



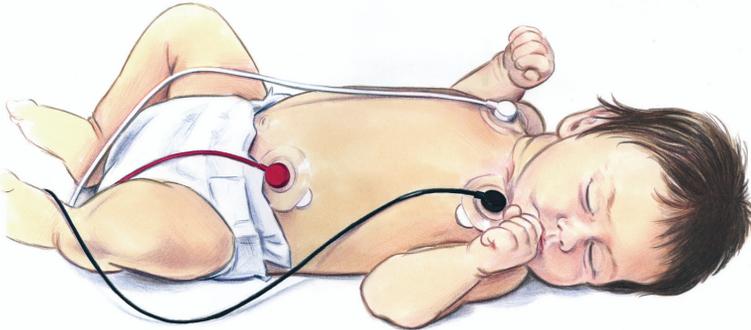
# **Rhythm Disturbances/ Electrical Therapy Procedures**

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# Procedure for Cardiac Monitoring

**Introduction** Management of any seriously ill or injured patient requires assessment of heart rate and rhythm (cardiac monitoring).

**Procedure** Follow these steps to perform cardiac monitoring. Modify for your specific device.

Step	Action
1	<b>Power on monitor/defibrillator.</b>
2	<b>Attach ECG leads to patient:</b> <ul style="list-style-type: none"><li>• White lead—to right shoulder</li><li>• Red lead—to left flank or abdomen</li><li>• Ground (black, green, brown) lead—to left shoulder</li></ul> <p>Note: In units with cardiovascular patients, 5-lead monitoring may be used. For 5-lead monitoring the green lead is placed under the white, lower on the torso. The brown lead is placed in the middle of the chest.</p>
	 <p>Placement of electrodes for ECG monitoring.</p>
3	<b>Adjust device to manual ECG monitoring mode</b> (not AED mode or paddles) to display rhythm in standard limb leads (I, II, III).
4	<b>Visually check monitor screen and assess heart rate and rhythm.</b>

# Emergency Interventions for Tachyarrhythmias

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**Introduction** Specific emergency interventions for tachyarrhythmias include

- vagal maneuvers
  - synchronized cardioversion
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## Vagal Maneuvers

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**Vagal Maneuvers** In normal infants and children the heart rate falls with stimulation of the vagus nerve. In patients with supraventricular tachycardia (SVT), vagal stimulation may terminate the tachycardia. Several maneuvers stimulate vagal activity. The success rates of these maneuvers in terminating tachyarrhythmias vary, depending on the child's age, level of cooperation, and underlying condition.

If possible, obtain a 12-lead ECG before and after the maneuver; record and monitor the ECG continuously during the maneuver. *If the patient is stable* and the rhythm does not convert, you may repeat the attempt. If the second attempt fails, select another method or provide pharmacologic therapy. *If the patient is unstable*, attempt vagal maneuvers only while making preparations for pharmacologic or electrical cardioversion. Do not delay definitive treatment with vagal maneuvers.

<b>Maneuver</b>	<b>Description</b>
Application of ice to the face	This is the most effective vagal maneuver in infants and young children.  <u>Method</u> One method is to mix crushed ice with water in a plastic bag or glove (Figure 1). While recording the ECG, apply the ice water mixture to the infant's face for only 10 to 15 seconds. Do not obstruct ventilation (ie, cover only the forehead, the eyes, and the bridge of the nose). If this method is successful, SVT will terminate in seconds.

	 <p><b>Figure 1.</b> Ice water is applied to the infant's face for vagal stimulation in an attempt to terminate SVT. Note that the bag of ice water does not cover the nares or mouth and does not obstruct ventilation.</p>
<p>Valsalva maneuver</p>	<p>Other vagal maneuvers may be effective and appear to be safe, based on data obtained largely in older children, adolescents, and adults. Older children can be taught to use these maneuvers on their own.</p> <p><u>Method</u>          Instruct the child to</p> <ul style="list-style-type: none"> <li>• blow through an obstructed straw</li> <li>• blow on his thumb as if it were a trumpet without letting any air out while blowing</li> <li>• bear down as if passing a bowel movement</li> <li>• hold his breath while ice is placed to the face</li> </ul>

*Do not* use the following methods to induce vagal activity:

- Application of external ocular pressure
- Carotid massage

# Synchronized Cardioversion

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**Introduction** Synchronized cardioversion is used for children with tachyarrhythmias (SVT, ventricular tachycardia [VT] with pulses, atrial flutter, atrial fibrillation) that are

- unstable (ie, associated with evidence of cardiovascular compromise, such as poor perfusion, hypotension, or heart failure)—requiring immediate cardioversion by an appropriately skilled provider
- stable—permitting elective cardioversion at the direction of a pediatric cardiologist

During synchronized cardioversion electrical therapy is administered through adhesive electrode pads or handheld paddles. *You will need to place the defibrillator/monitor in synchronized (sync) mode.* The sync mode is designed to deliver energy just after the R wave of the QRS complex.

