CAE

Healthcare

CAE Maestro User Guide

Disclaimer

This product is a simulation device designed for training and demonstration purposes only.

Proprietary Notice

Trademark Information

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System Requirements

This section describes the minimum requirements to run the simulator.

CAE Maestro Software

The following table identifies the software version associated with the release of this user guide.

Document	Document Version	Software Version
CAE Maestro User Guide	905K007152 v1.0	CAE Maestro v2.12 and later

Periodic system updates for Maestro are available at: https://caehealthcare.com/support/software-updates. You can download software updates from any Windows computer with an Internet connection.

Any device used to operate CAE Maestro™ must meet the following minimum requirements.

Windows® Operating System

	Maestro Requirement	Maestro Standalone
Software	• Windows 10 - 64 bit • .NET 4.8+	Same requirements
Hardware	• Intel Core i5, 1.6 GHz • 4 GB RAM • 20 GB Hard Drive space available • 1920x1280 screen resolution • Wi-Fi or Ethernet	

Mac® Operating System

	Maestro Requirement	Maestro Standalone
Software	• Mac OS X 10.13 (High Sierra) or Mac OS X 10.14 (Big Sur) only	Not supported
Hardware	• MacBook Pro (2020 or earlier), MacBook Air (2020 or earlier), or iMac (2020 or earlier) • Intel Core i5, 1.6 GHz • 4 GB RAM • 20 GB Hard Drive space available • 1280x800 screen resolution • Wi-Fi or Ethernet	

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Optional Setup: Connect to Organizational Network

The simulator normally operates as a closed wireless network. The simulator, instructor workstation, and patient monitor are connected only to each other. However, some workplaces require a configuration that allows the connection of the simulator to their secure organizational network. The following instructions are only for the setup of the connection to this type of network.

Multiple CAE simulators may be connected in this way, however the Multi-Sim capability for CAE Juno is not supported when using an organizational network. SimEquip and CAE LearningSpace™ are also not supported when using an organizational network.

Network firewall port requirements are listed at the end of this section.

Note: CAE Luna requires a different connection process. For Luna only, proceed to page 14: *Connect Luna to an Organizational Network*.

Step 1: Setup of CAE Discovery Service

To prepare for operating your simulator via your organization's network, your IT department must first install and setup CAE Discovery Service, an application that automatically tracks simulators on a network and identifies them by IP address.

Coordinate with your organization's IT department to ensure Discovery Service is in place and running with a dedicated IP address before proceeding. The IP address of the device hosting Discovery Service is required for this process.

Step 2: Power on and Connect Simulator

Follow the steps provided in the User Guide for your simulator to power on and connect the simulator and the instructor workstation laptop or tablet.

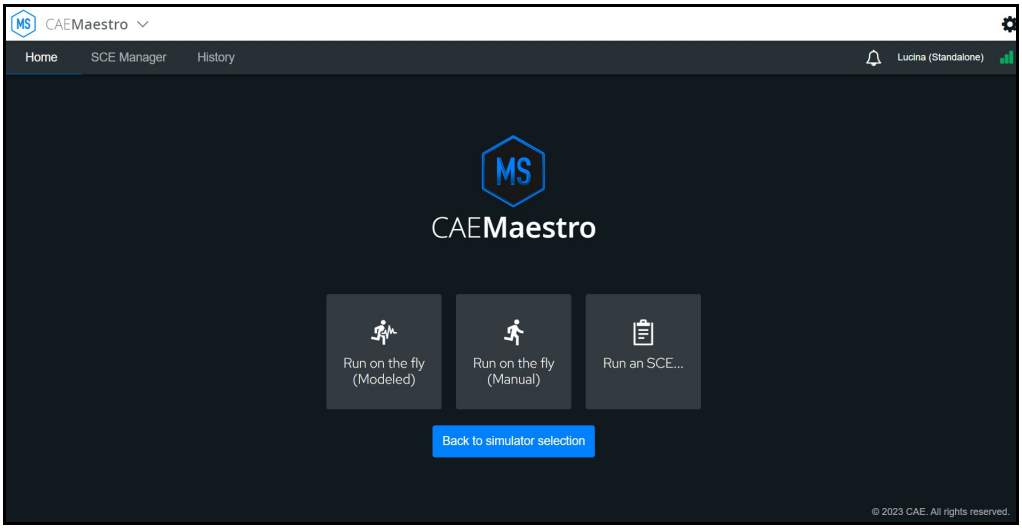
Note: The simulator and its tablet or laptop must first be connected via the simulator's own Wi-Fi before proceeding.

Step 3: Launch CAE Maestro Application

Tap or click on the icon on the tablet or laptop to launch Maestro for the simulator.

The Maestro App Icon

Once launched, the Maestro home screen shows the simulator connection in the upper right hand corner.



Maestro Home Screen

Step 4: Confirm Maestro Version 2.12 or Later

CAE Maestro version 2.12 or later is required for connecting to an organizational network. To check the software version, tap or click on the gear icon for the Settings menu and select **System** from the drop-down menu.

Update the simulator, instructor workstation, and patient monitor as needed before continuing. See *caehealthcare.com/support* to download Maestro 2.12 or later for your simulator type.

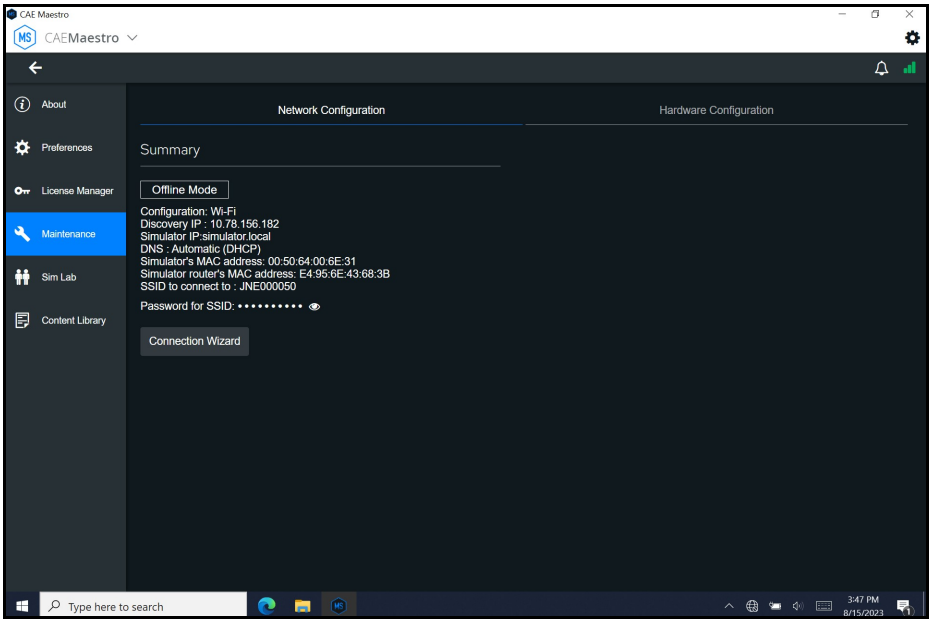
Step 5: Connect to Organizational Network

From the System screen, continue with the steps below to establish the simulator connection on your organizational network.

Note: The IP address of the device hosting the Discovery Service is required for this process.

1. Confirm that the Discovery Service is running and note the IP address.
2. Tap or click **Maintenance**.
3. Enter the six-digit passcode. If you have not been given a passcode, use 000000. **Note:** For CAE Aria, use the six-digit simulator identification number, including any leading zeros (ex. 000463).

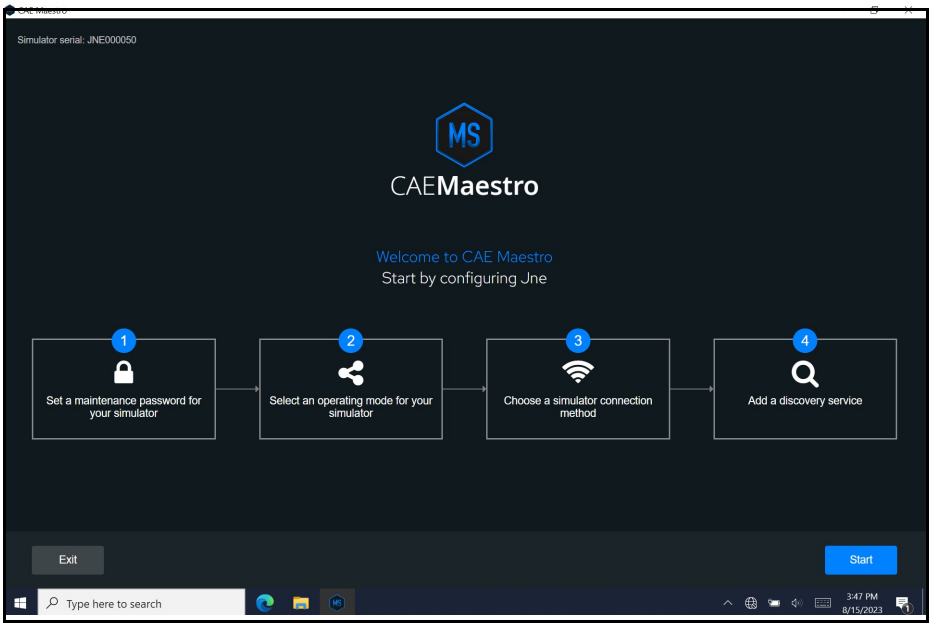
The Maintenance window appears.



Maintenance Screen

4. Tap or click **Connection Wizard**.

   The Connection Wizard interface appears.

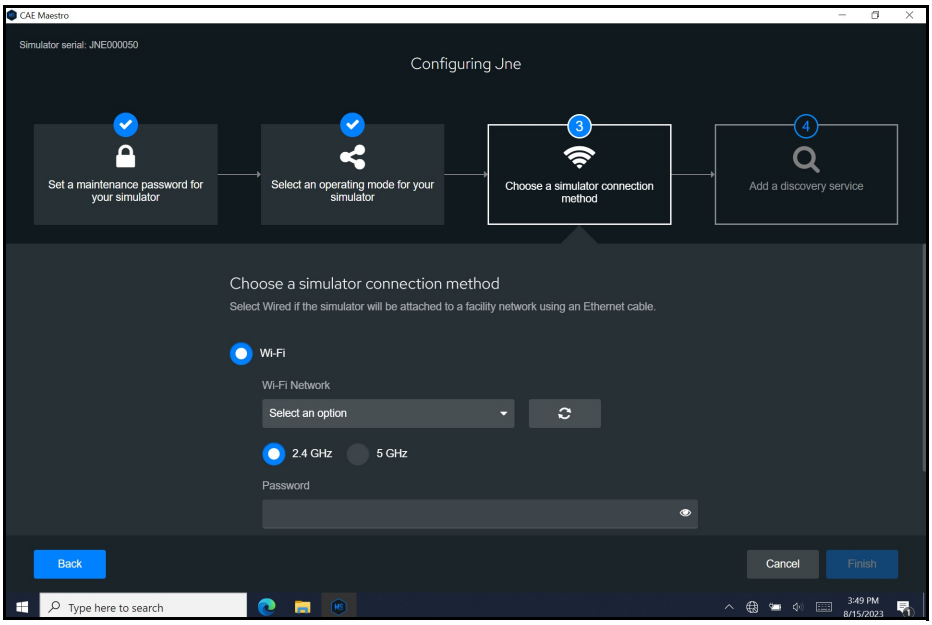


Connection Wizard Interface

5. Tap or click **Start**.
6. Set a password using only letters and/or numbers. To retain the old password, enter it into the New and Confirm Password fields.

   IMPORTANT! Record your password in a secure location. CAE is unable to retrieve your password if it is lost.

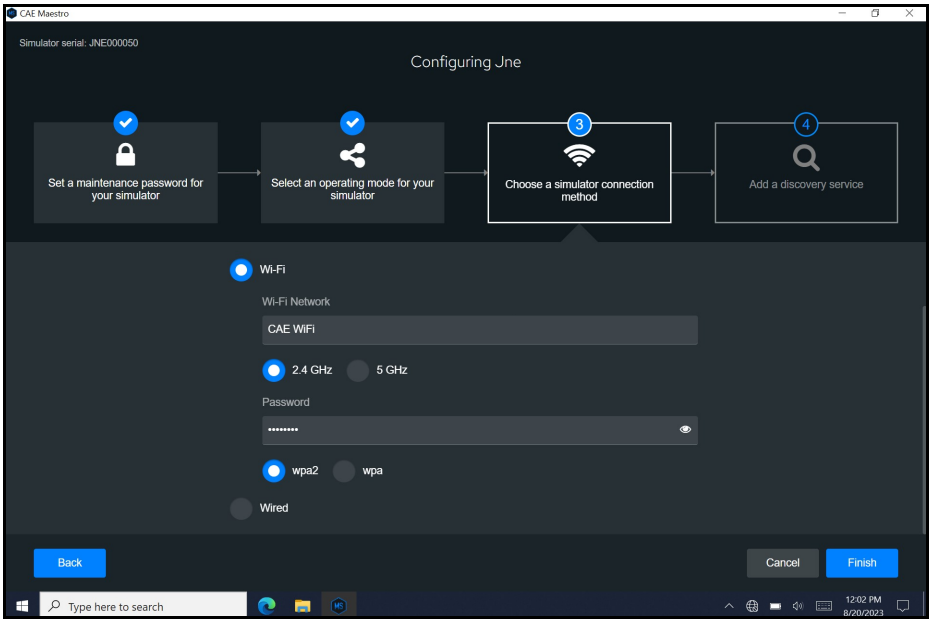
7. Tap or click **Continue**.



Connection Method Screen

8. Choose the simulator operating mode by selecting the Networked radio button.

9. Choose the simulator connection method by selecting either the **Wi-Fi** or **Wired** radio button.



Connection Method Drop-Down Menu

For **Wired** connection, connect a second Ethernet cable from the WAN port on the simulator to the organizational network wired port, then go to Step 15.

For **Wi-Fi** connection, continue with Step 10.

