
- Lack of Catecholamines

Myocardial dysfunction
- Altered mental status
- Cardiac irritability

Lethal cardiac arrhythmias
- Ventricular fibrillation
- Ventricular tachycardia
- Bradycardia
- Asystole
Trauma

Cardiac Insufficiency
- Decreased circulation
- Decreased oxygen capacity
- Direct cardiac injury
- Loss of sympathetic tone

Myocardial dysfunction
- Altered mental status
- Cardiac irritability

Lethal cardiac arrhythmias
- Ventricular fibrillation
- Ventricular tachycardia
- Bradycardia
- Asystole
Other Causes

Cardiac Insufficiency
- Decreased circulation
- Decreased oxygen capacity
- Cardiac muscle dysfunction
- Loss of sympathetic tone

Myocardial dysfunction
- Altered mental status
- Cardiac irritability

Lethal cardiac arrhythmias
- Ventricular fibrillation
- Ventricular tachycardia
- Bradycardia
- Asystole
All 4 “reasons” have 3 basic physiological components

Cardiac irritability and dysfunction → Cardiac Arrest
Pit Crew CPR

• Modeled after NASCAR racing teams
  – Each person has a specific duty
  – Each person is strategically placed to maximize their effectiveness
  – Each duty is coordinated for optimal timing
Example of a NASCAR Pit Crew

16 Seconds
Vehicle STOP to GO
All 4 tires changed
Formula 1 Pit Crew

Ferrari F1 Perfection
Directions for Pit Crew CPR

• Personnel on scene assignments
  – Based on number of personnel available

• Key steps in order of need
  – **CPR** – *compressions* only
  – **CPR** – *compressions* only, addition of AED
  – **CPR** – *compressions*, ventilations and AED
  – **CPR** – *compressions*, ventilations, AED, evaluation of status and rhythm analysis
  – **CPR** – *compressions*, ventilations, AED, additional treatment/implementation decisions
    • airway management
    • intravenous access and drug administration
M-CPR

- Human interaction
  - Dedicated person to monitor CPR performance
  - Available right now to everyone
1st Rescuer Arrives

- **Compressions only**
  - Provides the most time on the chest
- **Call for help early**
  - Alert dispatch to confirmed arrest
AED
Witnessed arrest → apply as soon as possible
Unwitnessed arrest → 2 minutes CPR first

Establish unresponsiveness, call for assistance
Check CAB: Circulation - no pulse → begin compressions only CPR
- + pulse, open airway, check breathing
- no breathing, begin rescue breathing
2nd Rescuer Arrives

- Continue compression only CPR
  - Continues to provide the most time on the chest
- Alternate between rescuers every 100 compressions
  - 1 minute on, 1 minute off
  - Diminishes rescuer fatigue
- Non-compressor applies AED as soon as possible
AED
Witnessed arrest -> apply as soon as possible
Unwitnessed arrest -> 2 minutes CPR first

Continue CPR and application of AED
1. Non-compressor operates the AED
2. Only stop CPR when AED announces “Stop CPR, Analyzing Rhythm”
3. If no shock advised, inform compressor to resume CPR
4. Alternate compressors every 100 compressions
5. Use the “count of 10’s” while performing CPR
3rd Rescuer Arrives

• Focuses on providing effective ventilation
• Gets BVM ready for use
  – Oxygen attached
  – Facemask on
  – Oral airway placed
• Uses CE or TE technique with 2 hands to apply BVM mask to patient
• Lift jaw into mask
• Non-compressor rescuer provides actual “squeeze” of BVM

• Goal is to provide the BEST ventilation possible
  – Each ventilation causes chest rise
  – Each given over 1 seconds
  – 2 ventilations given every 30 seconds
  – Minimizes gastric distention
Don’t Stop!!!!

• Rescue 1 and Rescue 2
  – Continue to provide effective CPR
  – Continue to operate the AED and ONLY analyze when prompted by the AED
  – Immediately resume CPR if AED announces “No shock advised”
Prepare BVM with mask
Attach O2 to BVM
Apply mask with CE or TE hold
Lift jaw into mask
Non-compressor will squeeze BVM
2 ventilations every 30 compressions
Goal is chest rise & minimal air leak

Continue CPR and application of AED
1. Non-compressor operates the AED
2. Only stop CPR when AED announces “Stop CPR, Analyzing Rhythm”
3. If no shock advised, inform compressor to resume CPR
4. Alternate compressors every 100 compressions
5. Use the “count of 10’s” while performing CPR
• Positioned out of the way of the effective CPR in progress
• Takes over operation of the AED
  – Including time monitoring for when rhythm analysis will occur
  – Continues even after arrival of ALS
• Completes the “Critical CPR Functions Checklist”
CPR - switch every 100
Non-compressor squeezes BVM

Ventilation
Monitor CPR

Rescue3

Rescue1

Rescue2

Rescue4

Critical CPR Functions Checklist
- Assures all actions completed
- Assumed AED duties and timing
- Relieves Rescuel & Rescue2 as needed
- Position assumes duties
5th Rescuer Arrives

- Documentation of events
- Reporting situation to ALS and others as needed
- Acquiring additional equipment or personnel as needed
CPR - switch every 100 Non-compressor squeezes BVM

Ventilation Monitor CPR

Rescue3

Rescue1

Rescue2

Rescue4

AED - Primary use
- Analyze every 2 minutes

Cardiac Arrest - Critical Functions Documentation
- Establishes time keeping
- Records interventions
Provides report to ALS
Procures additional equipment/personnel as needed

Rescue5
ALS Arrives – Primary Objective

- Receive report on patient status and situation
- Apply 3 or 4 lead EKG to patient during receipt of report
  - The AED should NOT be removed
- EtCO2 (capnography) and SaO2 (pulse oximetry) may be applied at this time
Receive report
Establish additional monitoring
- 3 or 4 lead EKG (do not remove AED and pads)
- EtCO2 capnography (may defer until adv. airway)
- SaO2 (may defer until ROSC)
Now that we are all here...

• Reassess patient status
  – Adequate CPR
  – Effectiveness of ventilation
    • Any complications – immediately identify and address

• Rescuer 1 – 5 continues with their duties
  – CPR (2 persons)
  – Ventilation
  – AED and timing
  – Supplies/personnel and recording events
Establish advanced airway
- EGD or ETI (Optimum first pass success attempt)
Institute EtCO2 capnography 1st breath
Reassess patient status
- Adequate CPR, adequate ventilations
See you on the field for HOT!
Thank You!

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Introduction to Pit-Crew Style Cardiopulmonary Resuscitation (CPR)