Purpose: **To provide a procedure for the performance of appropriate electrical therapy (defibrillation, synchronized cardioversion, external pacing, automatic external defibrillation) according to West Michigan Regional or "local" protocols.**

I. Manual Defibrillation

Note: This procedure is to be used in conjunction with the appropriate protocol by Paramedics only.

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A. Indications: ventricular fibrillation, pulseless ventricular tachycardia

B. Technique:

1. Confirm unresponsiveness and absence of pulse and respirations.
2. Turn defibrillator on.
   a. **ADULT:** Select energy level at **360 J for <u>monophasic</u>** manual defibrillator. Select **device-specific energy level for <u>biphasic</u>** manual defibrillator, typically 120 to 200 J; **if unknown select 200 J.**
   b. **PEDIATRIC:** Select energy level at **2 J/kg for <u>monophasic or biphasic</u>.** Escalate with **subsequent shocks to 4 J/kg**.
3. Set “lead select” switch on “paddles” (or lead I, II, or III if monitor leads are used)
4. Apply adhesive electrodes or if using paddles, apply gel to paddles or position conductor pads on the patient’s chest
5. Position paddles or hands free pads on the patient (sternum – apex)
6. Visually check the monitor display and assess the rhythm. (Subsequent steps assume VF/VT is present – perform steps to minimize interruptions in chest compressions)
7. Announce to team members, “Charging” or similar language
8. Press “charge” button on apex paddle or defibrillator controls
9. When the defibrillator is fully charged, state firmly in a forceful voice “Everyone clear” or similar chant, and visually inspect the patient to ensure that no one is in contact with the patient.
10. Hands free pads are preferred; if paddles are used, apply 25 pounds of pressure
11. Press the “shock” button on the defibrillator or press the two paddle “discharge” buttons simultaneously after confirming that all personnel are clear of the patient.
12. Immediately resume CPR, beginning with compressions, for 5 cycles (about 2 minutes), then recheck the rhythm. Interruption of CPR should be brief.
13. Repeat this sequence for defibrillation if the patient remains in a shockable rhythm
14. Continue to treat the patient according to the appropriate protocol.

C. Precautions

1. Dry the chest-wall if wet or diaphoretic.
2. Nitroglycerin paste should be removed; paddles should not be placed over nitroglycerin patches.
3. Avoid placing the paddles over a pacemaker or AICD generator.
4. If visible muscle contraction of the patient did not occur, defibrillation did not occur; check equipment.

D. Complications

1. Accidental shock of adjacent individual
2. Skin burns resulting from inadequate contact between paddles and skin or due to inadequate conducting gel or dry conductive pads.

II. Synchronized cardioversion

Note: This procedure is to be used in conjunction with the appropriate protocol by Paramedics only.

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A. Indications: pulsed ventricular tachycardia; supra-ventricular tachycardia

B. Technique:

1. Establish IV access if time and patient condition permit
2. Turn on defibrillator (monophasic or biphasic)
3. Attach monitor leads to the patient and ensure proper display of the patient's rhythm.
4. Engage the synchronization mode by pressing the "sync" button
5. Look for the markers on R waves indicating sync mode
6. If necessary, adjust the monitor gain until the sync markers occur on each R wave
7. Select the appropriate energy level
   a. **ADULT:** **100 J for initial shock (monophasic or biphasic)**
      Subsequent monophasic shocks at 200 J, 300 J and 360 J
      Subsequent biphasic shocks at 200 J
   b. **PEDIATRIC:** **0.5 J/kg for initial shock (monophasic or biphasic)**
      Subsequent shocks at 1 J/kg then 2 J/kg
8. Position conductor pads on the patient (or apply gel to the paddles)
9. Position paddles on the patient (sternum – apex)
10. Combo-pads may be used in place of paddles and gel/conductor pads
11. Announce to team members: "Everyone clear" or similar statement
12. Press the "charge" button
13. When charged, visually confirm that no one is in contact with the patient.
14. Adhesive pads are preferred; if paddles are used, apply 25 pounds of pressure on both paddles.
15. Press the "discharge" buttons simultaneously on the paddles or the shock button on the unit.
16. Check the monitor. If tachycardia persists, increase the joules as described above.
17. **Reset the sync mode after each synchronized cardioversion because most defibrillators default back to unsynchronized mode.**

C. Precautions

1. The same precautions as for defibrillation occur.
2. In "sync" mode, one may need to hold the shock/discharge button(s) down/in for a short period of time before a shock is delivered. If a shock is not delivered the first time, hold the buttons down/in again.
3. If the defibrillator does not discharge on "synch" with the tachycardia, turn off the "synch" switch and defibrillate the patient.
4. If a sinus rhythm is achieved by cardioversion, even briefly, and then reverts to previous rhythm, repeat the cardioversion at the same setting as was initially successful.

