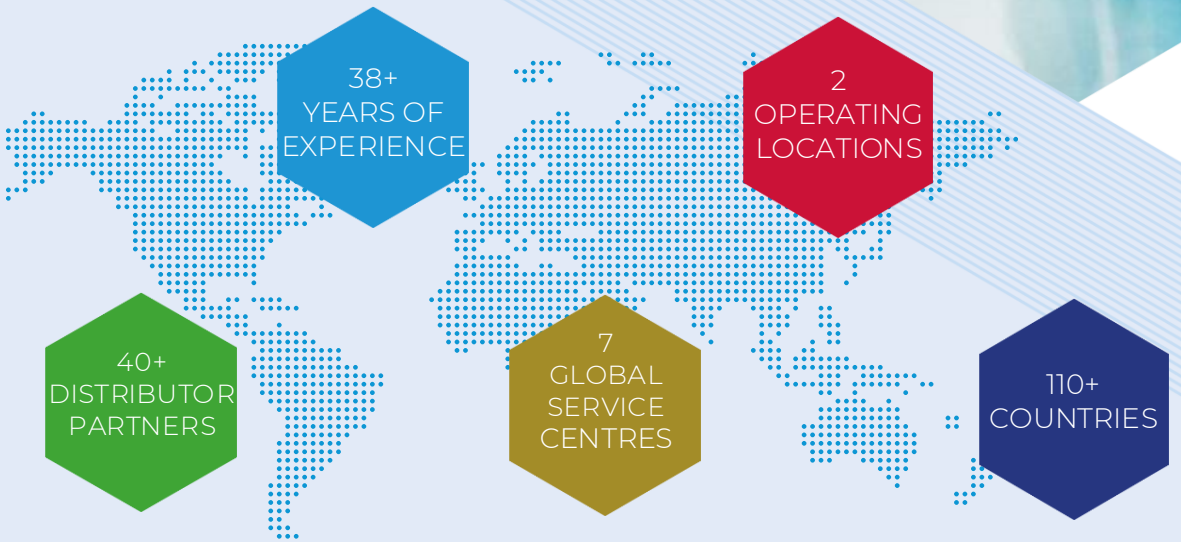
# AEDs Under the Microscope: Why Testing is Non-Negotiable

Passionate about patient safety.

RIGEL MEDICAL
GMC-INSTRUMENTS GROUP

Introducing **Rigel Medical**...
Making our world a safer place.
**Every. Single. Day.**

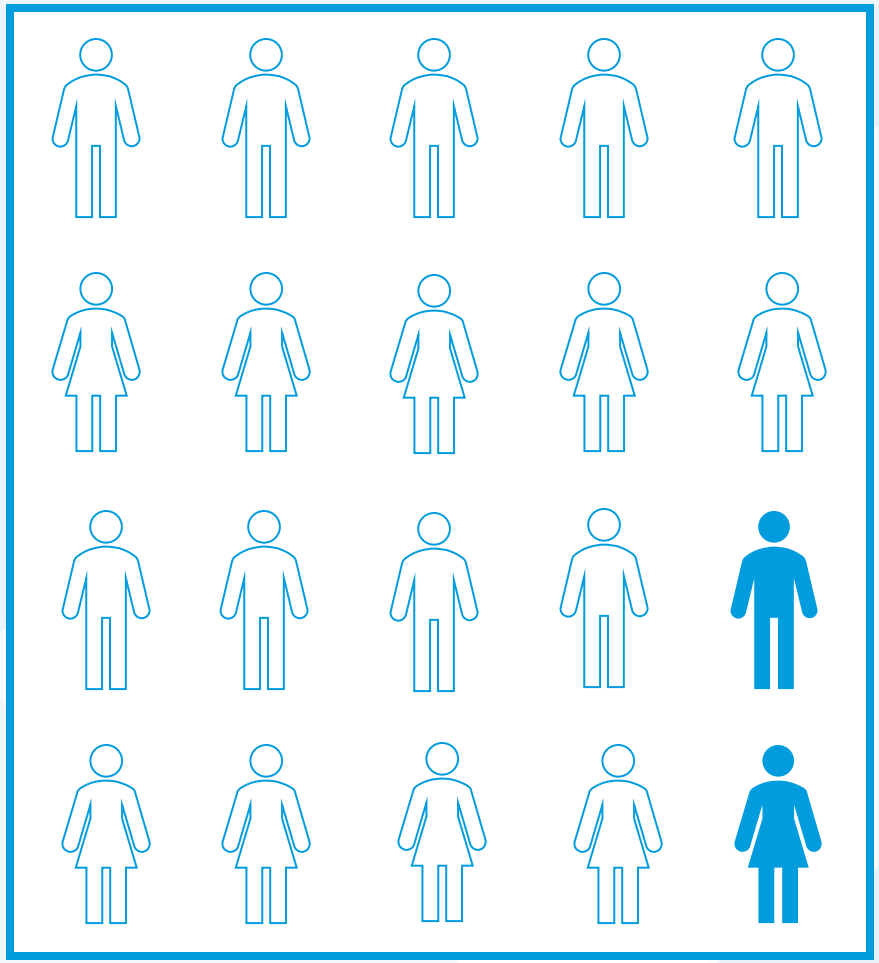



Rigel Medical are renowned globally as a designer and manufacturer of reliable, portable and compact biomedical test equipment.

Our products ensure that critical medical equipment is safe to use throughout the device's life-cycle. As metrology specialists, for almost four decades our innovative testing solutions have been mitigating risk worldwide in healthcare environments.

# Introduction

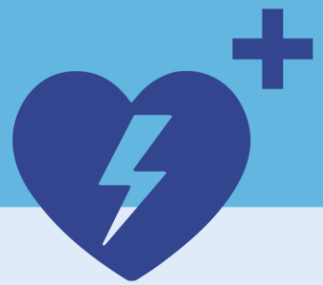
- Cardiac arrest stops the heart from pumping blood.
- 70% of cases occur at home.
- Annual OHCA estimates: France 10k–60k, UK 30k, USA 350k.
- Survival: 1 in 10 (OHCA); 1 in 5 (in-hospital).



