

The Role of Defibrillators in the Prevention of Sudden Cardiac Arrest (SCA)

What is a Defibrillator?



A defibrillator is a device that delivers an electric shock to the heart to restore a normal rhythm.

There are several kinds:

- **Manual defibrillators** – Used in hospitals by trained clinicians who interpret the heart rhythm and decide when and how strong a shock to deliver.
- **Implantable cardioverter-defibrillators (ICDs)** – Small devices placed inside the chest that automatically detect and treat dangerous rhythms.
- **Wearable defibrillators** – External vests that continuously monitor the heart and deliver a shock if needed.
- **AEDs (automated external defibrillators)** – Designed for use by anyone, anywhere – even without medical training.

Defibrillators Save Lives



- Survival from sudden cardiac arrest (SCA) declines rapidly over time. **Every minute without defibrillation reduces survival by ~10%.**
- **Early defibrillation can double or triple survival** compared to waiting for emergency medical services (EMS) to arrive.
- When an AED was used, about **24% of people survived** to hospital discharge, compared with around 9% when only CPR was done by a bystander.
- Early defibrillation of shockable rhythms is strongly associated with improved survival.

Table 3. Comparison of First-Responder Defibrillation With Paramedic/EMT Defibrillation						
Study	Location	Survival, % (No.)		P Value	Call-to-Shock Time, min	
		First Responder	Paramedic/EMT		First Responder	Paramedic/EMT
Mossesso et al ¹⁴	Allegheny County, Pa	26 (12/46)	3 (1/29)	.01	8.7	11.8
Weaver et al ¹⁷	Seattle, Wash	30 (84/276)	19 (44/220)	<.001	3.6	5.1
Shuster et al ¹⁸	Hamilton, Ontario	5.7 (8/140)	2.7 (4/147)	NA	8.5	12
White et al ¹⁹	Rochester, Minn	49 (41/84)	43 (23/53)	.02	5.6	6.3
Weaver et al ²²	Seattle, Wash	30 (26/87)	28 (105/370)	NS†	8.8	11.5

*EMT indicates emergency medical technician; CPR, cardiopulmonary resuscitation; and NS, not significant.
†Subset of patients who had prolonged paramedic response times or in whom initiation of CPR did demonstrate significant improvement in survival.

