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Use Cases:

UC1: Power ON
UC2: Power OFF
UC3: Cardiac Arrhythmia Detection
UC4: Real-Time CPR Feedback
UC5: Shock Delivery
UC6: CPR and Post-Shock Care

Power On AED (UC1)

Primary Actor: Device User

Scope: AED operation
Level: User goal
Stakeholders and Interests:

- Device User: Wants to quickly and accurately power on the AED to provide life-saving treatment.
- Patient: Wants to receive prompt and effective treatment.
- AED Manufacturer: Wants their device to be reliable, easy to use, and effective in treatment.

Preconditions:

- The first responder is trained in the use of the AED.
- The first responder locates the AED.
- The first responder identifies the need for an AED.

Postconditions:

- The AED is powered on and ready for use.
- The AED has performed a self-test to ensure it's functioning properly.
- The AED provides a visual and audible indication that it is operational.

Minimal Guarantees: If the AED does not power on, the first responder will attempt troubleshooting.
Success Guarantees: The AED is powered on and ready for use.
Trigger: The need for an AED is identified.

Main Success Scenario:

1. The first responder presses the power button on the AED.
2. The AED powers on and begins to give audio instructions for use.
3. The AED performs a self-test to ensure it's functioning properly.
4. The AED provides a visual and audible indication that it is operational.

Extensions:

1a. The AED does not power on:
1a1. The device user checks the battery installation.
1a2. The device user replaces the battery if necessary.

Power Off AED (UC2)
Primary Actor: Device User
Scope: AED operation
Level: User goal
Stakeholders and Interests:
- Device User: Wants to safely shut down the AED when it's no longer needed.

Preconditions:
- The AED is currently powered on.
- No immediate medical emergency is occurring.

Postconditions:
- The AED is powered off.
- No further instructions or feedback are provided by the AED.

Minimal Guarantees: The user can attempt shutdown, and if it fails, troubleshooting or support is sought.
Success Guarantees: The AED is safely powered off.
Trigger: The user determines the AED is no longer needed.

Main Success Scenario:
1. The user holds down the power button to initiate shutdown.
2. The AED powers off.

Extensions:
1a. If the AED does not power off:
1a1. The user is prompted to check if an emergency procedure is in progress.
1a2. The user consults the manual for troubleshooting steps or contacts support.

Cardiac Arrhythmia Detection (UC3)
Primary actor: Device User
Scope: AED cardiac function monitoring
Level: User goal
Stakeholders and Interests:
- Device User: Wants to detect and respond to cardiac arrhythmias accurately.

Preconditions:

- The AED is powered on.
- All self-tests are complete.
- The AED is in good physical condition.
- Electrodes are properly connected.

Postconditions:

- The patient's heart rhythm is analyzed.
- A determination is made whether a shock is needed.

Minimal Guarantees: The AED attempts to read the patient's heart rhythm and suggest treatment.
Success Guarantees: The patient's heart rhythm is analyzed, and a shock is advised if needed.
Trigger: The patient requires cardiac assessment.

Main Success Scenario:

1. Electrodes are placed on the patient as per instructions.
2. The heart rate is measured and arrhythmia is detected.
3. The AED advises a shock or other intervention.

Extensions:

1a. If the user struggles with instructions:
    1a1. The AED repeats instructions and provides visual aids.
31. If a non-shockable rhythm is detected:
    31a. The AED advises to monitor the patient or start CPR.

Real-Time CPR Feedback (UC4)

Primary Actor: Device User
Scope: AED operation during CPR
Level: User goal
Stakeholders and Interests:

- Device User: Needs immediate feedback on CPR performance to enhance effectiveness.

Preconditions:

- CPR is required to be performed on the patient.
- The AED simulation is operational and capable of providing CPR feedback.

Postconditions:

- Feedback on CPR performance is provided.

Minimal Guarantees: Basic feedback on CPR performance is provided, even if the system malfunctions.
Success Guarantees: Accurate, real-time feedback is given, improving CPR quality.
Trigger: CPR is initiated on the patient.

Main Success Scenarios:

1. The user performs CPR on the patient.
2. The AED monitors and provides feedback.
3. The user adjusts CPR technique accordingly.

Extensions:

1a. CPR feedback system malfunctions:

1a1. The user is prompted to continue CPR based on training.

2a. Feedback indicates incorrect CPR:

2a1. The AED provides corrective prompts.

Shock Delivery (UC5)

Primary Actor: Device User
Scope: AED shock delivery system
Level: User goal
Stakeholders and Interests:

- Device User: Needs to deliver shocks safely when indicated.

Preconditions:

- The AED simulation is operational.
- A shockable heart rhythm has been detected.

Postconditions:

- The AED prompts the user to deliver a shock.
- The user delivers a shock.
- Post-shock instructions are provided.

Minimal Guarantees: The AED attempts to deliver a shock, with safety as a priority.
Success Guarantees: The shock is delivered successfully.
Trigger: A shockable heart rhythm is detected.

Main Success Scenarios:

1. The user is prompted to press the shock button.
2. A shock is delivered to the patient.

Extensions:

1a. AED fails to deliver shock:

1a1. The user checks connections and battery, and reattempts.

CPR and Post-shock care (UC6)

Primary actor: Device user

Daniel Kolawole

Scope: AED operation post-shock
Level: User goal
Stakeholders and Interests:

- Device User: Wants to provide comprehensive care after a shock is delivered.

Precondition:

- The AED is powered on and functional.
- Electrodes are properly connected.

Minimal Guarantees: The AED provides guidance for post-shock care.
Success Guarantees: The patient receives continuous care post-shock.
Trigger: A shock has been delivered.

Minimal guarantee: The AED should successfully read the patients heart rhythm and issue the necessary amount of shock in order to help the patient, the AED also administers the appropriate shock level to the patient based on their condition

Main Success Scenario:

1. The user follows the AED's instructions for post-shock care.
2. The user performs CPR if needed and continues to monitor the patient.

Extensions:

1a. Multiple shocks are required:

1a1. The user performs CPR between shocks.

Use Case Diagram

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