# Introduction

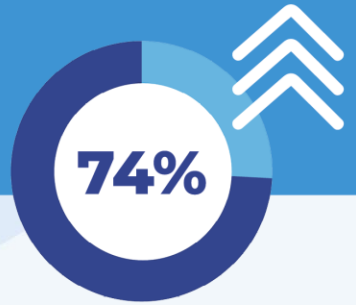
## EVERY SECOND COUNTS WHEN IT COMES TO SAVING A LIFE

Studies reveal that using an AED in public settings can **INCREASE SURVIVAL RATES BY 2 TO 3 TIMES** compared to cases where no AED is available.



When defibrillation is delivered within 3-5 minutes of a collapse, survival rates can soar to an impressive

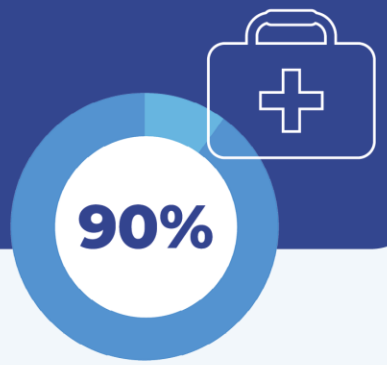
**74%**




AEDs deliver life-saving results in

**90%**

of cases.




When the AED detects a shockable rhythm, and with an **ACCURACY RATE EXCEEDING 95%,** they ensure that shocks are delivered only when necessary—reducing the risk of incorrect treatments.

# Introduction

## EVERY SECOND COUNTS WHEN IT COMES TO SAVING A LIFE

Each minute that passes without defibrillation during sudden cardiac arrest, survival rates drop by an alarming 7-10%.

**AFTER JUST 10 MINUTES, THE CHANCES OF SURVIVAL PLUMMET TO LESS THAN 5%.**

However, immediate defibrillation within the first few critical minutes can boost survival rates to over **50%**

It's crucial not only to have AEDs readily available but to ensure those nearby are fully trained to use them confidently and effectively. This combination of access and proper staff training can significantly increase survival rates during cardiac emergencies.

Proper CPR and AED training can double survival rates

# Introduction

## AED MAINTENANCE IS A GROWING CONCERN

**30-40%**

**OF AEDS IN PUBLIC LOCATIONS IN FRANCE WERE FOUND TO BE**

**OUT OF SERVICE**

**DURING ROUTINE INSPECTIONS**

This highlights the urgent need for regular AED maintenance and routine checks. In countries like France, regulations mandate strict AED testing to ensure functionality.

**NON-COMPLIANCE NOT ONLY RISKS DEVICE FAILURE DURING EMERGENCIES BUT ALSO CARRIES LEGAL REPERCUSSIONS.**

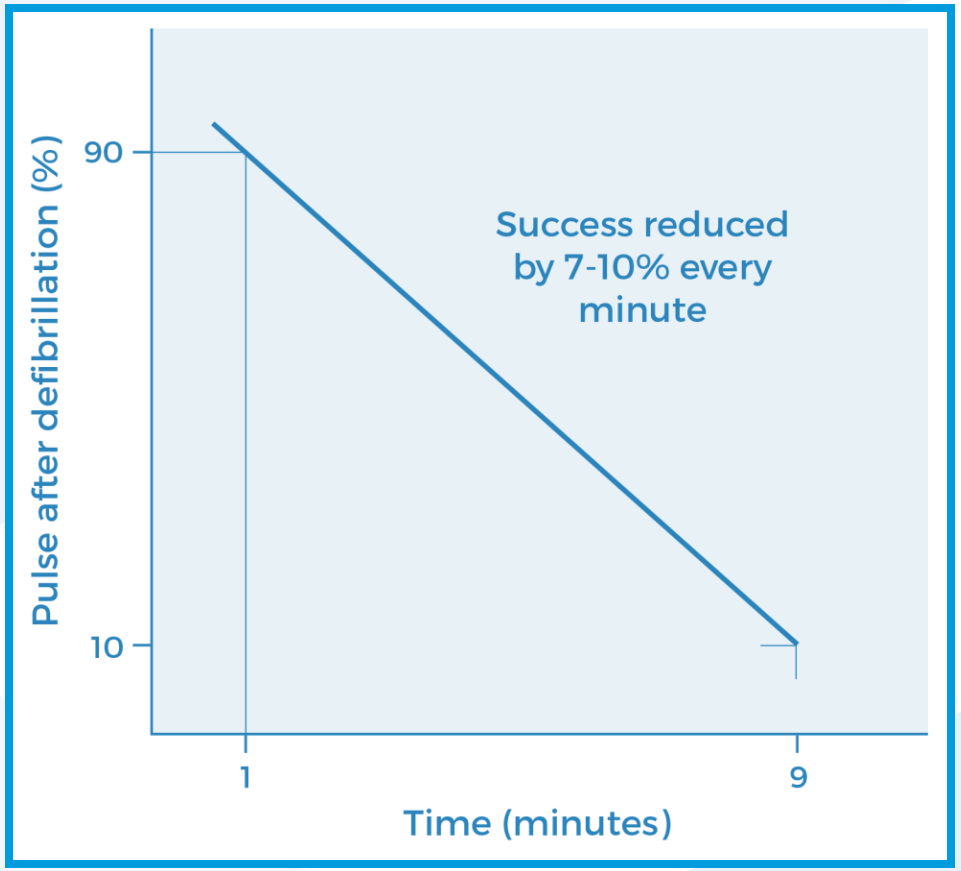
# Introduction

## Legal Obligations (France)

- AEDs are legally required in receptions, elderly care homes, stations, hotels.
- Employers must provide accessible first aid (Article R.4224-14).
- Non-compliance: 5 years prison + €75,000 fine.
- AED failure during emergency = serious liability.