10. View the Wi-Fi network drop-down menu and select **Enter SSID Manually**.

11. Type in the name of your organizational Wi-Fi network exactly as it appears (case-sensitive).

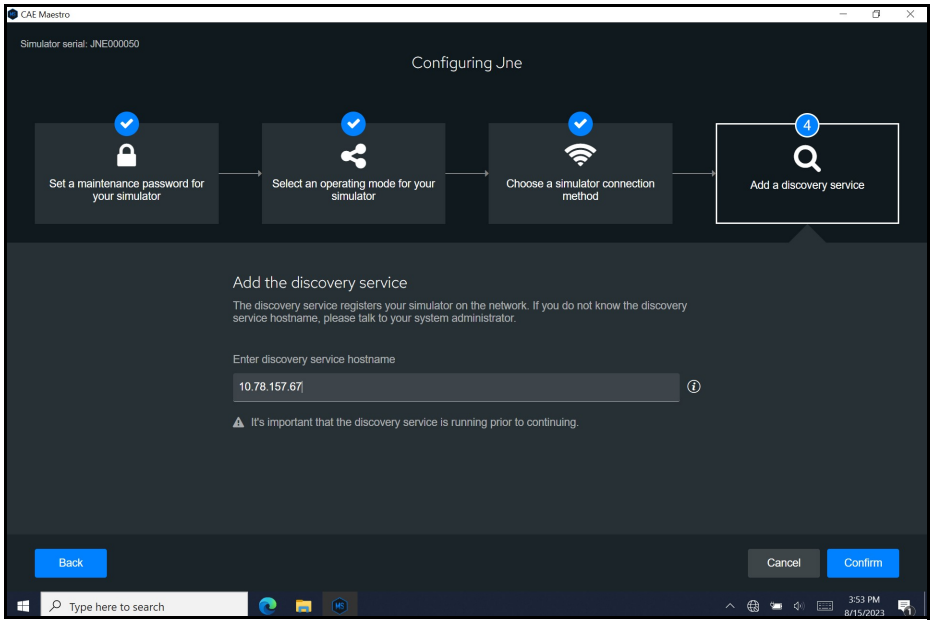
12. Enter the password for your network.

13. Select 2.4 GHz or 5 GHz. Consult with your IT department regarding the best choice for your environment.

Note: For Lucina only, the simulator will operate on either frequency band, including delivery, but full fetal health functionality requires an additional router on a 2.4GHz, channel 5 network. See the section *Setup Fetus Connectivity (CAE Lucina Only)* for further details and instructions.

14. Select WPA2 or WPA. Consult with your IT department regarding the best choice for your environment.

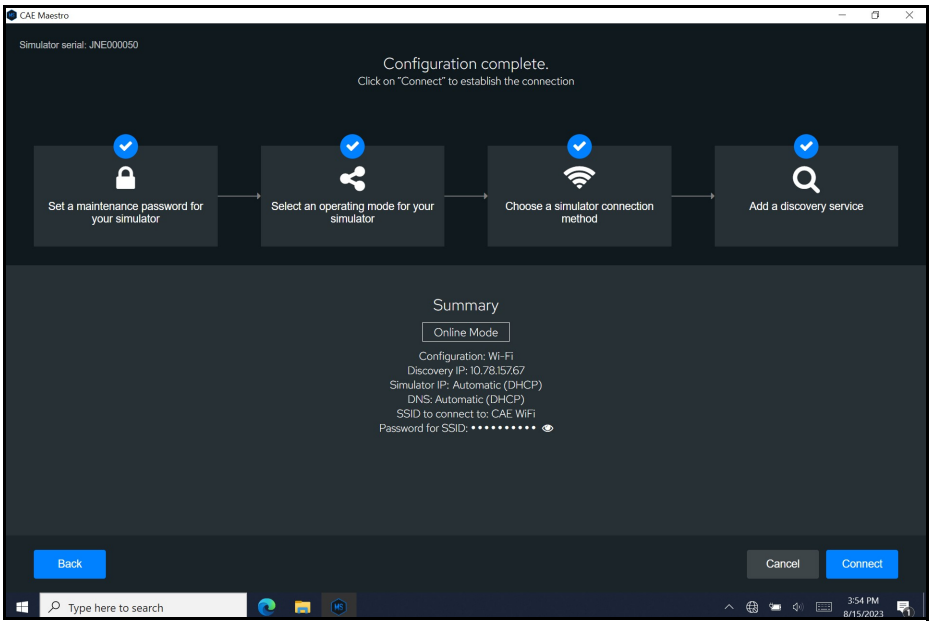
15. Tap or click **Finish**.



Discovery Service Screen

16. In the **Enter discovery service hostname field**, enter the IP address (IPv4) of the device that hosts the Discovery Service.

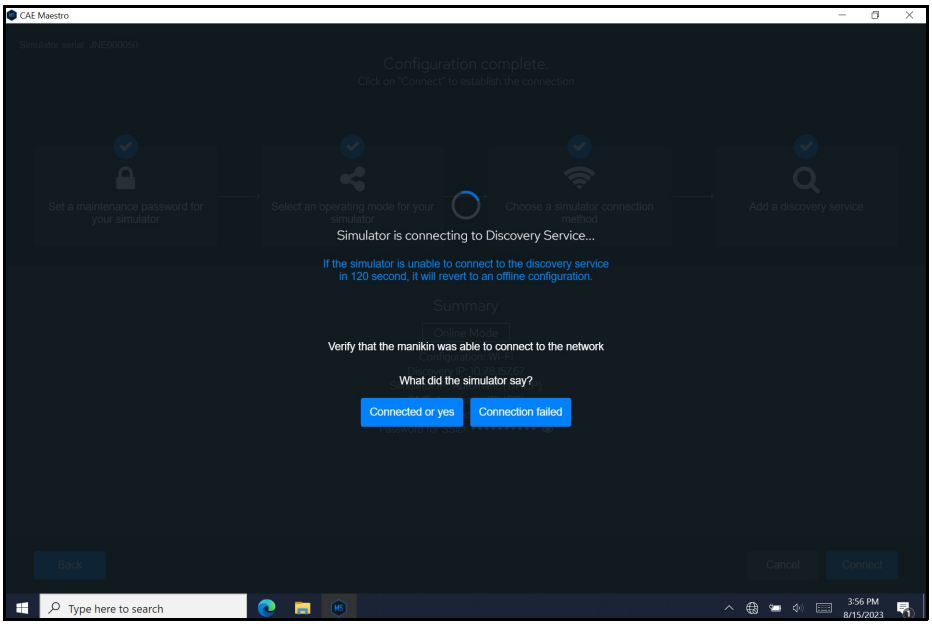
17. Tap or click **Confirm**.



Summary Screen

18. Review the selections, then tap or click **Connect**.

    Connection may take up to 120 seconds. The screen provides information about progress.



Connection Progress Screen

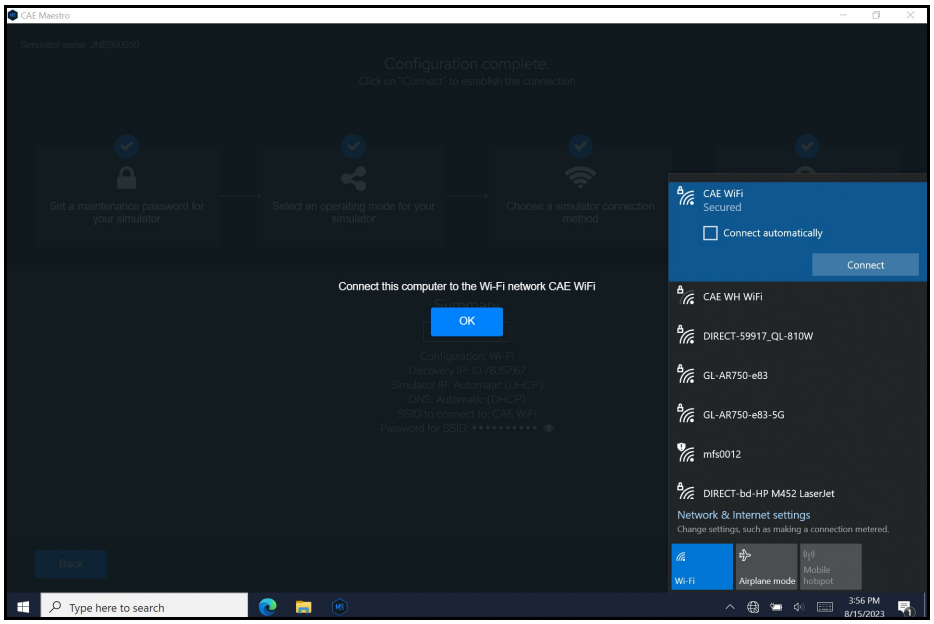
19. The simulator will say *"Connected"* or *"Yes"* when connected. When you hear this, tap or click the **Connected or yes** button, which will become available after the 120-second countdown.

Note: If the simulator does not respond or says *"No,"* tap or click **Connection failed**. The simulator will revert back to the last working configuration. Confirm with your IT department that the Discovery Service is running and the IP address, then return to *Step 5: Connect to Organizational Network* and repeat the process.

20. The screen will display an instruction to complete the connection before proceeding.

IMPORTANT! Do not tap or click the OK button until you have followed steps a-c:

a. Tap or click the Wi-Fi icon on the tablet or laptop to view the panel of Wi-Fi networks.



Available Wi-Fi Networks Panel

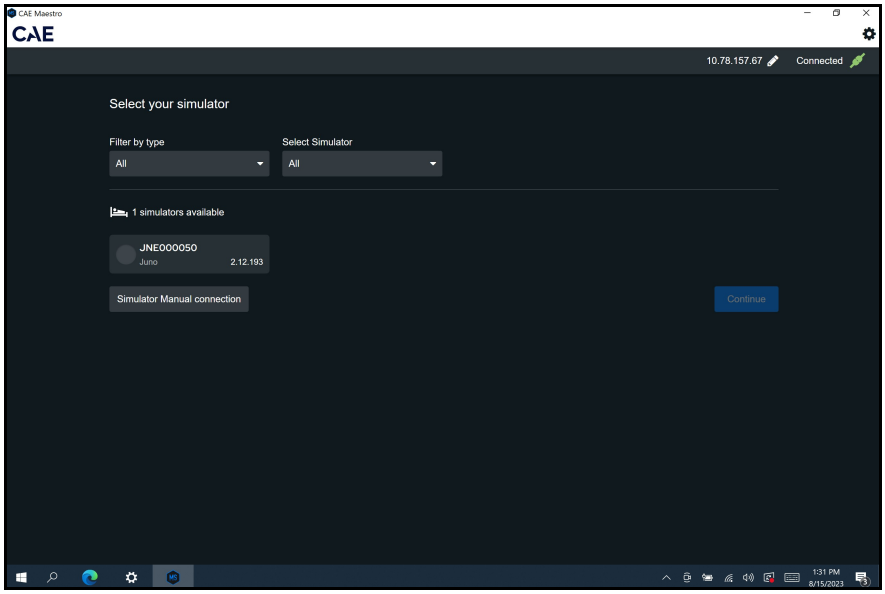
b. Locate the organizational Wi-Fi network and tap or click **Connect**.

c. Enter the password for the network.

21. Return to the Maestro screen and tap or click **OK**.

Note: After a short wait, CAE Maestro launches. If you do not see CAE Maestro, the instructor workstation may be in "Tablet Mode." If so, swipe right from the left edge of the screen to bring in the open applications to find CAE Maestro.

22. The simulator selection screen appears with any connected simulators displayed. The Discovery Service IP address and connection status is shown in the upper right hand corner.

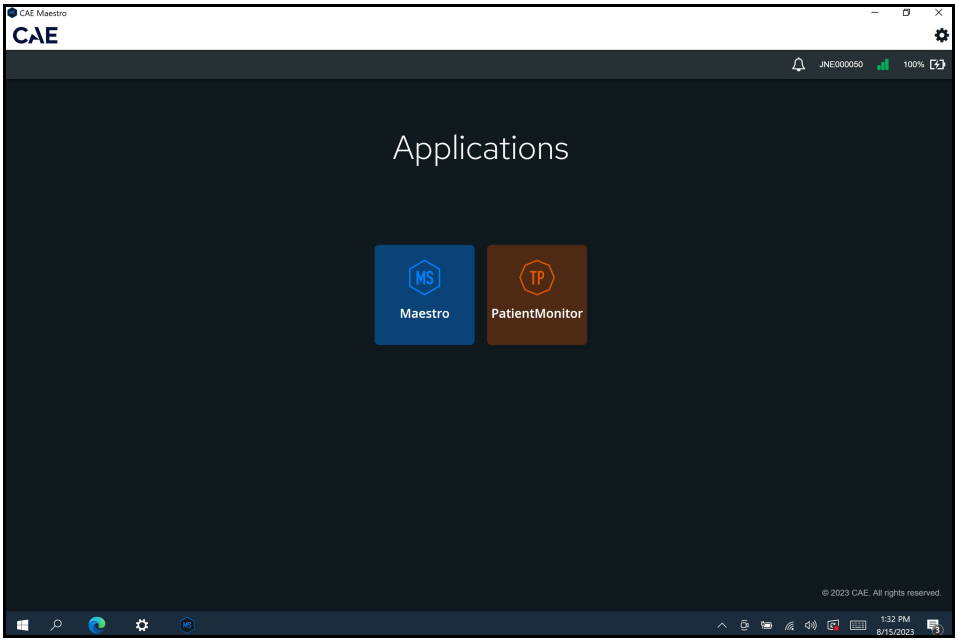


Simulator Selection Screen

23. Tap or click the radio button to select your simulator.

24. Tap or click **Continue**.

The Maestro Start Screen appears.



Maestro Start Screen

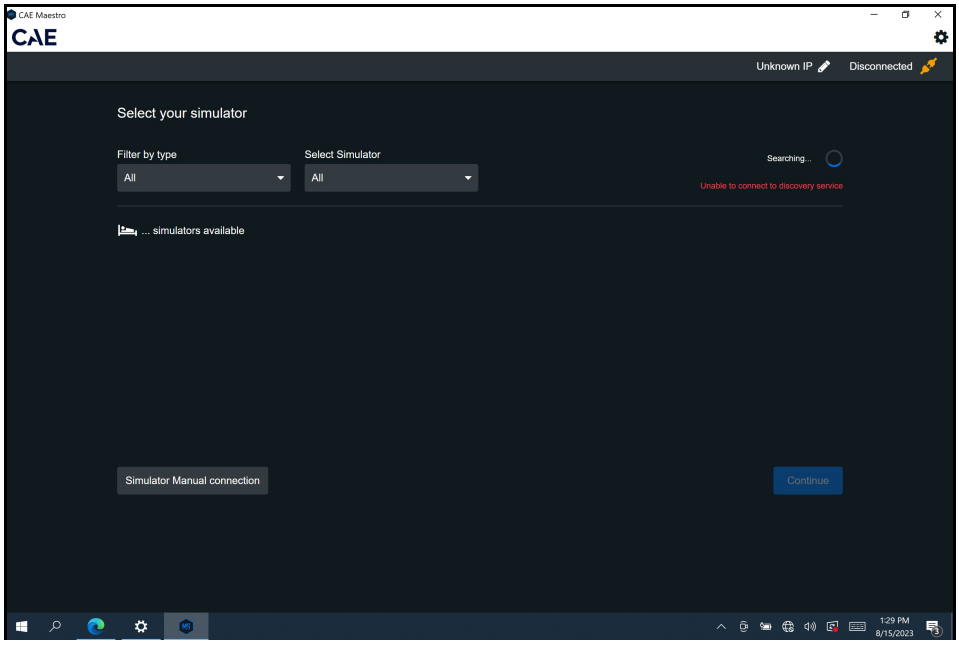
25. Tap or click **Maestro** to launch the application.

