



MedVision

**USER
MANUAL**

Simulator PS.A.HF

Adult Patient Simulator

LEONARDO HF



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Introduction

The Adult Patient Simulator is a human patient simulator of a male adult. It was designed to meet the most difficult tasks in professional training: vital signs, realistic feel and feedback.

Features and advantages

The patient simulator is a model of a real human. The neck and arms have a realistic mobility in all their joints.

- The patient simulator has a visually and anatomically correct structure similar to the human body
- The neck has realistic mobility
- The legs are mobile in the hip and knee joints repeating the mobility of human legs joints
- The arms are mobile in the shoulder joints repeating the mobility of human arms joints
- The skin of the patient simulator is soft, elastic and realistic in appearance and feel
- Blinking is programmable and depends on the state of consciousness being simulated at the moment
- Pupils automatically react to the light and reflect the current state of consciousness (being simulated at the moment)

- IO and IV injection simulation (automatic injected drug and dose recognition)
 - Noise/sound imitation:
 - Lung auscultation
 - Unilaterally configurable breathing sounds
 - Heart sounds auscultation
 - The simulator can produce sounds that mimic cough, cry and normal breathing
 - Imitation of the cardiovascular system which consists of a cardiovascular system computer model
 - The system automatically calculates the dependent variables (blood pressure and heart rate) in response to changes in patient condition (bleeding and intravenous infusion):
 - Imitation of bilateral pulse palpation on the carotid, brachial, radial, femoral, popliteal, posterior tibial and dorsalis pedis arteries
 - Pulse is activated when palpated
 - Imitation of the respiratory system, airway and thorax:
 - Spontaneous breathing imitation
 - Airway (mouth, oral pharynx, larynx, esophagus and trachea) imitation
 - Ventilation of either lung generates automatic chest rise
-

Introduction

- Lung ventilation with BVM or restored spontaneous breathing imitation returns the simulator to normal respiratory rate
 - Imitation of difficult airway for intubation
 - Tongue Edema imitation
 - CPR features detailed assessment:
 - Compression depth
 - Compression rate
 - Hand positioning
 - Decompression
 - Ventilation - volume and frequency
 - Defibrillator discharge
 - Defibrillator pads position
 - True-to-life bedside monitor:
 - Ability to set graphs, scale and alarms
 - ECG printing out and defibrillation
 - Imitation of drug administration and test results display
 - The stomach designed based on real patient data
 - Esophageal intubation with abdominal distension
 - The heart designed based on real patient data
-

- Heart auscultation is performed in five points: aortic valve, pulmonary valve, tricuspidal valve, mitral valve and secondary aortic area

1 Setting Up

1.1 Simulator charge

- Connect the adapter cord to the simulator charger.



Figure 1.1 Charger assembly

- Remove the silicone pad on the left shoulder of the simulator.
- Insert the charger plug into the slot under the power button and turn the plug clockwise until it clicks

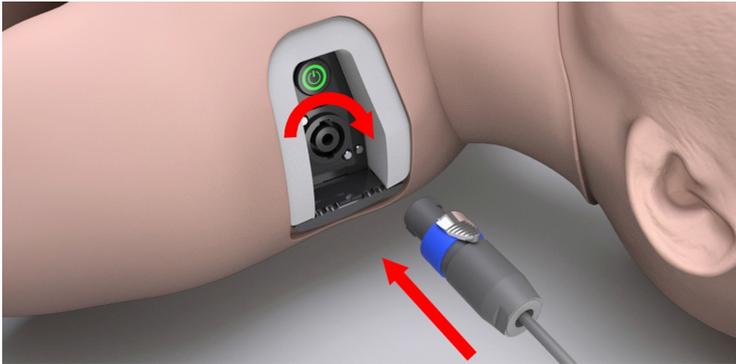


Figure 1.2

- Plug the charger into a power outlet (220 V)
- Wait until the simulator is fully charged (may take up to six hours)
- Running time is 4 hours

1.2 Smartscope charging

- Take a smartscope
- Insert the charger connector into the charging port of the device (Figure 1.3);

1 SETTING UP



Figure 1.3 Power connector

- Plug the charger into a power outlet (220 V)
- Wait until the smartscope is fully charged (may take up to 3 hours)
- The smartscope running time is 5 hours, and up to 8 hours in the standby mode

The LED located opposite to the port is used as a charge indicator (Figure 1.4). During charging, the LED indicator is blinking red. As soon as the battery charging is complete the LED stops blinking and turns off.



Figure 1.4 Charging indicator

1.3 Defibrillator/ECG charging

- Take a unit (Defibrillator/ECG) (Figure 1.5);



Figure 1.5 Defibrillator/ECG units

- Insert the charger connector into the charging port of the device (Figure 1.6);



Figure 1.6 Power connector

- Plug the charger into a power outlet (220 V)
- Wait until the simulator is fully charged (may take up to 3 hours)
- Running time is 8 hours

The **Power** LED is used as a charge indicator. While the unit battery is charging, the Power LED will be blinking green. As soon as the battery charging is complete the Power LED stops blinking and turns off.

1.4 Attaching limb modules (trauma)

- Find a small hole located on the back of the thigh (for a leg) or shoulder (for an arm)
 - Insert any narrow long object such, e.g. a ballpoint pen, into the hole and press the button located inside (until it clicks)
 - Gently pull the detachable limb to allow access to the connecting cables
 - Disconnect interface connections `figref Leg` and carefully remove the limb module from the internal fix
-

1 SETTING UP

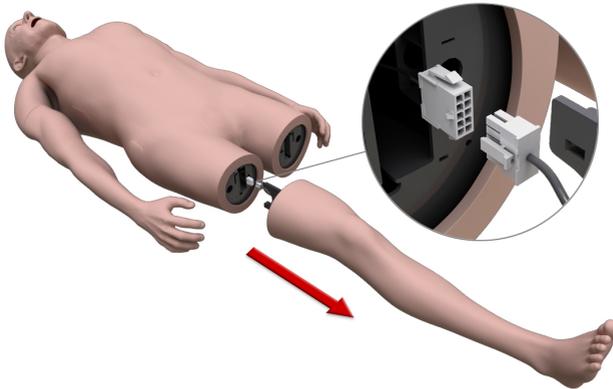


Figure 1.7 Detaching limbs (leg)

- Take the trauma module `figref LegConnect` of the required limb
- Position the limb module following the internal mounting guides
- Connect the interface connections

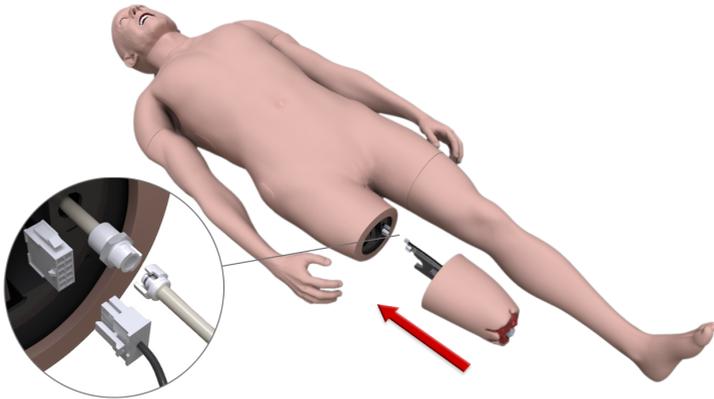


Figure 1.8 Attaching trauma modules

- Carefully, to prevent damage to the connections, push the limb module all the way.

1 SETTING UP

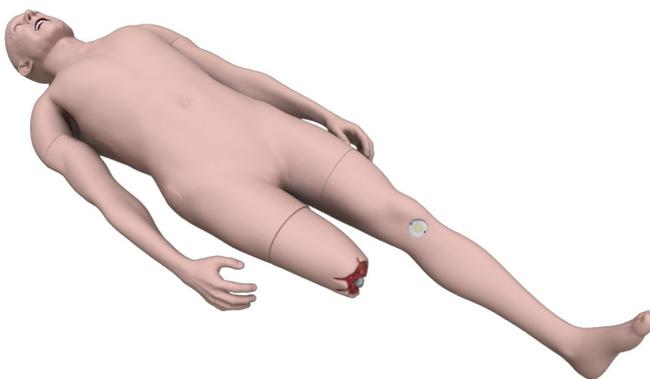


Figure 1.9 Trauma module

Note: The trauma module is optional. Please check for the trauma module subject to the List of Equipment.

1.5 Fillin in secretion fluid

- Remove the pad on the right (left — for blood) side of the simulator
- Insert the hose into the «water in» port
- Connect the air hose (red) to the «air out» port and turn the lock clockwise
- Insert the excess fluid bottle hose to the outlet port

- Half-open the bottle for excess fluid and keep the bottle of filling fluid tightly closed
- Turn on the switch next to the ports
- Wait until bubble-free water flows through the hose of the bottle for excess liquid, and turn off the switch
- After turning off the switch, without waiting for the liquid to stop moving through the hose, disconnect the excess fluid bottle hose. Then disconnect the air hose and the fill hose.

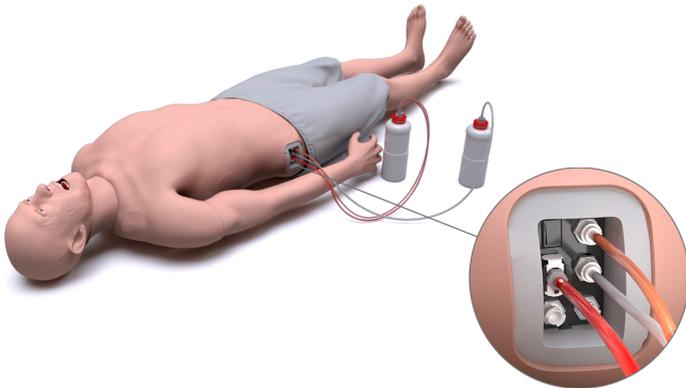


Figure 1.10 Connecting fill bottles

The artificial blood tank is on the left side of the body, and the urine, tear, saliva and sweat tank is on the right side of the body.

1 SETTING UP

Warning: To fill the urine, tear, saliva and sweat tank, you can use **distilled water** only.

The optimal volume of secretion liquid is 0.6 litres.