# Introduction

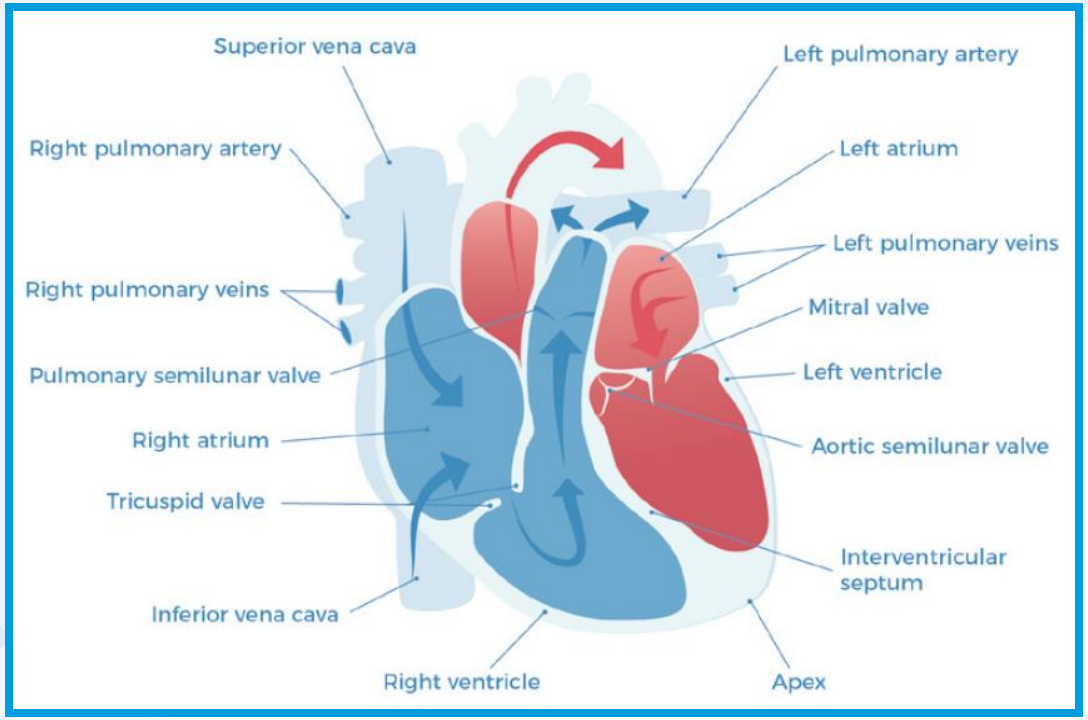
- Unless there is immediate intervention from cardiopulmonary resuscitation (CPR) and defibrillation, death will follow within minutes
- The introduction of communal automatic external defibrillators (AEDs) has led to further increases in survival rates



# The Heart and the Cardiac Cycle

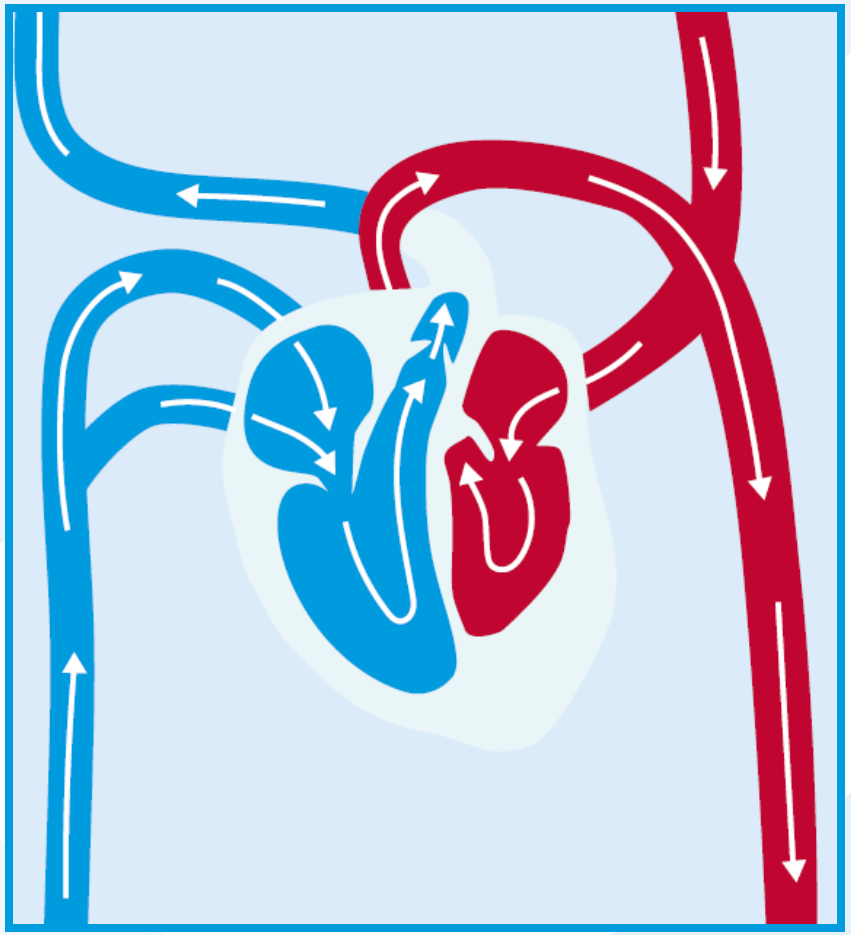
# The Heart

- Heart has four chambers: 2 atria, 2 ventricles.
- Electrical signals control contraction (systole).
- Atria contract first, then ventricles.
- This cycle maintains blood circulation.



