AED Use Cases

Use Case 1 (UC1) - Emergency Use of AED Plus Unit

Primary Actor: Rescuer

Level: User Goal

Stakeholders:
- Rescuer
- Patient

Precondition: There exists a workable AED Plus device in the vicinity of the patient, and there exists a rescuer to operate it. The electrode cables must be plugged in and the device must pass all self-checks.

Minimal Guarantee: Device turns on and all display / audio systems are functional.

Success Guarantee: All AED Plus operations work as intended, and its simplicity allows the rescuer to increase the odds of survivability of the patient until professionals can arrive on the scene.

Note - It can be assumed that in the main success scenario, the rescuer follows the instructions of the AED device to the letter.

Main Success Scenario:

1) Rescuer presses the AED Plus power button and turns it on **(See UC2)**
2) Unit performs a series of self tests, and displays the success of those tests visually and audibly. **(See UC4)**
3) Device emits an audio prompt stating *"STAY CALM"* and updates the display with the same message.
4) Device indicates the next step by flashing the light next to the image of a person kneeling next to the patient asking if they're okay. Device emits an audio prompt stating *"CHECK RESPONSIVENESS"* and updates the display with the same message.
5) Device indicates the next step by flashing the light next to an image of a phone and an ambulance. Device emits an audio prompt stating *"CALL FOR HELP"* and updates the display with the same message.

6) Device indicates the next step by flashing the light next to an image of the patient with the defib pads attached to their chest. Device emits an audio prompt stating *“ATTACH DEFIB PADS TO PATIENTS BARE CHEST”* and updates the display with the same message.
7) Device indicates the next step by flashing the light next to an image of a person kneeling beside the patient, but clearly away and not touching the patient. Device emits an audio prompt stating *“DON’T TOUCH PATIENT. ANALYZING”* and updates the display with the same message.
8) Analysis is completed and the device guides the user as needed based on what was found. **See extensions**.
9) Device indicates the next step by flashing the light next to an image of the patient with the defib pads still attached, and the rescuer's hands pressing on their chest. Device emits an audio prompt stating *“START CPR”* and updates the display with the same message.
10) After 2 minutes of CPR the device will emit an audio prompt stating *“STOP CPR”* and the display will be updated with the same message.
11) Device returns to the state as described in step (7). This loop from step 7 to step 11 repeats until the device is turned off or the electrodes are removed from the patient for an extended period of time (> 5 seconds).

Extensions:

1a. Batteries do not have a sufficient charge for the device to be turned on fully.
1a1. Device emits an audio prompt stating *“CHANGE BATTERIES”*.

2a. Self tests fail and the AED device acts accordingly. **(See UC4 Extensions)**

4a. Patient is conscious
4a1. In this event, the AED Device should not be used on the patient

6a. Patient is a child under the age 8 OR patient's weight is less than 55lbs.
6a1. Rescuer selects the child-sized electrodes and places them as shown in the operator guide

7a. Electrode pads are not properly placed on patient
7a1. Device emits an audio message that says *“CHECK ELECTRODE PADS”* blocking further use until pads are fixed.

8a. Analysis of the ECG has found a non-shockable rhythm.
8a1. Device emits an audio message that says *“NO SHOCK ADVISED. START*

CPR" and updates the display with the same message.

8a2. Device moves to step 9.

8b. Analysis of the ECG has found a shockable rhythm.

8b1. Central indicator "heart" light flashes. Device emits an audio message saying *"STAND CLEAR. DO NOT TOUCH PATIENT. SHOCK WILL BE DELIVERED IN THREE…TWO…ONE…"* updates the display with the same message**.**

8b2. Shock tone will sound and the shock will be delivered to the patient. The device will emit an audio message saying *"SHOCK DELIVERED"* . and updates the with the same message

8b3. After one shock, the device moves to Step 9

9a. Device detects the compressions of CPR are initially less than ¾ of an inch deep

9a1. Device emits an audio prompt stating *"CONTINUE CPR"*

9b. Device detects the compressions of CPR are consistently less than 2 inches deep

9b1. Device continuously emits an audio prompt stating *"PUSH HARDER"*.

9b2. Once rescuer has corrected their compressions, device emits an audio prompt stating *"GOOD COMPRESSIONS"*.

Use Case 2 (UC2) - Turn On AED

Primary Actor: Device User

Level: User Goal

Stakeholders:

- Rescuer
- Patient

Precondition: There exists an AED device for the user to turn on

Main Success Scenario:

1) Device user presses the "Power On" button
2) AED Device administers "Power On Self Test" **(See Use Case 4)**
3) Self Test is successful

4) AED Device remains active for use

Post-Condition: The device is turned on and begins to cycle through the functionalities as described by UC1.

Extensions:

3a. Self test is unsuccessful
3a1. AED responds accordingly **(See Use Case 4 Extensions)**

Use Case 3 (UC3) - Turn Off AED

Primary Actor: Device User

Level: User Goal

Stakeholders:
- Rescuer
- Patient

Precondition: AED device has been successfully turned on and “Power On Self Test” is successful

Main Success Scenario:

1) Device user presses the power button
2) AED Device powers down

Post-Condition: The device is turned off and battery power is no longer consumed

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Use Case 4 (UC4) - Power On Self Test

Primary Actor: AED Device

Level: Subfunction

Precondition: AED device has been successfully turned on

Main Success Scenario:

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

Postcondition: AED device powers up fully and allows further use of its main functionality

Extensions:

1a. Indicator comes back showing inadequate battery capacity remaining.
  1a1. AED Device issues a prompt stating *"CHANGE BATTERIES".*
  1a2. Status indicator window displays a red "X"

2a. Defibrillation electrodes are not properly pre-connected
  2a1. AED device issues a prompt stating *"PLUG IN CABLE"*
  2a2. Status indicator window displays a red "X"

Note - Steps 3-7 failing their verifications result in the status indicator window displaying a red "X" and further use of the device being blocked.