1.6 IO injections access unit change

- Remove the silicone bandage located just below the left knee
- Using the key from the service kit, turn the IO injection access unit counterclockwise so that the upper part of the unit is against the foot (Figure 1.11);



Figure 1.11 IO injection access unit removing

- Remove the used IO injection access unit.
 - Use a new IO injection access unit.
-

- Insert the new IO injection access unit into the port. Make sure the upper part of the IO injection access unit is against the foot

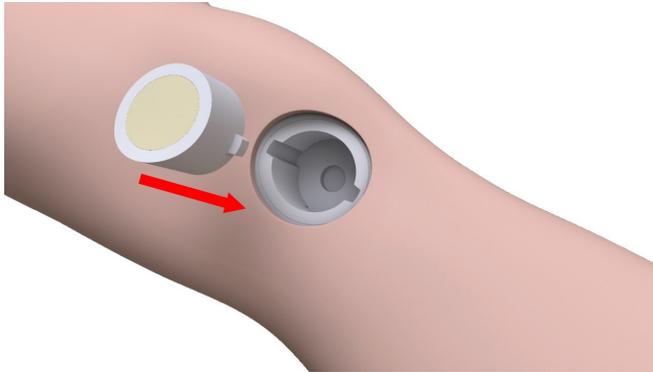


Figure 1.12 Placing a new IO injection access unit

- Using the key from the service kit, turn the IO injection access unit clockwise so that the upper part of the unit is against the thigh

2 Start-up

2.1 Start-up sequence

- Unpack the main components of the simulator and put them on the table
- Plug the Wi-Fi router and all-in-one PC (bedside monitor) into a power outlet (220 V)
- Press the power button (Power) on the router (the power button location depends on the router model). Wait for the router to load (about 1-2 minutes)
- Press the power button on the instructor's tablet. Wait for the Simulation Center software to launch (about 1-2 minutes)
- Press the power button on the left shoulder of the simulator (Figure 2.1)

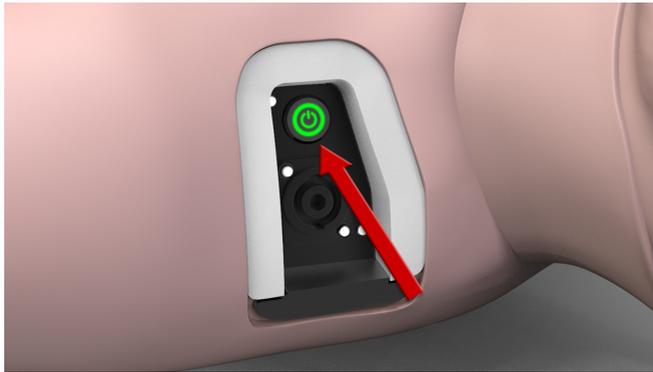


Figure 2.1 Power button

If the Simulation Center software did not launch automatically, launch it manually by double clicking on the icon located on the tablet desktop.

2.2 Wi-Fi router setting up and connecting

- Find and right click on the WiFi icon  in the bottom right-hand corner of the control panel, select **Wi-Fi** in the bottom right-hand corner of the control panel, select Network and Sharing Center (Figure 2.2) and left click on it

2 START-UP

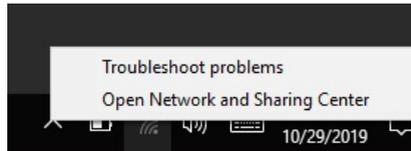


Figure 2.2 Rightclick menu

- In the Network and Sharing Center, select “Change adapter settings” (Figure 2.3) by left clicking on it

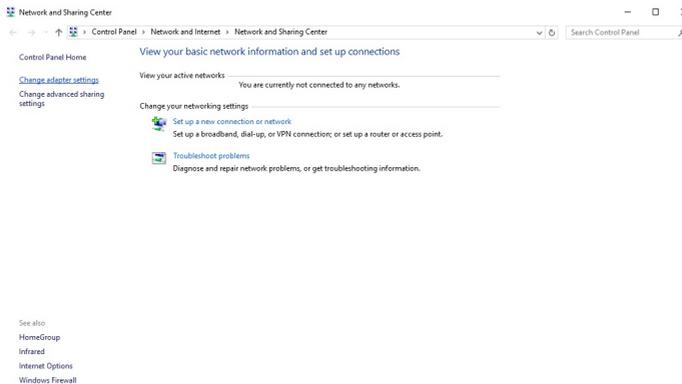


Figure 2.3 Network and Sharing Center

- Right click on the active Wi-Fi adapter (Figure 2.4), connected to the tablet (USB Wi-Fi adapter) and select Properties

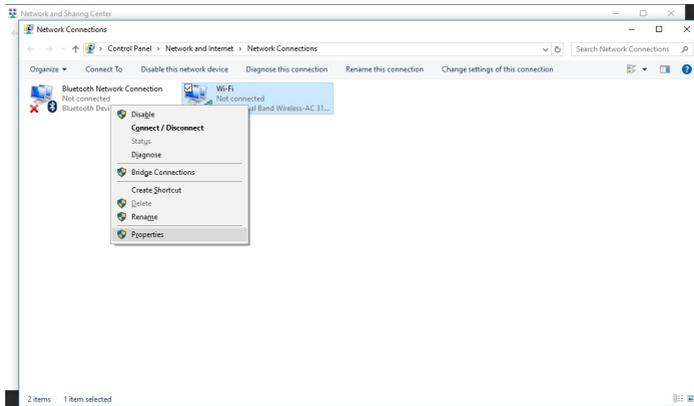


Figure 2.4 Network connection

2 START-UP

- In the Wireless Network Properties (Figure 2.5), left click on Internet Protocol Version (TCP/IP4)

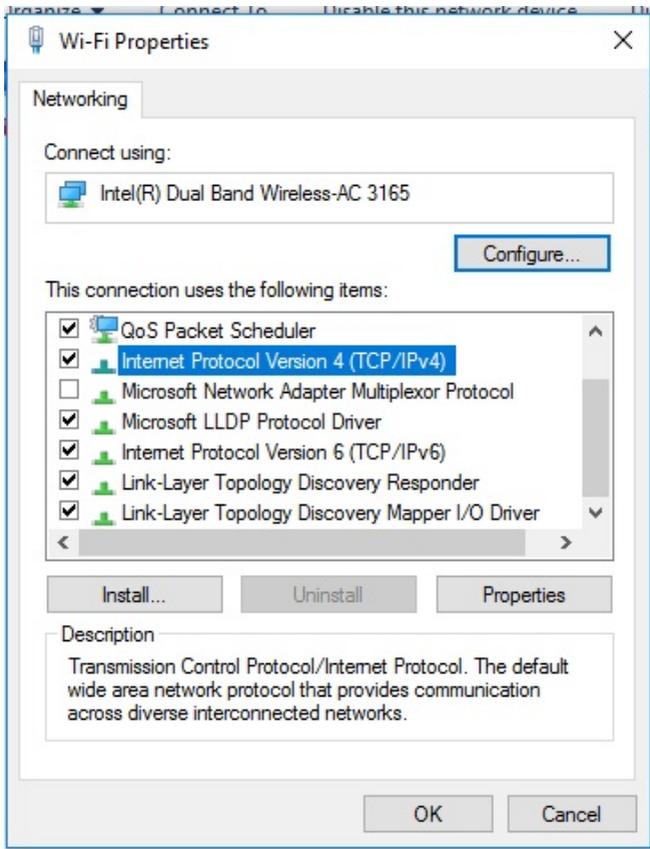


Figure 2.5 Wireless Network Properties

- Enter a static IP address in the Internet Protocol Version (TCP/IPv4) box (Figure 2.6) and click OK

The screenshot shows the 'Internet Protocol Version 4 (TCP/IPv4) Properties' dialog box with the 'General' tab selected. The dialog contains the following elements:

- Title Bar:** 'Internet Protocol Version 4 (TCP/IPv4) Properties' and a close button (X).
- General Tab:** A tab labeled 'General'.
- Introductory Text:** 'You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.'
- IP Address Selection:** Two radio buttons: 'Obtain an IP address automatically' (unselected) and 'Use the following IP address:' (selected).
- IP Address Fields:** Three text boxes for 'IP address:', 'Subnet mask:', and 'Default gateway:'. The IP address field contains '192 . 168 . 5 . 69', the Subnet mask field contains '255 . 255 . 255 . 0', and the Default gateway field contains three dots.
- DNS Server Selection:** Two radio buttons: 'Obtain DNS server address automatically' (unselected) and 'Use the following DNS server addresses:' (selected).
- DNS Server Fields:** Two text boxes for 'Preferred DNS server:' and 'Alternate DNS server:', both containing three dots.
- Validation:** A checkbox labeled 'Validate settings upon exit' which is unchecked.
- Buttons:** 'Advanced...' (disabled), 'OK' (highlighted with a blue border), and 'Cancel' (disabled).

Figure 2.6 Properties: Internet Protocol Version (TCP/IPv4)

2.3 Connecting the Defibrillator/ECG unit

To connect the Defibrillator/ECG unit:

- Insert the charger connectors into the charging port of the device (Figure 1.6)
- Press the switch button  on the Defibrillator/ECG unit
- After the Power indicator turns on, wait for the units to start up (takes about one minute)



Figure 2.7 The Defibrillator/ECG units' switch button, running indicators and the charging port

- Check the units' connection status in the software (the Connections section in the Instructor software) (Figure 2.8). If the connection is successful, the icon will be marked green

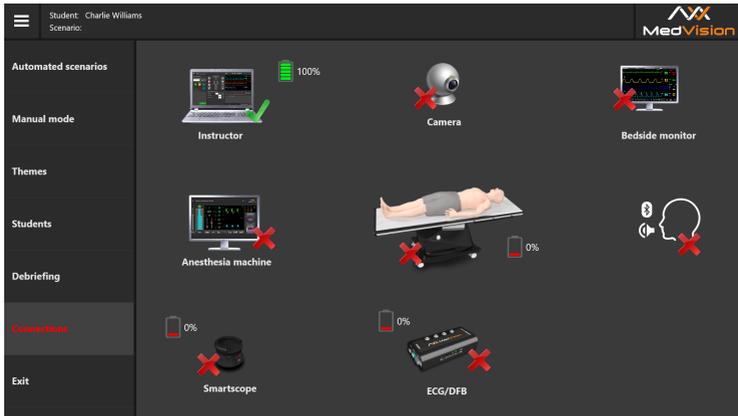


Figure 2.8 Connected units' indication in the Connections section in the Instructor software

2 START-UP

- Connect the defibrillator electrodes to the unit using the cable (Figure 2.9)



Figure 2.9 Connecting the defibrillator electrodes to the unit

- Connect the defibrillator monitor cable to the unit (Figure 2.10)



Figure 2.10 Connecting the defibrillator to the unit

2 START-UP

- Connect the defibrillator display cable pinch grabbers to the unit (Figure 2.11)

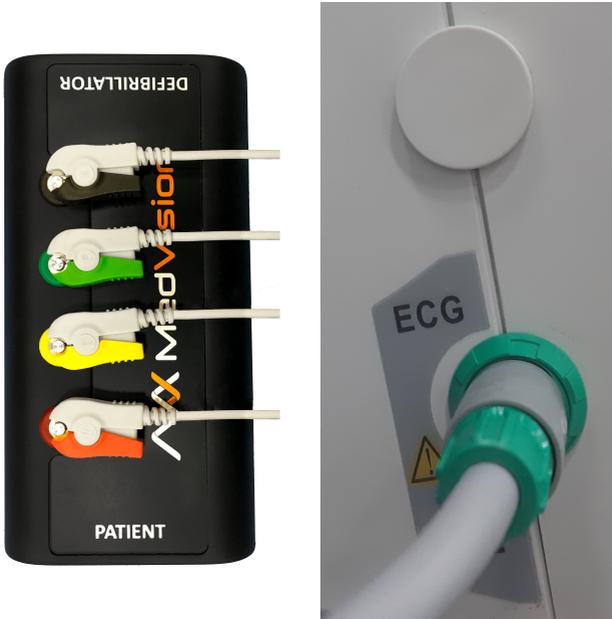


Figure 2.11 Connecting the monitor to the unit

- After you finish all the above steps, it is recommended to connect the ECG electrode cable (Figure 2.12).