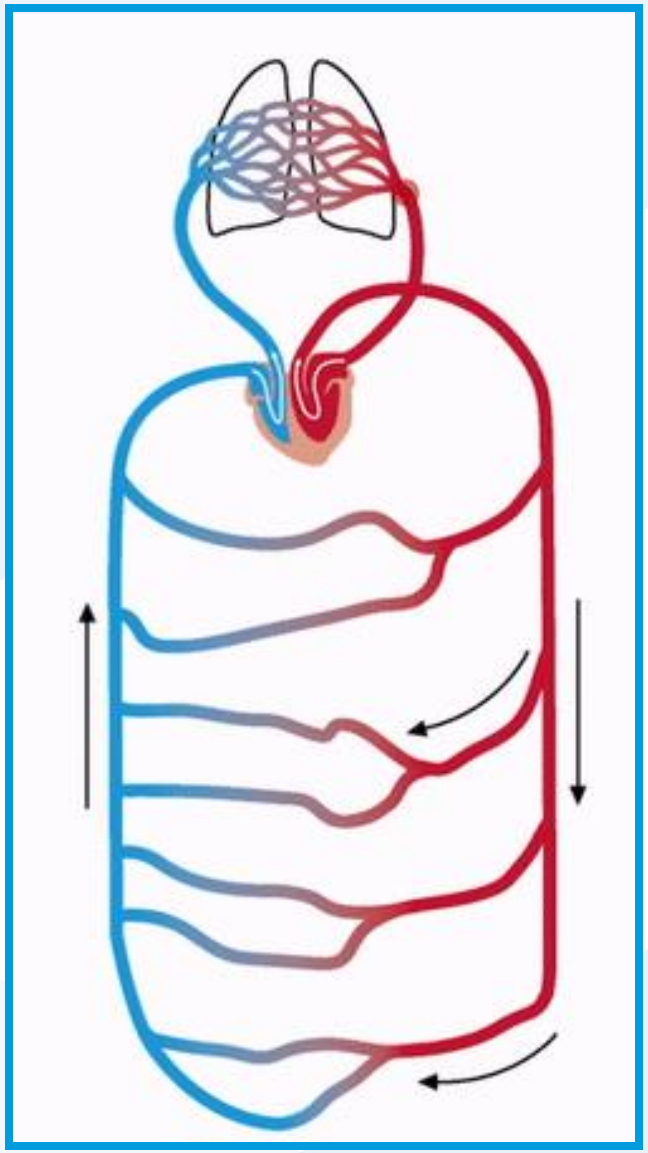
# The Heart

- Heart relaxes (diastole), filling with blood.
- Right atrium → right ventricle via AV valve.
- Blood pumped to lungs through pulmonary artery.
- $CO_2$ exchange begins in lungs.



# Cardiac Cycle

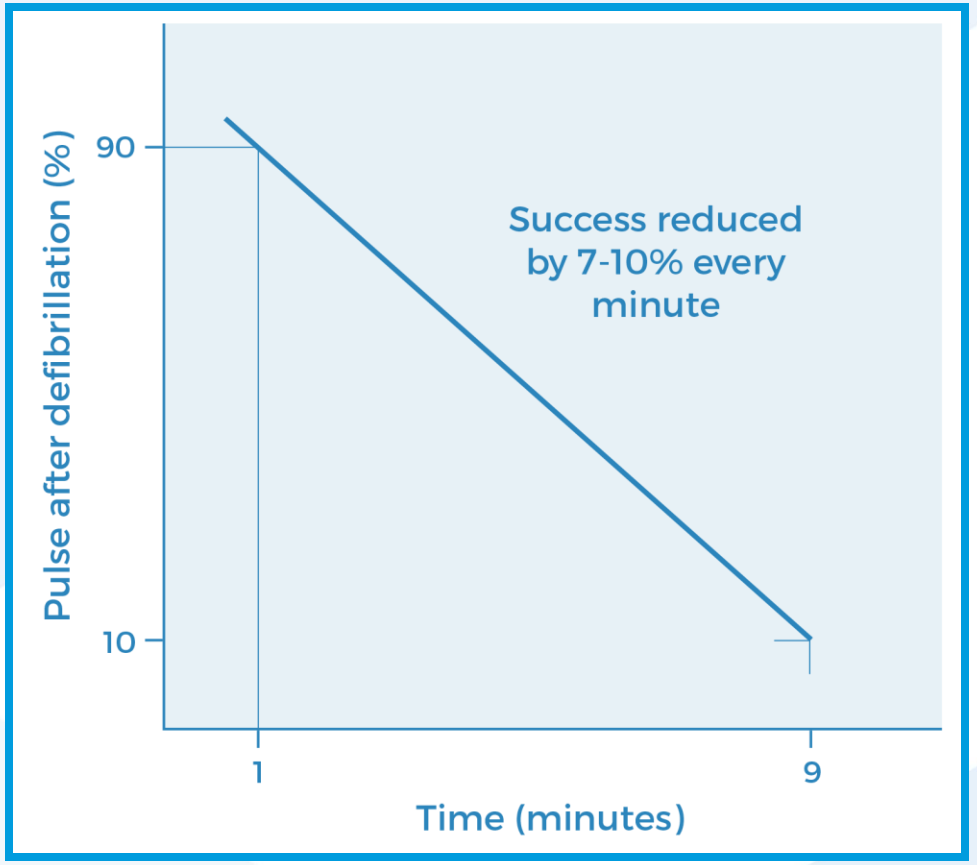
- Lungs exchange $CO_2$ for oxygen.
- Oxygen-rich blood enters left atrium.
- Then to left ventricle, pumped to aorta.
- Supplies oxygen to entire body.