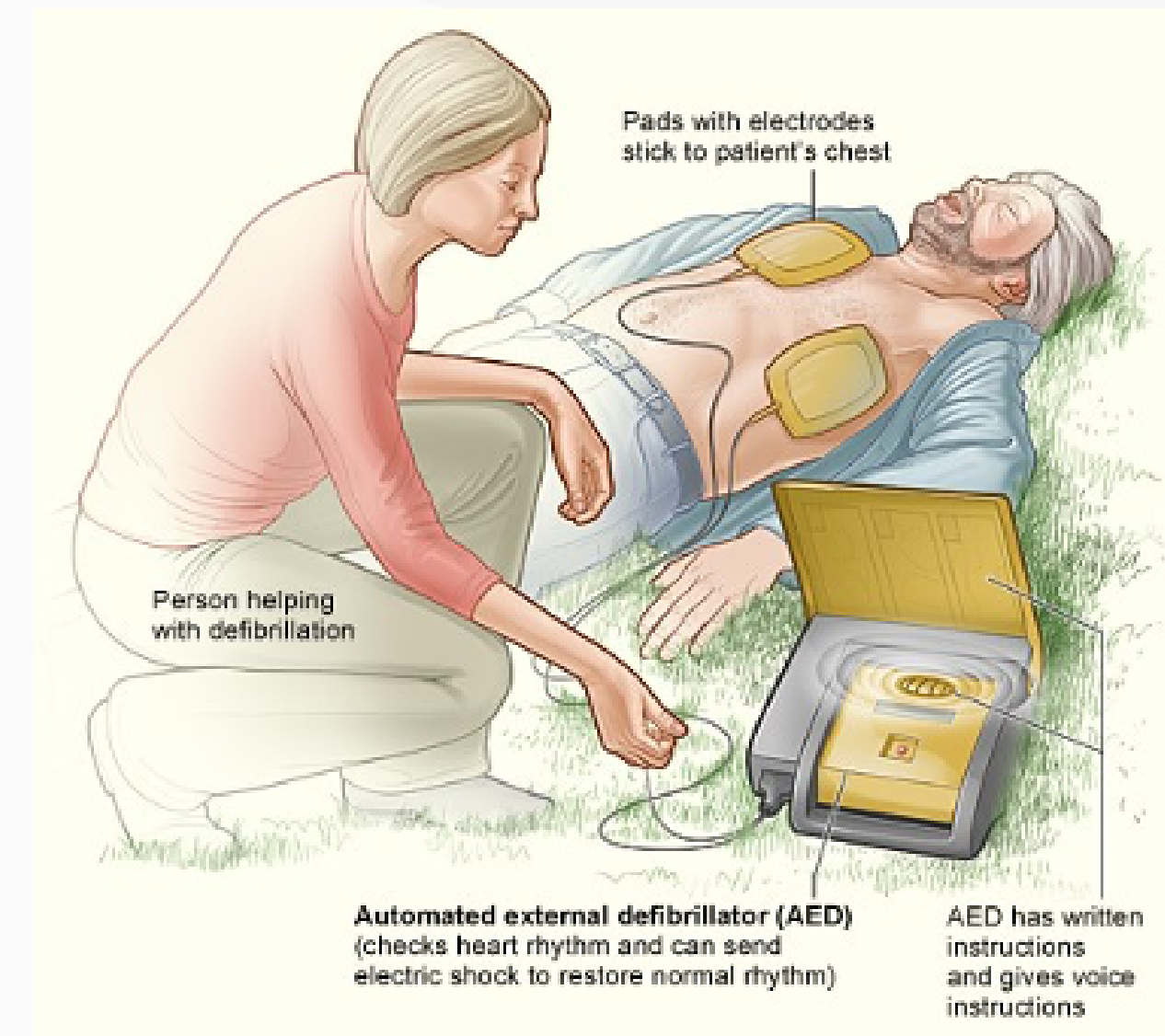
AEDs (Automated External Defibrillators)

- AEDs are designed for **public use**.
- They provide **voice and visual prompts**.
- They analyze rhythm automatically and decide whether a shock is needed.
- AED use by bystanders or first responders has reduced time to defibrillation and **improved survival** in multiple communities.
- Defibrillator-capable EMS systems **reduce mortality** in out-of-hospital cardiac arrest.



Why AEDs Work

- **AEDs are safe.** They deliver a shock only when a dangerous rhythm is detected.
- No requirement to manually interpret ECG.
- **Minimal training** is needed. Many people can learn to use an AED through short courses.
- They **reduce the duration of “time to shock,”** which is the most critical interval.



NHLBI

Real-World Impact of AEDs

Innovative Approaches to Public Access Defibrillation



Brooks, Circulation, 2022



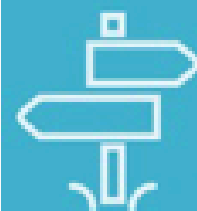
Improving Early Detection of OHCA

- Bystander and dispatcher education
- Automated detection and notification of OHCA



Optimizing AED Availability, Reliability, and Usability

- Encourage 24/7 access to AEDs
- Improve human-computer interaction, rhythm detection and data access



AED Signage

- Develop and promote a universal sign for AED recognizable by all
- Position signage at AED and within the operational range for wayfinding



Novel or Strategic Delivery Vectors

- Deliver AEDs with robots by land or air
- Equip police, firefighters and community volunteers with AEDs to be dispatched in parallel with paramedics



Improving Public Awareness and Willingness to Use

- Use innovative educational approaches
- Address psychological and legal barriers



AED Registration

- Develop innovative techniques to create and maintain AED registries
- Use location data to support rapid AED retrieval and use during OHCA events



Mobile Apps for AED Retrieval

- Use mobile device applications to recruit nearby bystanders to the OHCA
- Guide responding users to nearest AEDs



