Use Case:

Use Case 1: Operate the AED Plus
Primary Actor: User
Scope: Public space (e.g. airport, shopping mall)
Level: User goal
Stakeholder & Interests:

- User: wants to effectively use the AED Plus device in a cardiac emergency to save or improve the chances of saving a person's life
- Patient: needs immediate medical intervention

Precondition:

- The AED Plus device is installed and functional in the public space.
- Cardiac emergency occurs

Success Guarantee: The user can successfully use the AED Plus to respond to a cardiac emergency.

Main Success Scenario:

1. The user turns on the AED Plus by pressing the 'ON' button (Use Case 6).
2. The AED Plus initiates a self-test to ensure it's working properly, and provide a visual and audible indication that it is operational. (Use Case 4)
3. The AED Plus prompts the user to place the pad to the patient.
4. The AED Plus monitors the patient's heart rhythm through the electrodes to determine if a shockable rhythm is present and displays the ecg waveform (Use Case 8).
5. The user delivers the shock by pressing the shock button if there is a shockable rhythm detected (Use Case 5).
6. The AED Plus provides voice and visual prompts to help the user perform actions like when to perform CPR and when to stand clear during defibrillation.
7. The AED Plus provides real-time feedback on the quality and rate of chest compressions during CPR.(Use Case 3)
8. The AED Plus continues to monitor the heart rhythm and provides further shocks or CPR instructions if needed (goes back to step 4).

Extensions:
2a. The battery level of the AED Plus is at 0%.
    2a1. The AED Plus does not turn on.
2b. The battery level of the AED Plus is below 20%.
    2b1. It detects the low battery condition and provides the user with a visual prompt alerting them of the low battery condition.
3a. The unresponsive person is an adult.
    3a1. The bystander/user will use the adhesive electrode pads labeled 'Adult Pads'.
3b. The unresponsive person is a child.
    3b1. The bystander/user will use the adhesive electrode pads labeled 'Child Pads'.
3c. The 'On' button is turned off or the electrodes are disconnected from the victim for an extended period of time
    4b1. The AED Plus is turned off.
4a. The AED Plus does not detect electrical activity from the patient, and the patient has flatlined
    4a1. The AED Plus does not work (stops its operation)
4b. The AED Plus detects healthy rhythm

4b1. The AED Plus stops its operation

4c. The unresponsive person is being contacted when the AED Plus is detecting

4c1. The AED provides inaccurate results

6a. The AED Plus detects no shockable rhythm.

6a1. The AED prevents accidental shocks (Use Case 2)

6a2. The AED guides the user on starting CPR until medical services arrive.

11a. The AED detects a non-shockable rhythm and advises against shocking.

11a1. It continues to provide CPR instructions until medical services arrive.

11b. The AED detects need for additional shocks.

11b1. It guides the user through the process until the unresponsive person's normal heart rhythm is restored.

Related information:

1. Use case can be ended anytime when user stops using it and clicks 'ON' button again (Use Case 7), or when the AED Plus' remaining battery drops to 0
2. Use case can also be ended if the electrode is disconnected during any time of the operation.
3. Once the electrode is connected with the AED Plus, the user cannot change the pad.
4. The battery of the AED Plus is not consumed when it is turned on, it is only consumed when the AED Plus passed the self test and gives instructions

Use Case 2: Prevents accidental shocks

Primary Actor: The AED Plus

Scope: The AED Plus

Level: Subfunction

Stakeholder & Interests:

- The AED Plus: wants to prevent accidental shocks that can cause harmful results to the patient
- Patient: needs to receive correct medical treatment

Precondition:

The AED Plus detects no shockable rhythm.

Success Guarantee:

The AED Plus successfully prevents an accidental shock from happening

Main Success Scenario:

1. The AED Plus disables its shock feature
2. The AED Plus plays an audio message informing the user that shocks are not required.