# Fibrillation and Defibrillation

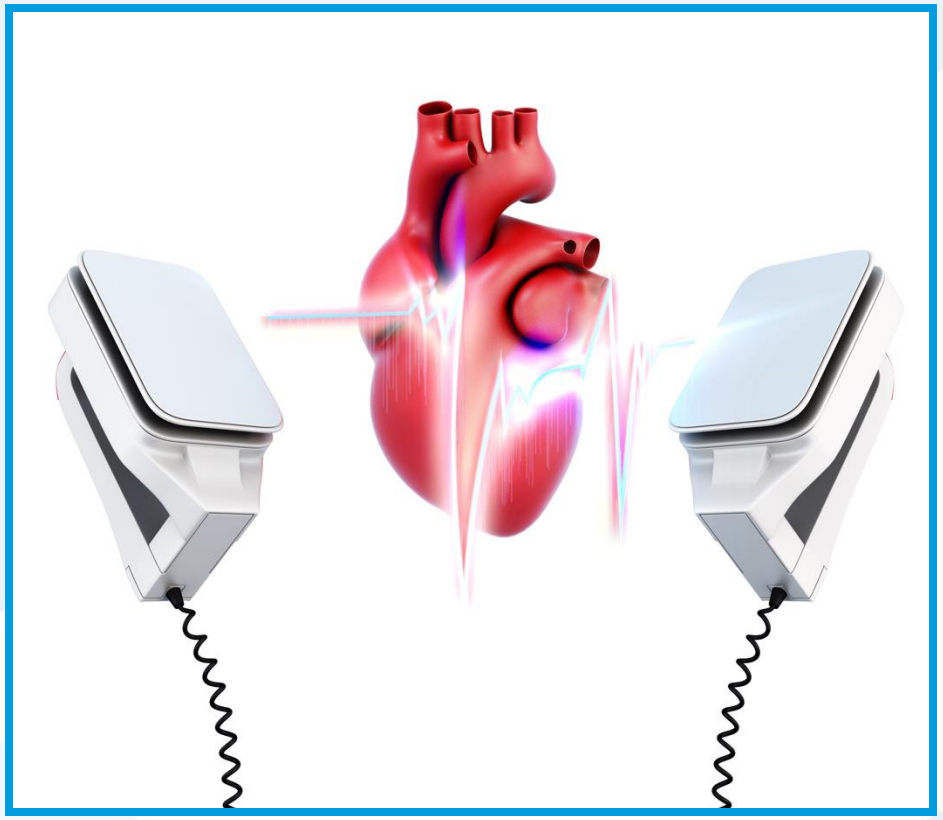
# What is Fibrillation?

- Atrial fibrillation (AF): irregular, non-fatal rhythm.
- Ventricular fibrillation (VF): life-threatening.
- VF leads to cardiac arrest and unconsciousness.
- Must be treated within 10 minutes.



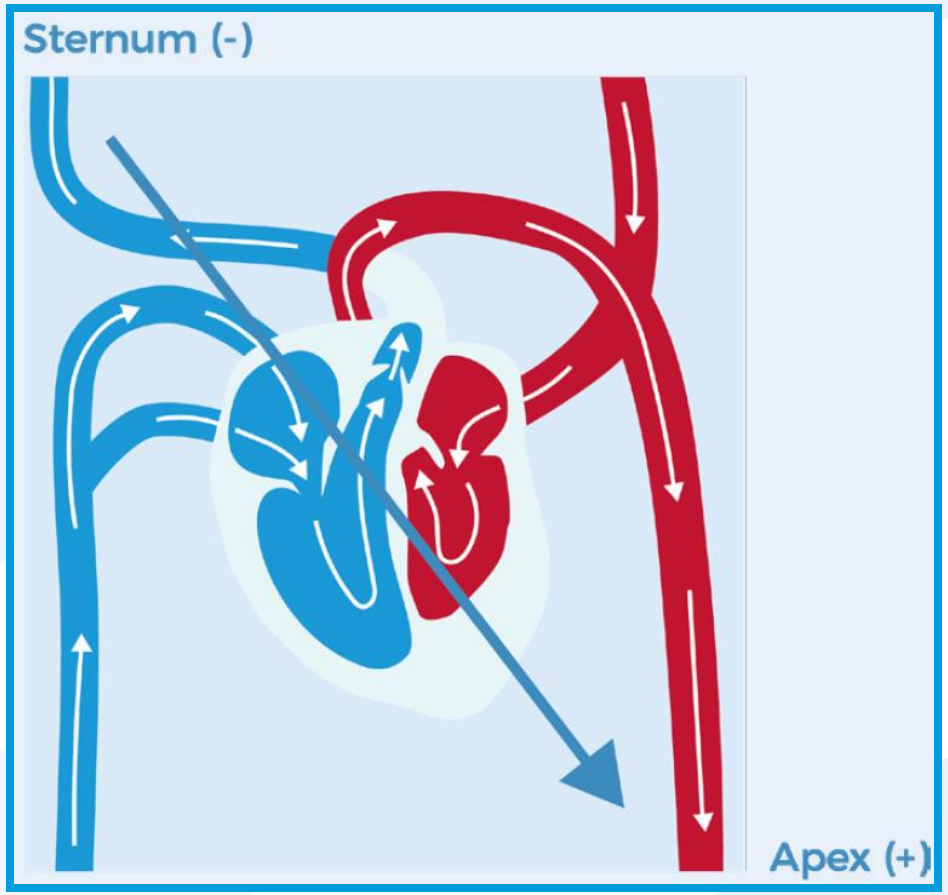
# What is Fibrillation?

- AF treated with meds, cardioversion, or ablation.
- VF usually needs high-energy defibrillation.
- Some ventricular types are non-shockable.
- May require drug therapy and CPR instead.



# What is Defibrillation?

- Pads deliver energy across the heart.
- Standard: sternum to apex.
- Anterior-anterior or anterior-posterior setups.
- Pads labeled Apex (+), Sternum (–) for guidance.



