

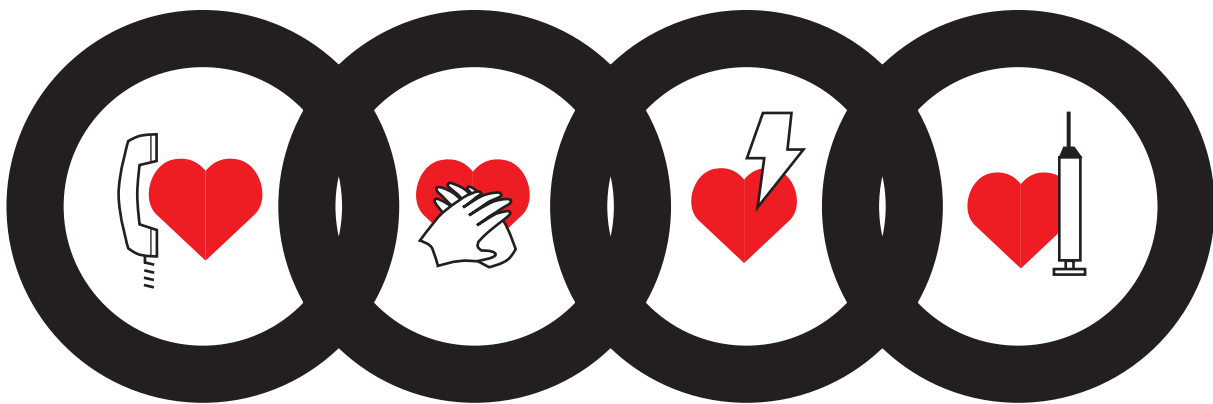


Medtronic
PHYSIO-CONTROL

LIFEPAK® 500

automated external defibrillator

Instructor Guide



Introduction

This instructor guide is intended to assist instructors conducting initial AED training for the LIFEPAK 500 AED. It contains a content outline and suggestions for teaching the class. The information and treatment guidelines are based on currently available American Heart Association (AHA) guidelines.¹ Local protocols may vary from the materials contained within the lesson plan. Use this lesson plan as a guide and insert local protocols as necessary.

The class is designed to be taught by a qualified instructor who has read the operating instructions for the LIFEPAK 500 defibrillator and the disposable defibrillation electrodes, and who is thoroughly familiar with the operation of the device as well as with local policies, practices and protocols. In order to teach this class, the instructor should be an experienced AED provider and educator.²

The target audience for this course are authorized First Responders and EMTs who have completed first aid training, but do not have defibrillation experience. Prerequisite skills for this class include successful completion of a course in CPR and basic airway management. This course builds upon the student's knowledge of CPR and integrates it with defibrillation.

After completing the initial AED training, students should be able to demonstrate proper use of the LIFEPAK 500 AED in three simulated cardiac arrest events.

Each student should be given three different cardiac arrest scenarios (ventricular fibrillation, non-shockable rhythm, troubleshooting scenario) and the assistance of a fellow student who will perform CPR and follow the directions of the defibrillation technician.

By the end of the class, each student should be able to correctly:

- Determine cardiac arrest
- Attach and place the defibrillation electrodes and defibrillate victim under normal conditions
- Attach the defibrillation electrodes and defibrillate victim under special circumstances, e.g., victim with a hairy chest, an implantable pacemaker, wet skin, or in the presence of motion
- Deliver an initial shock within 90 seconds from the time the AED is placed at the victim's side
- Correctly sequence defibrillation and CPR according to local protocol making no major sequence errors
- Conduct defibrillation procedures in a safe manner, without harm to victim or anyone associated with the rescue effort

Class—Sequence of Events

Below is a suggested sequence of events for the initial training class:

1. Distribute the student study guide to students two weeks before the scheduled class. Ask them to read the material and complete the exercises before attending class.

Limited copying of the student study guide for internal training and education is authorized. Make a copy of the guide for each student attending the class. In addition, distribute copies of local AED protocols or treatment guidelines, skill checklists, and operating instructions at this time.

The course coordinator and instructors should meet prior to class so instructors can become familiar with equipment, facilities and training materials.

2. At the scheduled class, first present the introductory lecture (20 minutes). Use the outline in this lesson plan as a guide. Next give a demonstration of how to use the device (20 minutes). Finally, cover treatment protocols and answer student questions (20 minutes).
3. Conduct practical skills stations where each student practices using the device (60 minutes). Start with a simple one shock scenario and progress to more difficult scenarios. Each student should complete at least three practice opportunities. Integrate CPR and other skills into the scenarios to make a realistic response to cardiac arrest.