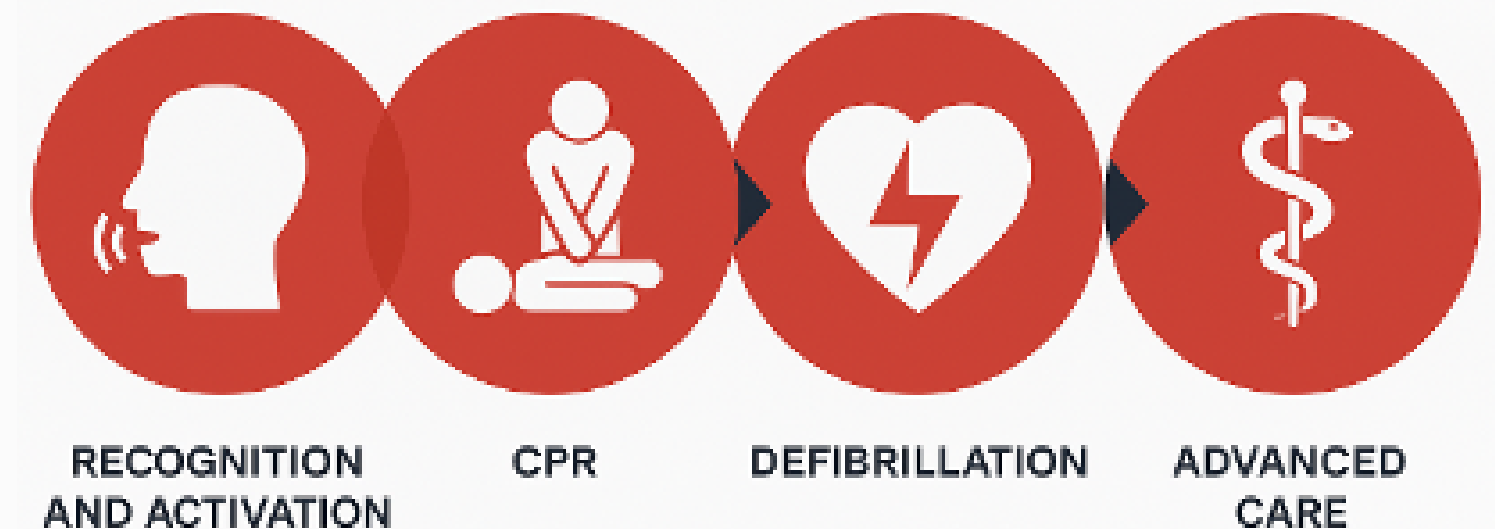
Personal or Home Access Defibrillation

- Deploy affordable and portable AEDs to be carried by individuals and deployed broadly in residential settings