Figure 2.12 Connecting the ECG electrode cable

2 START-UP

It is recommended to use AXION Defibrillator (Figure 2.13).



Figure 2.13 AXION Defibrillator

2.4 Connecting SpO2 probe

A pulse oximeter is a device used to measure the heart rate (HR) and monitor a person's oxygen saturation. Take the SpO2 cable and connect it to the ECG Monitor Adapter. Then position the SpO2 probe on the finger of the patient simulator as shown below.



Figure 2.14 Connecting SpO2 probe

2.5 Turning on the smartscope

- Do a short press on the power button once. The power button is located on the opposite side of the charging port
- Wait until the smartscope is ready (takes about a minute)

2 START-UP

- Check the smartscope's connection status in the software (the Connections section in the Instructor software)



Figure 2.15 The smartscope power button

2.6 Switching on the all-in-one PC (bedside monitor)

- Press the power button on the bedside monitor (the power button location depends on the bedside monitor model)
- Wait for the bedside monitor software to launch (about 1-2 minutes)
- Check the bedside monitor connection status in the software (the Connections section in the Instructor software)

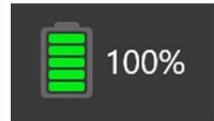
If the bedside monitor did not launched automatically, go to **Settings-> Network & Internet** and check for connections to the Wi-Fi network of the simulator. If there are no problems with Wi-Fi connection, disable the firewall of the all-in-one PC and the instructor's laptop and restart the devices.



Icon of the **connected** unit



Icon of the **disconnected** unit



Battery level indicator

2.7 Connections

The Connections menu shows all available and active connections of the system components. Active connections are marked green, disabled connections are marked red.

2 START-UP

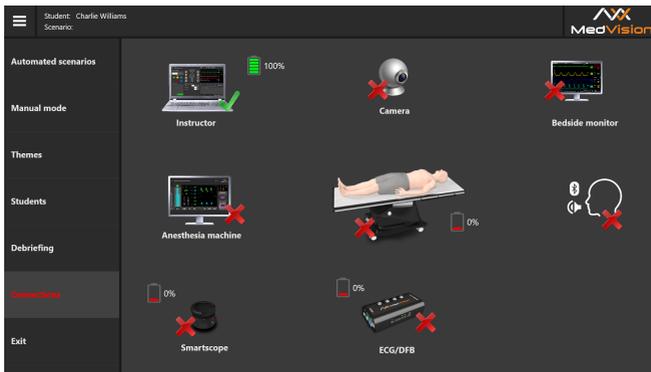


Figure 2.16 The Connections tab in the Instructor Software

3 Scenario Constructor

The **Scenario Constructor Software** is used to create new training scenarios or edit the existing ones. To **start** running the Scenario Constructor:

- Turn on the instructor tablet
- Wait for the Simulation Center software to launch
- In the Scenario Constructor Software, launch the Scenario Constructor software

3.1 The Scenario Constructor control bar

The control bar is at the top of the window. The following functions are available:

- **New.** To create a new scenario
 - **Open.** To open an available scenario.
 - **Save.** To save changes
 - **Save As.** To save changes (with confirmation request)
 - **Actions.** To open the library of actions that may be added to a scenario
-

3 SCENARIO CONSTRUCTOR

- **Scenario info.** To open/close the scenario general information (in the right part of the screen)
- **Configuration.** To display information on the current software version and to change the interface language.



Figure 3.1 The Scenario Constructor control bar

To **close** the Scenario Constructor and return to the Simulation Center, click on  in the upper right corner.

3.2 Creating new scenario

To create a new training scenario, tap the **New** button. In the pop-up dialog box, enter the scenario name, select one of the three available modes (Automated Scenarios, Manual mode or Themes), enter the name of the group the new scenario will be assigned to and select the patient type (adult, junior, baby). Tap **OK** to confirm the action. After that, the main menu of the scenario constructor will open.

3.3 General procedure for creating a new scenario

The general procedure for creating a new scenario or editing the existing one:

- Turn on the instructor tablet
- Wait for the Simulation Center software to launch
- In the Simulation Center software, launch the Scenario Constructor software
- Tap the New or Open buttons
- **To create a new scenario**, enter the scenario name, select the patient type, enter the group name and scenario type
- Fill in the general scenario data
- Set the initial state of the patient, i.e. the first stage of the scenario
- Add and set the necessary number of states (scenario stages).
- Tap Save or Save As to finish the creation process.

3.4 Editing and setting the scenario

To edit, configure or add a scenario, tap the  button and follow the instructions on the screen. When you tap **Scenario Info** on the

3 SCENARIO CONSTRUCTOR

control panel at the top of the window, a field with **general information about the scenario** — is displayed. The information contains a brief description, patient data, medical history, major learning objectives, etc.

The patient states (scenario stages) are shown in the black field of the screen. All connections and triggers are also displayed there. At the bottom, you can see **Add new state**. If you tap it, a new patient state will be created.

The scenario general information includes:

- **Scenario name.** Displays the current name of the created/edited scenario. May be edited
- **Scenario description** Gives a brief description of the scenario, which will be displayed in the main menu after the scenario has been selected. To add/delete/edit the description, use the field under the Scenario description
- **Patient data.** Gives information on the patient: image (optional), name, age, gender, weight and height.

The patient data can be edited. To do this tap the  button next to **Patient data** and make changes in the dialog box that opens. To change the patient's image, use the same dialog box and tap. Choose image and select a photo/image from the root folder. Tap **OK** to confirm the action.

- **Case history** Describes the medical history of the patient for a particular scenario. To add, delete or edit the text, tap the square button next to the Case history field and enter the text in the window that opens.
- **Learning objectives.** Shows major objectives of the scenario being created/edited. To add/delete/ change the objectives, tap the square button located next to Learning objectives and edit data in the pop-up dialog box. Tap “+” to add a new objective and “-” to delete an objective. Press OK to save changes.
- **Additional data.** Contains data on additional instructor materials that can be added to the scenario.

3.5 Configuring scenario stages

The first stage (initial state) is created automatically. To add new states, tap **Add new state**. To configure/edit the stage, tap the button  in the upper right corner.

The menu has the following sections:

- **State name** The default name of the patient state
- **Short description.** A brief description of the state currently being edited

3 SCENARIO CONSTRUCTOR

- **Vital signs.** The patient's vital signs to be displayed on the all-in-one PC. To set a vital sign, select it from the general field and follow the instructions in the pop-up dialog box
- **Patient state menu.** Select one of the icons around the patient body and make necessary settings in the pop-up dialog box. All actions will be displayed in the box on the right
- **Next state.** Selecting the next state (following the current state)

When selecting **the next state**, the following settings become available:

- **Transition time to next state** The time needed to shift from the previous to the current state
- **Transition curve.** Describes transition from the current to the next state. There are two transition modes: abrupt (with immediate changes) and linear (with gradual changes).

Tap the **OK** button to finish configuring the stage. Tap the **Cancel** button to discard the changes made. To save the created stage to be further used in other scenarios, tap the **Save**, enter the file name in the dialog box, select a folder and confirm your action. To make the created stage available for downloading in the program, do the following:

- Select any stage for editing
-

- Tap the  icon in the upper right corner
- Tap the **Load** button in the new menu

3.6 Triggers

To configure the sequence of the scenario stages, you can use the **Add a new state** button. Tap the first state and, pressing and holding the mouse key (sliding your finger across the touch screen), draw a line to the second (required) state.

To configure an action, tap the  icon in the upper right corner.

To add an action necessary to activate the transition from one stage to another, tap **Add**. After that, the library of available actions opens.

You can use a shorter list, if selecting one or several categories. To do this, open a drop-down menu (the upper right corner) and tick the necessary categories. Find a necessary action from the list and tap **OK**. Tap **Cancel** to discard the changes.

To search for an action by its name(s), enter the name of the desired action in the field next to the category drop-down menu and select the desired action from the search results. In addition, you can create new actions marked as **User actions**. When running a pre-set scenario, the instructor should mark them manually.

One trigger can contain several actions (sequence). Subsequent actions (following the first action) are added to the sequence similarly

3 SCENARIO CONSTRUCTOR

to the first action, i.e. tap Add, then tap Select and select an action from the list. Once an action or the sequence of actions has been defined, tap **OK** to finish creating the trigger.

Warning: If the trigger includes several actions, each of them must be successfully completed.

In addition to a sequence (where all actions must be performed), you can also create several single-action triggers. In this case, any action performed will lead to the activation of the corresponding trigger and transition from one stage to another.

4 Authentication

Authentication in the Instructor Software

The Simulation Center software runs automatically after the instructor's tablet is turned on and when the simulator starts up.

After launching the Simulation Center software, go to the Instructor section. If for some reason the Simulation Center software did not start automatically, launch the software manually by clicking on the relevant icon on the desktop.

Authentication menu (Figure 4.1) will open immediately after the program starts running. To sign in and go to the main menu, enter your username/login in the User field, enter your password in the Password field and click on the Accept button.