Ideally, the student to instructor ratio for this session should be no greater than one instructor to six students. The practical skills station is the core part of the class.

4. Reassemble the class and cover remaining issues such as medical control, maintenance, continuing education, documentation and quality assurance (15 minutes).
5. Administer the written quiz that is supplied with this lesson plan (30 minutes).
6. Administer the practical exam using the skills checklist provided with this lesson plan (1 hour). Do this immediately after the practice session or consider waiting for one week or so to allow students the opportunity to practice and study the student workbook.
7. Conduct remedial training for those who do not achieve a satisfactory level of performance on the practical exam. Offer these students opportunities for guided practice before testing again.

Points to Emphasize

Training should emphasize the following issues throughout the class:

1. **Safety**
Emphasize the importance of safety during all parts of the class—safety for the victim and rescuers. Perform all safety precautions during all demonstrations.
2. **Rapid defibrillation**
The speed of the first shock is important to improved survival. The goal is that no more than 90 seconds should pass from the time the defibrillator is placed at the victim's side until the time the first shock is delivered.
3. **Practice**
AED skills are readily learned by most people. It is customary in most AED programs for defibrillation technicians to have quarterly skill reviews. The majority of class time during these skill reviews should be hands-on practice with a few scenarios. A field event may replace a quarterly review.

Equipment and Materials

The following items are recommended for teaching the class:

- LIFEPAK 500 AED with rechargeable sealed lead-acid (SLA) battery and Medtronic Physio-Control patient simulator to simulate VF, VT and MOTION or LIFEPAK 500 AED trainer (1 unit per 4–6 students)
- QUIK-COMBO™ disposable pacing/defibrillation/ECG electrodes or QUIK-COMBO training electrodes and cables
- CPR/defibrillation manikins
- Student study guide
- Written quizzes
- Skills checklists
- Local protocols and automated defibrillation algorithm (or AHA)—copies for each student
- Airway devices used by your agency in performing CPR (e.g., pocket-face mask, bag-valve-mask unit, suction unit)
- Towel or cloth to dry skin
- Scissors, razor or clippers
- LIFEPAK 500 AED 35mm slide set, overheads or computer presentation
- LIFEPAK 500 AED inservice videotape (VHS videotape player/TV monitor)
- Miscellaneous journal articles and textbooks
- Device-specific information (operating instructions for the device, patient simulator and electrodes)

Training Records

Students should sign a course roster at the beginning of class. The instructor will complete a practical skills performance checklist for each student during the practical skills evaluation. Keep these with other training records. This training program contains a sample skills checklist and course roster.

Course Objective

By the end of the class the student will be able to demonstrate how to use the LIFEPAK 500 AED in three simulated cardiac arrest events.

Getting Started—Slide 1

Introduce instructor(s). Present a short description of experience and qualifications if audience is not familiar with instructor(s). Remind students that defibrillation with an AED is easy to learn. Voice and screen messages will coach them through the process.

Consider capturing your students' interest by sharing a personal experience about defibrillation

I. Early Defibrillation—Slide 2

The Chain of Survival

- Symbolizes the four major events that should occur in out-of-hospital emergency cardiac care
- Cardiac arrest victims have a better chance of survival if these events occur rapidly¹
- Early defibrillation is a major link in the chain

Early Access

- Everyone should be able to recognize signs of cardiac arrest
- It is crucial to act immediately to access the EMS system
- Public education is key to strengthening this link

Early CPR

- CPR provides enough circulation to temporarily keep small amounts of oxygenated blood circulating through vital organs and the heart in ventricular fibrillation (VF) until a defibrillator arrives
- Ideally, CPR will be initiated by bystanders, and telephone CPR instructions will be given by emergency medical dispatchers if necessary
- If CPR is in progress, it should be continued until the AED is attached

Early Defibrillation

- Purpose is to reestablish a normal heart rhythm
- Early defibrillation greatly increases the chances of survival from cardiac arrest^{3, 4, 5}
- Responders throughout the world are providing defibrillation because AEDs have become easier to use and widely available
- International Association of Fire Chiefs (IAFC), American Heart Association (AHA), National Heart, Lung and Blood Institute (NHLBI), and European Resuscitation Council (ERC) have endorsed the concept

Early ACLS

- Early advanced cardiac care is the treatment provided by the ACLS team
- Includes endotracheal intubation and intravenous administration of drugs

Importance of Early Defibrillation—Slides 3, 4 and 5

- Defibrillation is now considered a basic life support (BLS) skill
- Early defibrillation can double or triple survival rates¹
- In Rochester, MN with rapid defibrillation by police and paramedics, overall survival from cardiac arrest increased to 49%
- Defibrillation by basic life support personnel has decreased time to defibrillation