D. Complications

1. Same as for defibrillation

III. External Transcutaneous Pacing

Note: This procedure is to be used in conjunction with the appropriate protocol by Paramedics only.

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A. Indications: heart blocks and bradycardias which are symptomatic and refractory to drug therapy.

B. Technique:

1. Ensure continuous EKG monitoring during procedure. EKG electrodes must be in place, along with pacing pads or combo-pads, in order for the pacer to function.
2. Consider sedation, per procedure
3. Prep patient skin:
   a. Clip/shave hair (if pads won't adhere).
   b. Dry skin if diaphoretic.
4. Apply pacing electrodes (follow diagram on the pads)
5. If QRS complexes are present, select a lead in which the QRS is the most positive or upright (so machine can sense their presence).
6. Set external pacemaker rate to 70 bpm to begin.
7. Set Milliamp (MA) at zero.
8. Dial up MA until evidence of capture has occurred.
9. Dial up at increments of 20 MA for unconscious/arrest patients and 5 MA for conscious patients.
   a. Use only minimal MA needed for mechanical capture.
10. Run an EKG strip and save.
11. Ensure adequate capture including electrical and mechanical capture.
    a. **Electrical:**
       Visible pacer spike immediately followed by wide QRS and Broad T waves.
    b. **Mechanical:**
       Palpable Pulses; LOC; BP, improved patient color

C. Precautions

1. Use of external transcutaneous pacemakers can cause painful muscle contractions. Consider the use of sedation in patients that are awake.

D. Contraindications

1. Wet environment
2. Burns to the chest (relative)

IV. Automatic External Defibrillation (AED)

Note: This procedure is to be used in conjunction with the Cardiac Arrest protocol by Medical First Responders, EMT's and EMT-S's.

M B S A. Indications: unresponsive patient without pulse, and agonal or no respirations

B. Technique:

1. **Assess for Responsiveness**
2. Open the **AIRWAY**, check **BREATHING**
3. **If not breathing, provide 2 BREATHS** that make the patients chest rise
4. **If no response, CHECK PULSE** for 10 seconds
5. **If no pulse, PROVIDE CPR** (30 compressions to 2 respirations) until AED has been attached and is ready to analyze. **Push hard and fast (100/min)**
   a. Minimize interruptions in CPR (e.g., to analyze rhythm, deliver shock). Keep interruptions as short as possible.
   b. **Ensure ALS response.**
6. **Power AED ON** and follow the voice prompts
7. **ATTACH AED Pads to the Patient**– place according to the pictures on the pads
   a. If >8 years old, attach adult AED pads.
   b. If 0 to 8 years old, attach pediatric AED pads. If pediatric pads are not available, use adult pads.
   c. If a Public Access Defibrillator (PAD) AED is in place and is working properly, it may be left in place and utilized. If it is not working properly or the wrong sized pads are in place (adult pads on a pediatric and your AED has peds pads, but the PAD AED does not), remove the PAD AED and use yours.
8. **STOP CPR** when the AED begins to analyze or prompts you to push **"ANALYZE"**
   a. Ensure that no one is touching the patient.
9. **If a shock is indicated,** the **AED will charge** and prompt you to "SHOCK"
   a. **ENSURE that no one is touching the patient**
   b. **Push** the **"SHOCK"** button **–** typically the button flashes as well
   c. Only one (1) shock should be delivered
      1) If the AED cycles back to "ANALYZE" immediately, it has not been reprogrammed to the current AHA standards. The AED should be allowed to cycle through the three shock cycle. DO NOT SHUT THE AED OFF.
10. **Resume CPR immediately after the shock** (**or if no shock was indicated)**
    a. Perform 5 cycles of 30 compressions to 2 ventilations
    b. The AED will reassess after 2 minutes
    c. If the AED does not interrupt your compression to ventilation cycles and you complete the 5 full cycles, PUSH ANALYZE.
11. **Continue with cycles of CPR and shock(s) as prompted by the AED until ALS arrives.**
    a. For BLS transport, begin transport following the second shock cycle.