Session Number 206

CODE BLUE: WHY WE DO THE THINGS WE DO

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Content Description

Critical Care Nurses are often required to be certified in advanced cardiac life support and basic life support. The algorithms that are carried out for various code situations are known to the critical care nurse. However, the rationale behind these steps is not always known. This program will present the rationales behind the various interventions utilized in an adult code. It will also look at the current research going on in the world of cardiopulmonary resuscitation.

Learning Objectives

At the end of this session, the participant will be able to:

1. Discuss the current 2010 American Heart Association adult guidelines for CPR and Emergency Cardiac Care support.
2. Explain the rationale behind these interventions.
3. Examine the current research being carried out in the area of resuscitation.

Outline

See power point slides

References

1. 2010 American Heart Association Guidelines for CPR and ECC. Circulation 2010; 122 (18).

**Speaker contact:** dbarto@virtua.org
A nursing assistant comes running to tell you that a family member is lying unconscious on the hallway floor. You immediately run to the victim.

**What do you do now?**

**YOUR ACTIONS**

- Check for unresponsiveness and breathing
- Call for help
- Feel for a pulse
- Give 30 compressions
- Give two breaths
- Monitor arrives – VTach!
- Defibrillate with AED
WHY ARE WE DOING THIS?

LEARNING GOALS
- Discuss the current 2010 American Heart Association adult guidelines for CPR and Emergency Cardiac Care support.
- Explain the rationale behind these interventions.
- Examine the current research being carried out in the area of resuscitation.

INTERNATIONAL CONSENSUS
- International Liaison Committee on Resuscitation (ILCOR)
- Group formed to review resuscitation science and develop evidence-based guidelines
- New guidelines released in October 2010
- 356 resuscitation experts from 29 countries
ILCOR MEMBERS

- American Heart Association (AHA)
- European Resuscitation Council (ERC)
- Heart and Stroke Foundation of Canada (HFSC)
- Australian and New Zealand Committee on Resuscitation (ANZCOR)
- Resuscitation Council of Southern Africa (RCA)
- Inter American Heart Foundation (IAHF)
- Resuscitation Council of Asia (RCA)

CHAIN OF SURVIVAL

- Nearly 383,000 out of hospital sudden cardiac arrests occur annually
- 88% of cardiac arrests occur at home
- Effective bystander CPR provided immediately after sudden cardiac arrest can double or triple a victim’s chance of survival
- Only 32% of people who suffer cardiac arrest outside the hospital survive

EARLY INTERVENTION/EARLY ACCESS

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- 88% of cardiac arrests occur at home
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www.heart.org as of June 2011
COMPRESSIONS ONLY CPR

- Adequate oxygen exists within the blood during at least the first 10 minutes of a cardiac arrest
- Community: Two steps to save a life

WHO SHOULD NOT RECEIVE “HANDS ONLY”

- Unwitnessed cardiac arrest
- Cardiac arrest in children
- Cardiac arrest presumed to be of non-cardiac origin
  e.g. drug overdose
drowning
trauma
respiratory distress

INCREASING BYSTANDER NUMBERS

- Nielsen et al improved bystander involvement over a two year period
  DVD based self instruction kits
  4 hour courses during working hours
  Public service announcements

Vast majority of cardiac arrests occur in adults
Highest survival rates are reported among patients who have a witnessed arrest and the initial rhythm of VF or pulseless VT
For these victims, the critical initial elements of BLS are chest compressions and early defibrillation
Tailoring the Rescue

- Tailor rescue actions to most likely cause of arrest
- Example:
  - Sudden collapse
  - Asphyxial arrest (drowning)

COMPRESSIONS

- Push hard
- Push fast
- AT LEAST 100 compressions/minute
- Allow complete recoil between compressions
- Minimize interruptions
- Depress adult sternum at least 2 inches (5 cm)

EFFECTIVE CPR

- Early, high quality increases rate of survival
- Interruptions lower coronary perfusion pressure
- More difficult to convert v-fib from ischemic heart muscle
“PUSH HARD AND FAST”