II. Electrical System of the Heart—Slide 6

Electrical System

- Heart has a network of specialized conductive fibers
- Network distributes electricity throughout the heart
- Delivers electrical impulses directly to the cardiac muscle tissues, which are stimulated to contract

Pacemakers

- Conductive fibers which generate own electrical impulses
- *Primary pacemaker* is the sinoatrial (SA) node
- Conductive fiber network carries an impulse generated in the SA node through the cardiac muscle tissue of the atria
- Impulse travels through the network to the ventricles
- If the SA node fails, another site in the network will generate impulses, e.g., atrioventricular (AV) node

Electrocardiograms—Slide 7

- Electrocardiogram (ECG) is a measurement of electrical activity in the heart
- Impulses pass through body tissue and reach the skin and can be detected by disposable electrodes placed on the skin
- LIFEPAK 500 AED detects electrical signals on the skin
- AED may also detect *artifact*
- Small electrical interference or movement can be mistaken for the heart's activity
- Eliminate all movement and try to avoid extraneous sources of electrical signals including:
 - CPR, victim movement, movement of vehicle
 - muscle tremors
 - poor skin prep
 - use of dried out or expired defibrillation electrodes
 - loose electrodes
 - interference from electronic devices and lighting

Dysrhythmias—Slide 8

- ECG of a healthy heart is organized and uniform
- Rhythm is called a *normal sinus rhythm*
- *Dysrhythmias* are abnormal heart rhythms that can prevent the heart from pumping properly, caused by:
 - narrowing of the arteries of the heart (coronary heart disease)
 - chemical imbalances
 - trauma to the heart muscle
 - low blood oxygen (drowning, suffocation)

- central nervous system damage
- drugs and medications
- electrocution
- hypothermia (low body temperature)
- Coronary heart disease—narrowing and hardening of the arteries—is a major cause of cardiac arrest
- A *heart attack* (acute myocardial infarction) is caused by heart disease, too
- During a heart attack, the heart does not usually stop beating

Ventricular Fibrillation—Slides 9, 10, 11, 12, 13

- *Sudden cardiac arrest* (SCA) means the heart has unexpectedly stopped beating
- Most common dysrhythmia in SCA is *ventricular fibrillation* (VF)
- VF is a totally unorganized rhythm where many sites attempt to function as pacemaker
- Results in uncoordinated cardiac muscle contractions and prevents circulation
- If untreated, VF virtually always results in death
- Only effective treatment is defibrillation
- Defibrillation can reorganize the chaotic electrical activity
- Effectiveness of defibrillation depends on speed of shocks
- Must deliver shocks within minutes of cardiac arrest in order to have the best chance of survival
- Success rates decrease approximately 7 to 10 percent for every minute that defibrillation is delayed⁵

Other Dysrhythmias—Slides 14, 15

- VF and *pulseless ventricular tachycardia* (VT) are treatable with shocks
- Pulseless VT sometimes precedes VF
- Not all dysrhythmias of cardiac arrest can be treated with defibrillation, e.g., asystole and *pulseless electrical activity* (PEA)
- LIFEPAK 500 AED is designed to advise the operator if a shockable rhythm is detected (VF or pulseless VT)
- Interpretation is done by software that has been tested in thousands of simulated cases in the laboratory and clinically field tested
- Never attach an AED to someone with a pulse or other signs of circulation such as normal breathing, coughing or movement

III. How to Defibrillate—Slides 16, 17, 18, 19, 20, 21

Defibrillation is the delivery of a strong electrical shock to the heart. It is the only effective treatment for VF and must be done quickly in order to give the best chance of survival. The LIFEPAK 500 AED is an automated defibrillator that analyzes the victim's heart rhythm and advises the operator if a shockable rhythm is detected. It is easy to use because it gives voice prompts and screen messages for each step in the defibrillation process. The instructor should now demonstrate how to use the LIFEPAK 500 AED.

STEP 1—Verify victim is unconscious, breathless and pulseless.

- Victim must be in cardiac arrest—unresponsive, not breathing normally, without a pulse/circulation
- Shake shoulders and shout “Can you hear me?”
- Open the airway using the head tilt-chin lift and check for breathing
- Deliver two initial ventilations
- Check for signs of circulation (if trained, check the carotid pulse for 5 to 10 seconds), if no pulse/circulation, prepare the AED
- Place the victim on a hard, firm surface
- Attach an AED only to someone who is unconscious, breathless and without pulse/circulation

STEP 2—Turn on the LIFEPAK 500 AED and attach the disposable defibrillation electrodes. If alone, have an AED and cannot immediately get assistance, skip CPR compressions and concentrate on attaching the AED.

