**Northwest Community EMS System – Continuing Education – July 2016 – CE Credit Questions – page 1 of 2**

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<tr>
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<th>Question</th>
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<tr>
<td>1</td>
<td>What 3 places on the body does rigor mortis first occur?</td>
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<td>2</td>
<td>Complete the quote from Dr. Ortinau, “Of all the medical emergencies where we (EMS) make a difference, for most we just get the ball rolling….”</td>
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<td>3</td>
<td>In cardiac arrest, what 2 things are “known” to improve outcome?</td>
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<td>4</td>
<td>In cardiac arrest, what 2 things have NOT been shown to improve outcome?</td>
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<td>5</td>
<td>List the 5 components of quality CPR.</td>
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<td>6</td>
<td>Are compression rates higher than 120, or less than 100, associated with a decreased likelihood of survival? Why?</td>
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<td>7</td>
<td>Why is releasing completely important?</td>
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<td>8</td>
<td>When using the ResQPOD impedance threshold device what compression rates are associated with best outcome?</td>
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<td>9</td>
<td>Are there improved cardiac arrest outcomes, when using mechanical CPR devices, compared to manual CPR?</td>
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<td>10</td>
<td>In pit crew cardiac arrest resuscitation, what are the 5 roles?</td>
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<td>11</td>
<td>What should be done if only 2 rescuers are on the scene of a cardiac arrest?</td>
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<td>12</td>
<td>Where should defib pads/paddles be placed?</td>
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<td>13</td>
<td>What are 2 acceptable reasons to interrupt chest compressions?</td>
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<td>14</td>
<td>Is it important to minimize pre-shock and post-shock pauses in compressions?</td>
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<td>15</td>
<td>Should patients be moved with CPR in progress?</td>
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<td>16</td>
<td>Why should an OP/NPA be inserted prior to beginning BVM ventilation?</td>
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<td>17</td>
<td>When using the ResQPOD/ITD when is it more important to maintain a tight face-mask seal - during compressions or ventilations?</td>
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Note: Completion of these questions is worth one (1) CE hour (as this module was primarily psycho-motor simulated cardiac arrest team resuscitation). This may be submitted without penalty until November 30, 2016.
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<tr>
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<th>Question</th>
<th>Answer</th>
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<tbody>
<tr>
<td>18</td>
<td>What are 5 ways capnography is helpful during cardiac arrest resuscitation?</td>
<td>Confirm airway patency &amp; ventilation, Prevent hyperventilation, Monitor compression quality, Predict ROSC, Identify when ROSC unlikely</td>
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<td>19</td>
<td>In cardiac arrest resuscitation, which has the higher priority – vascular access &amp; medication administration or advanced airway placement?</td>
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<td>20</td>
<td>While one PM is obtaining vascular access (IO/IV) what can other PM’s be doing to assist?</td>
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<td>21</td>
<td>When during cardiac arrest resuscitation can placement of an advanced airway be considered?</td>
<td>After at least 3 min of pre-oxygenation, after epi &amp; amiodarone (if VF) given, sooner if unable to BVM ventilate</td>
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<td>22</td>
<td>What is persistent/refractory VF?</td>
<td>VF that occurs despite multiple defibrillation attempts</td>
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<td>23</td>
<td>If VF persists after 3-4 defibrillations, what should be done?</td>
<td>Leaving 1st set of pads on pt, attach new set of defib pads to pt in AP position, switch cable to new set, shock using new pads/placement</td>
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<td>24</td>
<td>What are causes of PEA?</td>
<td>Hypovolemia, hypoxia, hypoglycemia, hydrogen ion excess, hypo/hyperkalemia, hypothermia, tension pneumo, toxins, tamponade, thrombosis, trauma</td>
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<td>25</td>
<td>List 5 assessment/interventions appropriate for PEA?</td>
<td>IVF bolus w/ pressure infuser, glucose, lung sounds for tension pneumo, airway/O2 supply, PMH &amp; meds</td>
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<td>26</td>
<td>List 4 aspects of post-ROSC care.</td>
<td>Monitor closely, Assess &amp; support BP, Do not hyperventilate, Acquire 12L</td>
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<td>27</td>
<td>What should be done post-ROSC if pt is hypotensive?</td>
<td>Administer IVF until pressor (dopamine) ready, start 2nd IV/IO if needed</td>
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<td>28</td>
<td>Is therapeutic hypothermia still highly recommended by the AHA? Why was it removed from pre-hospital care?</td>
<td>Yes. Removed because no evidence of benefit when started prehospital and was distracting from other priorities like BP support and acquiring 12L ECG.</td>
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<td>29</td>
<td>Is re-arrest common? What type of re-arrest is most common? What can be done to promptly detect it?</td>
<td>Yes. PEA. Keep finger on pulse, watch O2 sat pleth</td>
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<td>30</td>
<td>What should be documented on an ePCR for a cardiac arrest patient?</td>
<td>ECG &amp; EtCO2 every 2 minutes, CPR started &amp; stopped time – not every 2 minutes, PMH &amp; meds</td>
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Cardiac Arrest “Pit-Crew” Team Resuscitation