- Should there be a recommended range of compressions rather than a minimum?
- Study showed an association between higher compression rates and lower compression depths
- Study recommended rescuers not compress at rates exceeding 145/minute (depth of compressions found to be less than 4 cm)


USE OF METRONOME

- Does a visual/verbal cue help keep compression rate ≥100/minute?
- Practiced CPR during the playing of “Staying Alive”
- Retest after 5 weeks
- N=15
- Mean CPR rates were 109.5 during primary assessment; 113.2 during secondary assessment
- Subjects felt that the music improved their ability to provide CPR


MRX Q-CPR Defibrillator

- Monitors CPR performance
- Sensor pack placed on patient’s chest during CPR and attached to a small defibrillator
METHODS TO MONITOR COMPRESSIONS

MONITOR YOUR PERFORMANCE

FUTURE OF FEEDBACK MECHANISMS WITH CPR

- No definitive evidence of improvement in patient survival
- Evidence of improvement in CPR quality performance measures when real time performance feedback is given
- Feedback/prompt devices may increase CPR performances such as ventilation rates, ETCO2, compression rate, depth, recoil.
- More studies needed

HISTORY OF COMPRESSION DEVICES

COMPRESSION DEVICES

- Automated Load distributing band
- Mechanical Piston

CARDIOPUMP
“To date, no adjunct has consistently been shown to be superior to standard conventional (manual) CPR for out-of-hospital basic life support, and no device other than a defibrillator has consistently improved long-term survival from out-of-hospital cardiac arrest.”

2010 American Heart Association Guidelines for CPR and ECC. Supplement to Circulation; 122 (18): S723.
VENTILATIONS

- Studies continue to show health care providers hyperventilate patient during a code
- Faster rates increase mean intrathoracic pressure and impede blood flow to coronary arteries
- Avoid excessive ventilation
- Give breath over one second
- 8 – 10 breaths/minute for CPR with advanced airway
- "Look, Listen, and Feel "eliminated
- Avoid cricoid pressure

AVOID CRICOID PRESSURE

IMPEDEANCE THRESHOLD DEVICE

- ResQPod Circulatory Enhancer
- Used with face mask or endotracheal tube
- Timing light flashes at 12 breaths/minute
- Provides increased blood flow back to heart during compressions
IMPEDANCE THRESHOLD DEVICE

- Recommended as a Class IIB, LOE B when used by trained personnel (AHA/2010)
- ROC PRIMED study showed device used with CPR improved overall survival by 25%
- ResQ Trial showed device with ACD-CPR improved survival rates by 53%

Irdis et al. Circulation 2011; 124: A 289
Aufderheide, T. et al. NEJM 2011; 365 (9): 798-806

CAPNOGRAPHY

- Quantitative waveform capnography is recommended for confirmation and monitoring of endotracheal tube placement and CPR quality
- PETCO2 (end tidal carbon dioxide values) can also serve as a physiologic monitor of the effectiveness of chest compressions
VENTRICULAR FIBRILLATION PLAYS A ROLE IN MOST CASES OF Sudden cardiac arrest
Rate of survival decreases 7-10% each minute the arrhythmia continues
First shock converts ventricular fibrillation more than 90% time

Key concepts with Defibrillation
- Too much current causes damage to the heart
- Too little current fails to depolarize cells
- Monophasic delivers current that travels in single direction; biphasic delivers current on two phases
Key Concepts

- Recommend the use of AED programs in public locations
- Consider AED's for the hospital setting as a way to facilitate early defibrillation (Goal is within three minutes)
- Might be reasonable to avoid placing the pads or paddles directly over the implanted device

KEY CONCEPTS

- If arrest greater than 4-5 minutes, can give a brief period of CPR before defibrillating
- DON'T CHECK PULSE/RHYTHM IMMEDIATELY AFTER THE SHOCK

PHARMACOLOGICAL THERAPY

- Vasopressin vs Epinephrine
- Vasopressin: 40 units IV/IO; can replace first or second does of epinephrine
- Epinephrine: 1 milligram every 3 – 5 minutes IV/IO
- Purpose: increase peripheral vasoconstriction and optimize cardiac output
- Studies point to equivalent outcomes with either drug
**VASOACTIVE DRUGS**