- Press the ON/OFF button
- Give a verbal report, if required
- Remove the disposable defibrillation electrodes from the package
- Make sure electrode cable connector is plugged into the LIFEPAK 500 AED
- Bare the victim's chest
- Remove moisture, ointment, creams, medication patches
- Remove the self-adhesive electrode backing and place the electrodes by following the diagrams on the electrodes (place the ♥ electrode pad on the victim's left ribs—to the side of the nipple; place the other electrode above the victim's right nipple, below the collarbone and to the side of the breast bone); press firmly
- Avoid placing the electrodes directly on surgically-implanted devices such as implantable cardioverter/defibrillators or implantable pacemakers
- Analyze the heart rhythm

STEP 3—Stop CPR and Analyze.

- Tell everyone to stand clear of the victim
- Stop all motion (including artificial ventilations), and proceed with analysis
- *STAND CLEAR, ANALYZING NOW, STAND CLEAR* messages will appear on the LCD and voice prompts will be heard

Do not touch the victim and do not cause any victim movement during analysis.

- Wait about 6 to 9 seconds for analysis to finish and the next message and voice prompt to occur

STEP 4—If SHOCK ADVISED message occurs, clear everyone away from the victim and push the SHOCK button when advised to do so.

- *SHOCK ADVISED* message occurs when the unit determines rhythm is shockable
- Make certain no one is touching the victim and anything that will conduct electricity
- Push the SHOCK button when the unit gives the *PUSH TO SHOCK* prompt

STEP 5—Analyze again immediately after shocking to see the results of the shock.

The device will automatically analyze after shocks 1 and 2, 4 and 5, etc. Follow the voice prompts and stand clear during analysis and shocks.

- Repeat the sequence of *analyze/shock* for up to three shocks in a row as prompted by the AED
- After the third consecutive shock, the AED will prompt to check the victim for pulse/circulation
- The AED will prompt to perform CPR for up to 1 minute if there is no pulse/circulation
- Check pulse/circulation prompt occurs after every third shock
- If no pulse/circulation, perform CPR for one minute, then check pulse/circulation
- Continue this process until the *NO SHOCK ADVISED* prompt appears
- Your local protocols may dictate a maximum number of shocks to give
- If victim regains pulse/circulation, support airway and breathing; monitor closely

No Shock Advised

- Not all abnormal heart rhythms associated with cardiac arrest require a shock to be treated
- AED will prompt to check the pulse/circulation when analysis results in *NO SHOCK ADVISED*
- If no pulse/circulation, CPR prompt occurs and times CPR for one minute
- Local protocols dictate how to proceed when *NO SHOCK ADVISED*

Continuous Patient Surveillance System (CPSS)

Sometimes the rhythm spontaneously changes from a non-shockable rhythm to a shockable rhythm.

If the LIFEPAK 500 AED has an ANALYZE button:

- LIFEPAK 500 AED monitors the victim's ECG—even when it is not analyzing
- If CPSS detects a potentially shockable rhythm, the AED prompt *PUSH ANALYZE* occurs warning that the rhythm has changed and it is possible that the victim needs to be shocked
- Clear victim and analyze rhythm

If the LIFEPAK 500 AED does not have an ANALYZE button, the AED will analyze automatically.

- Clear victim and allow the analysis to proceed

Transfer of Care

- If advanced life support (ALS) units arrive, they should take control of the resuscitation effort
- ALS may ask you to continue defibrillation procedures
- Give brief report

Troubleshooting

- If *CONNECT ELECTRODES* prompt occurs quickly check that the electrode cable is firmly connected to the AED and that the defibrillation electrodes are securely adhered to the chest
- If the electrode pads do not stick to a hairy chest, quickly remove the hair with a razor or clippers
- Battery symbol lit, battery is low, replace at next opportunity. If AED has Readiness Display, the battery symbol is visible.
- Battery symbol flashes on and off, *REPLACE BATTERY* voice prompt and message occur, battery should be replaced immediately. If AED has Readiness Display, the battery symbol is visible.
- Service indicator (wrench) is lit (but not flashing), device may still be used for therapy—call authorized service personnel as soon as possible. If AED has Readiness Display, the wrench symbol is visible.
- Service indicator (wrench) is flashing and *CALL SERVICE* message is displayed, turn AED off, then on again—if *CALL SERVICE* message is displayed, AED cannot be used until the problem is corrected by authorized service personnel. If AED has Readiness Display, the wrench symbol is visible.