Step 6: Connect Patient Monitor to Organizational Network

Before proceeding, reconfirm that the simulator, instructor workstation, and patient monitor all have CAE Maestro 2.12 or later installed. For more information, review *Step 4: Confirm Maestro Version*.

Follow these steps to connect the Patient Monitor to the organizational network:

1. Power on the simulator and instructor workstation tablet or laptop.
2. On the instructor workstation, launch CAE Maestro and select the simulator.
3. On the patient monitor tablet or device, launch the CAE Patient Monitor application.
4. The Simulator Selection screen will appear.



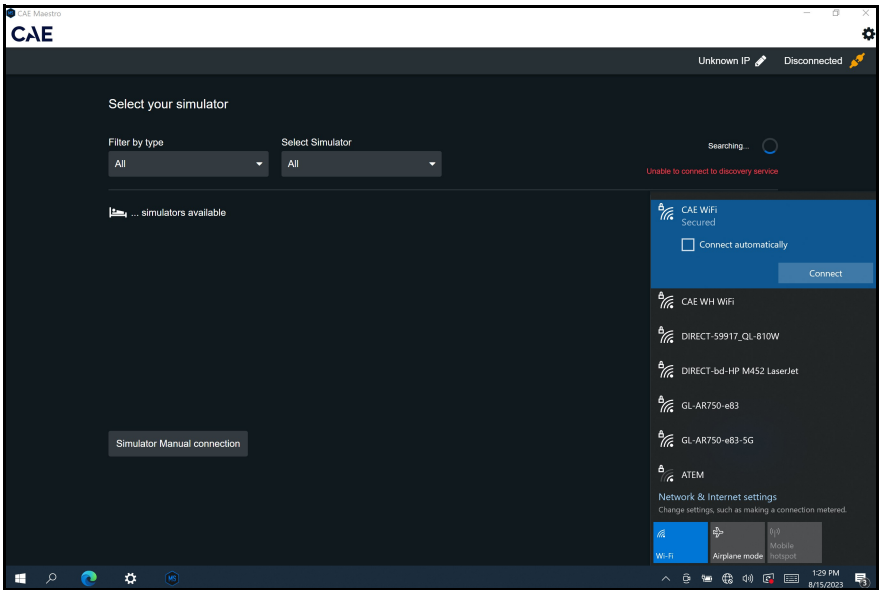
Simulator Selection Screen

5. Follow the steps for the type of connection you require:

   For **Wired** connection, connect a second Ethernet cable from the Patient Monitor to another organizational network wired port, then go to Step 6.

For **Wi-Fi** connection, do this:

a. Tap or click the Wi-Fi icon on the patient monitor to view the panel of Wi-Fi networks.



Simulator Selection Screen

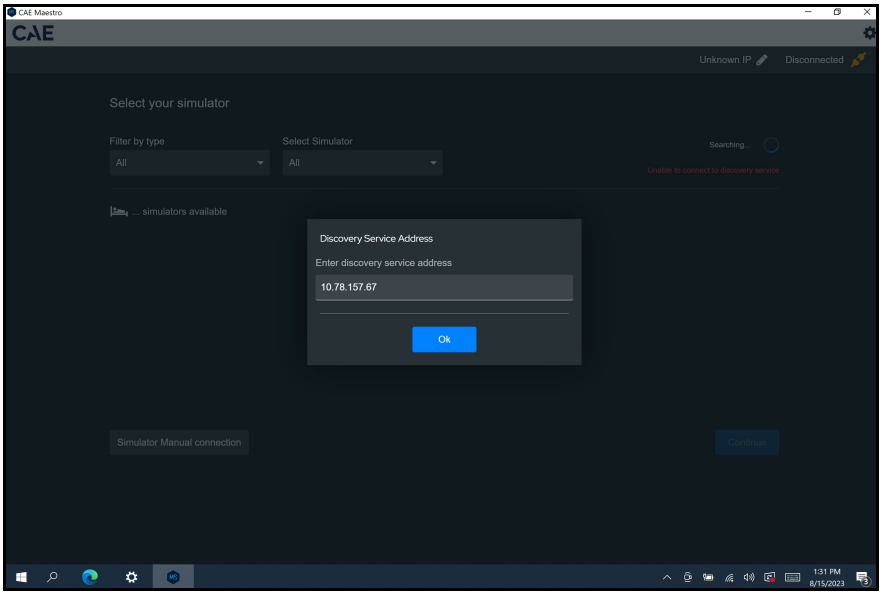
b. Tap or click the organizational Wi-Fi network.

c. Tap or click **Connect**.

d. Enter the password.

6. Click on the editing pencil icon in the upper right of the screen.

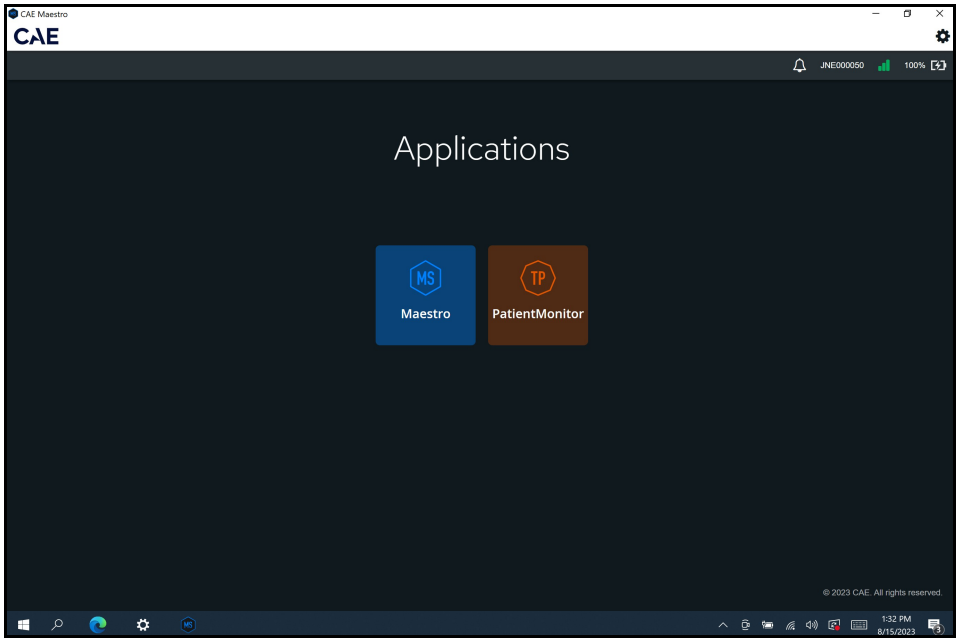
   The Discovery Service Address window appears.



Discovery Service Address Window

7. Enter the IP address of the device hosting the Discovery Service.
8. Tap or click **OK** to return to the Simulator Selection Screen
9. Tap or click the radio button for your simulator.
10. Tap or click **Continue**.

    The Maestro Start Screen appears.



Maestro Start Screen

11. Tap or click on **Patient Monitor** to launch the application.

Step 7: Setup Fetus Connectivity (CAE Lucina Only)

If Lucina is connected to an organizational network, further steps are needed to ensure connectivity for the associated fetus. Follow the steps below to complete the setup of Lucina.

Setup the Fetus Router

Adding an external router to Lucina is the easiest method to add support for the Fetus Wi-Fi.

Note: The instructions below are general to accommodate a variety of routers:

1. Enable the 2.4 GHz Wi-Fi band as a hotspot (disable any other bands e.g., 5 GHz).
2. Set the Wi-Fi name (SSID) to mfsXXXX, where XXXX represents Lucina's serial number.
3. Set the 2.4 GHz channel to 5.

4. Allow WPA2 security and type in caeadmin as the password.

5. Set the LAN IP address to 192.168.X.3, where X is the third octet of Lucina's IP address.

6. Disable DHCP. On the GL router, the “ignore interface” checkbox for LAN turns off DHCP for both wired and wireless network interfaces.

7. [Optional] Add MAC Address of fetus Wi-Fi interface to the whitelist of MAC addresses on the router for additional security.

8. Connect an Ethernet cable from Lucina's LAN port to a LAN port (not WAN) on the fetus router. On the GL-router, the LAN ports are either of the 2 ports closest to the Micro-USB power cable.

Note: the router can be left powered on if desired.

Verify Fetus Connectivity

Confirm that the fetus has been successfully setup:

1. Start the Lucina simulator.
2. Turn on the Fetus router.
3. Start the fetus, then wait two minutes.
4. After two minutes, connect to Maestro and confirm that the fetus battery is seen.

Connect Luna to an Organizational Network

Follow these steps to connect Luna to an organizational network:

1. Connect Luna’s instructor workstation to organizational Wi-Fi.

   Note: A wired connection is not supported for the instructor workstation.

2. Note the IP address of the instructor workstation. To find this:

   a. Select **Start > Settings > Network & internet > Wi-Fi** and select the Wi-Fi network to which you are connected.

   b. Under **Properties**, look for the IP address listed next to **IPv4 address**.

3. Connect the Patient Monitor to organizational Wi-Fi.

4. Ask your organizational IT department to create a MAC address reservation for the Luna instructor workstation.

5. Refer to the *Ideal Network Configuration* document for ports required to be open on the Luna instuctor workstation for any remote instructor workstation to connect to Maestro running on the Luna instructor workstation.

6. For any remote instructor workstation, download the Maestro client app by navigating to the Luna instructor workstation IP in browser, and pointing the client application at the IP address of the Luna instructor workstation noted in Step 2.

Firewalls

Traffic on the following ports must be allowed for simulators and instructor workstations to communicate.

Inputs to simulator:
- TCP 80, 443 for the Web browser and REST APIs
- TCP 58080 for the simulator maintenance web page
- TCP 9004 (for Juno multi-sim only)
- UDP 30100-30299 for VOIP

Outputs from simulator:
- TCP 80, 443 for cloud gateway/auto-update (Internet)
- TCP 40002 for the Maestro Licensing server (Internet)
- TCP 19001 for the Maestro Discovery service
- TCP 9004 (for Juno multi-sim only)
- UDP 30100-30299 for VOIP

Introducing CAE Maestro

CAE Maestro is a user friendly software that allows facilitators to control and monitor CAE patient simulators, in addition to creating Simulated Clinical Experiences (SCEs) Maestro includes dynamic controls that allow you to adjust the physiology of the patient as you proceed through a simulation, whether you are using it On the Fly or running a programmed SCE. A patient status overview on the runtime screen allows the facilitator to keep track of the current status of the manikin and the display on the CAE Patient Monitor. Maestro's dynamic flexibility and ease of use allow you to adjust the learner's training experience to meet their needs, capabilities, and experience.

CAE Maestro Application Overview

Users have the following choices for managing their simulation in the CAE Maestro software:

- Run simulations "On the fly" in Manual mode
- Run simulations "On the fly" in Modeled mode using CAE Physiology
- Run preconfigured simulations using Simulated Clinical Experiences (SCEs) in Manual or Modeled mode

Run on the Fly

When operating on the fly, no content is authored ahead of time and the simulation is simply controlled in real-time by the instructor. There are no predetermined scenarios nor any intended progression of events. You can run on the fly in Manual or Modeled mode.

In Manual mode, the user drives all changes to the patient's condition and responses to interventions by making manual selections in the software.

In Modeled mode, the simulation is automatically driven by CAE Physiology (a computational model of human physiology). This model controls patient status, progression of clinical signs, and response to interventions. Modeled mode also allows the instructor to override the model's output with manual inputs.

From the Run Screen, you can manually alter the patient's status and adjust parameters as needed for specific situations. The functionality in this mode is described in the *Run an SCE* section of this user guide.

Note: Only simulators with CAE Physiology can be run in Modeled mode.

If your configuration includes virtual equipment, these operate only in Modeled mode:

- Ventilator
- Transport Ventilator
- Anesthesia Machine

Simulated Clinical Experience (SCE)

Simulated Clinical Experiences (SCEs) are process tools that let facilitators execute a learning strategy using simulation. Preconfigured CAE SCEs provide an extensive overview and outline of the learning exercise, and require minimal additional faculty development time for use. Each SCE is typically comprised of a patient and a scenario.

With an SCE, some details of the simulation are defined ahead of time (e.g. states, patient profile, and other scenario background information). During an SCE, users can still make changes on the fly as needed.

Using CAE Maestro

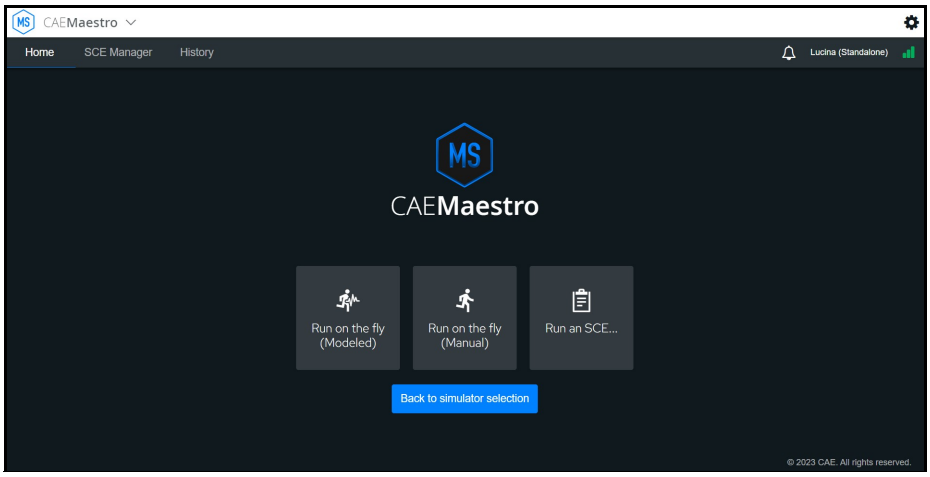
Using the CAE Maestro software, you can create and run SCEs, assess learners, and adjust system controls.

Note: For optimal performance, no other software program should be open while Maestro is running.

Starting a Simulation

Upon launching the CAE Maestro app, the Home Screen appears and users have the option to choose one of the following simulation types: Run on the fly (Modeled), Run on the fly (Manual), or Run an SCE.

Note: Modeled physiology is optional on some simulators.



CAEMaestro Home Screen

If multiple simulators are connected, tap or click the **Back to simulator selection** button to switch to a different simulator.

Run on the Fly Simulations

Run on the fly (Manual or Modeled) mode starts a simulation without an SCE.