# Defibrillation

## Myth

- Defibrillator starts the heart
- Used when there is flat-line (asystole)

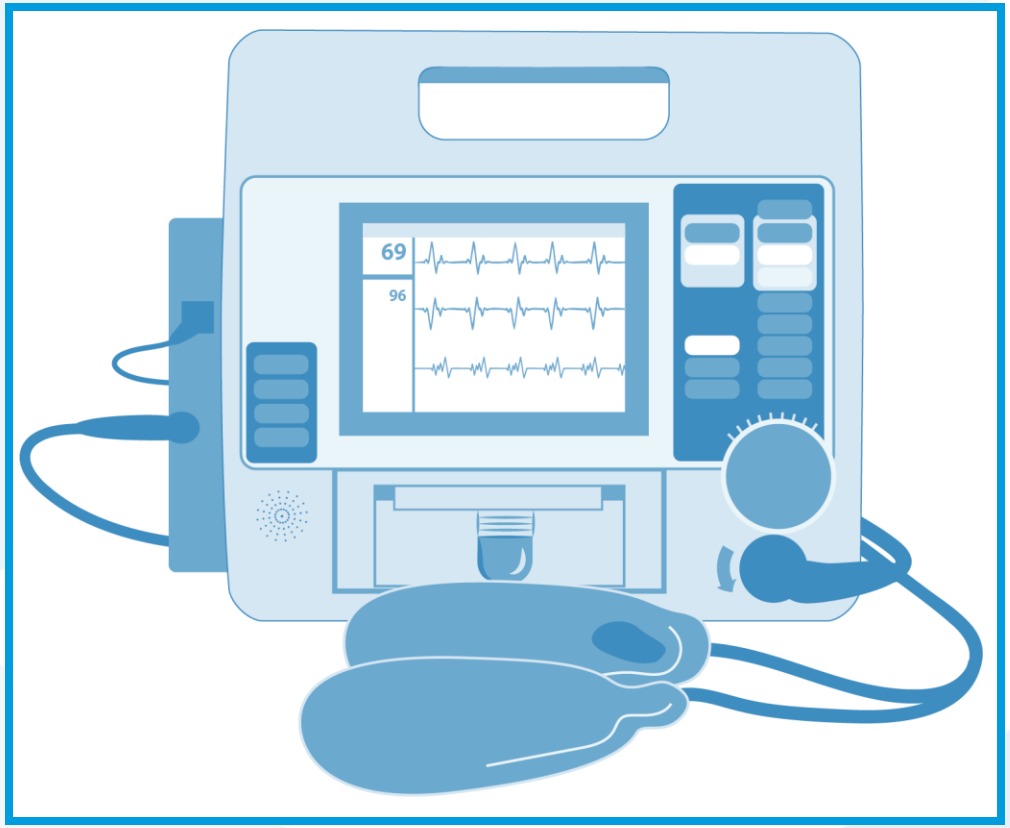
## Truth

- It stops irregular rhythm, allowing restart.
- Won’t work on asystole (flatline).
- Requires residual electrical activity.

# Types of External Defibrillator

## Advanced life support (ALS) – External defibs

- Used by EMS for critical care.
- Includes pacing, ECG, and diagnostics.
- Multi-function devices with extensive capability.
- Designed for professional use.



# Types of External Defibrillator

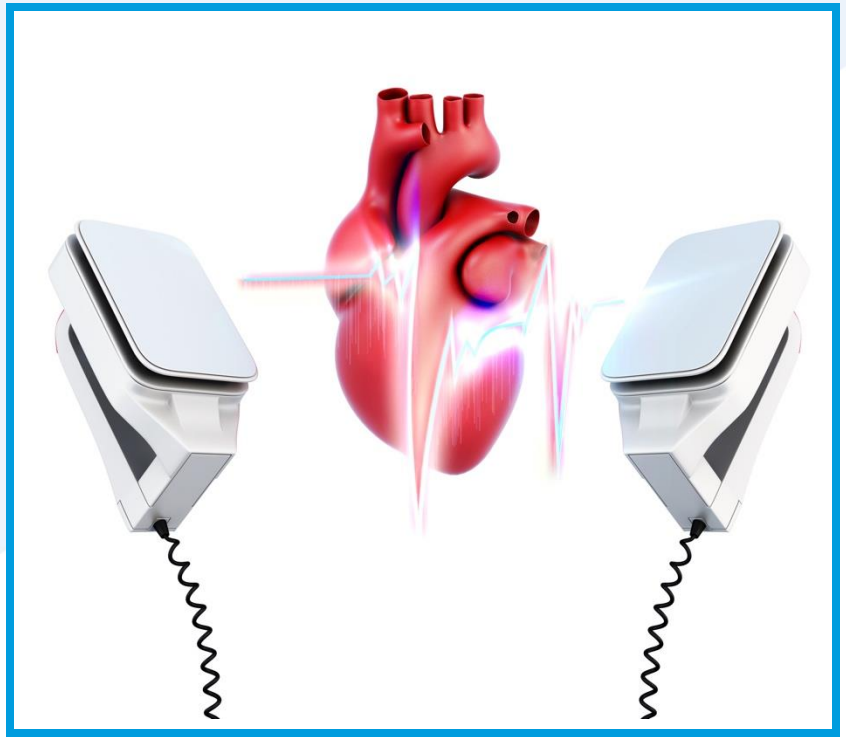
## Basic Life Support (BLS) – Automatic External Defibrillator (AED)

- Designed for public use, no medical training needed.
- Automatically detects rhythms.
- Shocks only pulseless VF or VT.
- Follows preset safety protocols.

# Shockable and Non-Shockable Arrythmias

# Shockable and Non-Shockable Arrhythmias

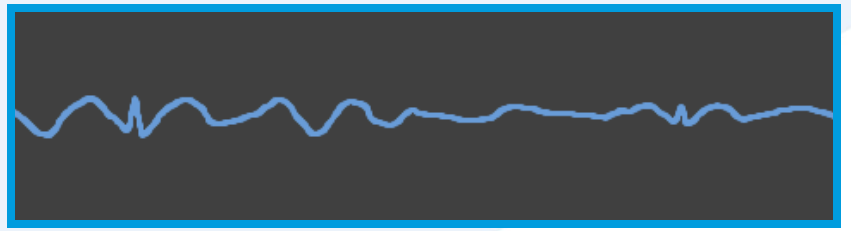
- AEDs must recognize shockable vs non-shockable rhythms.
- Shockable = electrical activity needing defib.
- Non-shockable = low/no activity (CPR + meds).
- Some rhythms require synchronized defib.