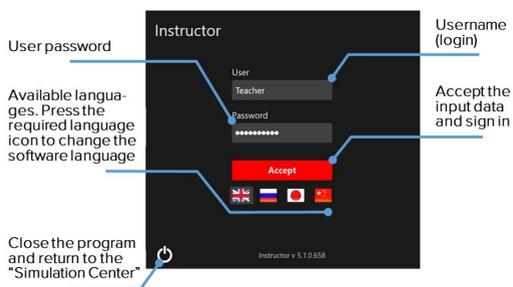


Figure 4.1 Instructor Software authentication window

4 AUTHENTICATION

In the authentication menu (Figure 4.1) you can change the software interface language. The available languages are represented as icons of flags located under the Accept button. To change the software interface language, click on the relevant flag icon.

To close the program and return to the Simulation Center, click on the exit icon (Figure 4.1) located in the bottom left-hand corner of the authentication window.

5 Instructor Software main menu

To open the Instructor software sections list, click on .

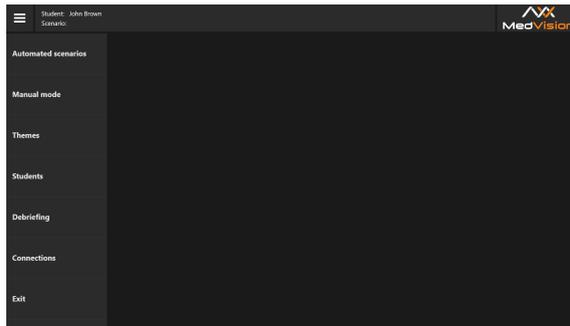


Figure 5.1 Instructor Software main menu

The following sections (Figure 5.1) are available in the program main menu:

- **Automated Scenarios** Contains a list of all available automatic scenarios (cannot be changed).
- **Manual mode** Contains a list of all available manually constructed scenarios (can be changed by the instructor)
- **Themes** Contains a list of available training topics (for certain skill learning and mastering).

5 INSTRUCTOR SOFTWARE MAIN MENU

- **Students** Contains a general list of students and study groups. Creating student profiles and study groups.
- **Debriefing** Contains a list and review of all completed exercises.
- **Connections** Shows the connection status of all simulator elements and battery charge levels.
- **Exit** Returns to the authentication menu.

To open a certain section, click on its name in the list. The color of the section name will change, and its main menu will be displayed on the right side of the window.



Figure 5.2 Example of a selected (A) and unselected (B) section

6 Exercise selection and launch

Training scenario tabs are found in the software main menu. **To open the tab of the required mode**, click on its name in the list. After that, the general menu will appear on the right side of the screen containing a list of all exercises available for this mode and the general information for each of the exercises.

To select an exercise from the list, click on its name. The color of the section name changes, and its information window (Figure 6.1)/(Figure 6.2) opens in the field to the right.

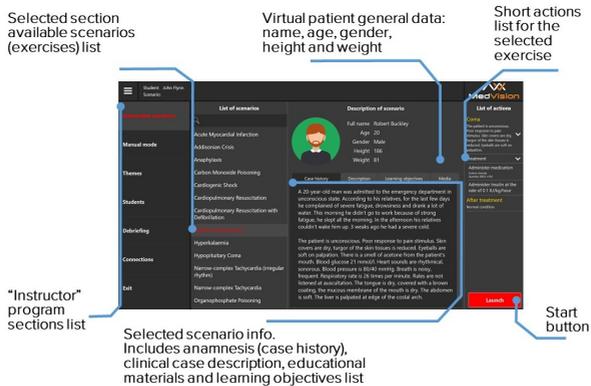


Figure 6.1 The exercise start menu for the Automated Scenarios

6 EXERCISE SELECTION AND LAUNCH

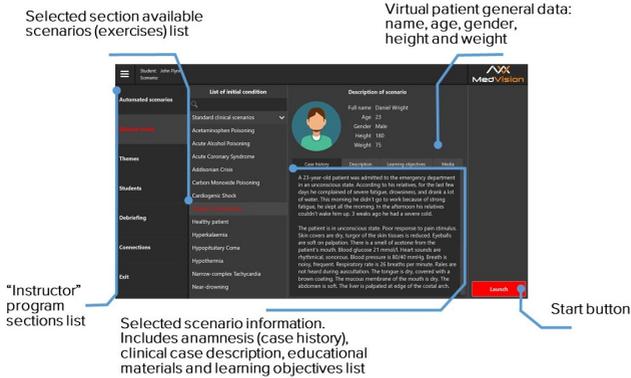


Figure 6.2 The exercise start menu for the Manual mode

The **patient data** includes:

- Name
- Age
- Sex
- Height
- Weight

Training materials include:

- **Case history:** the patient's disease/state records as at the beginning of the scenario.
- **Description:** methodological description of the disease or physical state.
- **Learning objectives:** a list of basic skills that the exercise is intended to practice.
- **Media:** extra training materials, including generally accepted diagnostic methods, a list of common symptoms and complications, risk factors, a prescribed treatment algorithm, X-rays and CT scans, laboratory tests, etc.

The exercise start menu for the Themes section (Figure ??) contains a list of available patient states for the exercises (themes) and initial data on the patient's vital signs for the selected physiological state.

6.1 Exercise selection and search

When you select one of the three available modes (Automated Scenarios, Manual mode or Themes), a list of all exercises (List of Scenarios) available for this section opens. The list of scenarios is located on the left side of the window, next to the Instructor software sections list.

6 EXERCISE SELECTION AND LAUNCH

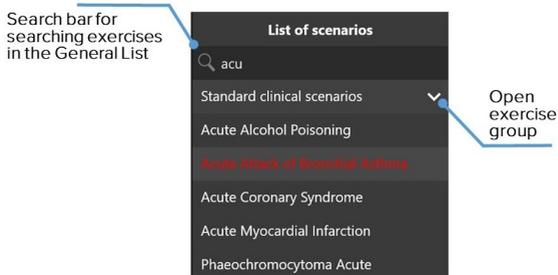


Figure 6.3 List of scenarios (example)

To select an exercise from the list, click on its name. The color of the scenario name changes, and its information window (Figure 6.1)/(Figure 6.2) opens in the field to the right.

Use a search bar located at the top of the main list to find the required exercise.  Click on the search bar and enter the name or a part of the name of the required scenario.

You can also search for exercise groups. To expand the group and open the exercise list, press the arrow  located next to the group name.

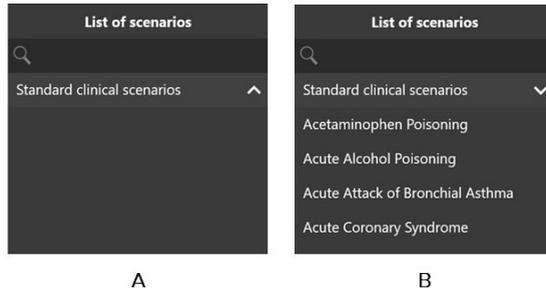


Figure 6.4 Example of a closed (A) and opened (B) group of scenarios

6.2 Start-up

To run an exercise:

- Turn on the instructor's tablet (see the Start-Up section)
- Wait for the Simulation Center Software to launch. If the Simulation Center did not start automatically, launch the program manually by clicking the icon on the desktop
- Go to the Instructor section
- Select the mode (Automated Scenarios, Manual mode or Themes)
- Select an exercise from the list

6 EXERCISE SELECTION AND LAUNCH

- Press the Start button



Figure 6.5 The Start button

- In the new window, press Start to activate the scenario
- Click on Change Parameters to re-set the initial settings of the selected scenario

7 Imitation of life processes

7.1 Simulator body

The body has realistic mobility in the spine, neck, lumbar sections and main joints. The mobility is achieved by the imitation of the **human musculoskeletal system**, which includes:

- finger bones imitation
- ulna bone imitation
- palpable ribs
- palpable shoulder blades
- palpable pelvic bones
- mobile kneecaps

In addition, the simulator provides **detailed action logging** covering the following features:

- Automatic blinking (Figure 7.1) depending on the patient physiological status (e.g. level of consciousness)

7 IMITATION OF LIFE PROCESSES



Figure 7.1 Programmable blinking

- Automatic pupillary light response reflecting the patient physiological status (Figure 7.2);



Figure 7.2 Pupillary light reflex

- Tonic and clonic convulsions
- Bendable & flexible lumbar region
- Mobility in all joints
- Head tilt angle control
- Jaw thrust control
- Automated touch-induced pupillary response
- Aschner reflex

The silicon skin of the simulator is realistic in appearance and feel. There are interchangeable models of «wounded» arms and legs to support modular training.

7.2 Respiratory system

The respiratory system of the simulator includes the entirely independent right and left lungs. As a result of ventilation of either lung the simulator automatically produces respective breathing sounds and chest rise. During spontaneous ventilation the simulator breathes with automatically controlled respiratory volume and respiratory rate maintaining eucapnia and normal oxygen saturation.

The airway (mouth, oral pharynx, larynx, esophagus and trachea) is designed based on CT scan data of real patients. This ensures that ventilation of either lung generates automatic breathing sounds and chest rise and fall.

Due to the realistic airway of the simulator, sensitivity to ventilation and intubation errors has increased (Figure 7.3). For example, if, in the course of intubation, the tube is fixed incorrectly (deeper than expected), only one lung will be ventilated, and only one side of the chest will rise.



Figure 7.3 Orotracheal intubation

7.3 Auscultation and palpation

Auscultation, anterior and posterior, includes heart, breathing, bowel and Korotkoff sounds auscultation. Breathing sounds are independent and are not generated by either lung ventilation in case of spontaneous or mechanical ventilation. Speech imitation with pre-recorded sounds includes «yes», «no», certain words, coughs and other sounds.

In addition, you can download and playback personalized sounds to produce speech and auscultation.

Lung auscultation is performed in 4 points anterior (two points in the upper lobes of the lungs and two points in the lower lobes of

7 IMITATION OF LIFE PROCESSES

the lungs). You can use the Instructor software to configure breathing sounds. Breathing sounds are independent and are not generated by either lung ventilation in case of spontaneous ventilation.

Heart sounds auscultation is performed in 5 points: aortic valve, pulmonary valve, tricuspidal valve, mitral valve and secondary aortic area. Heart sounds align with heart beats. Inefficient chest compressions lead to inadequate cardiac output and negative changes in the patient physiological status.

The pulse is activated when palpated at the corresponding points, minimum 10: bilateral carotid , radial, popliteal, femoral, brachial, radial artery (Figure 7.5), tibial arteries and spinal artery. The pulse strength depends on the physiological state of the patient, which can be changed, including in the software.



Figure 7.4 Radial pulse palpation



Figure 7.5 Pulse palpation

7.4 Secretion

The secretion of fluids includes imitation of sweat on the forehead (diaphoresis), imitation of tears, imitation of discharge from ears and mouth and imitation of urine and bleeding. Secretion configuration is available to indicate the symptoms of various pre-set diseases.