Diana Neubecker RN BSN PM
NWC EMSS In-Field Coordinator

Objectives - Related to cardiac arrest resuscitation:
1. Discuss new knowledge.
2. Review selected key elements.
3. Identify & demonstrate treatment priorities.
4. Practice team “pit-crew” approach skills.
5. Improve documentation.

Cardiac Arrest Resuscitation

“Of all the medical emergencies where we (EMS) make a difference, for most we just get the ball rolling. In cardiac arrest, we own it. We are the ones that make a difference. Initial care, what we do in the field, determines outcome more than anything else.”

John M. Ortinau, MD, FACEP
NWC EMSS Medical Director

Do NOT delay something “known” to improve outcome, to do something NOT known to improve outcome

- “Known” to improve outcome
  - Quality CPR
  - Defibrillation

- “Might” improve outcome
  - Medications, especially if given early

- NOT shown to improve outcome
  - Advanced airway
  - Transport w/ CPR in progress

Quality CPR

1. Rate (at least 100, but less than 120)
2. Depth (2 - 2¼ “)
3. Release completely
4. Minimize interruptions
5. Do NOT hyperventilate

Metronome – USE ONE!

- Monitor
- Smartphone
- Device
Avoid too Fast Compressions

“data show that survival peaks with a chest compression rate around 120/min, with rates of 120/min or higher or less than 100/min being associated with a decreased likelihood of survival. ...rates were greater than 120/min in nearly one third of cases.”

RELEASE Completely
- Do NOT lean on chest
- Assure chest recoils completely after compressions
- Pressure between compressions creates positive intrathoracic pressure - which decreases heart & coronary artery refilling w/ blood

Real Time CPR Feedback

Chest Compression Fraction (CCF)
- Proportion of each minute interval during which chest compressions are provided
- Associated with survival
- Often expressed as percentage (%)

ResQPOD Impedance Threshold Device
- Circulation enhancing device
- “Works” during compressions
- Best outcome when compression rate 100-110/min
What’s the story with the RQP ITD?

2015 AHA Guidelines: level of recommendation
Study: 8718 pts, 4345 sham, 4373 functioning ITD, did not show a benefit from ITD. No differences in adverse events (pulmonary edema, airway bleeding) between the groups.

AHA Recommendation: Routine use of the ITD as an adjunct during conventional CPR is not recommended. Class of Recommendation indicates that evidence did not demonstrate benefit or harm associated with the ITD when used as an adjunct to conventional CPR.

Published after 2015 Guidelines written

If “acceptable” quality CPR, when using RQP/ITD, there is improvement in neuro intact survival

If “unacceptable” quality CPR, better to not use the RQP/ITD

“Unacceptable”
- Rate less than 80, or greater than 120
- Depth less than 4 cm, or greater than 6 cm
- Compression fraction less than 50%

With “acceptable” CPR, there is a difference

Categorized as “acceptable” ranges:
- Rate: 100 ± 20% (80–120)
- Depth: 5 cm ± 20% (4–6 cm)
- Compression fraction 250%

45% had “acceptable” CPR

“**This analysis supports the notion that the quality of CPR needs to be taken into account during randomized controlled trials of interventions for cardiac arrest. Our analysis of the prospectively collected, well-defined ROC-PRIMED dataset showed statistically significant and clinically important interactions between the quality of CPR provided, the study interventions, and survival to hospital discharge with favorable neurological outcome.”**

If “acceptable” quality CPR, when using RQP/ITD, there is improvement in neuro intact survival

If “unacceptable” quality CPR, better to not use the RQP/ITD

“Unacceptable”
- Rate less than 80, or greater than 120
- Depth less than 4 cm, or greater than 6 cm
- Compression fraction less than 50%

Mechanical chest compression does not seem to improve outcome after out-of-hospital cardiac arrest. A single center observational trial.


AIM: Recently three large post product placement studies, comparing mechanical chest compression (cc) devices to those who received manual cc, found equivalent outcome results for both groups. Thus the question arises whether these results could be replicated using the devices on a daily routine.