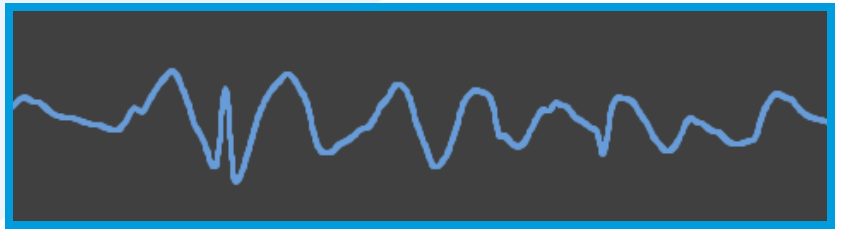
# Shockable Arrythmia

- Unsynchronized shocks:
  - VF (fine/coarse), pulseless VT.
- Synchronized shocks:
  - AFIB, AFLT, VT with pulse.
- Sync avoids shocking during heart's vulnerable period.
- Misuse can worsen arrhythmia.

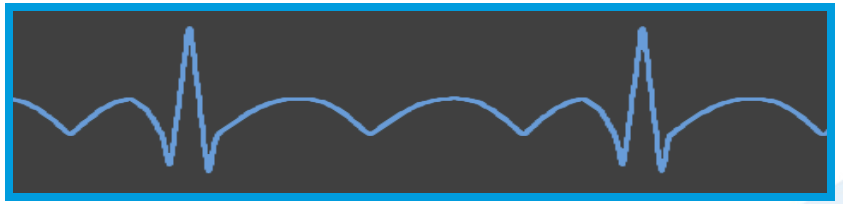
VFF



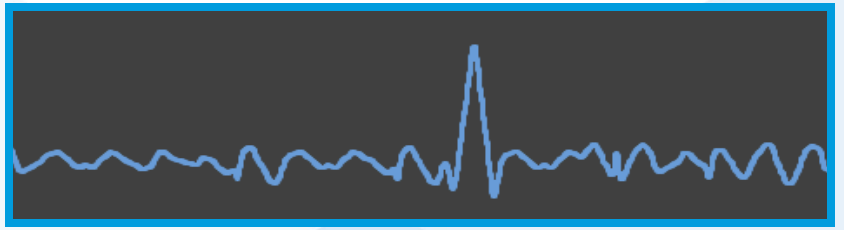
VFC



AFLT



AFIB



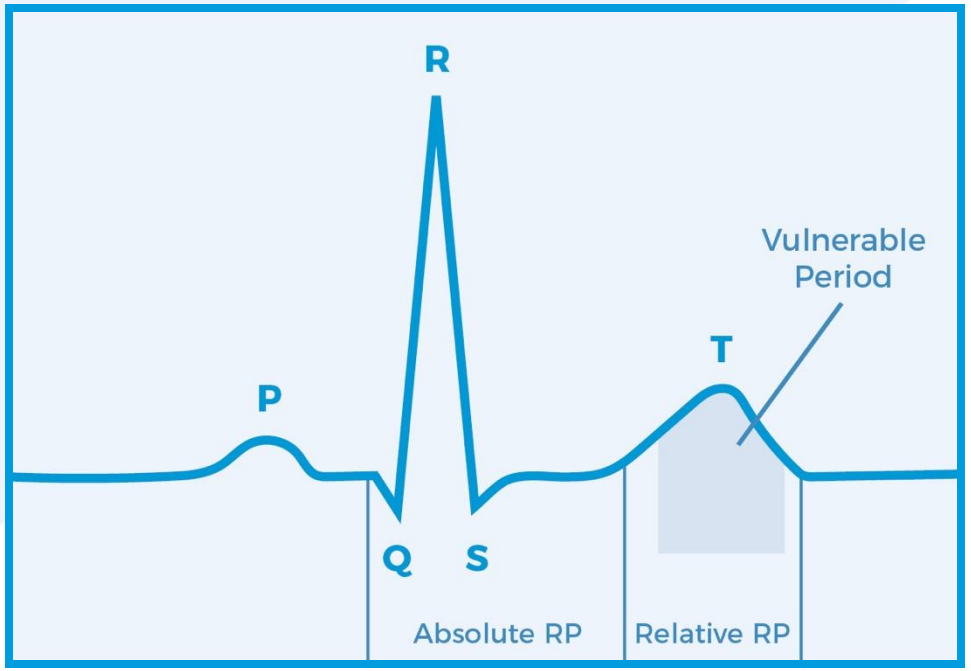
# Non-Shockable Arrhythmia

- Non-shockable arrhythmias include pulseless electrical activity (PEA), and asystole.
  - PEA: A condition where an ECG is present but there are no signs of a palpable pulse or other signs of circulation
  - Asystole: The absence of ventricular contraction. The ECG is almost a flat line, sometimes with the occasional P wave
- Treatment possible through CPR and drugs to stimulate the heart into any electrical activity

ASYSTOLE

# Cardiac Synchronisation

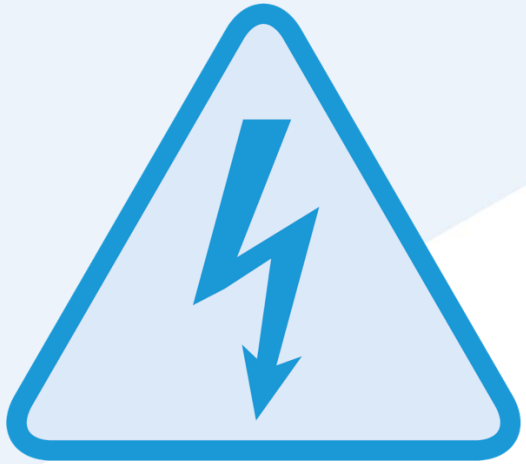
- Defib must sync with R-wave for safety.
- Avoids shock during vulnerable heart phase.
- Delay typically 10–30ms.
- Analysers measure shock timing accuracy.