The secretion fluid is stored in tanks located on both sides of the body in the pelvic area.

The tank on the right side is used to store blood, on the left side - for everything else.

7 IMITATION OF LIFE PROCESSES

7.4.1 Tank

To fill in the secretion fluid tank, do the following:

- Turn off the patient simulator. Disconnect it from the charger, if necessary
- Find the tab on the left or right side of the body
- Gently remove the tab to have access to the filling holes and the air-out hole
- Connect the bottle hose with the filling hole
- Connect the smaller diameter hose to the air-out hole
- Keep the bottle in the position above the patient simulator body and gently squeeze it to let the tank be filled with artificial blood*/ water (to imitate tears, urine, etc.)

* Artificial blood is not included into the List of Equipment.

7.5 IO and IV injections

Simulation of **intravenous injections** (Figure 7.6) is performed through a special module (catheter imitator) located on the inside of the right arm. To do this, special syringe imitators are used.



Figure 7.6 Simulation of intravenous injections

To simulate an injection, select one of the syringe imitators (with necessary medicine), pull the plunger back to the line for the dose. Then insert the syringe into the catheter imitator and push the plunger. The system automatically detects the type and quantity of the administered medicine.

Simulation of **intraosseous injections** is performed through a special module (catheter imitator) located on the inner side of the left leg knee. To do this, a special syringe imitator is used along with a real needle. The silicone skin at the injection site can be replaced easily without having to replace the skin for the entire leg.

7.6 Defibrillation and ECG

According to the list of equipment, a customized defibrillator or defibrillator and ECG adapters are used to perform a defibrillation and ECG:

- If a customized DFB unit is used, the charge power is set on the front panel of the customized defibrillator. In order to avoid overheating of the defibrillator sensors, defibrillation should be performed no more than twice a minute with an interval of less than 30 seconds (Figure 8.20). ECG data is read from electrodes (Figure 7.7) located at certain points on the patient's chest and can be printed out using the customized defibrillator;
- If the DFB unit is used, the power and the number of charges are set in the instructor software in the CPR field. ECG data is read from electrodes located at specific points on the patient's chest and displayed on the bedside monitor.



Figure 7.7 ECG monitoring

8 Exercise menu

8.1 Automated scenarios. List of actions

The main distinctive feature of the **Automated Scenarios** section is a pre-installed, invariable sequence of actions and the virtual patient's vital signs.

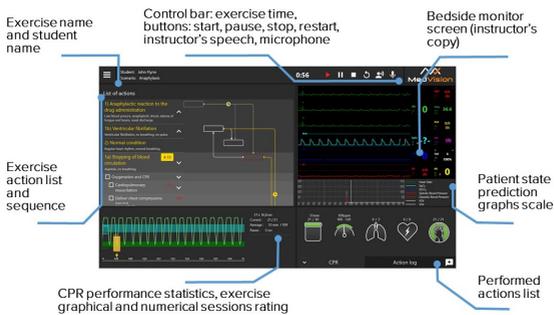


Figure 8.1 The Automated Scenarios simulation menu

The list of the patient's conditions and basic actions (Figure 8.2) to be performed to successfully complete the exercise is located on the left side of the screen.

There is certain timing for the actions indicated next to the patient's state definition. An action or a specific sequence of actions must be completed by the timer is reset.

If the action or the sequence of actions is not completed within a specified period of time, they are considered to be failed and, depending on the course of the exercise, this can also mean the death of the patient and the end of the exercise.

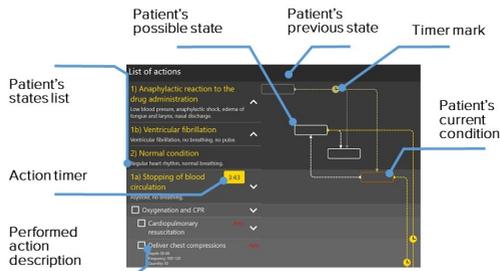


Figure 8.2 List of actions

Transitions between patient states are indicated by dashed lines and arrows.

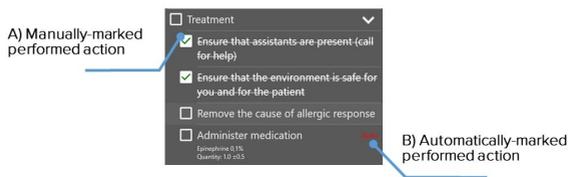


Figure 8.3 Marked actions

Certain actions marked by icon in the general list must be

manually marked , by the user after their completion (Figure 8.3). Such actions include elements of teamwork (calling for help), the patient's body manipulation (bringing the patient to a sitting position), etc.

To mark an action as completed, click on the box next to it . A successfully completed action will be marked with a tick  (Fig. 8.3 — A).

Actions that are automatically recognized by the program (CPR, administration of drugs, etc.) are marked with  icon (they could also be marked manually).

Note: manual marking of actions is mandatory for having them seen by the program and having the exercise successfully completed.

8.2 Patient states. Manual mode and Themes sections

The main distinctive feature of the **Manual mode and Themes** sections is the absence of a pre-installed, invariable sequence of actions and the virtual patient's vital signs. An exercise is managed and controlled by the instructor.

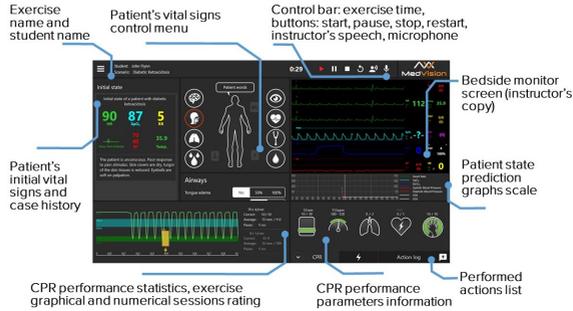


Figure 8.4 The Manual mode and Themes exercise menu

The Manual mode and Themes exercise menu contains the Initial State section. The section includes a brief description of the patient's case history at the beginning of the exercise and the vital signs. This section remains unchanged and serves as a source of information.

Initial State

The section includes a brief description of the patient's case history at the beginning of the exercise and the vital signs. This section remains unchanged and serves as a source of information.

8.3 Patient state settings

Control bar

Exercise controls (from left to right: exercise time, scenario management, the current scenario restart, microphone (to be used by

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the student) and speaker for two-way communication with the student).



Figure 8.5 The launched exercise control bar

Vital signs control menu

To set a parameter, select its value/type from the drop-down menu or set the parameter using a slider on the scale. Open the required parameter menu by clicking on the icon of the relevant system and follow the instructions on the screen.

General setting are detailed below:

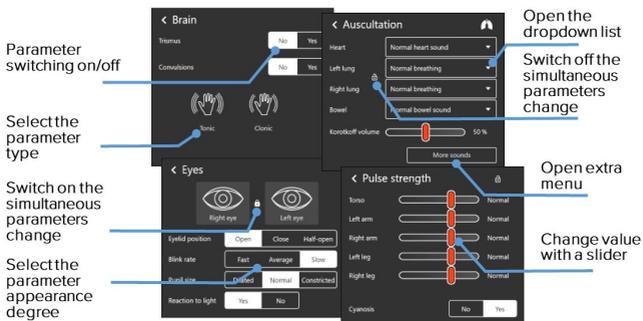


Figure 8.6 The patient's vital signs and behavior settings

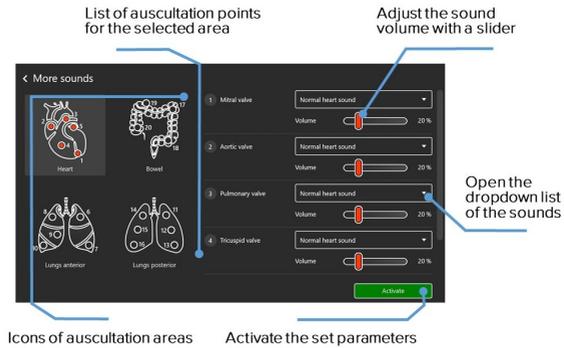


Figure 8.7 The More Sounds window

Icon description:

 **Open lock.** Change the settings of the selected menu individually.

 **Open close** Change all the settings of the selected menu at a time.

 **Active lungs** Spontaneous breathing is on.

 **Inactive lungs.** Spontaneous breathing is off.

Settings for the following functions are available:

Patient words

Patient words

A set of pre-recorded words and short phrases that the patient can say. To activate a word or phrase, click on the Patient Words icon and select a word/phrase from the list in the new window. After that, the patient will pronounce the selected word/phrase. In addition, it is possible to use the microphone on the control bar (Figure 8.5) for the patient to pronounce individual words/phrases.



Airways

Determines the presence/absence of airway obstruction. To activate obstruction, tick Yes in the box, to deactivate it tick No.



Airways

Configures the lungs condition and type. Click on the arrow icon to open a drop-down menu with a list of complications, or use the scale to determine the resistance/compliance level.



Brain

It is an organ of the central nervous system consisting of many interconnected nerve cells and their processes. The brain determines the state and reaction of the patient. To activate the reaction, tick Yes in the box. To deactivate it, tick No.



Eyes

A control bar to adjust the blink rate, pupil size, eyelid position, and

pupillary light reflex switching on/off. The “lock” icon allows determining whether the changes will apply to both eyes or to only one. If the “lock” is closed, the changes will apply to both eyes; if the “lock” is open - only to a selected one.



Pulse Strength

Changes in the strength and intensity of the pulse felt at the points of palpation. There are individual settings for the pulse strength for the arms/legs/body.



Auscultation

This section allows controlling the type and intensity of the sounds/noises used for auscultation. Click on the arrow icon to open a drop-down menu with a list of complications. The “lock” icon allows determining whether the changes will apply to the left and right lung bilaterally, or only to one of them. If the “lock” is closed, the changes will apply to both lungs; if the “lock” is open - only to a selected one. When clicking on the More Sounds button, an additional menu will open (Figure 8.7)

Bedside Monitor (Instructor’s Copy) displays the patient’s vital signs. The data displayed in the software repeats the data of the bedside monitor.

