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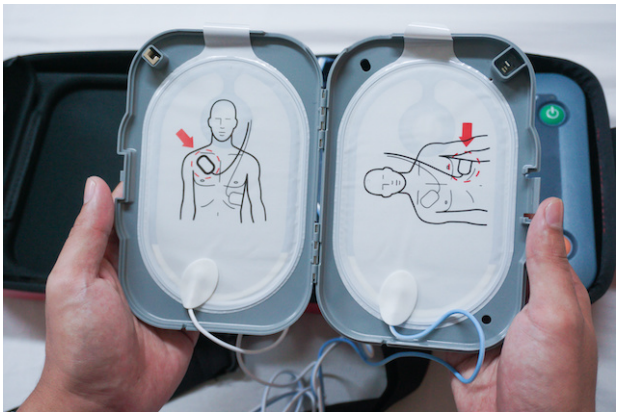
An Overview of Defibrillation and Cardioversion In Hospitalized Patients

Overview

Defibrillation and cardioversion are immediate, life-saving procedures in which an electrical shock is delivered to the chest to restore normal cardiac rhythm. They differ significantly in their indications, procedural nuances, and energy delivery. Understanding these distinctions is paramount for effective and safe patient care.

Nurses working in critical care areas such as emergency departments and intensive care units receive training in cardiac resuscitation through courses such as the Advanced Life Support (ACLS) or Pediatric Advanced Life Support (PALS) programs. These courses offer training in rhythm recognition, code team roles, and the use of defibrillators.



Manual external defibrillators (MEDs) are standard in the hospital setting. They offer advanced features, including manual control over shock delivery and the ability to monitor heart rhythms. The electrodes on the defibrillator will be either disposable self-adhesive pads or handheld paddles. Pads are generally preferred over paddles because pads allow for ongoing cardiac rhythm monitoring in the peri-arrest situation, chest compressions can continue while they are charging, and the MED operator can defibrillate a safe distance from the patient. Automated External Defibrillators (AEDs) are discussed in a separate pocket card.

Defibrillation

Defibrillation is an unsynchronized electrical shock delivered to the heart to terminate chaotic and life-threatening ventricular arrhythmias, specifically ventricular fibrillation (VF) and pulseless ventricular tachycardia (pVT). In these rhythms, the heart's electrical activity is disorganized, leading to a complete loss of cardiac output. Defibrillation aims to depolarize a critical mass of myocardial cells simultaneously, allowing the heart's natural pacemaker to regain control. Because there is no organized electrical activity to synchronize with, the shock is delivered immediately once the defibrillator is charged and activated.

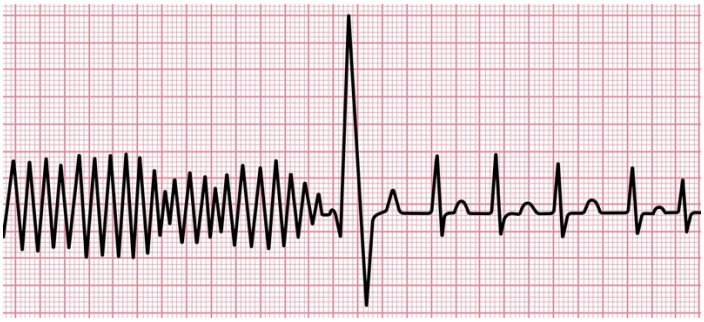


Figure 1: Rhythm strip showing ventricular fibrillation followed by unsynchronized shock delivery and conversion to normal sinus rhythm.

Cardioversion

Cardioversion, in contrast, is a synchronized electrical shock used to treat organized tachyarrhythmias that are causing hemodynamic instability or are resistant to pharmacological management. These rhythms include supraventricular tachycardia (SVT), atrial fibrillation (AF) with rapid ventricular response, atrial flutter, and ventricular tachycardia (VT) with a pulse. The amount of energy required to convert one of these tachyarrhythmias is usually less than the energy required for VF or pVT. The key difference lies in the synchronization: the cardioversion shock is timed to be delivered during the R wave of the QRS complex. This avoids shock delivery during the refractory period, which could precipitate VF.

Figure 2: Rhythm strip showing rapid atrial fibrillation followed by synchronized shock delivery and conversion to normal sinus rhythm.

Defibrillation versus Cardioversion

A side-by-side comparison of defibrillation and cardioversion is outlined below.

	DEFIBRILLATION	CARDIOVERSION
Indications	Ventricular Fibrillation (VF) Pulseless Ventricular Tachycardia (pVT)	Supraventricular Tachycardia (SVT) Atrial Fibrillation (AF) with rapid ventricular response Atrial Flutter Ventricular Tachycardia (VT) with a pulse
Synchronization	Unsynchronized	Synchronized (timed to R wave)

Patient Status	Unresponsive, no pulse	Conscious or sedated, with a pulse (though often unstable)
Urgency	Emergency – immediate intervention required	Urgent, but typically not as immediately life-threatening as VF/pVT
Procedure	**Mode:** Turn on the defibrillator and attach the defibrillator pads to the patient's chest, following the diagrams on the pads.	**Mode**: Turn on the defibrillator and attach the defibrillator pads to the patient's chest, following the diagrams on the pads. S**elect synchronized mode**. A synchronizing marker appears above each QRS complex on the telemetry display, indicating the synchronize feature is active.
	Energy: Charge the device based on the model available. • Biphasic: 120-200 J (escalating if needed) • Monophasic: 360 J	**Energy (initial):** Charge the device based on the model available and to the device's recommended energy level to maximize first shock success, varying from 50 to 200 joules. There are no guidelines for specific shock dose recommendations. In general, start at the lowest energy level (50 joules), and if the shock is unsuccessful, double the amount of energy used. In a refractory case, 200 joules could be used after just 3 shocks.
	Sedation: Not applicable (patient is pulseless)	**Sedation:** Conscious sedation (e.g., midazolam, etomidate) is typically required to minimize discomfort.
	Monitoring: Continuous ECG monitoring	**Monitoring:** Continuous ECG and SpO2 monitoring, blood pressure, airway assessment.
	Timing: The discharge/shock button is pressed and the shock is delivered immediately.	**Timing:** The discharge/shock button is pressed and held. The defibrillator does not release the shock immediately. Instead, it waits for the next R-wave to appear and delivers the shock at the time of the R-wave to avoid R-on-T phenomenon (delivery during refractory period).
Other Considerations	• Cardiopulmonary Resuscitation (CPR) initiated immediately and	• Anticoagulation may be required before cardioversion for certain arrhythmias (e.g., AF greater than 48 hours duration) to prevent thromboembolic events.

	continued until the defibrillator is ready. • Emphasis on minimal interruptions to chest compressions. • Post-resuscitation care, including airway management and targeted temperature management if indicated.	• Airway management and ventilatory support may be necessary during sedation. • Close monitoring for rhythm changes and hemodynamic stability post-procedure.

In summary, while both defibrillation and cardioversion utilize electrical energy to reset cardiac rhythm, their application is dictated by the underlying rhythm and the patient's clinical status. Defibrillation is a chaotic, unsynchronized shock for pulseless rhythms, whereas cardioversion is a precisely timed, synchronized shock for organized tachyarrhythmias with a pulse. Hospital-based nurses must be adept at recognizing the indications for each, preparing the patient appropriately, and executing the procedure safely and effectively.

References

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