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**Technique** Follow these steps to perform synchronized cardioversion. Modify for your specific device.

Step	Action
1	<b>Consider sedation but do not delay cardioversion in an unstable patient.</b>
2	<b>Power on</b> the monitor/defibrillator (monophasic or biphasic).
3	<b>Attach monitor leads</b> to the child (“white to right, red to ribs, what’s left over to the left shoulder”) and ensure proper display of the child’s rhythm.
4	<b>Interpret the heart rhythm. Confirm indication for synchronized cardioversion.</b>
5	Press the <b>SYNC control button</b> to engage synchronization mode.
6	<b>Look for markers on the R wave</b> indicating sync mode. Adjust monitor gain if necessary until sync markers occur with each R wave.
7	<b>Select the appropriate energy level.</b> The initial energy dose for synchronized cardioversion is 0.5 to 1 J/kg. If tachyarrhythmia persists after the first attempt, double the dose to 1 to 2 J/kg.
8	<b>Select the largest paddles or pads that will fit on the chest wall without touching. Prepare paddles and</b>

	<b>conducting surface for placement. Place paddles/pads correctly.</b> (See steps 2, 3, and 4 in the Procedure for Manual Defibrillation on the student CD.)
<b>9</b>	<b>Announce to team members: “Charging cardioverter—stand clear!”</b>
<b>10</b>	Press the <b>CHARGE</b> button.
<b>11</b>	<b>When the cardioverter is fully charged, clear the patient.</b> To ensure the safety of cardioversion, always announce when you are about to deliver a shock (eg, “I am going to shock on three. One, I’m clear. Two, you’re clear, oxygen’s clear. Three, everybody’s clear.” Direct oxygen flow away from the patient’s chest and consider temporarily disconnecting the bag or the ventilation circuit from the endotracheal tube during shock delivery.
<b>12</b>	Press the <b>DISCHARGE</b> buttons simultaneously on the paddles or the <b>SHOCK</b> button on the cardioverter.
<b>13</b>	Check the monitor to <b>evaluate the rhythm.</b> If the tachyarrhythmia persists, increase the energy level (joules) according to the appropriate algorithm.
<b>14</b>	<b>Activate the sync mode after delivery of each synchronized shock if the patient remains in a tachycardic rhythm.</b> <i>Most defibrillators default back to the unsynchronized mode after delivery of a synchronized shock.</i> This default allows an immediate shock if cardioversion produces VF.

# Procedure for Manual Defibrillation

**Introduction** Defibrillation shocks are indicated for ventricular fibrillation (VF) or pulseless ventricular tachycardia (VT). To treat VF/pulseless VT effectively, you need to know how to operate a manual defibrillator and perform manual defibrillation.

**Procedure** Follow these steps to operate a manual monitor/defibrillator (either biphasic or monophasic) and attempt manual defibrillation. Modify for your specific device.

Step	Action						
1	<b>Power on monitor/defibrillator.</b>						
2	<p><b>Select the proper pads or paddles. Attach adhesive electrode pads.</b> Select largest paddles or pads that will fit on the chest wall without touching.</p> <table border="1"> <thead> <tr> <th>Weight/Age</th> <th>Paddle/Pad Size</th> </tr> </thead> <tbody> <tr> <td>10 kg ( approximately 1 year old)</td> <td> <ul style="list-style-type: none"> <li>• Large adult paddles (8 to 13 cm)</li> <li>• Adult pads</li> </ul> </td> </tr> <tr> <td>&lt;10 kg (&lt;1 year old)</td> <td> <ul style="list-style-type: none"> <li>• Small infant paddles (4.5 cm)</li> <li>• Pediatric pads</li> </ul> </td> </tr> </tbody> </table>	Weight/Age	Paddle/Pad Size	10 kg ( approximately 1 year old)	<ul style="list-style-type: none"> <li>• Large adult paddles (8 to 13 cm)</li> <li>• Adult pads</li> </ul>	<10 kg (<1 year old)	<ul style="list-style-type: none"> <li>• Small infant paddles (4.5 cm)</li> <li>• Pediatric pads</li> </ul>
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3	<p><b>Prepare paddles/pads for rhythm identification and shock delivery.</b></p> <ul style="list-style-type: none"> <li>• If using <i>paddles</i>, apply electrode cream or paste to them. Placing paddles directly on the child's bare skin decreases the delivered current. Note: Do not use saline-soaked gauze pads or sonographic gels. Do not use alcohol pads because they may pose a fire hazard and produce chest burns.</li> <li>• If using adhesive electrode <i>pads</i>, peel the backing away.</li> </ul>						
4	<p><b>Position paddles or pads</b> so that the heart is between them. Place one paddle or pad on the upper right side of the chest below the clavicle, along the patient's right upper sternal border. Place the other paddle/pad lateral to the left nipple in the anterior axillary line (positioned under and to the left of the nipple and between the nipple and the axilla). Make sure paddles do not touch. Do not overlap pads.</p>						