METHODS: We prospectively enrolled 948 patients over a 12 months period. Chi-Square test and Mann-Whitney-U test were used to assess differences between manual and “mechanical” cc subgroups. Uni- and multivariate Cox regression hazard analysis were used to assess the influence of cc type on survival.

RESULTS: A mechanical cc device was used in 30.1% (n=283) cases. Patients who received mechanical cc had a significantly worse neurological outcome - measured in cerebral performance category (CPC) - than the manual cc group (56.8% vs. 78.6%, p=0.009). Patients receiving mechanical cc were significantly younger, more were male and were more likely to have bystander CPR and an initially shock-able ECG rhythm.

CONCLUSION: Even with high quality CPR in both, manual and mechanical cc groups, outcome in patients who received mechanical cc was significantly worse. The anticipated benefits of a higher compression rate and a steadier compression depth of a mechanical cc device remain uncertain. In this study selection for mechanical cc was not standardized, and was not random. This merits further investigation. Further research on how mechanical cc is chosen and used should be considered.

“Pit-Crew”

Seconds make a Difference
“Pit-Crew” Roles - in order

#1 - Compressor
- responsive & pulse
  Begin Compressions

#2 - Monitor
- Attach combo-pads to pt & monitor
  Take over compressions

#3 - Airway
- Insert OP/NPA
  Attach S/VM ROP, capno, O2
  Tight face-mask seal w/ 2 hands

#4 - Meds
- Obtain IV/IO access
  Administer meds

#5 - Team Leader
- Code Commander
  Coach crew & document

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#3 Airway
* Explorer*

#2 Monitor
* Attach defib electrodes, then takes over CC*

#4 Vasc & Meds

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Best outcome when treated on-scene by 7-8 EMS rescuers (EMT’s & PM’s); supporting practice of sending additional vehicle to scene.

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Does number of EMS personnel on scene affect outcome?
Study of 16,122 cases, 7-8 EMS personnel on-scene was associated w/ highest survival compared with fewer personnel on-scene.

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Defib Pad/Paddle Placement
- Location
  - Upper chest, to R of sternum, under clavicle
  - Apex of heart, L of nipple, mid-axillary line
- Apply firm pressure when using paddles
- No advantage anterior-posterior position for defib

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Defibrillation Pad Placement
- ~V6 position (L) armpit
  - Mid-axillary line
  - Horizontal to nipple

Chest Compressions (CC)

Acceptable reasons to interrupt compressions

1. ✓ ECG every 2 minutes (goal less than 5 sec)
   Should it be shocked? Is it organized?
   Change compressor at the same time
   If reliever NOT in place/ready to take over – speak up!

2. Defibrillate (goal less than 5 sec)

Goal: Minimize peri-shock pauses
Minimize time from last compression to shock, and from shock to next compression
Do NOT ✓ ECG during same pause as defib

Pre-Shock Pause Comparison

Checking ECG during same pause as defib increases pre-shock pause

Should pts be moved w/ CPR in progress?
NO (unless very unique situation), interrupts & decreases CPR quality

OPA/NPA & BVM Ventilation
Insert OP/NPA before beginning BVM ventilation to minimize gastric distention, vomiting & aspiration
Use 2-hand method before adv. airway to maintain tight face-mask seal esp. w/ RQP/ITD during compressions

Ventilation

• Hyperventilation is Lethal
  - Watch both RATE and VOLUME

• Do NOT squeeze bag right before:
  - ECG ✓ (can cause artifact)
  - Defibrillation (↓ effectiveness)

Capnography

✓ every 2 minutes to:
1. Confirm airway patency & ventilation
2. Prevent hyperventilation (shows ventilation rate)
3. Monitor compression quality
4. Predict ROSC (before pulse detected)
5. Identify when ROSC unlikely
NEW – Priority Emphasis
Complete vascular access & 1st round meds before preparing for advanced airway placement

Vascular Access - ASAP
Dedicate additional personnel, if available to help
1. ID vascular access site (IV or IO)
2. Prep site w/ CHG/IPA
3. Prep 10mL NS flush, if IO
4. Prime connecting tubing, if IO
5. Prep IVF & tubing
6. Insert & secure IO (or IV)
7. Prep epinephrine
8. Prep amiodarone
9. Place IVF in pressure infuser, if IO

Medications
- 1st med all pulseless = vasopressor
- Prepare/administer epinephrine ASAP
- Prepare meds in advance, so ready when time to give
- Give based on last ECG, do NOT delay until next ECG
- Follow w/ 20-50 mL IVF bolus
  If extremity IV: elevate x 20 sec

Scenario – Prep Meds Before Need

We found that time to vasopressor administration is significantly associated with ROSC, and the odds of ROSC declines by 4% for every 1-minute delay between call receipt and vasopressor administration.

Amiodarone possibly most beneficial if given early
Medication Double Cross-Check

Beyond the Rights.....

Check meds w/ another PM prior to giving

Advanced Airways (ETI, KLTSD)

- No evidence to support early placement
- Preoxygenate for at least 3 min prior
- Consider after epi & amiodarone (if VF) given
- Insert sooner - if unable to BVM
- Avoid interrupting compressions

Ventricular Fibrillation (VF)

- “Recurrent” VF
  - Other rhythms between episodes of VF
- “Refractory/Persistent” VF
  - VF despite multiple defibrillation attempts

Persistent/Refractory VF

- Defib goal - stop electrical activity, to allow normal pacemakers to function
- VF has different vectors
- While anterior-lateral placement works for most VF....
- If it does not, changing pad placement has been shown to be effective
**Pulseless Electrical Activity**
- PEA is not a rhythm; any rhythm can be PEA
- PEA can be fast or slow; wide or narrow
- “Pseudo” vs true PEA (cannot yet determine in field)

**Post ROSC Care**
1. Monitor closely
2. BP support HIGH priority; maintain heart & brain perfusion
   - & support BP/MAP
   - If hypotensive:
     - Administer IVF until Dopamine ready
     - Begin DOPAMINE, titrate to response
     - Start additional IV, if needed
3. Do NOT hyperventilate - even if ↑ ETCO₂
4. Acquire 12L

**Therapeutic Hypothermia**
- Not harmful; Still highly recommended by AHA
- Removed from prehospital SOP’s because no evidence of benefit when given prior to hospital arrival
- Was distracting from other priorities in prehospital care (BP support, 12L ECG)

2015 Recommendations — We recommend that comatose (ie, lack of meaningful response to verbal commands) adult patients with ROSC after cardiac arrest have TTM (Class I, LOE B-R for VF/pVT OHCA; Class I, LOE C-E0 for non-VF/pVT (ie, “nonshockable”) and in-hospital cardiac arrest)….Of note, there are essentially no patients for whom temperature control somewhere in the range between 32o C and 36o C is contraindicated.

Hypothermia in the Prehospital Setting - When cooling maneuvers were initiated in the prehospital setting, neither survival nor neurologic recovery differed for any of these trials alone or when combined in a meta-analysis….Current evidence indicates that there is no direct patient benefit from these interventions and that the intravenous fluid administration in the prehospital setting may have some potential harm, albeit with no increase in overall mortality.

**Rearrest**
- Re-arrest occurs in ~38%, most often in first 10 minutes
- Most common type: PEA (so ECG rhythm may not change)
- Risk w/ re-arrest: Not detected quickly, not treated aggressively
- Detected quickly & treated aggressively; does not worsen outcome!
- Keep finger on pulse; watch O₂ sat pleth on monitor to detect

**Documentation – Key Points**
- Document ECG & EtCO2 - every 2 minutes
  - Not BP & pulse; not checked every 2 min
  - Pulse is a palpable pulse (not HR on ECG)
- CPR started when started and stopped due to ROSC or TOR (termination of resuscitation)
  - Not every 2 minutes with rhythm check
- O₂ sat should not be documented during CPR
  - Number is meaningless without a pulse
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<th>Time</th>
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<td>Compressions started</td>
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<td>ECG monitor/defib electrodes on</td>
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<td>Airway: OPA/NPA in place</td>
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<td>BVM ventilation w/ oxygen</td>
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<td>RQP/ITD &amp; Capnography on BVM</td>
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<td>Vascular Access IO-IV</td>
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<td></td>
<td>□ Hypo/hyperkalemia</td>
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<td>□ H ion/ACIDOSIS</td>
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<td>□ Trauma</td>
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<tr>
<th>Time</th>
<th>ETCO2</th>
<th>ECG rhythm</th>
<th>Defib J</th>
<th>Med given</th>
<th>Notes</th>
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**ROSC**

- □ Check & support BP
- □ If hypotension: IVF bolus while prep dopamine
- □ Monitor VS & ECG closely
- □ 12-L ECG
- □ Check O2 sat
# 1
begin CHEST COMPRESSIONS

# 3
Insert OP/NPA
Attach RQP/ITD & capnography to BVM w/ O2
Maintain tight 2-hand face-mask seal during compressions & ventilations
Compressor squeezes bag, after compression sets, until advanced airway placed

# 4
Establish IV/IO
Administer MEDICATIONS

# 2
TURN ON MONITOR & ATTACH ELECTRODES/DEFIB PADS
(Will relieve compressor)

# 5
TEAM LEADER
Code Commander

DIANA: pit-crew team-resuscitation