To begin a Run on the fly simulation:

1. From the Home Screen, tap the **Run on the fly** button.
2. Select the patient's gender, if available.

Start Screen - Select Gender

3. Tap **Start** to begin the simulation.

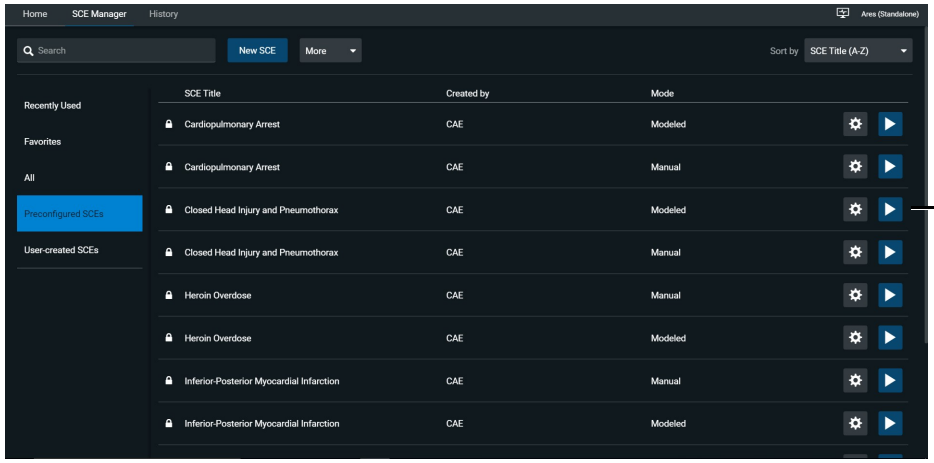
   From the Run Screen, you can manually alter the patient's status and adjust parameters as needed for specific situations. The functionality in this mode is described in the *Run an SCE* section of this user guide.

Run an SCE

From the SCE Manager, various simulations are available.

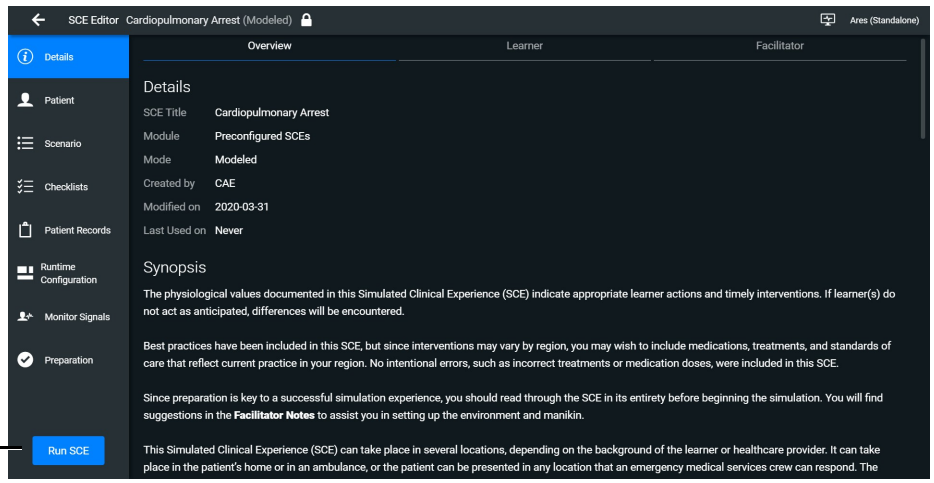
To run an SCE:

1. From the Home Screen, tap or click **Run an SCE**. The **SCE Manager** tab is selected by default.
2. Tap or click the **Preconfigured SCEs** tab to view the list of preloaded SCEs.



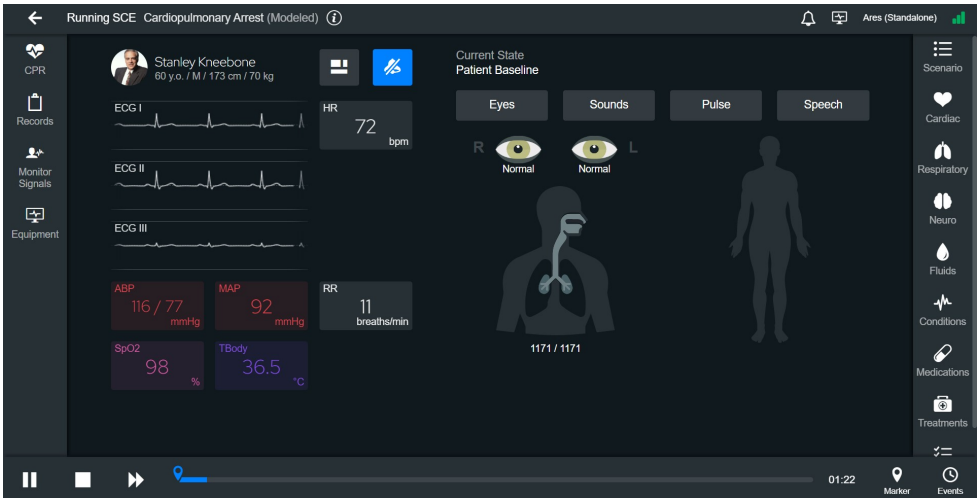
SCE Manager Screen - Preconfigured SCEs

3. Start the SCE in either of two ways:
   - Tap or click on the **Play** button.
   - Tap or click on the SCE title to view SCE details, then tap or click the **Run SCE** button.



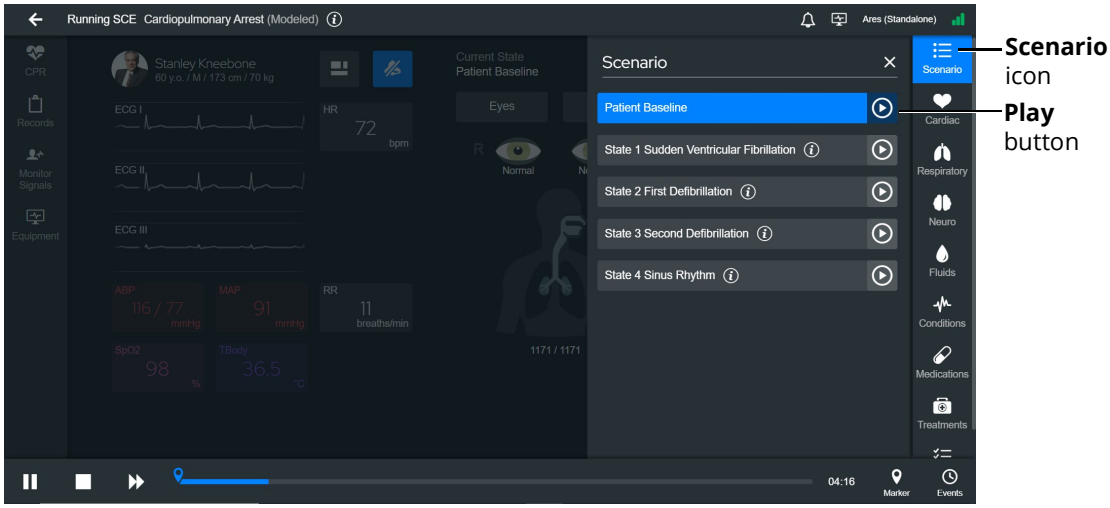
SCE Manager Details Screen - Run SCE Button

The Run Screen appears and displays the Patient Baseline state.



SCE Run Screen

4. Tap the **Scenario** icon in the upper-right corner of the Run Screen.



SCE Run Screen - Scenario Icon

The list of scenario states appears. A scenario will remain in the Patient Baseline until the **Play** button is tapped in another state.

5. Tap the **Play** button to apply a state to the running SCE.

Run Screen Features

When an SCE is started or when running on the fly, the Run Screen appears and displays a series of panels that group related controls and information. The content for each control is dynamic and varies whether you run scenarios on the fly or as an SCE. Users can adjust the status of the patient while they proceed through a simulation using these controls. When running an SCE, some panels contain additional controls.

Note: Throughout this section, the user interface examples may vary in options and complexity depending on which patient simulator is connected.

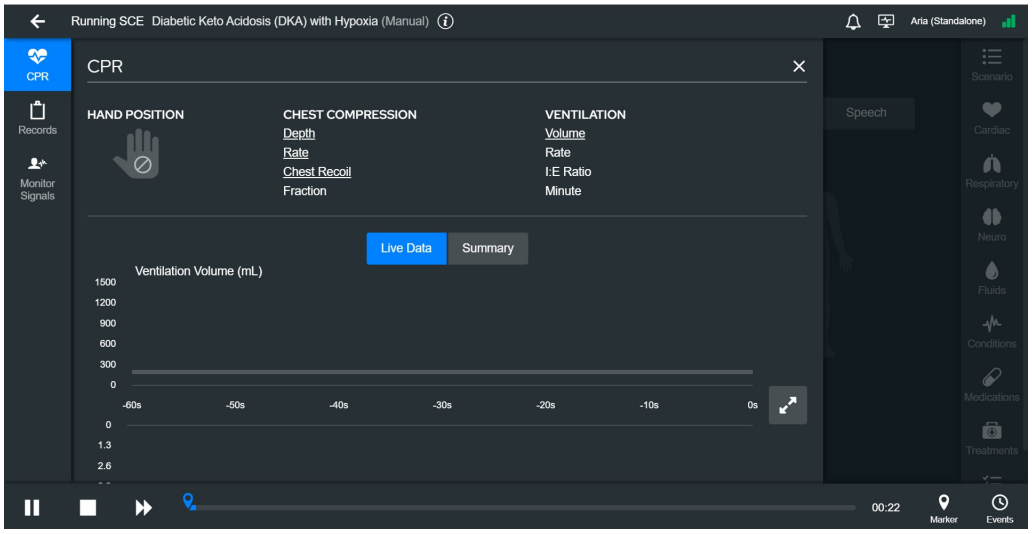
The CPR Monitor

Some simulators support an internal CPR Monitor to track the efficacy of CPR interventions. The CPR Monitor is available from the Run Screen and will appear on the top left, if available.

Note: The CPR Monitor is only active while running Maestro connected to a simulator. It does not appear in the Standalone software interface.

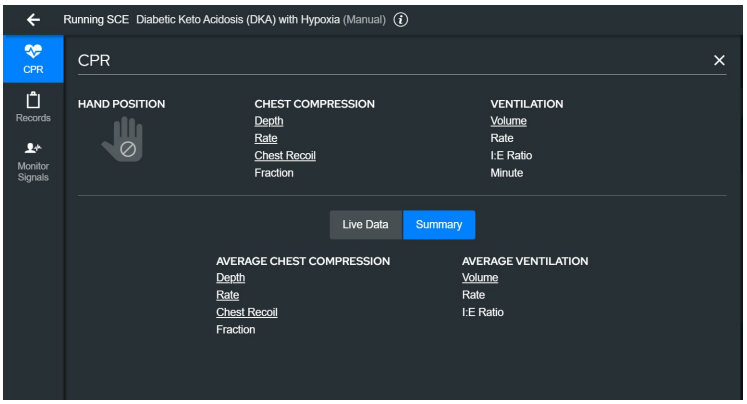
To use the CPR monitor:

1. Tap the **CPR Monitor** button at the top-left of the Run Screen.



CPR Monitor - Live Data

2. Tap the **Summary** button to display the summary view.



CPR Monitor - Summary

3. Tap the **Live Data** button to return to the Live Data view.

   The CPR Monitor displays several statistics, including current hand position, compression and ventilation rates, compression depth, ventilation volume, and compression-ventilation ratio.

   CPR data is recorded in the Event Log.

   To close the CPR monitor, tap the **X** button.

Records

You can display patient records while an SCE is running.

To display a patient record:

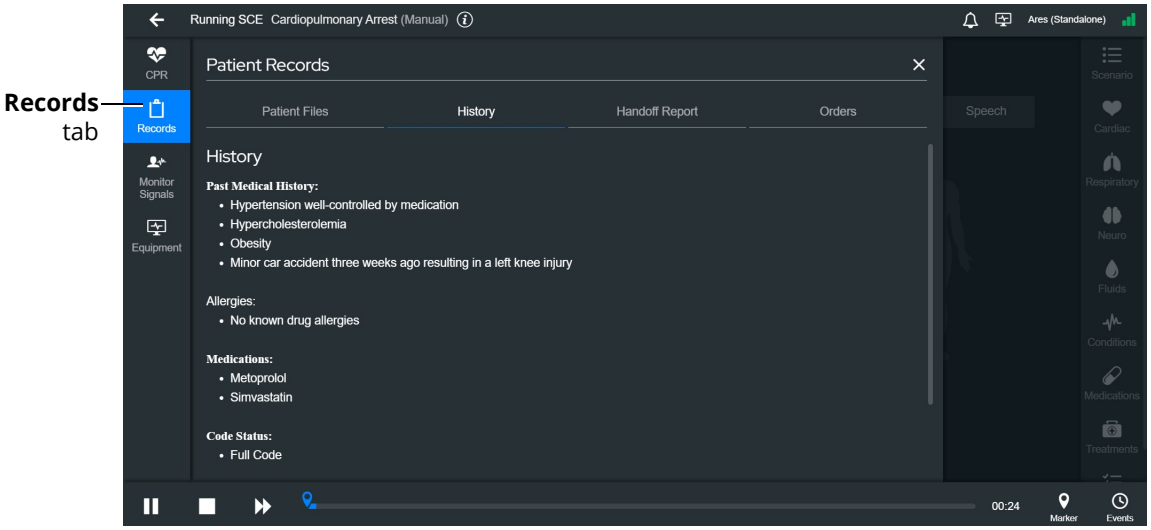
1. From the Maestro Run screen, select **Records**.

   The Patient Files tab displays by default.

   To view patient files, select **Show Library** button.

   The list appears with all available patient records appears.

To view the Patient's history, select **History** tab.



Patient Records - History

2. (Optional) To preview a patient record before sending to the Patient Monitor, select the record and tap the **Preview** button.
3. Select a patient record and tap **Send to Patient Monitor**.