Extensions:

Use Case 3:Provides real-time feedback on CPR

Primary Actor: The AED Plus

Scope: The AED Plus

Level: Subfunction

Stakeholder & Interests:

- The AED Plus: wants to provide real time feedback on the quality and rate of chest compression during CPR
- User: wants to receive real time feedback on the quality and rate of chest compression during CPR

Precondition:

The AED Plus is in CPR period

Success Guarantee:
The AED Plus provides precise real time feedback to the chest compression during CPR

Main Success Scenario:

1. The AED Plus prompts the rescuer to provide CPR compressions
2. The AED Plus detects CPR compressions delivered by rescuer
3. The AED Plus provides feedback on the CPR compression, and also displays the compression depth on the LCD screen
4. The AED Plus prompts the rescuer to stop CPR

Extensions:

2a. No CPR compressions more than at least ¾ of an inch are detected during CPR periods
2a1. The AED Plus periodically re-issues the CONTINUE CPR prompt
2b. The electrode pad is detached when the user is performing CPR
2b1. The AED Plus does not detect any compression
3a. The AED Plus detects adult pad and determines that compression depth is consistently less than 2 inches
3a1. a PUSH HARDER prompt will be issued
3b. The AED Plus detects the compression at least 2 inches deep after the PUSH HARDER prompt
3b1. a GOOD PUSH prompt will be issued

Use Case 4: AED Plus performs self-test
Primary Actor: The AED Plus
Scope: The AED Plus
Level: Subfunction
Stakeholder & Interests:

- The AED Plus wants to verify unit integrity and its readiness for emergency use

Precondition: The user has turned the AED Plus on.
Success Guarantee: The AED Plus successfully **completes all the self-test**s and the user can use the AED Plus to respond to a cardiac emergency.
Main Success Scenario:

1. The AED Plus verifies that the battery usage indicator shows adequate battery capacity remaining.
2. The AED Plus verifies that the defibrillation electrodes are properly pre-connected to the device.
3. The AED Plus verifies that the ECG signal acquisition and processing electronics are functional.
4. The AED Plus verifies that the device's defibrillator electronics are functional and can charge and discharge at 200 joules.
5. The AED Plus verifies proper function of the Fully Automatic AED Plus microprocessor electronics and the integrity of its software.
6. The AED Plus verifies that CPR monitoring and compression depth detection are functional.
7. The AED Plus verifies that voice prompts are functional.
8. The AED Plus verifies that visual indicators are functional.

Use Case 5: the AED Plus gives shock to the patient
Primary Actor: the AED Plus
Scope: During the usage of the AED Plus
Level: Subfunction
Stakeholder & Interests:

- The user: wants to click the shock button
- The AED Plus: wants to deliver the shock to the patient

Precondition: The AED Plus has detected a shockable rhythm
Success Guarantee: Patient receives the shock
Main Success Scenario:

1. The AED Plus enables the shock button
2. The AED Plus gives prompt to ask user to deliver shock
3. The AED Plus waits for user to click the shock button and continues analyzing
4. The user clicks the shock button
5. Shock successfully delivered, the battery of the AED Plus is consumed and user waits for other instructions

Extensions:

3a. User unplugs the electrode or detaches the pad from the patient

3a1. The AED Plus receives flatlined or no signal and stops the operation

Related information:

1. The battery consumption for giving shock while using the adult pad is higher than the child pad

Use Case 6: User turns on the AED Plus
Primary Actor: User
Scope: During the usage of the AED Plus
Level: Subfunction
Stakeholder & Interests:

- The user wants to turn on the AED Plus

Precondition: There is a AED Plus for the user to use
Success Guarantee: The AED Plus is turned on
Main Success Scenario:

1. The user clicks the powerOn button
2. The AED Plus checks if the remaining battery is above 0
3. The AED Plus is turned on

Extensions:

2a. The remaining battery is 0

2a1. The AED Plus fails to turn on

Use Case 7: User turns off the AED Plus
Primary Actor: User
Scope: During the usage of the AED Plus
Level: User goal
Stakeholder & Interests:

- The user wants to turn off the AED Plus

Precondition: There is a AED Plus is turned on

Success Guarantee: The AED Plus is turned off
Main Success Scenario:

1. The user clicks the powerOn button
2. The AED Plus clears its lcd screen and also stops all current running process
3. The AED Plus is turned off

Use Case 8: The AED Plus starts analyzing
Primary Actor: The AED Plus
Scope: The AED Plus
Level: Subfunction
Stakeholder & Interests:

- The AED Plus wants to analyze the heart rhythm and gives feedback to the user using ecg waveform

Precondition: The AED Plus is operating.
Success Guarantee: The AED Plus successfully analyzes the heart rhythm and displays the ecg waveform.
Main Success Scenario:

1. The AED Plus gives voice prompts to tell the user it is analyzing
2. The AED Plus constantly updates the ecg waveform corresponds the the rhythm detected for 8 seconds

Related information:

1. If the AED Plus detects a healthy rhythm, the waveform turns to green, otherwise red

UML Use Case Diagram: