EMS Alert # 10-01

Ventricular Fibrillation/pulseless Ventricular Tachycardia Witnessed by the EMS Field Providers

This EMS Alert explains the defibrillation sequence for patients who develop ventricular fibrillation or pulseless ventricular tachycardia (VF/pVT) in the presence of EMS personnel or first responders.

Introduction:

The results of the Resuscitation Outcomes Consortium (ROC) Cardiac Arrest Trial confirm that only two main clinical issues have been shown to improve survival in out-of-hospital cardiac arrest patients:

1. Survival improves when EMS field providers defibrillate patients in VF/pVT as soon as possible, limiting the amount of time that patients remain in these rhythms.
2. Survival improves when EMS personnel deliver high-quality cardiac compressions for at least 40 seconds or more out of each minute that CPR is being performed.

The 2010 version of the BioTel Treatment Guidelines provides for a series of three defibrillation attempts in the initial treatment of cardiac arrest caused by VF/pVT, but only when paramedics witness the onset of the arrest. These defibrillation attempts are **NOT** the same as “stacked shocks” that appeared in past cardiac arrest guidelines. Rather, the rescue team must maintain chest compressions at all possible times except during rhythm analysis and defibrillation, both while preparing for defibrillation (charging the defibrillator) and after defibrillation.

The Science:

Blood flow to the heart muscle drops off almost instantaneously with the onset of cardiac arrest. Restoring blood flow to the heart seems to require at least ten seconds of high-quality chest compressions. Any interruptions in chest compressions quickly reduce blood flow to the heart muscle.

In order to give the cardiac arrest patient the best opportunity for survival, the rescue team must maintain adequate blood flow to the heart muscle at all possible times during the resuscitation attempt. Performing high-quality, uninterrupted chest compressions is the only way to achieve this.

Defibrillation is critical for terminating VF/pVT in any phase of cardiac arrest. The first few minutes of cardiac arrest due to VF/pVT are called the “electrical phase”, a brief period during which early defibrillation is critical for minimizing muscle damage. The

combination of excellent compressions with defibrillation optimizes outcome.

Procedure:

Cardiac Arrest Witnessed by the Providers: If rescue personnel (paramedics, EMTs, first responders) witness a patient experiencing cardiac arrest, they should begin high quality chest compressions immediately. Rescuers must maintain high quality chest compressions throughout the resuscitation.

AED Use During Cardiac Arrest: Once pulselessness is confirmed, start chest compressions immediately, power on the AED, and then attach AED defibrillation pads to the patient's bare chest, minimizing interruptions in chest compressions. Personnel should then follow all AED voice and visual prompts. At any point when the AED determines the heart rhythm to be shockable and begins charging, the rescue team should resume chest compressions for about 15 to 20 seconds before delivering the shock. Some AEDs will prompt the rescuer to start CPR while the device charges. These compressions given during the charging phase are called **Compressions-While-Charging**. Rescuers should aim to deliver the shock within 5 seconds of pausing chest compressions.

After the shock is delivered, resume chest compressions immediately and follow all subsequent AED voice and visual prompts. This will entail two minutes of effective chest compressions with ventilations at a 30-to-2 ration of compressions to ventilations before pausing for the next heart rhythm analysis (**After-Shock-Compressions**).

Paramedic Use of Manual Defibrillators with an Automated Mode: It is not recommended that paramedics use their manual defibrillators in the automated mode.

Using a manual defibrillator: Paramedics should attach the hands-free defibrillation pads to the patient's bare chest as soon as possible, while avoiding interruptions in chest compressions as much as possible. The rescue team may momentarily interrupt compressions (preferably less than 5 seconds) while the paramedic interprets the ECG rhythm, restarting compressions immediately after the completion of analysis. If VF/pVT is present, the paramedic should set the defibrillator to the appropriate energy setting and initiate charging of the defibrillator.

After rhythm analysis and as the charging sequence begins, the rescue team should resume high quality chest compressions for 20 seconds before delivering the shock (**Compressions-While-Charging**). The paramedic should attempt to deliver the shock within 5 seconds of the stopping of chest compressions. After the shock, rescuers should resume chest compressions as quickly as possible and continue uninterrupted for two minutes (**After-Shock-Compressions, approximately 200 compressions**) **WITHOUT DELAYING THE RESUMPTION OF CHEST COMPRESSIONS TO ANALYZE THE RHYTHM**.

After two minutes of **After-Shock-Compressions**, the paramedic should momentarily

interrupt compressions (less than 5 seconds) and reanalyze the rhythm. If VF/pVT persists, the paramedic should provide a second shock, following the same sequence described above of **Compressions-While-Charging** and **After-Shock-Compressions**.

After two minutes of **After-Shock-Compressions**, the paramedic should momentarily interrupt compressions (less than 5 seconds) and reanalyze the rhythm. If VF/pVT persists, the paramedic should deliver a third shock following the same **Compressions-While-Charging** sequence described in the previous paragraph. After delivering the third shock, the paramedic should perform two minutes of chest compressions before reanalyzing the rhythm.

If cardiac arrest persists following the third shock, paramedics should follow the appropriate cardiac arrest guidelines.

In a situation where more than two rescuers are present, every effort should be made to establish ACLS treatments promptly, so long as those interventions do not interrupt high quality CPR.

SUMMARY:

The critical performance points when a patient arrests in front of the provider are:

- When a cardiac arrest occurs, initiate high-quality chest compressions immediately.
- Maintain high-quality chest compressions while the defibrillator is charging **(Compressions-While-Charging).**
- Resume high-quality chest compressions for two minutes immediately after a defibrillation attempt and before performing a rhythm assessment **(After-Shock-Compressions).**
- If a third shock is delivered, immediately resume and continue high-quality chest compressions for two minutes.
- If cardiac arrest persists after the third shock, follow the appropriate cardiac arrest guidelines.

Witnessed Ventricular Fibrillation/pulseless Ventricular Tachycardia