	An alternative method is to place the paddles/pads in an anterior-posterior position with one just to the left of the sternum and the other over the back. Anterior-posterior placement may be necessary if the child is an infant and only large paddles or pads are available. In dextrocardia, position pads in a mirror image of the standard placement.								
<b>5</b>	<b>Adjust device to manual mode (not AED mode).</b>								
<b>6</b>	<b>If necessary, adjust LEAD button to display rhythm in</b> <ul style="list-style-type: none"> <li>• standard limb leads I, II, or III (if ECG leads are used)</li> <li>• paddles (if paddles are used instead of pads)</li> </ul>								
<b>7</b>	<b>Interpret heart rhythm. Confirm indication for defibrillation.</b>								
<b>8</b>	<b>Adjust ENERGY button to select appropriate energy dose.</b> An initial dose of 2 J/kg (biphasic or monophasic waveform) is recommended. If this dose does not terminate VF or pulseless VT, deliver subsequent doses of 4 J/kg.								
<b>9</b>	<p><b>Apply firm pressure to paddles</b> to create good contact between the paddle and the skin. Ensure good contact between the skin and the adhesive electrode pad. If a large amount of hair on the chest prevents good skin-electrode contact, quickly shave the area and reapply the paddle/pad.</p> <p>Modifications may be required in special situations.</p> <table border="1" data-bbox="550 1083 1398 1789"> <thead> <tr> <th>Special Situation</th> <th>Modification</th> </tr> </thead> <tbody> <tr> <td>Standing water</td> <td>Remove the victim from the water and quickly wipe the chest.</td> </tr> <tr> <td>Implanted defibrillator or pacemaker</td> <td>Do not place an electrode pad directly over the implanted device because the device may reduce delivery of current to the heart. Place the pad at least 1 inch (2.5 cm) to the side of the implanted device.</td> </tr> <tr> <td>Transdermal medication patch</td> <td>Do not place an electrode pad directly over a medication patch. If the patch is in the way, remove it and wipe the child's skin before attaching the pad.</td> </tr> </tbody> </table>	Special Situation	Modification	Standing water	Remove the victim from the water and quickly wipe the chest.	Implanted defibrillator or pacemaker	Do not place an electrode pad directly over the implanted device because the device may reduce delivery of current to the heart. Place the pad at least 1 inch (2.5 cm) to the side of the implanted device.	Transdermal medication patch	Do not place an electrode pad directly over a medication patch. If the patch is in the way, remove it and wipe the child's skin before attaching the pad.
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<b>10</b>	<b>Press the CHARGE button to charge the defibrillator.</b> The CHARGE button is located either on the defibrillator or								

	<p>on one or both paddles. If the device requires more than 10 seconds to charge, rescuers may resume chest compression until the device is charged and ready for shock delivery.</p>
11	<p><b>“Clear” the patient when the defibrillator is fully charged.</b> To ensure the safety of defibrillation, always announce when you are about to deliver a shock. State a “warning” firmly and in a forceful voice before delivering each shock (this entire sequence should take less than 5 seconds). You may use a warning like this:</p> <ul style="list-style-type: none"> <li>• <b>“I am going to shock on three. One, I’m clear.”</b> Check to make sure you are clear of contact with the patient, the stretcher, or other equipment.</li> <li>• <b>“Two, you’re clear.”</b> Make a visual check to ensure that no one is touching the patient or stretcher. In particular, check the person providing ventilations. That person’s hands should not be touching the ventilatory adjuncts, including an advanced airway. Be sure oxygen is not flowing across the patient’s chest. Direct flow away from the patient’s chest and consider temporarily disconnecting the bag or the ventilation circuit from the endotracheal tube during shock delivery.</li> <li>• <b>“Three, everybody is clear.”</b> Check yourself one more time before pressing the SHOCK button(s).</li> </ul> <p>You need not use these exact words, but you must warn others that you are about to deliver shocks and that everyone must stand clear.</p>
12	<p><b>Press SHOCK button(s) to deliver current.</b> Press either</p> <ul style="list-style-type: none"> <li>• a single SHOCK button located on the defibrillator</li> <li>• both SHOCK buttons on paddles simultaneously</li> </ul>
13	<p><b>Immediately resume CPR</b> starting with chest compressions for about 2 minutes.</p>