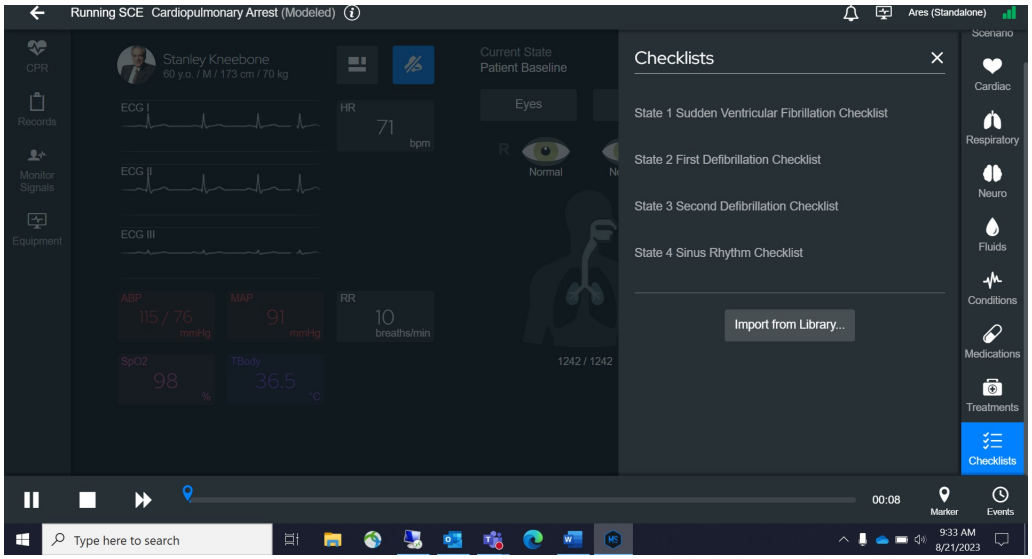
   The patient record opens in CAE Patient Monitor.

   Note: Only one patient record displays at a time.
4. To stop displaying a patient record, tap **Remove from Patient Monitor**.
5. To close the Patient Record list, tap **Records**.

Checklists

To access learner checklists:

1. Tap the **Checklist** tab at the bottom of the parameters panel on the right side of the screen. It may be necessary to use the scroll bar to access this lowermost tab.



The Checklists Popup Screen

2. Tap or click on the name to select a checklist.
3. Tap **Begin** to launch the first checklist and start verifying steps performed by learner.
4. After a checklist has been completed, Tap **New Instance** to begin another checklist for the next learner.

   The Checklist drop-down list displays each instance completed, numbered 01 as first instance, 02 as second instance, etc. within each state.

5. Tap the **X** to close the Checklist panel.

Monitor Signals

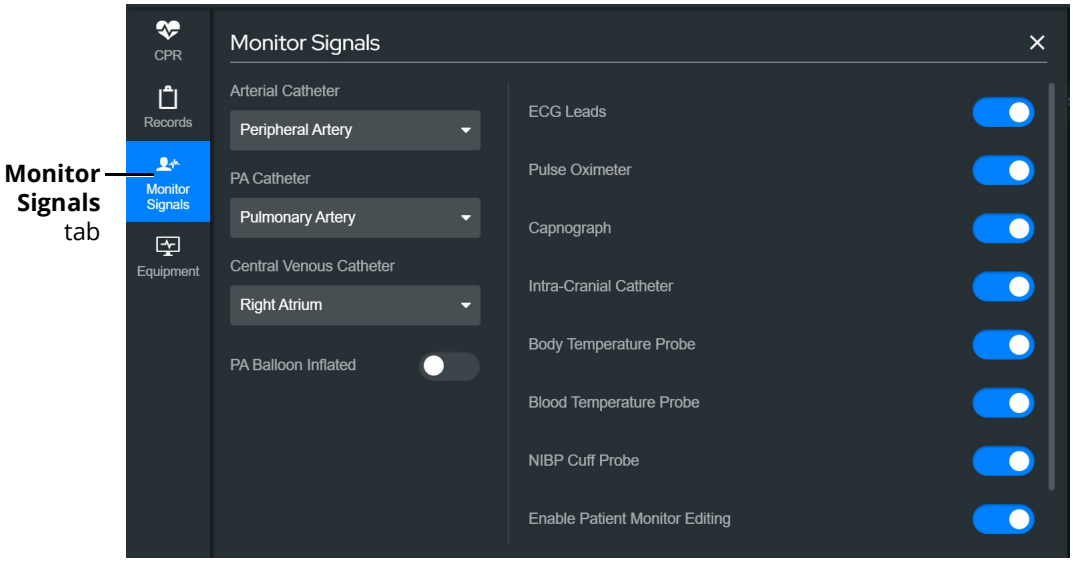
The Monitor Signals tab gives the users control over the values and signals that appear on the simulated Patient Monitor.

Tap the **Monitor Signals** icon to define which patient indicators will be monitored.

Patient Monitor Signals

Use the drop-down menus to define which patient parameters will be visible for learners viewing the patient monitor.

Use the toggles to turn the various values and signals on and off.



Monitor Signals

By default, all probes are on. When probes are turned off, it impacts different waveforms and numerical values on the patient monitor.

Probe Turned Off	Impact
ECG Leads	Hides the ECG waveform and HR value
Pulse Oximeter	Hides the PLETH waveform and SpO2 value
Capnograph	Hides the CO2 waveform and EtCO2 value
Intra-Cranial Catheter	Hides the Intra-Cranial Catheter values
Body Temperature	Hides the body temperature values
Blood Temperature	Hides the blood temperature values
NIBP Cuff Probe	Prevents the user from measuring NIBP on Patient Monitor

Setting the catheter placement to Atmosphere causes a flat line to appear, even when an override is used. Available catheters include:

- Arterial Catheter
- PA Catheter
- Central Venous Catheter

If the catheter placement is *None*, no trace appears at all.

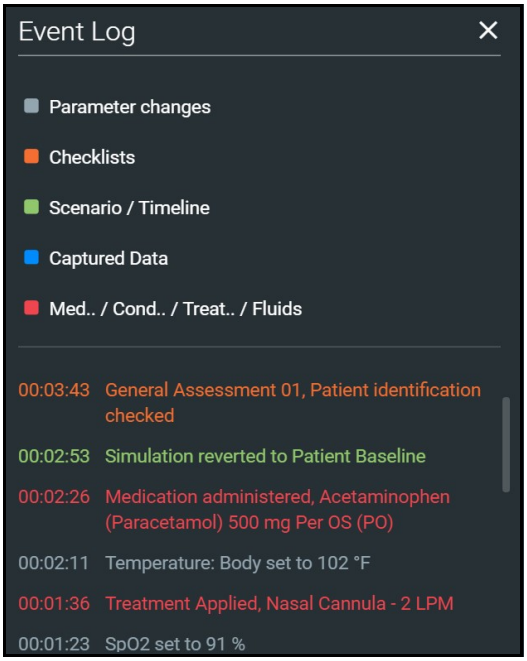
Tap the **PA Balloon Inflated** toggle to inflate the patient's PA Balloon. Tap it again to deflate.

Event Log

During an SCE, all changes (manual or detected by the system) to simulation settings, learner actions, and checklist results are recorded in the Event Log.

To access the Event Log, tap the **Events** button in the bottom-right corner of the Run Screen.

The event log records the time and details of instructor and learner actions, which are color coded by category.



Event Log

In Manual SCEs, the administered medication information tracked in the Event Log does not have an automatic effect on patient physiology.

Reset an SCE

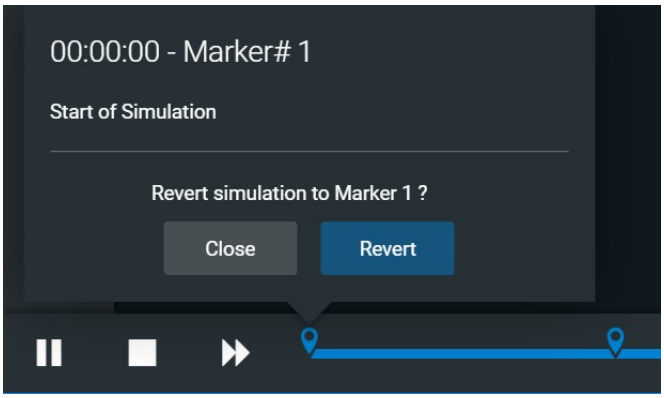
Resetting an SCE brings the patient's initial status data back to its original status. The SCE time is unaffected. Reset data appears in the Event Log.

To reset patient data:

1. While running an SCE, select the first marker on the timeline.

Timeline

2. Tap **Revert**.



Revert to Marker

The patient returns to the Baseline state. The patient reset is indicated on the SCE timeline bar and in the Event Log.

Reset Notification

Changing Patient Status

You can adjust the patient status when running on the fly or running an SCE by:

- Using one of the parameter panels on the Run Screen to modify parameters. For more information, see *Patient Status Display* section of this user guide
- Applying a Condition, Treatment, or Medication
- Applying a Scenario state

Patient Status Parameters

From the Run Screen, select a parameter icon to display the associated parameters panel for various body systems and features. To access a parameters panel, tap the appropriate icon or button on the right side of the Run Screen.

The Run Screen shown here may differ somewhat in options and complexity based on which human patient simulator you are using. This example is for CAE Ares.

Run Screen with Cardiac Parameters

Types of Parameters

There are two types of parameters: numeric and discrete.

Once a parameter is selected and set, the patient's physiology changes according to the model for that parameter.

Numeric Parameters

To change numeric parameters, tap the relevant field and enter a new value in place of the existing one. Or, use the slider to move through the range of parameter values until the numeric value is established.

In Run on the fly Modeled mode, there are a larger set of parameters that are either monitored patient values, or physiological model inputs. When users set or modify monitored patient values, it overrides the output of the physiological model. To return to a physiologically modeled value, tap the **Modeled** button and tap **Accept**.

Changing physiological model inputs indirectly impacts the output of the physiological model. When a modeled input is called a Factor, it acts as a multiplier. For example, Heart Rate Factor 2.0 is two times the baseline Heart Rate.

Discrete Parameters

Discrete parameters let users choose the appropriate option from a drop-down menu or toggle switch.

The following image shows the Bronchial Occlusion controls in the Respiratory parameter. The Bronchial Occlusion control is set using a discrete parameter switch that toggles between **OFF** and **ON**.

Bronchial Occlusion Parameter

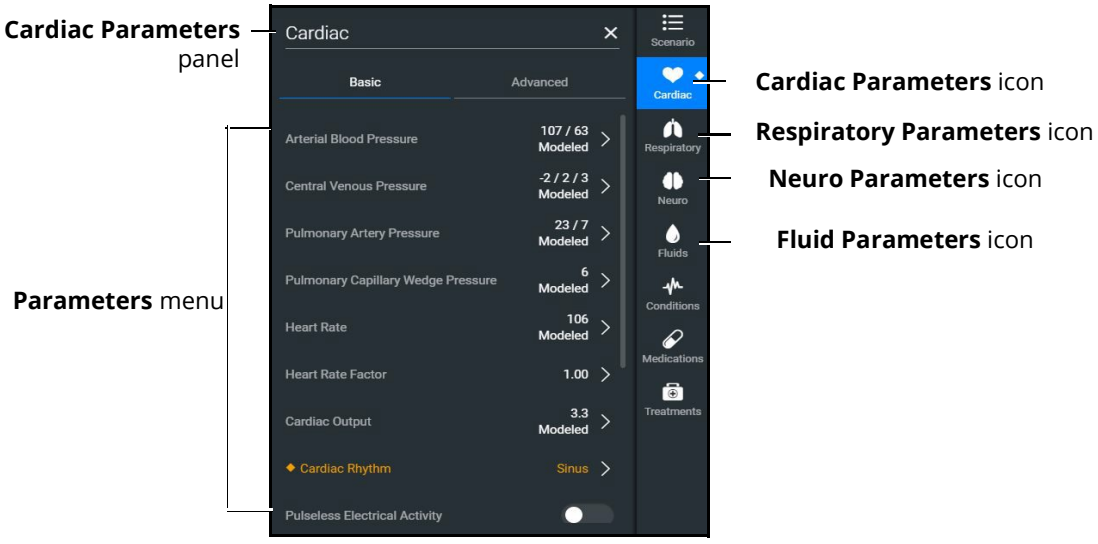
Some parameters have two toggle switches or buttons, one for each side of the manikin.

Changing a Patient's Parameters

To change a patient's parameters:

1. Tap the appropriate parameters icon to view the parameter panel.

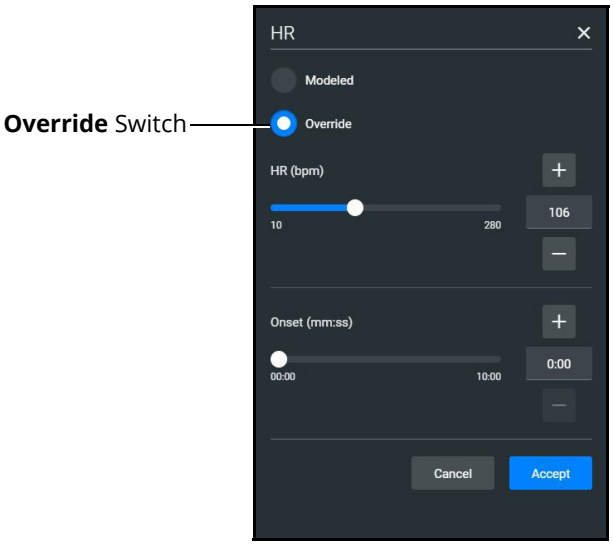
   The Cardiac Parameters panel shown here may differ somewhat in options and complexity based on which human patient simulator you are using.



Cardiac Parameters Panel

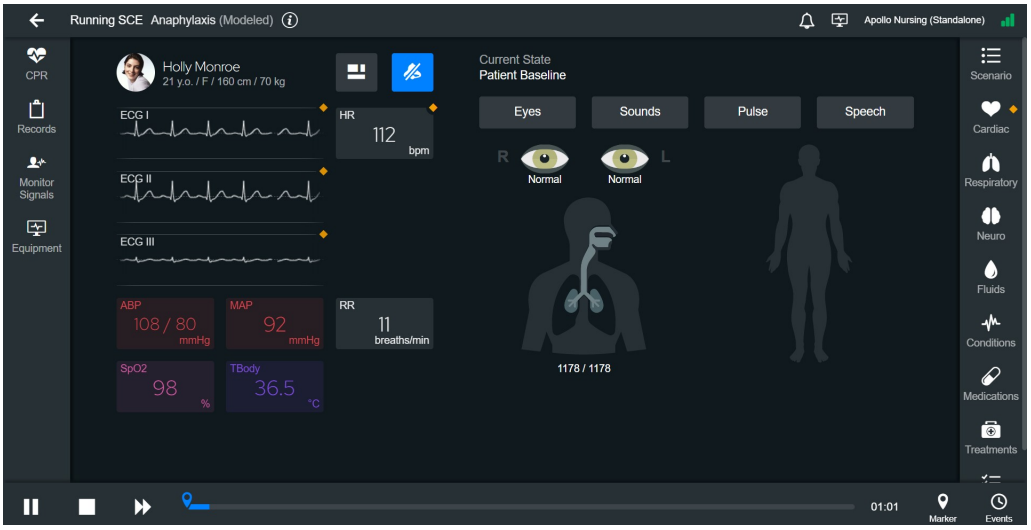
If running on the fly or running an SCE in Modeled mode, the parameters will display the physiological responses in real-time.

Note: Patient status parameters can be toggled between modeled and override modes. Tap the arrow next to a parameter to open the control menu on the right side of the screen. Turn on the Override switch to adjust settings as desired, then tap **Accept**.