Motion

- All motion should be stopped when analyzing and shocking
- *Motion artifact* is ECG signal distortion created by movement of the victim or defibrillation cables
- May cause incorrect interpretation of the ECG
- Unit avoids analyzing until all motion has stopped
- *MOTION DETECTED* and *STOP MOTION* prompts occur if motion is detected
- Eliminate all sources of motion such as ventilation assistance, CPR compressions, and electrode/cable movement
- Once all motion stops, the LIFEPAK 500 AED will continue to attempt to analyze for up to 20 seconds
- If agonal respirations are present, try to time the analyses between the respirations (for AEDs that do not have an ANALYZE button, analysis occurs automatically). Perform CPR until analysis can be completed.
- If motion continues for more than 20 seconds, analysis will stop
- If analysis “times out” due to motion artifact, proceed with analysis as prompted (for AEDs that do not have an ANALYZE button, analysis occurs automatically)

IV. Safety First—Slides 22, 23

Cardiac Arrest Only!

- Be certain the victim is unresponsive, breathless and without pulse/circulation

Safety Zone

- Defibrillation can be dangerous if performed improperly
- AEDs are very safe if you take several important precautions
 - never touch the victim when analyzing or shocking
 - when analyzing or shocking maintain a buffer or safety zone around the victim

- imagine an invisible shield surrounding the victim
- allow no one to penetrate this zone
- Check each time before shocking by saying “I’m clear, you’re clear, everybody’s clear” while looking to see that no one is within the safety zone

Electrodes Firmly Adhered

- Good technique is important to minimize the possibility of arcing

Defibrillation in the Presence of Oxygen

- Use care when defibrillating near oxygen sources (such as bag-valve-mask devices)
- Remove oxygen from the victim and place it well away from the rescue effort prior to defibrillating to help prevent a fire hazard

Age/Weight Limit

- Do not attach to anyone under eight (8) years of age unless used with Infant/Child Reduced Energy Defibrillation Electrodes
- The Infant/Child Reduced Energy Defibrillation Electrodes are designed to be used with biphasic LIFEPAK 500 AED with a pink connector and deliver lower energy levels appropriate for young children.
- Local protocols may dictate restrictions for defibrillation of children. Follow local protocol.

V. Summary—Slides 24, 25

- AEDs eliminate the need for rhythm recognition
- Personnel with less training can defibrillate
- AEDs reduce time to therapy
- AEDs offer potential for improved outcome

VI. Practical Skills Stations

Practice Scenarios

- Simulate a real cardiac arrest response including dispatch information, CPR, airway management, defibrillation and report to arriving ALS team (if applicable)
- Rotate through all the positions on the resuscitation team
- Use a manikin to do practice and skill evaluations
- Watch for common mistakes made by students:
 - incorrect electrode placement
 - not clearing before analysis
 - not clearing before shock
 - not looking to see that area is clear before shock

- poor communication among rescuers
- inadequate direction of rescuers by defib technician (take charge of the scene)
- pulse/circulation checks too slow
- inadequate voice report
- Encourage speed in the delivery of the first shock, and performance of CPR with good technique with a minimum of interruptions
- CPR and other sources of motion must be stopped during analysis, even though BLS training has always stressed no interruptions
- Consider using troubleshooting scenarios

VII. Miscellaneous Issues

AED Use is of No Benefit in Victims with Signs of Obvious Death

- Rigor mortis
- Obvious mortal wounds
- Lividity

Voice Data (optional)

- Requirements for voice reports

Post-Resuscitation Care

- Refer to local protocols

Special Situations

- Before placing electrodes—clear skin of ointments, creams, sweat, medication patches
- Excessive chest hair—remove quickly
- Hypothermia (refer to local protocols)
- Pediatric (use Infant/Child Reduced Energy Defibrillation Electrodes for children under 8 years old or 55 lbs (22 kg) or refer to local protocols)
- Traumatic arrest (refer to local protocols)
- Implanted pacemaker, implanted cardioverter/defibrillator (refer to local protocols)
- Rain, snow
- On metal surface
- Agonal respirations

Early Defibrillation Program

- Medical control
- Protocols or standing orders

- Quality assurance, case reviews
- Initial training
- Continuing education
 - regular skill reviews every three months
 - evaluate the skills of each defib-technician in two scenarios
 - field event can count for one quarterly skill review

Data Management

Review steps to transfer data according to local protocol

- Modem, direct connection to PC, or print directly from the LIFEPAK 500 AED

Maintenance (see Operating Instructions, Guidelines for Inspection and Testing and refer to local guidelines)

- Care
- Cleaning
- Battery replacement
- Battery maintenance for SLA batteries
- Service needed symbols

References

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