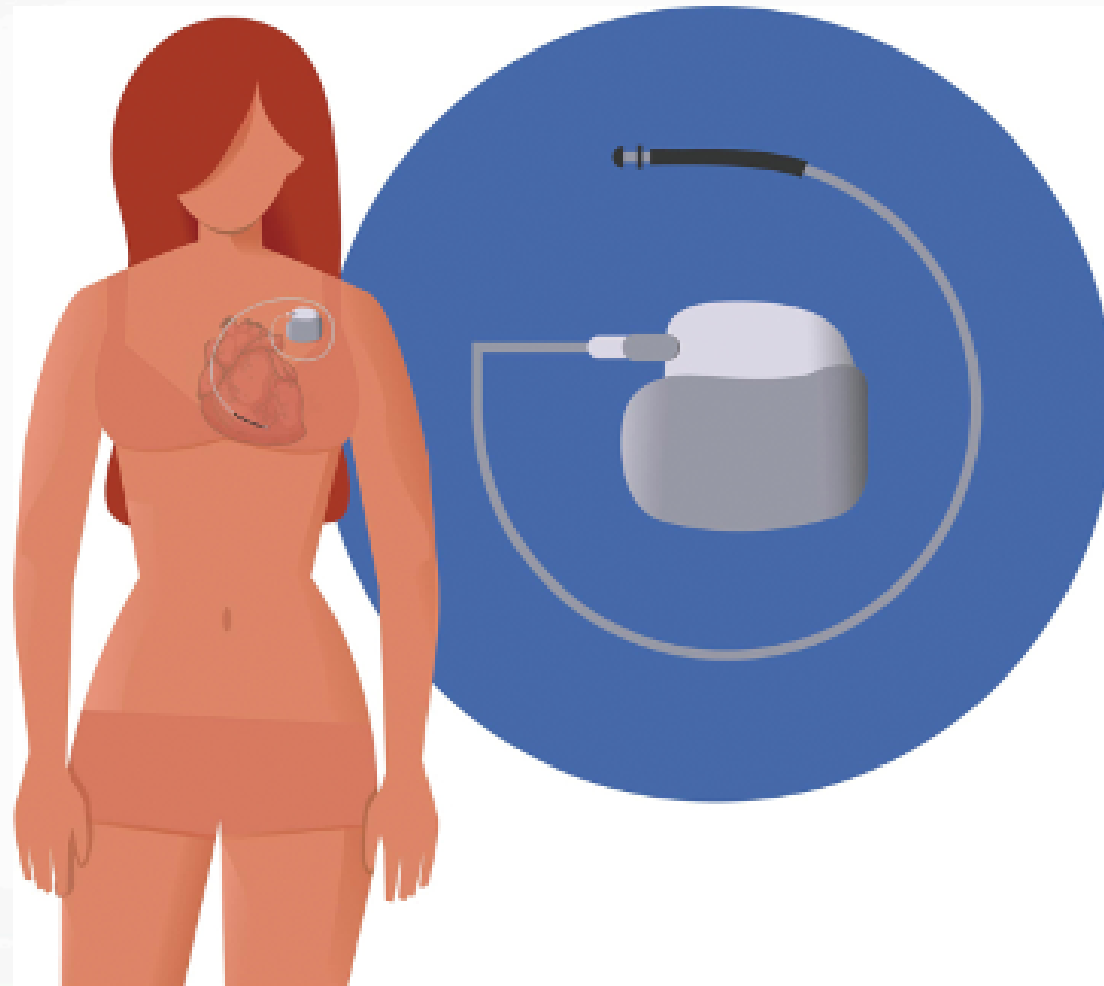
AED State & Local Oversight (U.S.)

- **No state** currently mandates AEDs in all public or private buildings.
- Many states lack requirements for quality improvement, event tracking, or comprehensive program oversight.
- **Good Samaritan protections vary** — in some states, coverage may not extend to employees or property owners considered to have a duty to act.
- **Local ordinances can differ**, with some municipalities adopting stricter AED requirements than state law.
- Enforcement and compliance remain **inconsistent** across jurisdictions.

CHAIN OF SURVIVAL



Implantable Defibrillators (ICDs)



Hoevelmann, Cardiovascular
Diagnosis & Therapy, 2020

- ICDs are implanted devices inside the chest (like a pacemaker) connected to leads in the heart.
- They **constantly monitor** the heart's rhythm and deliver shocks automatically when needed, without external action.
- Meant for patients at **high risk of lethal arrhythmias**.
- ICDs reduce sudden cardiac death (SCD) incidences to **<1% annually** among recipients in many studies.

Wearable Defibrillators (WCDs)

- Worn externally like a vest
- **Monitors rhythm 24/7** and can deliver shocks when needed
- Used temporarily when an ICD cannot yet be implanted (e.g., during recovery, infection, waiting period)
- The AHA/ACC/HRS guidelines give a Class IIb recommendation for WCDs in patients at risk, but not candidates yet for ICDs.



Defibrillators in Everyday Life

- AEDs in public places (e.g., schools, airports, gymnasiums, malls, etc.)
- Strategic placement matters: Models for optimizing AED locations based on cardiac arrest data exist
- Emerging technologies: drone delivery of AEDs to shorten time to shock in remote settings



Key Patient Takeaways



- Defibrillators (AEDs, ICDs, WCDs) are powerful tools to prevent death from sudden arrhythmias.
- **AEDs** are safe, simple, and lifesaving in public settings.
- **ICDs** protect high-risk patients automatically.
- **WCDs** can provide interim protection when ICDs aren't yet possible.