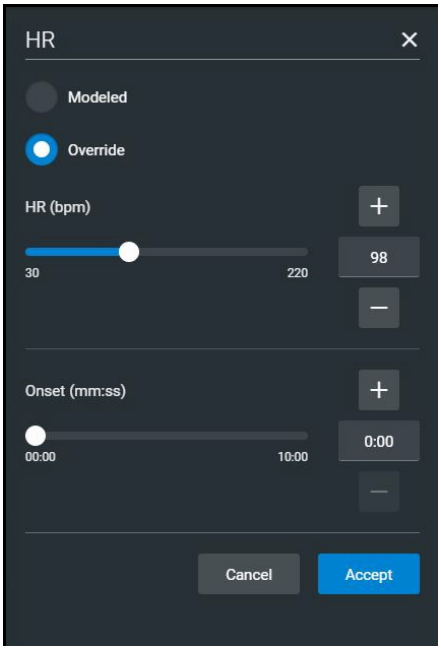
Override Controls

When you override a setting, an orange diamond-shaped indicator will appear at the upper-right corner of that parameter icon to show it is no longer driven by the model. The same indicator will also appear on the parameter widget and associated waveforms.



Override Indicators Visible

2. Select the desired parameter. The Parameter Controls screen appears.



Heart Rate Parameter Controls

3. Set the new value and tap **Accept**.

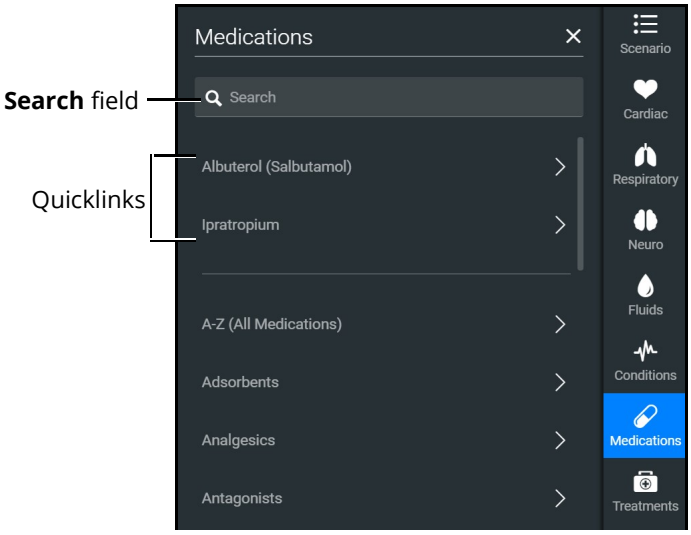
Applying Conditions and Interventions

Conditions or interventions, such as medications and treatments, may be applied during simulation. Once applied, conditions are reflected in the patient's physiology (if in Modeled mode) and logged. All medications and other interventions are also logged, and most also affect the patient's physiology (in Modeled mode only).

Using Quicklinks

When programming an SCE, conditions, medications, and treatments likely to be used in a given simulation can be set up as Quicklinks, which will appear in alphabetical order at the top of the panel for quick access.

Note: Quicklinks can only be added when creating or editing an SCE. To learn more about setting up Quicklinks, see *Runtime Configuration* in *Using the SCE Editor* section of this user guide.



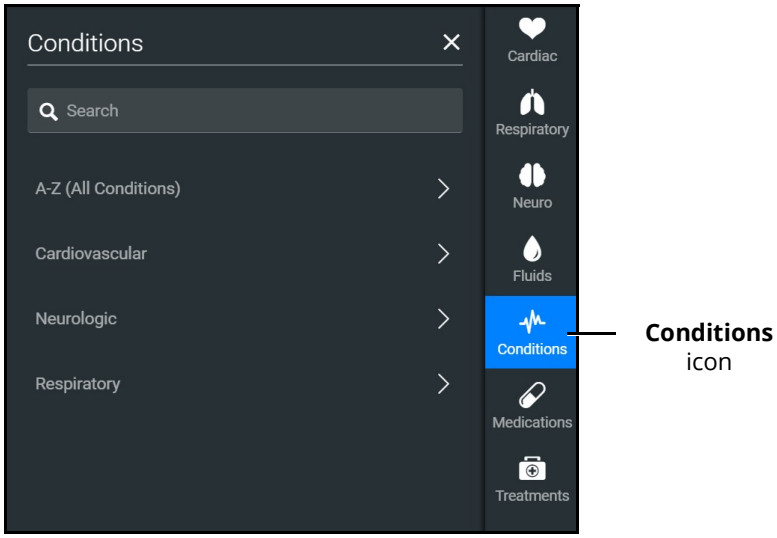
Medications Panel - Quicklinks

Conditions

Conditions are preprogrammed pathophysiological states that incorporate one or more physiological parameters and are designed to enable multiple physiological changes more easily. Conditions are similar to scenario states in that they can contain multiple parameter changes that make it easy to quickly adjust the patient's status.

Conditions are especially useful when programming in Modeled mode, where they continuously interact with the modeled physiology and any interventions to ensure appropriate changes for the condition.

The Conditions panel shown here may differ somewhat in options and complexity based on which human patient simulator you are using.



Conditions Panel

To apply a condition:

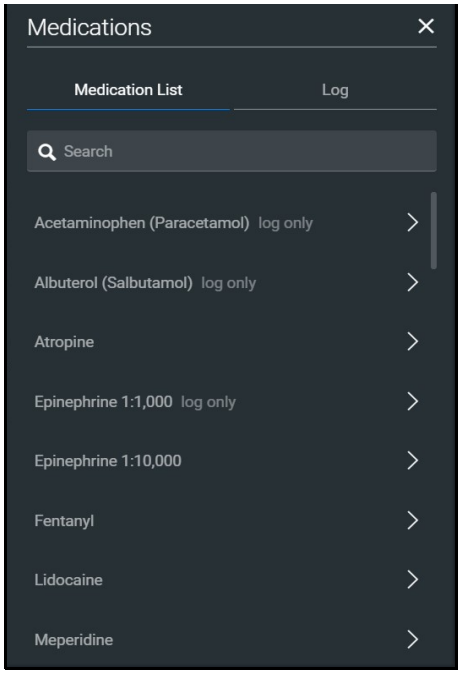
1. In the **Conditions** panel, tap a Quicklink, if available, or select a condition from within the listed categories or by tapping on **A-Z (All Conditions).** You can also use the Search feature to quickly find a specific condition.
2. Tap the name of the desired condition and select a severity, if available.
3. Tap **Apply condition.**

Medications

To choose a medication:

1. In the **Medications** panel, tap one of the Quicklinks, or from the Medications list, tap **A-Z (All Medications)** to browse all medications in alphabetical order, or use the Search feature to quickly find a specific medication. Medications are also grouped by category below the **A-Z (All Medications)** list option.

   The Medications panel shown here may differ somewhat in options and complexity based on which human patient simulator you are using.

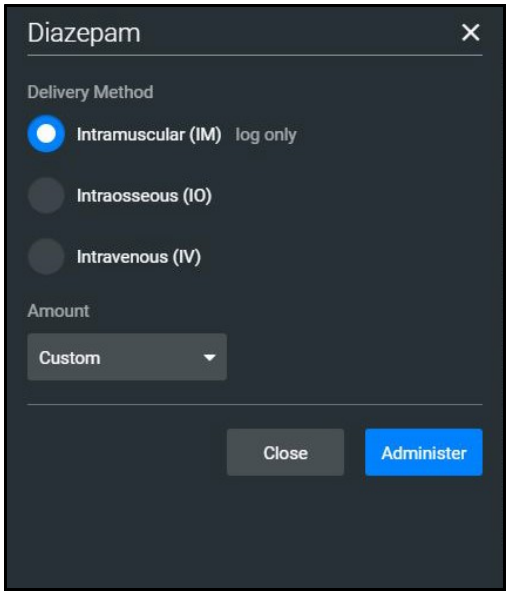


Medications Panel Example

2. Tap on a specific medication to choose a dose and route of administration.

   The medication controls appear. The delivery method and amount options, which include pre-defined doses and custom dose options, are displayed.

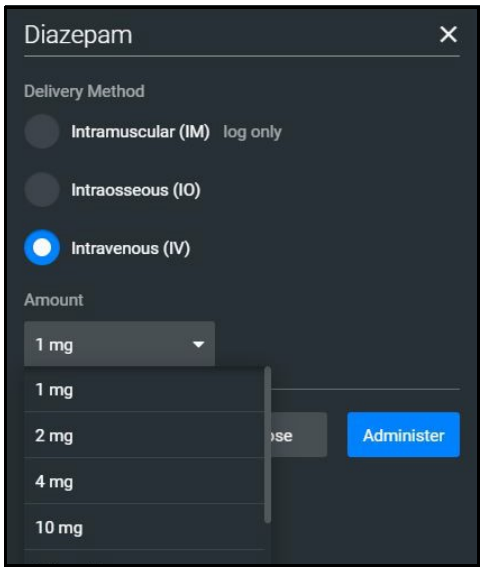
   The Medication Controls panel shown here may differ somewhat in options and complexity based on which human patient simulator you are using.



Medication Controls

Under **Delivery Method** options, tap the desired route of administration.

In the **Amount** drop-down menu, select a pre-defined dose or choose Custom to enter a custom dose.



Custom Dose

3. Tap **Administer**.

   Note: All administered medications are added to the **Event** log.

In Manual mode, administered medications do not affect the patient's status. Any associated changes to the vital signs or other parameters must be manually adjusted. For more information, see *Changing Patient Status* section of this user guide.

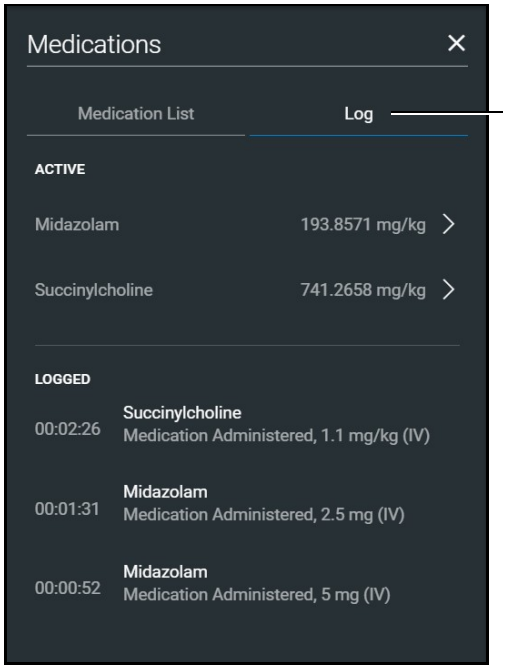
In Modeled mode, medications affect the patient's status unless labeled *log only.* Medications are also logged in the **Log** tab on the **Medications** panel.

The Medications Log

The Medications Log, present in Modeled mode only, tracks the administered medications. If applicable, the infusion rate of the medication is also displayed.

To view the Medications Log:

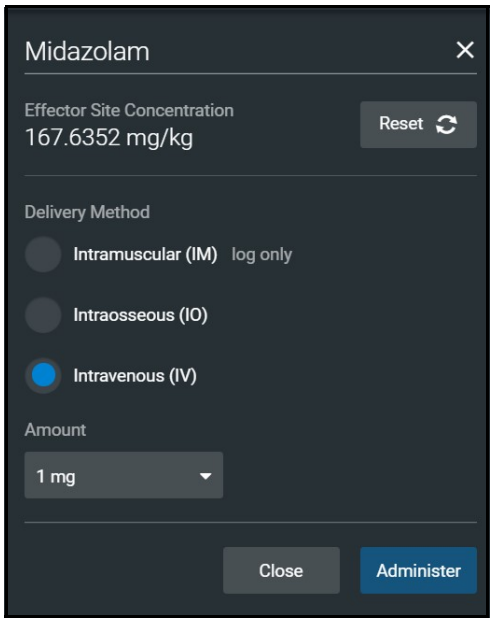
1. From the Run Screen, tap the **Medications** control.
2. Tap the **Log** tab.



Medications Log

The medications that have previously been administered appear in the *Logged* section of the screen. Medications that are currently impacting the patient physiology appear in the *Active* section of the screen.

Tap an active medication to display medication information.



Medication Information

The normalized effector site concentration is shown next to each medication listing. This represents the amount of medication that is affecting the patient physiology.

Reset a Medication

To reset a medication:

1. From the Medications Log, select an active medication.
2. From the medication information, tap **Reset**.
3. When the Reset Effector Site Concentration prompt appears, tap **Reset**.

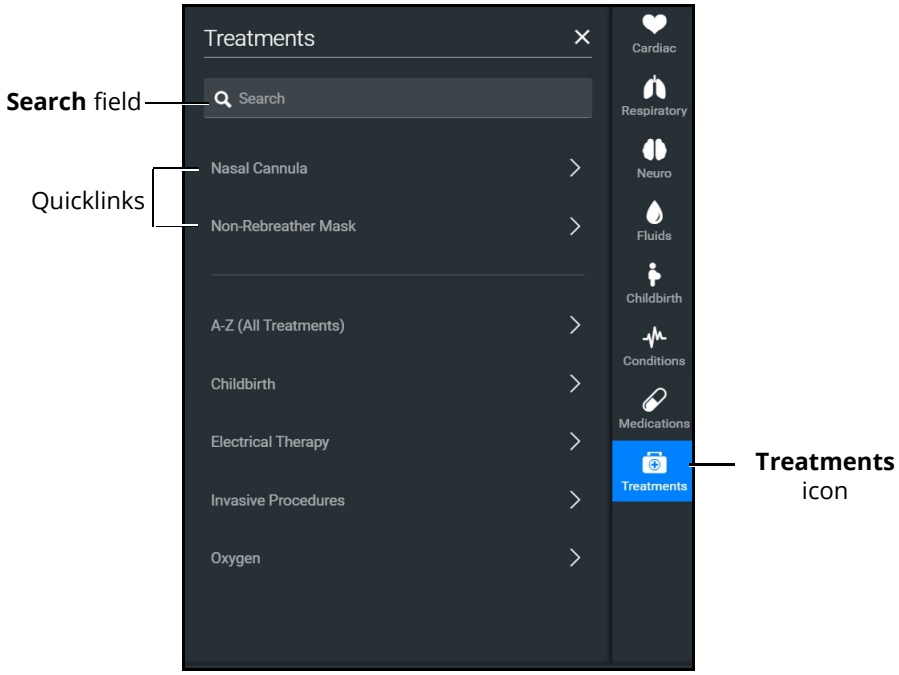
   The medication is cleared from the Active list. The original administration information remains in the Medications Log, however, and the **Events** Log reflects both the administration and resetting of the medication.