# Defibrillator Testing

# Defibrillator Testing

- When testing a defibrillator, it is crucial to understand the operation of the device under test
- The output energy from defibrillators is extremely hazardous; precautions must be followed to ensure the device is tested under safe conditions only
- Always ensure that all tests are carried out by a competent suitably trained individual

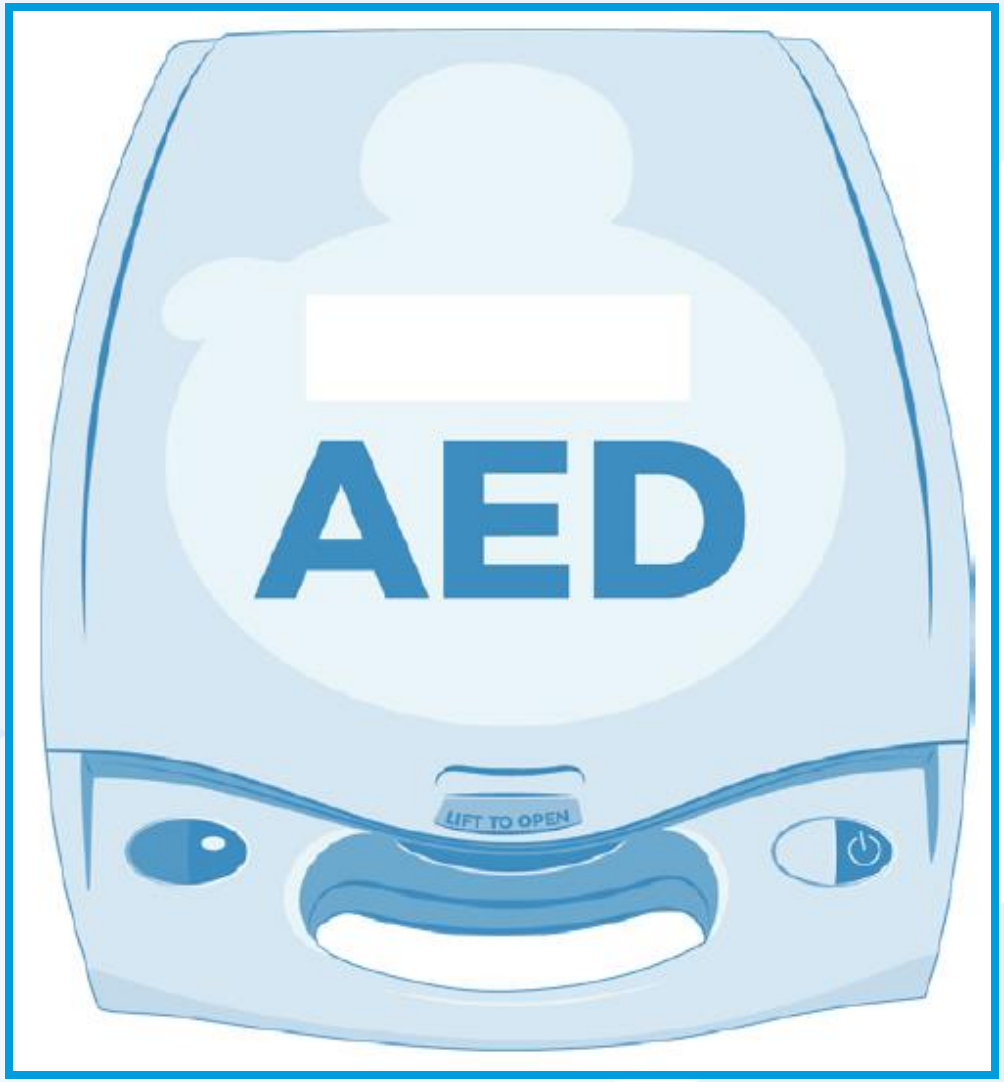


# Defibrillator Energy

- Key Test Measurements
  - energy (J)
  - peak voltage (Vp)
  - current (Ip)
  - pulse duration (t)
- Mono: 0–360J; Bi: 0–200J.
- Test under varying resistances. Use analyser per manufacturer guidance.

# AED Testing

- Simulate arrhythmias to verify rhythm detection.
- Measure shock energy as well.
- Test response to signal interference.
- Ensure accurate rhythm classification.



INTRODUCING THE...

# Rigel UniPulse 400

The Ultimate Solution for Defibrillator Maintenance

# How Rigel Medical can help

## Why choose the Rigel UniPulse 400?

### ENSURED COMPLIANCE

Meets international regulatory requirements to ensure defibrillators are always ready for use.

### TIME EFFICIENCY

Its ease of use allows for faster testing, reducing downtime for your clients.

### PORTABILITY

Its compact design makes it an ideal on-the-go tool for field technicians.

### COST SAVINGS

Detects and prevents failures, avoiding costly repairs and extending equipment lifespan.

# Key Features:

- **Multi-energy and Multi-phase Testing:** Compatible with monophasic, biphasic, and pulsating waveforms, it allows for precise analysis of all manufacturers' energy types.
- **High-Precision Display:** Captures critical data in real-time, ensuring each device meets the highest standards.
- **Customisable Simulations:** Test various charge scenarios to verify device effectiveness under real-world conditions.
- **Enhanced Connectivity:** Automated data storage and reporting for easier and more efficient maintenance tracking.

# Key Features:

- **IEC 60601-2-4 Compliant:** Meets rigorous design criteria requirements for medical electrical equipment.
- **Transcutaneous Pacer Testing:** Offers advanced defibrillation testing capabilities.
- **Built-in 12 Lead ECG Simulator:** Simulates critical arrhythmias for comprehensive testing.
- **AED Testing:** Features a dedicated test to simplify AED maintenance.
- **On-board Results Storage:** Easily store and access results on demand.

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