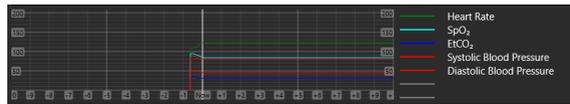


Figure 8.9 The patient state prediction graphs

The patient state prediction graphs are plotted and vary depending on the student's actions. Using this scale, the instructor can foresee the effect of the student's actions. The software initially sets the following parameters by default:

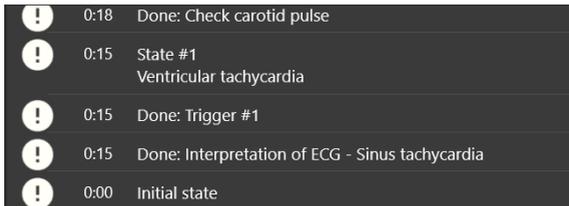
- Heart Rate (HR)
- EtCO₂
- Systolic pressure
- Diastolic pressure

The program also allows selecting additional parameters to be displayed as graphs. To add or change the vital signs, click on the empty line (marked grey) or one of the lines with parameters and select the desired parameter from the list opened (Figure 8.8).

Action log

The actions performed by the student are recorded in the action log. To open the action log, click on the **Action log**, tab in the lower right corner.

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!	0:18	Done: Check carotid pulse
!	0:15	State #1 Ventricular tachycardia
!	0:15	Done: Trigger #1
!	0:15	Done: Interpretation of ECG - Sinus tachycardia
!	0:00	Initial state

Figure 8.10 Action log

The instructor can add notes to the Action log by selecting them from a ready-made list or by adding personal notes (Figure 8.11).

To add a remark, click on the  button in the bottom right corner.

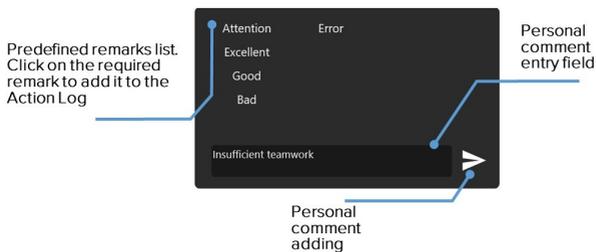


Figure 8.11 Adding notes and comments to the Action log

CPR data bar

Graphical and statistical presentation of CPR parameters and data. The right side of the screen contains the **required parameters for performing a single CPR cycle**: number of chest compressions

and their frequency, bag-valve-mask ventilations quantity (mechanical manual device to perform temporary mechanical lung ventilation. Provides a simple and reliable way to ventilate a patient with room air or oxygen), defibrillator discharges quantity and the correctness of the hands positioning in the course chest compressions.

On the left there is a graph showing the performance data of the current CPR cycle, as well as statistical (numeric) data of all the cycles performed. The CPR performance graph can be moved along the timeline (from the start to the end). To do this, click on the CPR graph and, holding the button, move the graph along the available timeline. When using exercises from the Manual mode and Themes sections, the instructor determines and sets the CPR sequence.

8.4 Bedside monitor settings

In the **Automated Scenarios, Manual mode and Themes** sections, the instructor determines the type of the bedside monitor and sets its displayed parameters. To open the bedside monitor settings menu, touch any of the bedside monitor graphs and hold your finger for a while or hover the cursor over it and click the middle button (or the wheel) of the mouse.

The bedside monitor setup menu allows choosing preset menus to operate in the following sections:

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- **Reanimatology**
- **Anesthesiology**
- **Neonatology**
- **Transport**
- **Cardiosurgery**
- **Custom (customization and parameter selection)**
- **Default**

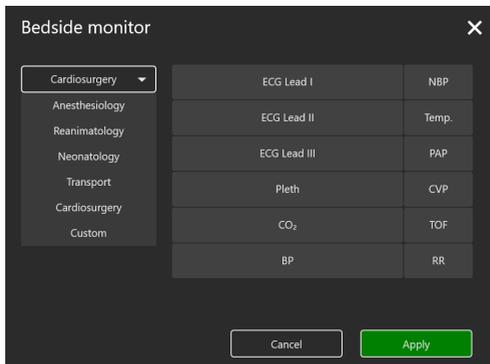


Figure 8.12 Bedside monitor type selection menu

Use the following algorithm to select the monitor type (Anesthesiology, Reanimatology, Neonatology, Transport, Cardiosurgery and Custom):

- Touch any of the bedside monitor graphs and hold your finger for a while or hover the cursor over it and click the middle button (or the wheel) of the mouse
- Click on the arrow icon  to open the drop-down list of the bedside monitors' available types
- Click on the name of a desired monitor type
- The selected monitor will be displayed in the box at the top



Note: Recommended types of displayed parameters are preset for all menus except for Custom. Do the following to set the displayed parameters:

- Select any of the parameters displayed to the right of the monitor type selection menu
- Click on the name of the selected parameter
- Find a new parameter in the list opened (Fig. 8.13/8.14)
- Click on the name of the new parameter
- The selected parameter will be displayed in the box instead of the previous one

Press **Accept** to confirm the changes and to close the setting menu or press **Cancel** to discard the changes and to close the setting menu.

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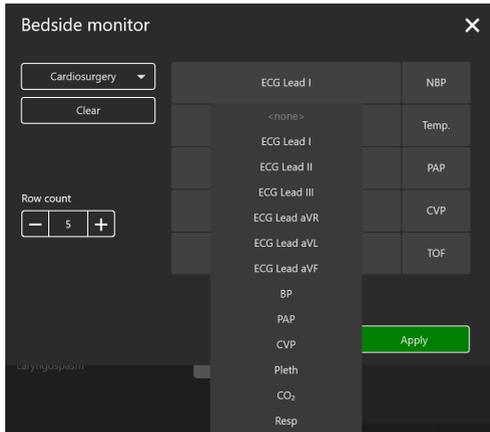


Figure 8.13 Bedside monitor settings menu 1

To discard the changes made without closing the setting menu, press the **Clear** button located under the name of the selected monitor type. To increase the number of displayed parameters, use the **Row** count menu. Press "+" to increase or "-" to reduce the number of lines. The maximum number of parameters to display is 14.

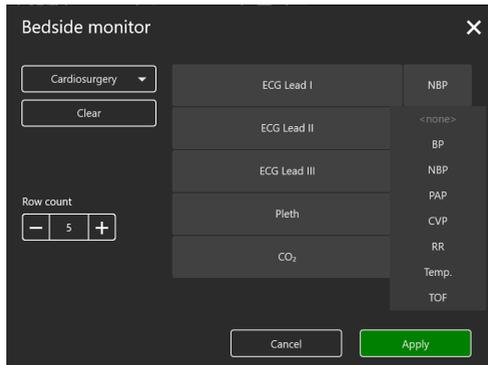


Figure 8.14 Bedside monitor settings menu 2

8.5 ECG rhythm editing

When running exercises from the **Automated Scenarios**, **Manual mode** and **Themes** sections, you can edit the ECG rhythm. To open the rhythm settings menu, click once on the ECG graph. At the top of the menu window, there is a graph of the current ECG rhythm, and the selected ECG lead (to change the lead, click on the arrow icon and select the desired ECG lead in the drop-down list).

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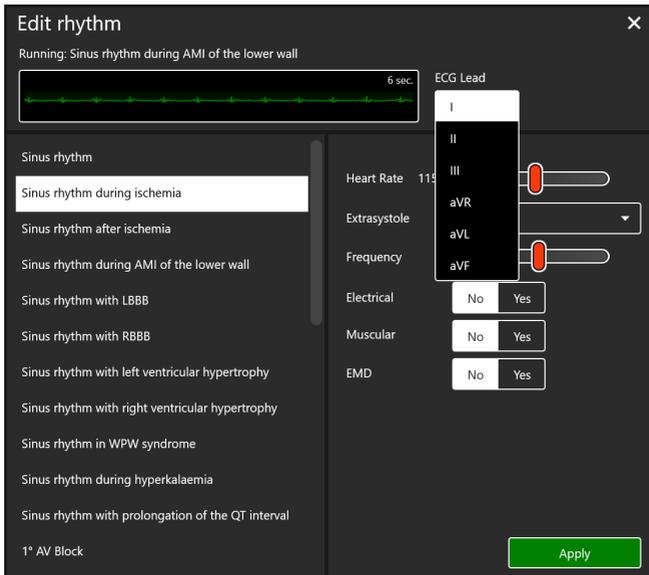


Figure 8.15 Rhythm Setting Menu

The left side of the menu window contains a list of available ECG rhythm types:

- Sinus rhythm
- Sinus arrhythmia
- Sinus rhythm with prolongation of the QT interval
- Sinus rhythm during ischemia

- Sinus rhythm after ischemia
 - Wellens syndrome
 - Sinus rhythm during inferior MI
 - Sinus rhythm during anterior MI
 - Sinus rhythm during lateral MI
 - Sinus rhythm during posterior MI
 - Sinus rhythm during anteroseptal MI
 - Sinus rhythm during anterolateral MI
 - Sinus rhythm during hyperkalemia
 - Sinus rhythm during hypercalcemia
 - Sinus rhythm during hypokalemia
 - Sinus rhythm during hypocalcemia
 - Sinus rhythm during hypothermia
 - Sinus rhythm with left ventricular hypertrophy
 - Sinus rhythm with right ventricular hypertrophy
 - Biventricular hypertrophy
 - Sinus rhythm during right atrial hypertrophy
 - Sinus rhythm during left atrial hypertrophy
-

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- Sinus rhythm during biatrial enlargement
 - Sinoatrial block
 - 1° AV Block
 - 2° AV Block Mobitz I
 - 2° AV Block Mobitz II
 - 2° AV Block Mobitz II with RBBB
 - 3° AV Block
 - Coronary sinus rhythm
 - Atrioventricular rhythm
 - AV nodal reentrant tachycardia
 - Wandering atrial pacemaker
 - Atrial tachycardia and wandering pacemaker
 - Supraventricular tachycardia
 - Sinus rhythm with LBBB
 - Sinus rhythm with LBBB and MI
 - Sinus rhythm with RBBB
 - Sinus rhythm with incomplete RBBB
 - Idioventricular rhythm
-

- Sinus rhythm with WPW syndrome (left lateral)
- Sinus rhythm with WPW syndrome (right lateral)
- Sinus rhythm during pericarditis
- Atrial flutter
- Atrial fibrillation
- Torsades de pointes
- Ventricular flutter
- Ventricular tachycardia
- Ventricular fibrillation
- Asystole
- Ventricular pacemaker
- Atrial pacemaker
- AV sequential pacing

To change the current rhythm type, click on the name of the desired rhythm from the list and press **Apply**. There are other parameters for settings on the right side of the menu window. In the lower part of the window there are settings allowing changing the current rhythm. In the upper part of the window there are parameters of the selected rhythm type. To change these parameters, select the desired mode or adjust the parameter value using the slider and click on the **Apply button**.

8.6 CPR Activation

To initialize the CPR, open the ECG rhythm editing menu window by single-clicking on the ECG graph, select the **Asystole, Ventricular Fibrillation or Ventricular Tachycardia** (with missing pulse) rhythm types and press **Apply**. Then proceed to the CPR performance.