Treatments

To apply a treatment:

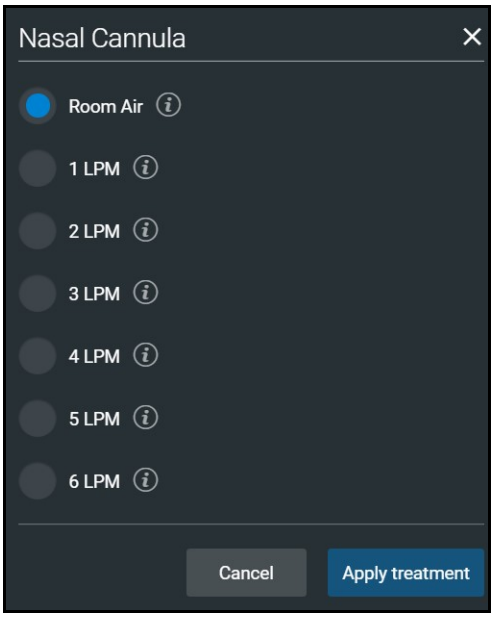
1. Tap the **Treatments** icon and select a treatment from the Quicklinks, or select a category to see treatments organized by type, or tap **A-Z (All Treatments)**. You can also use the Search function. Navigate through the menus to locate the desired treatment.

   The Treatments panel shown here may differ somewhat in options and complexity based on which human patient simulator you are using.



Treatments Panel

Make further selections as needed, such as Room Air or LPM of oxygen for the nasal cannula.



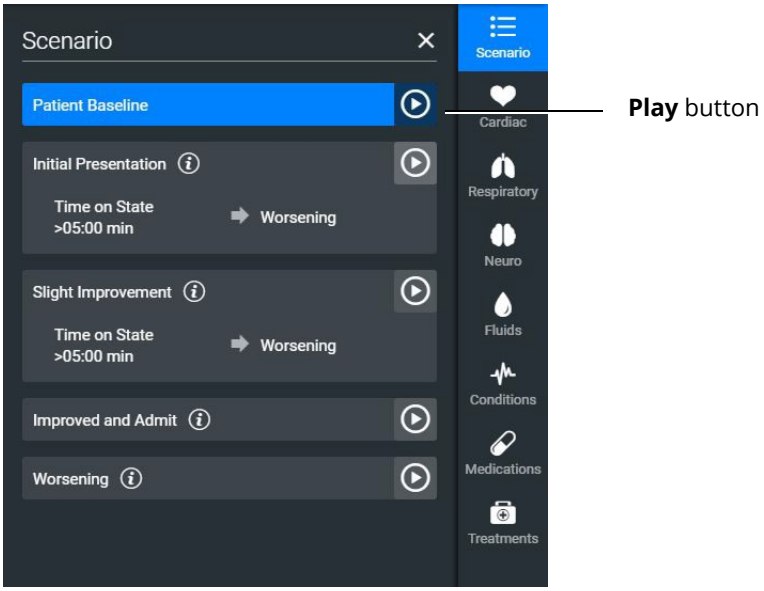
Treatments Menu

2. Select a treatment and tap **Apply treatment**.

Transitioning Scenario States

To move between scenario states from the Run Screen:

1. Tap the **Scenario** icon to expand the scenario panel.



Scenario Management Panel

2. Tap the **Play** button in the desired state to advance from the current state to the desired state.

   To pause or continue a scenario, tap the **Pause** or **Play** button from the Scenario Management menu.

SCE Timeline Controls

The SCE timeline controls are located at the bottom of the Run Screen.

Timeline

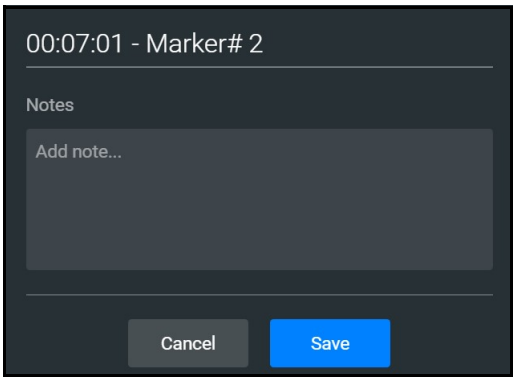
- The **Timeline** bar shows the amount of time that has elapsed and markers that have been created.
- The **Marker** button places a marker at the current point in the SCE. The marker can be used to annotate, or to reset the patient's physiology to what it was when the marker was placed. For more information, see *Using Markers* section of this user guide.
- The **Fast-Forward** button accelerates the SCE time to a 4x or 8x speed. This feature is optimal to obtain monitor readings for the learners to reference during scenarios, as well as advance the states and programmed physiology in a shorter amount of time.
- The **Pause/Play** button pauses the SCE (and the simulator) or starts the SCE if it has been paused. The **Pause/Play** button also returns the SCE time to normal speed after **Fast-Forward** has been selected.

Using Markers

To annotate the timeline, tap the white **Marker** button to the right of the timeline.

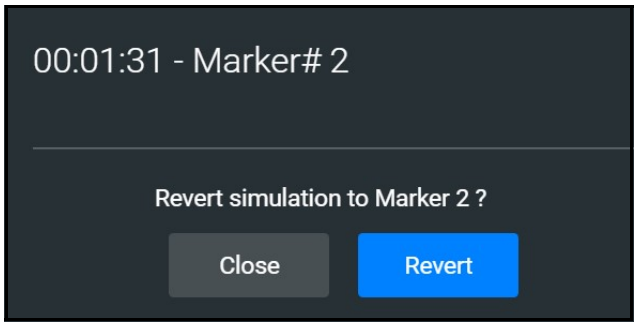
Timeline with Markers

A blue marker appears on the timeline bar and the Marker panel appears. Notes or comments may be added as needed. Tap **Save**.



Marker Panel

To return to the patient status at the time a marker was created, tap that marker, then tap **Revert**.



Revert to Marker #2

The patient's status returns to the selected point in the timeline.

Note: When running an SCE, the SCE time continues moving forward and does not reset to the marker time.

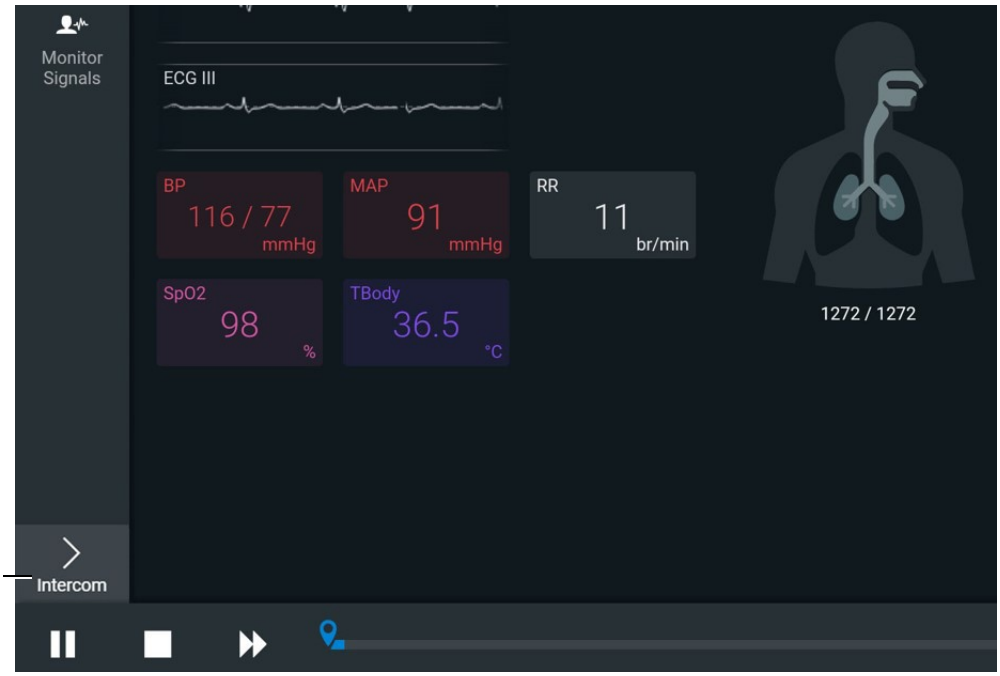
Using the Intercom

Maestro provides an intercom feature which allows facilitators to communicate with learners and to speak as the patient. Users can speak through the intercom using a headset or by speaking directly into the tablet's microphone. Users can initiate one-way and two-way communications or mute all audio communications.

Communicate with Participants

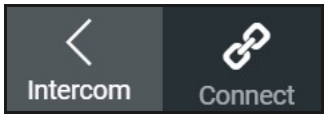
To use the intercom:

1. While running an SCE, tap **Intercom** in the left panel to expand intercom options.



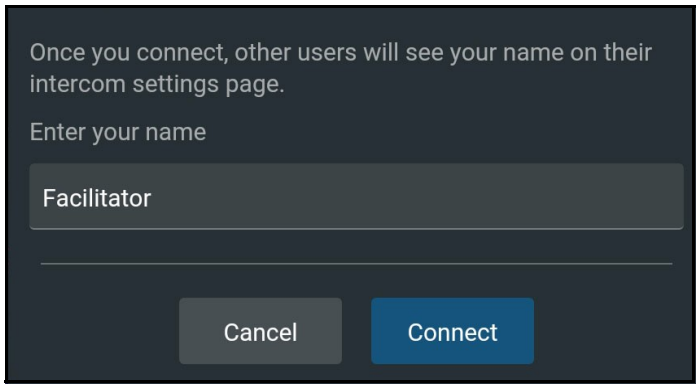
Intercom on Run Screen

2. When the **Connect** button appears next to the **Intercom** tab, tap **Connect**.



Connect Button

The Connect Window appears.



Connect Window

3. Tap in the text field to access the keyboard and enter in the desired name for the intercom.
4. Tap **Connect.**

   Once connected, the Intercom Tools menu appears.

Intercom Tools Menu

5. Tap **Participants** to begin 2-way communications with all participants in the simulation.

   Note: Tap and hold the **Participants** button to initiate communications only while pressing the button. Communication ends when the button is released.

Additional participants may join the network. For example, another facilitator is able to join the network by launching a second instance of Maestro via tablet or PC. The facilitator can then use the Intercom controls to talk as the manikin or talk to the primary facilitator.

Speak as the Patient

On the Intercom Tools menu, tap or click and hold the **Patient** button to speak through the manikin's vocal speakers. For longer hands-free dialog, tap or click the button once to activate Patient Voice Mode. Tap or click again to exit Patient Voice Mode.

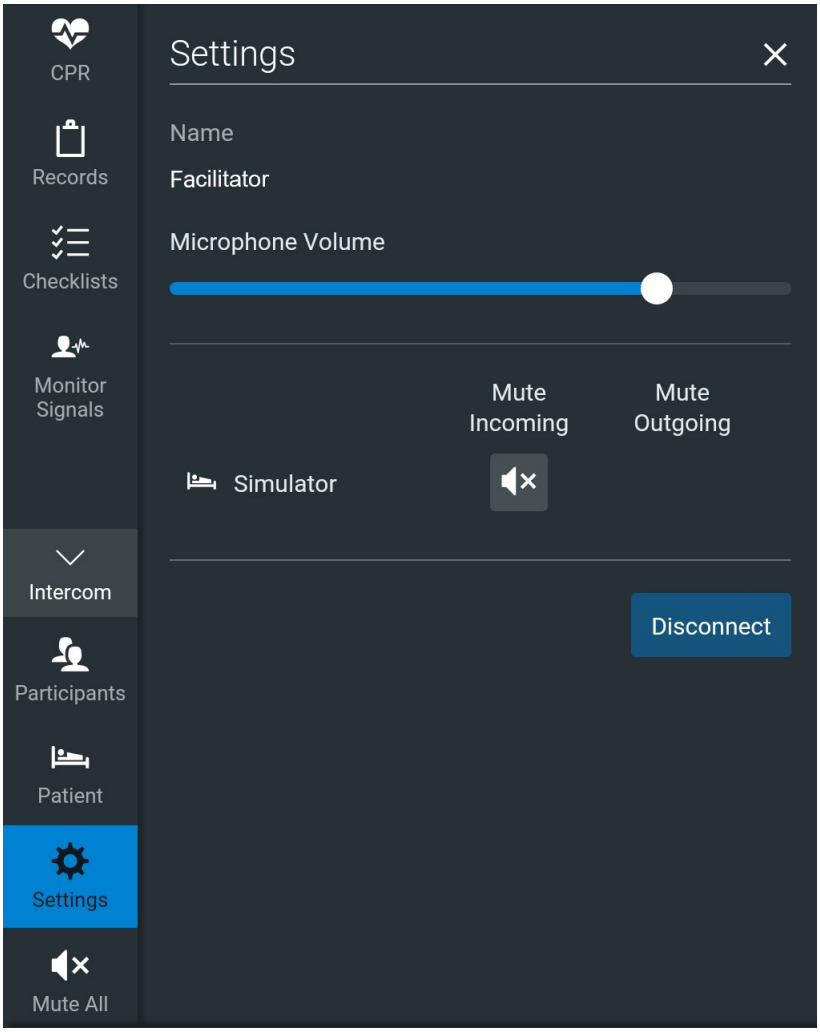
To mute all communications between faciliator and participants, on the Intercom Tools menu, tap **Mute All**.

Settings

Settings allow users to control how the intercom functions. To modify settings:

1. On the Intercom Tools menu, tap **Settings**.

   The Settings pane appears.



Settings Panel

2. In the Settings panel, users can:
   - Tap **Disconnect** to disconnect from the manikin's intercom functions.
   - Use the slider to adjust the microphone volume.
   - Tap the **Mute** icon to mute incoming communications from the manikin's microphone.
3. To exit, tap the **X** icon.

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Patient Display

The Patient Status appears when running on the fly or running an SCE.

The Patient Status displays the same information except when running an SCE:

- the Current State (e.g. Patient Baseline) appears.
- the Scenario icon appears at the upper-right of the Run screen.