- Increase return of spontaneous circulation (ROSC)
- Vasopressin half-life = 10 – 20 minutes
- Give drugs during compressions with 20-30 cc bolus fluid, elevate extremity; have next drug ready to go

**ANTIARRHYTHMICS**

- No evidence that antiarrhythmics increase survival to hospital discharge
- High quality CPR most important
- Lidocaine is a Class Indeterminate drug
- Amiodarone dose: First dose 300 milligrams bolus; second dose 150 milligrams
- Magnesium for torsades

**ATROPINE**

- Not recommended for routine use in the management of PEA/Asystole
Simplified ACLS Algorithm

- Streamlined to emphasize the importance of high quality CPR
- ACLS actions should be organized around uninterrupted periods of CPR
- Circular algorithm
- De-emphasis of Devices, Drugs, and other distractors
- Emphasis on high quality CPR and early defibrillation for VF/pulseless VT

Postreanuscitation Support

- Optimize cardiopulmonary function and vital organ perfusion
- After out of hospital cardiac arrest, transport patient to an appropriate hospital with a comprehensive post cardiac arrest treatment system of care that includes acute coronary interventions, neurological care, goal directed critical care and hypothermia
- Transport the in-hospital post cardiac arrest patient to an appropriate critical care unit capable of providing comprehensive post cardiac arrest care
- Try to identify and treat the precipitating causes of the arrest and prevent recurrent arrest
TITRATION OF OXYGEN

- After initial resuscitation, titrate oxygen to the lowest level required to achieve an arterial oxygen saturation of ≥ 94%
- Keep PETCO₂ at 35 – 40 mm Hg (or a PaCO₂ of 40 – 45 mm Hg)

TREAT HYPOTENSION

- Keep systolic blood pressure > 90 mm Hg or mean arterial blood pressure of ≥ 65 mm Hg
- Fluid boluses (can use cold)
- Vasoactive medications (dopamine, norepinephrine, epinephrine)
CONSIDER TREATABLE CAUSES

- Hypovolemia
- Hypoxia
- Hydrogen ion (acidosis)
- Hypo/hyperkalemia
- Hypothermia
- Tension pneumothorax
- Tamponade, cardiac
- Toxins
- Thrombosis, pulmonary
- Thrombosis, coronary

THERAPEUTIC HYPOTHERMIA

- Widespread cerebral ischemia and edema lead to severe neurological impairment after resuscitation
- Hypothermia decreases oxygen consumption in ischemic brain
- If patient unconscious, cool to 32°–34° degrees Centigrade for 12-24 hours
HOW LONG TO RUN A “CODE BLUE”

“Duration of resuscitation efforts and survival after in-hospital cardiac arrest: an observational study”
- Study from 2000 – 2008
- 64,339 patients at 435 hospitals
- Patients at hospitals with the longest resuscitation attempts (25 minutes) had a higher likelihood of ROSC and survival to discharge


KEY ISSUES WITH CPR/ACLS EDUCATION

- 2 year certification should include periodic assessment with refresher or reinforcement
- Hands only CPR should be taught
- BLS can be learned equally well with “practice while watching” video as well as with traditional instructor led courses
- AED use should not be limited only to persons with formal training in their use
- Training in teamwork and leadership skills should be part of the course

Education

- Performance assessment as well as written test is needed in ACLS
- Insufficient evidence to recommend for or against routine use of simulator manikins in courses
- CPR prompt and feedback devices may be useful in training and as a part of overall strategy to improve the quality of CPR in actual situations
- Debriefing is important
RESUSCITATION SYSTEM ERRORS

- Estimated 350,000-750,000 adult in-hospital cardiac arrests events occur annually in U.S.
- Study looked at 118,387 cases from 2001-2008
- Resuscitation errors reported in 40.4% of v-fib and pulses less v-tach arrest
- Errors reported in 26.8% of those with non-VF/pulselss v-tach


MORE INFORMATION

- aacn.org
- americanheart.org
- www.circulationaha.org