The screen contains the required parameters for performing a single CPR cycle:



Figure 8.16 Cardiopulmonary resuscitation (CPR)

- The number of chest compressions and their depth
- The number of bag-valve-mask (BVM) ventilations
- BVM ventilation
- Defibrillator discharge quantity and discharge rate
- Hand positioning and chest compressions

There is a graph showing the performance data of the current CPR cycle, as well as statistical (numeric) data of all the cycles performed.

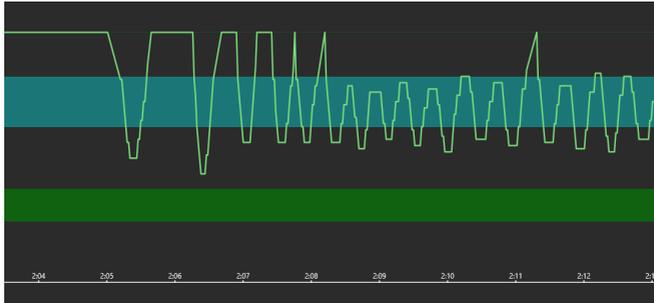


Figure 8.17 Graph



Figure 8.18 BVM ventilation and hand positioning

If the hands are placed incorrectly during chest compressions, the icon will turn red (Figure 8.19).



Figure 8.19 Wrong imposition of hands

Defibrillation



Figure 8.20 Defibrillation

When running an exercise in the **Manual mode and Themes** sections, in the lower right corner, in addition to the **CPR and Action log** tabs, there is a **Cardiac Control** tab, indicated by the icon . Using this tab, you can set the current and expected rhythms. To do this, click on the window with the name of the current/expected rhythm, the rhythm editing menu will open, select the desired rhythm type from the list in the left part of the window and press Apply. Below, in the Cardiac Control tab, the defibrillation parameters (quantity, energy and current parameters of the defibrillator discharges) are indicated. To adjust these parameters, click on the "–" and "+" icons  и .

If defibrillation is performed correctly, the current rhythm will shift to the rhythm indicated as an expected one.

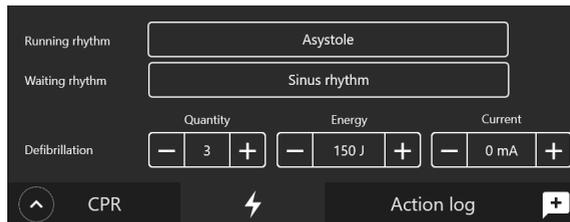


Figure 8.21 Cardiac Control Tab

Note: If the task is performed incorrectly, the icons light up in red; if the task is performed successfully, the icons light up green.

8.7 List of auscultation sounds

The total list of the **heart sounds** (Fig. 8.6) available for selection and setting in the patient menu while running an exercise from the Manual mode and Themes sections and when creating or editing training scenarios:

- Normal heart sound
- Split first heart sound
- Split second heart sound
- Third heart sound (gallop)
- Fourth heart sound (gallop)
- Functional murmur
- Diastolic murmur
- Opening snap
- Holosystolic murmur
- Early systolic murmur
- Mid-systolic murmur
- Continuous murmur
- Austin Flint murmur

- Pericardial friction rub
 - Still's murmur
 - Aortic valve regurgitation
 - Aortic valve stenosis
 - Aortic valve stenosis and regurgitation
 - Mitral valve regurgitation
 - Mitral valve stenosis
 - Mitral valve prolapse
 - Mitral valve stenosis and regurgitation
 - Mitral valve stenosis and tricuspid valve regurgitation
 - Pulmonary valve stenosis
 - Pulmonary valve regurgitation
 - Tricuspid valve regurgitation
 - Coarctation of the aorta
 - Hypertrophic cardiomyopathy
 - Patent ductus arteriosus
 - Atrial septal defect
 - Ventricular septal defect
-

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- Acute myocardial infarction
- Congestive heart failure
- Systemic hypertension
- Acute pericarditis
- Dilated cardiomyopathy
- Pulmonary hypertension
- Tetralogy of Fallot
- Ventricular aneurysm

The total list of the **lung anterior and posterior sounds** (Fig. 8.6) available for selection and setting in the patient menu while running an exercise from the **Manual mode and Themes** sections and when creating or editing training scenarios:

- Bronchial respiration
- Fine crackles
- Vesicular respiration
- Wheezes
- Diminished vesicular
- Rhonchi
- Stridor
- Coarse crackles
- Pleural friction rub

The total list of the bowel **sounds** (Fig. 8.6) available for selection and setting in the patient menu while running an exercise from the

Manual mode and Themes sections and when creating or editing training scenarios:

- Normal bowel sound
- Hypoactive sounds
- Hyperactive sounds
- Borborygmus
- Capotement
- Bruits due to renal arteries stenosis
- Peritoneal friction rub
- Normal bowel sound
- Constipation
- Ulcerative colitis
- Irritable bowel
- Crohn's disease syndrome
- Paralytic ileus
- Diarrhea

The total list of the **patient voice sounds** (Fig.8.6) available for selection and setting in the patient menu while running an exercise from the **Manual mode and Themes** sections and when creating or editing training scenarios:

• **Words and phrases:**

- Yes
- No
- Can not breath
- Feel like I could die
- Go away
- Don't feel dizzy
- Don't feel well
- I feel better

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- Feel really bad
 - Feel very dizzy
 - Feel really bad
 - I'm fine
 - I'm hungry
 - I'm so sick
 - No allergies
 - No diabetes
 - Pain for 2 hours
 - Feel nauseous
 - I'm thirsty
 - No cardiac problems
 - Something for this pain
 - Thank you
 - Sore throat
 - Stomach hurts
 - Joint pain
 - Ears are ringing
 - That helped
 - Heart beating quickly
 - Headache
 - I have a fever
 - Sometimes
 - leg hurts
 - High blood pressure
 - Dull pain
 - Sharp pain
 - Severe coughing
 - Terrible pain
 - Burning pain
 - Mild coughing (1)
 - Severe coughing (2)
 - Screaming
 - Difficult breathing (1)
 - Difficult breathing (2)
 - Difficult breathing (3)
 - Vomiting (1)
 - Vomiting (2)
 - Mild coughing (2)
 - Never had pain like this
 - Pain moans (1)
 - Pain moans (2)
-

- I am short of breath
 - Tightness in my chest
 - Throbbing headache
 - I have diabetes
 - Don't touch me
 - I Don't remember
 - heart attack last year
 - I have asthma
 - Pain in the heart area
 - I am cold
 - Arm hurts
 - Eyes are watering
 - Since this morning
 - Hurts when I breath
 - Back hurts
 - Vision went dark
 - Since this afternoon
 - That hurts!
-
- **Severe coughing (two types);**
 - **Mild coughing (two types);**
 - **Difficult breathing (three types);**
 - **Vomiting (two types);**
 - **Pain moans (two types);**
 - **Screaming.**

8.8 ECG graph library

The basic* ECG graphs available for selection and use in the ECG constructor when creating or editing training scenarios and CPR settings (see the list in section 8.5 Exercise Menu. Rhythm Setting Menu) can be extended by the user.

9 Exercise finish

To complete an exercise, press the Stop button on the control bar.



Figure 9.1 The launched exercise control bar

After that, the exercise completion menu with the following available functions will open:

- **Go to Debriefing** — complete the exercise and go to the exercise debriefing window (See Section 11 "Debriefing")
- **Restart** — restart the exercise
- **Finish** — complete the exercise and go back to the main menu.

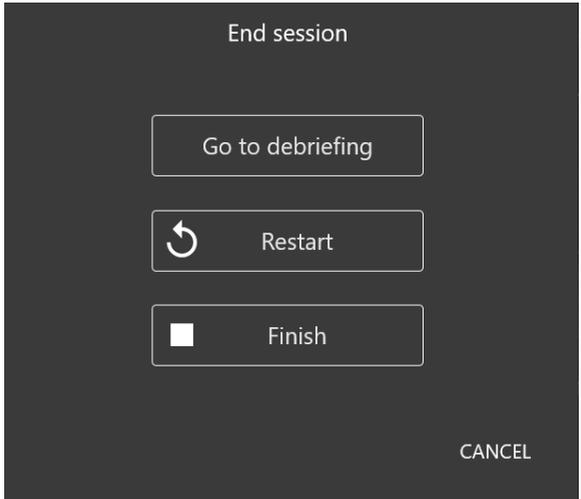


Figure 9.2 Exercise completion menu

10 Students and study groups

The **Students** section is divided into two parts: List of Groups and List of Students.

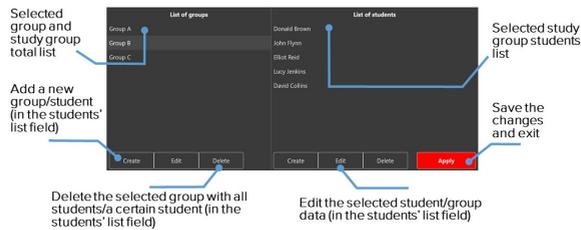


Figure 10.1 The Students menu

10.1 Student account creation and settings

In the **List of Students** field you can select, create, edit and delete student accounts.

10 STUDENTS AND STUDY GROUPS

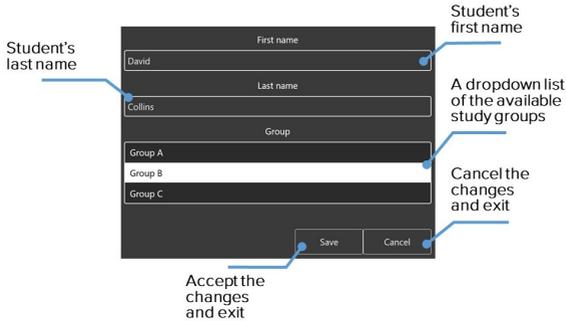


Figure 10.2 Student account settings menu

- To create a new student account, press **Create**, enter the first and last names of the student, select the desired group and press **Save**.
- To **select** a student account, select a group from the list on the left by left-clicking on its name. After that, a list of all students added to this group should appear on the right. Select the desired student from the list and press **Apply**. The name of the selected student will be displayed in the upper left corner in the Student field.
- To edit the student's account information, select it from the list by clicking on the name of the student and pressing Edit. In the new window, change the first and last names of the student; select the desired group and press Save.

- To delete a student account, select it from the list by clicking on the first and last names, press the Delete button and confirm your action.

10.2 Study group creation and settings

In the **List of Groups** field, you can select, create, edit and delete study groups



Figure 10.3 Study group settings menu

- To create a new group, press Create, enter the name of a new group and press Save.
 - To rename a group, select it from the list and press Edit. In the new window, change the group name, press Save.
 - To delete a group, select it from the list, press Delete and confirm your action.
-

11 Debriefing

You can view the results and details of a completed (or interrupted) exercise in the **Debriefing** section. The debriefing window for the completed exercise can be opened immediately after the completion (or interruption — by pressing the corresponding key) of the exercise (Figure 9.2) or later from the main menu (Figure 5.1) when switching to the **Debriefing** section.

In the opened menu, a list of all completed exercises will be shown. Select the required debriefing file and press **Start** to open the statistics for the selected exercise (debriefing).

To **exit** the Debriefing section, click on the  icon, select **Close** in the drop-down list. To open the list of all debriefing files, click on the , icon, select **Open** in the drop-down list.

The Debriefing window contains three tabs:

- Description (student name, scenario name, date and duration of an exercise)
- Exercise
- CPR

11.1 Debriefing. The Exercise tab

The **Exercise** tab (Fig. 11.1) contains a video of the exercise*. Press **Start** button to start playing the video of the exercise and **Pause** — to pause it. To rewind the video of the exercise, left-click on the state prediction graph or the timeline located at the bottom of the screen.

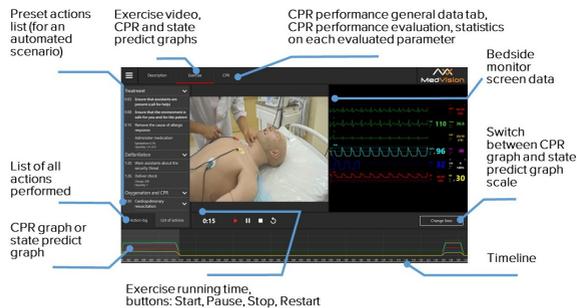


Figure 11.1 Debriefing menu. The Exercise tab

Note: the exercise video will be available only if an external USB video camera has been connected. You can check the camera connection status in the **Connections** section (Figure ??)

The **scale of graphs** is implemented in two modes. The first one is the **prediction scale graph**, which shows how the selected indicators of the patient's physiological states changed during the exercise. The second one is the **CPR performance graph**, which displays all completed CPR sessions and their graphical evaluation.

To switch between them, use the **Change lines** button. When using the CPR performance graph, you can **zoom out** the scale using the slider next to **Zoom** 

11.2 Debriefing. CPR tab

The **CPR** tab (Figure 11.2) contains detailed statistical information about the performed CPR actions, their quantity and quality. In the left side of the window, there is a field of score, which includes both the total score for the exercise performed and its individual elements.

The tab contains five fields:

- **Overall score** Consists of scores for good-quality compressions, adequate ventilation and proper-rate defibrillation.
- **General info** Data on the number of CPR cycles, total operating time and assessment time.
- **Compressions** Lead to the simulation of circulation, cardiac output, central and peripheral blood pressure and palpable pulse.
- **Ventilation** Statistics on the performed ventilation and its performance quality score (the score is repeated in the Overall score field).

12 Safety precautions

Before starting a session, carefully inspect the simulator and the power cable for tears, cracks, burned or scorched areas, etc. If any damage is found, wait until the failure is fixed.

In case of burning smell, smoke or sparks, immediately stop using the simulator and inform the person responsible for safe operation.

YOU MUST NOT:

- Spill liquids on the simulator or submerge it in water
- Install the simulator on the wet surface
- Dismantle the simulator
- Leave the simulator switched on if unused

Warning: the environment in the room where the simulator is located must not cause any condensation on electronic and mechanical components of the product.

Make sure simulator cables are not located in the walking area and do not cause any danger when being moved during and after sessions.

13 Cleaning and maintenance

- Use wet wipes to gently remove dirt
- Do not allow liquid leak inside the simulator. Clean the monitor screen, use special cleaning cloth
- Do not forget to perform regular dry and wet cleaning of the facility housing the simulator
- If heating radiators are on in the facility make sure the simulator's body is not in its proximity
- If you are not planning to use simulator for some time, turn off its power source

Warning: to prevent fire, never place candles or other open flames near the virtual simulator.

14 Definitions

- ECG unit is a unit simulating the heart activity and hemodynamics. It is connected to a real ECG device or patient monitor.
- ECG electrodes are cables imitating real ECG electrodes, allowing monitoring the correct installation on the patient's body. They are connected to the ECG unit.
- Intravenous catheter is a preset port for measuring the volume and speed of drug administration, visually simulating a real intravenous catheter.
- A smartscope simulates auscultation sounds of the heart, lungs and bowel. Allows monitoring the area where the auscultation is currently being performed. The smartscope is installed on a real stethoscope.
- Syringes with RFID tags (Figure 14.1) are modified real syringes with ability to install various RFID tags.



Figure 14.1 Syringes with RFID tags

- BP cuff is a modified real BP cuff used in measuring blood pressure, which can be connected to the simulator.
- Adam's apple (Thyroid cartilage) imitates the prominence of anterior upper part of the thyroid cartilage.
- WiFi router is a specialized computer that enables packet forwarding from one network segment to another based on rules and routing tables. To decide upon forwarding the packets, information about the network topology and certain rules set by the administrator are used.
- Mechanical ventilation is artificial ventilation to assist or replace spontaneous breathing.

15 Malfunctions

PROBLEM	CAUSE	SOLUTION
No positive reaction when performing bag-valve-mask ventilation	Air leakage during the ventilatio	Make sure that the mask of the bag-valve-mask is tightly pressed against the face of the simulator

<p>The instructor's tablet does not connect to the Wi-Fi router</p>	<ol style="list-style-type: none"> 1. Failure in automatic Wi-Fi connection. 2. IP failure 	<ol style="list-style-type: none"> 1. Go to Settings->Network and Internet, check your Wi-Fi connection. 2. To configure IP, go to the network and sharing Center> Change adapter settings. Find the required Wi-Fi network in the General list and select "Properties". In the window that opens, select the line IP version 4 (TCP/IPv4) and double-click on it. In the new menu put a tick in the "Use the following IP address" and enter the following data: IP-address: 192.168.0.(simulator number) Subnet mask: 255.255.255.0 Default gateway: 192.168.0.1 Preferred DNS server: 192.168.0.11 Alternative DNS server: 192.168.0.111
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15 MALFUNCTIONS

<p>The bedside monitor imitator does not connect to the system within 5 minutes</p>	<p>Automated Wi-Fi connection has failed</p>	<p>Go to Parameters >Network and Internet and check Wi-Fi connection and IP. To configure IP, go to Network and Sharing Center> Change adapter settings. Find the desired Wi-Fi network in the general list and select "Properties". In the window that opens, select the line IP version 4 (TCP / IPv4) and double-click on it. In the new menu, check the box "Get IP address</p>
<p>Lost connection between the system elements (bedside monitor imitator, patient simulator, smartscope, ECG and defibrillator) during operation.</p>	<p>1.The simulationequipment wasinstalled in thearea not coveredby the wirelessnetwork. 2. Other software onthe user's laptopmay interfere withthe work of theInstructor softwareand/or thebedside monitorimitator. 3. Interference withother Wi-Finetworks</p>	<p>1. Place all theelements in closeproximity to eachother. 2. Removeunnecessarysoftware on theuser's laptop. 3. Disable other Wi-Fi networks</p>

<p>Graphics in the Instructor software are delayed during CPR performance</p>	<ol style="list-style-type: none"> 1. System failure. 2. Low battery 	<ol style="list-style-type: none"> 1. Physically restart the system (laptop, patient simulator, bedside monitor). 2. Check the battery level in the Connections menu. If the battery level is lower than 15%, connect the charger
<p>ECG graphs are not displayed on the monitor of the defibrillation machine</p>	<ol style="list-style-type: none"> 1. The ECG adapter is not connected to the system. 2. Problems with the cable connecting. 3. System failure 	<ol style="list-style-type: none"> 1. Check ECG adapter connection in Connections section. 2. Check that the cables from the ECG adapter are properly connected. 3. Physically restart the system (laptop, patient simulator, bedside monitor imitator)
<p>Unexpected shutdown</p>	<p>Data loss or total system failure</p>	<p>Physically restart the system (laptop). If the error recurs, contact the service center</p>

16 Information to be presented to the Service Centre

In case of any other malfunction, please contact our Service Centre.

Please attach the following information to the letter:

- The simulator full model name and serial number
- Problem description
- Error message screenshot
- Detailed description of the actions leading to the problem
- A **dxdiag.txt** file from the PC where the software error occurred. To create such a file, simultaneously press Windows and R and type «dxdiag» in the pop-up window. After that click on **Save All Information** in the pop-up window

Serial number: _____

Administrator password: _____

Warning: keep the password in a safe place.

To restore or change the password, request the Service Centre for a new password.

17 Questions & Answers

- *How long does it take to fully charge a simulator?*
 - Up to 6 hours.
 - *What languages does the simulator speak?*
 - English and Russian.
 - *What liquid is recommended to use when working with a simulator?*
 - Distilled water only.
 - *What is the warranty period?*
 - The warranty period for the supplied simulator is at least 12 months. The warranty period may be extended subject to a supplement agreement.
 - *How to take care of the simulator and what cleaning materials can be used?*
 - Make sure to perform regular dry and wet cleaning of the facility housing the simulator.
 - Use wet wipes to gently remove dirt.
 - To clean the monitors of the instructor's tablet and all-in-one PC, use special cleaning cloth.
-

17 QUESTIONS & ANSWERS

- If heating radiators are on in the facility, make sure the simulator's body is not in its proximity.
- If there is no need to work with the simulator for a long time, cover it with a cloth to avoid dust accumulation on the nodes and elements.

You must not: Use solvents (gasoline, kerosene, acetone, etc.) or abrasive cleaners to clean the surface of the simulator. Using these products can lead to skin damage and paint coming off.

- *What is the life of electronic components?*
 - Life of simulator: 8 years.
 - Life of battery: 10 years.
 - Life of charger: 10 years.
 - Life of tablet: 5 years.
 - *Can I use lubricating oil to perform invasive works (related to penetration through the body's natural barriers)?*
 - No, only the spray, i.e. grease, supplied with the simulator or similar materials approved by the manufacturer.
 - *How should the equipment be positioned when being transported?*
 - Lying on its back.
 - Seated forward bending (arm-chair)
-

- Seated backward bending (bed).
- *What sounds are available for auscultation?*
 - Breath sounds
 - Bowel sounds
 - Korotkoff sounds.
- *If any defects are found, where should we e-mail our request to?*
 - In case of any malfunction, please contact our Service Centre.