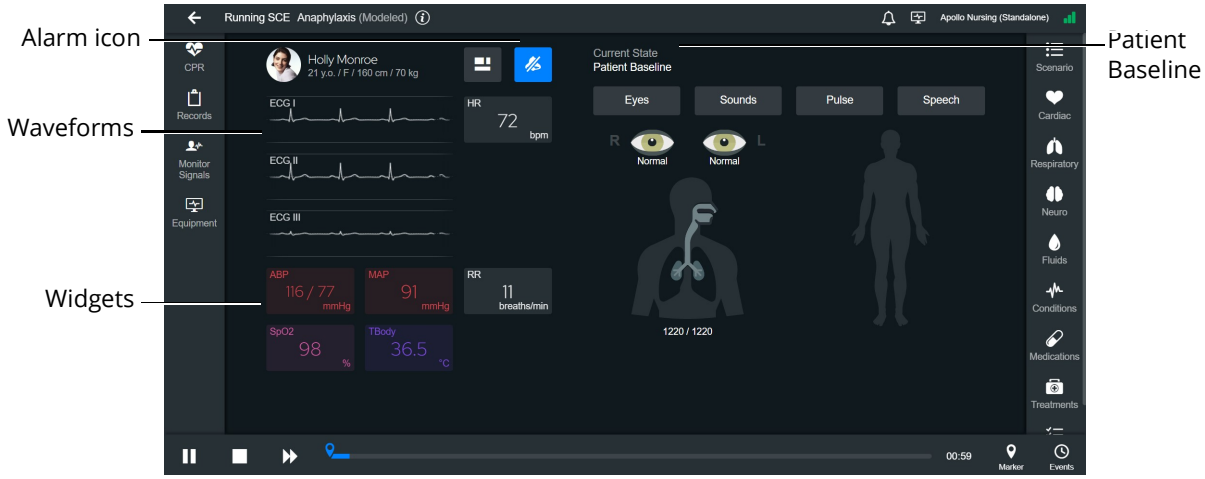
Patient Status Display

Patient Status display appears in the main frame on the Run Screen. From this screen, users can:

- tap the Alarm icon to mute or unmute alarm sounds.
- tap waveforms, numeric widgets, and other parameters to adjust them.
- edit a layout.

The status includes numeric data and waveforms, as well as the Patient Baseline if running an SCE.

Note: The user interface will vary in options and complexity from the examples shown throughout this section, depending on which simulator is connected.



Patient Status Display

Patient Controls

The patient's current state is shown on the Patient Status Display, allowing users to easily adjust parameters and patient states. The following controls are available whether running on the fly or running an SCE:

- Eyes (available for SymEyes only)
- Sounds
- Pulse
- Speech
- Respiratory

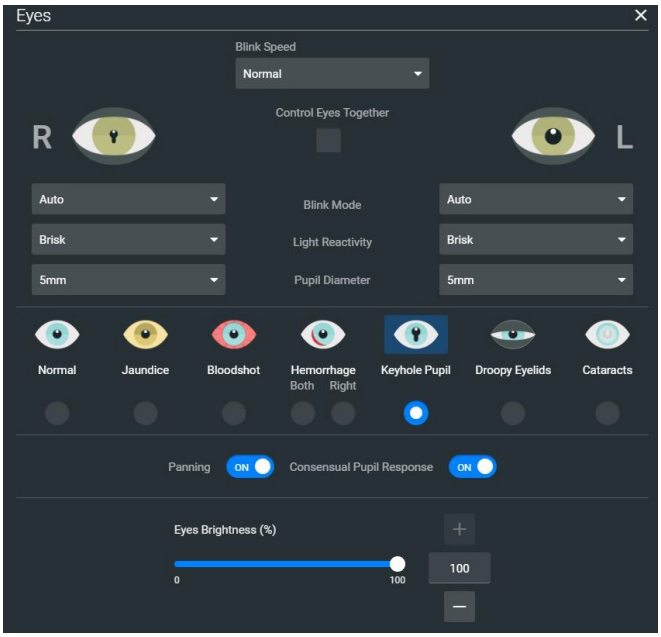
Eyes

To change Eye states:

1. From the Patient Status Display panel, tap the Eyes button or the eyes illustration.

Patient Baseline - Eyes Button and Illustration

The Eye states panel appears.



Eye States Panel

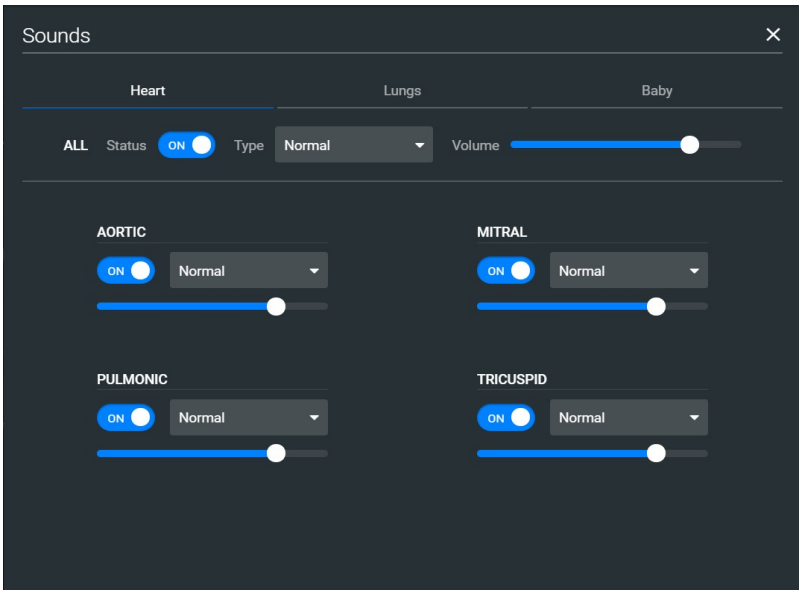
2. Adjust eye states including blink speed, blink mode, light reactivity, and pupil diameter, and eye states (if available) as desired by using the drop-down menus and toggles. Close the panel (by tapping the **X)** to apply the changes.

   NOTE: For CAE Apollo only, the **Pupil Diameter** parameters are available only if **Light Reactivity** is set to **None**.

Sounds

To change Sounds:

1. From the Patient Status Display screen, tap the **Sounds** button.
2. Adjust Sounds including heart, lung, bowel, and Korotkoff (if available) sounds by choosing each sound tab and using the drop-down menus, toggles, and sliders as desired. Close the panel (by tapping the **X**) to apply the changes.



Patient Baseline - Sounds States Panel

Pulse

To change pulse parameters:

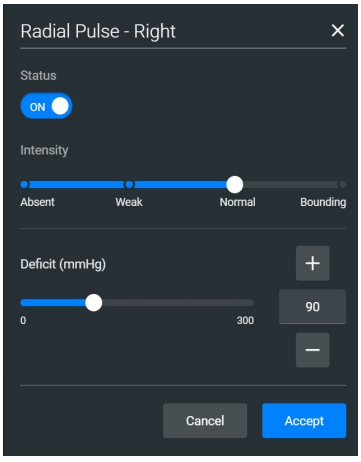
1. From the Patient Status Display screen, tap the **Pulse** button.

   The Pulse panel appears.

Pulse Deficit Default Values

   The numeric widgets display the *pulse deficit value* on the patient body diagram for each pulse location available on the connected simulator. This is the value at which the pulse will disappear if the systolic blood pressure drops below that value. The pulse deficit values default settings are the accepted clinical values, but these may be modified using the controls, if desired.

2. Tap a numeric widget, and the associated pulse parameter control window will open allowing you to adjust the pulse parameter controls.



Pulse Parameter Controls

3. Tap the **Accept** button to apply the changes.

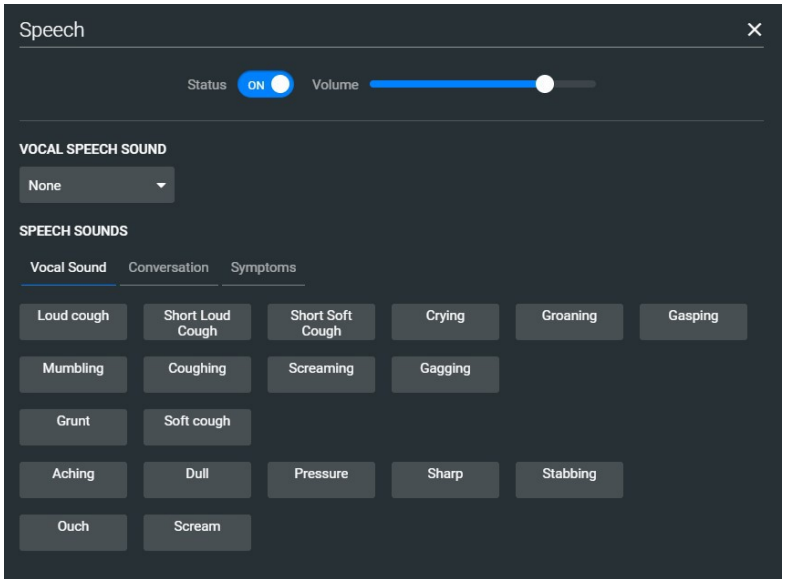
Speech

Simulators are equipped with many speech options and vocal speech sounds. Speech can be turned on or off and volume can be adjusted. Speech options and complexity will vary depending on the simulator that is connected.

To choose speech and vocal speech sounds:

1. From the Patient Status Display screen, tap the **Speech** button.

   The Speech panel appears.



Speech Panel

2. To turn the speech on or off, tap the **Status** toggle. Adjust the slider next to the Status toggle to control the speech volume.

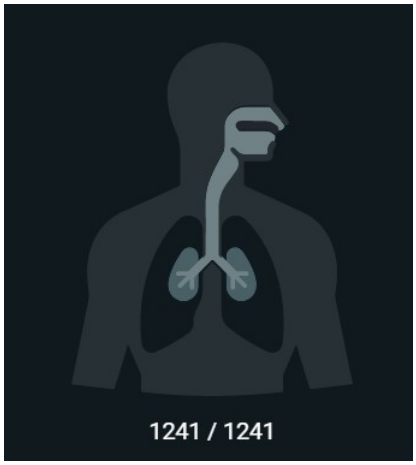
3. Tap the **Vocal Speech Sound** drop-down box to open the menu and select an option as desired.

4. Tap **Vocal Sound**, **Conversation,** or **Symptoms** to select from the list of options.

Respiratory

To adjust respiratory parameter controls:

1. From the Patient Status Display screen, tap the airway avatar.



Airway Avatar

The Respiratory Parameter Controls panel appears.

Respiratory Parameter Controls

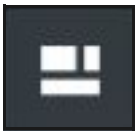
2. Adjust the controls as desired. Close the panel (by tapping the **X**) to apply the changes.

Change the Control Widget Layout

You can change the layout of the patient vitals display and save parameters as part of the layout.

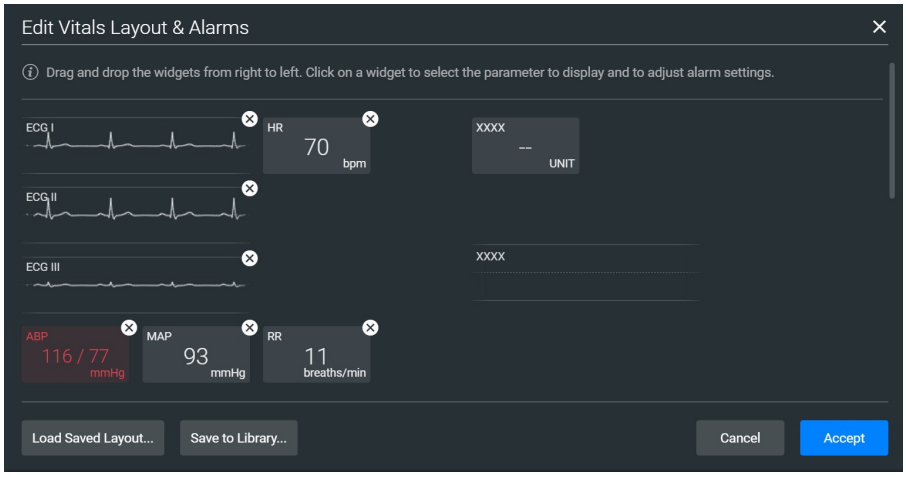
To change the control widget layout:

1. In the Run Screen, tap the **Patient Status** button.



Patient Status Button

The Edit Vitals Layout & Alarms panel appears.



Edit Vitals Layout and Alarms

2. Either begin modifying the baseline layout or tap **Load Saved Layout** to select another patient display layout to modify.
3. Drag and drop a waveform or numeric widget from the right side of the panel to an available display space on the left.

   Once in place, the Select Waveform or Select Numeric Widget panel appears.
4. Tap a widget to modify which value will be displayed.
5. To delete a widget, tap the **X** to delete it.

   Note: When a widget is deleted, there will be a blank space. Widgets are not rearranged.
6. Select or change the physiological parameter(s) as needed. Tap **Save**.

7. When the Edit Vitals Layout & Alarms panel appears either:
    - Tap **Accept** to update the layout without saving it.
    - Tap **Save to Library** to save the layout.

    Note: When changes are applied in Runtime, the layout is stored for Runtime only. In the case of the SCE editor, the changes would be stored with the SCE so that a copy of the layout is locally stored with the SCE. This way, they are not impacted by changes to the layouts, or if the SCE is used with another simulator.

Onset, Read-Only, and Override Indicators

Onset indicators are blue, rotating circles that indicate when the value of the parameter is in transition. Read-only indicators are yellow triangles that indicate a parameter is read-only and cannot currently be modified by the user (occurs in Manual Mode only).

Onset and Read-only Indicators in Manual Mode

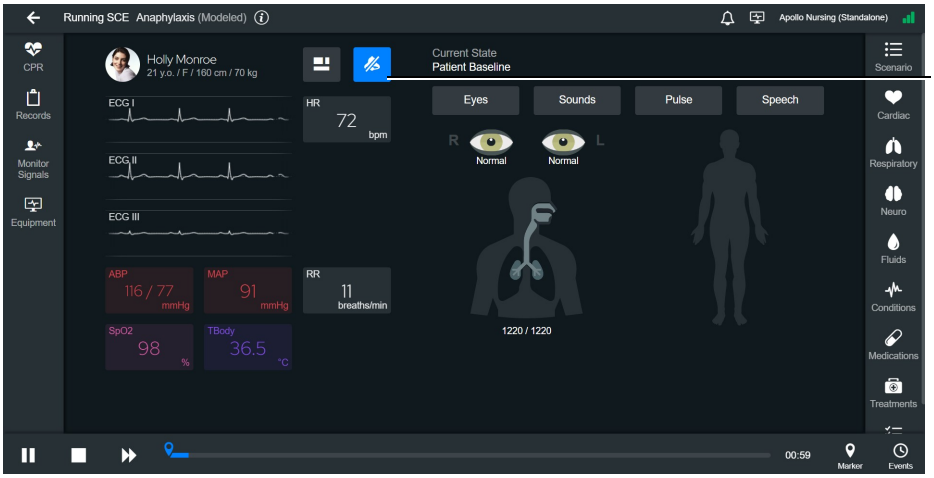
Override indicators are yellow diamonds indicating a user selection is currently overriding a modeled value (occurs in Modeled Mode only).

Onset and Override Indicators

Alarm State

The instructor workstation alarm is muted by default. To unmute the alarm, tap the **Alarm State** button. The icon will turn white when it is unmuted.

The alarm also has a visual cue: When a value reaches a critical state, the associated widget flashes.



Alarm State Button - Muted by default

Editing Parameters

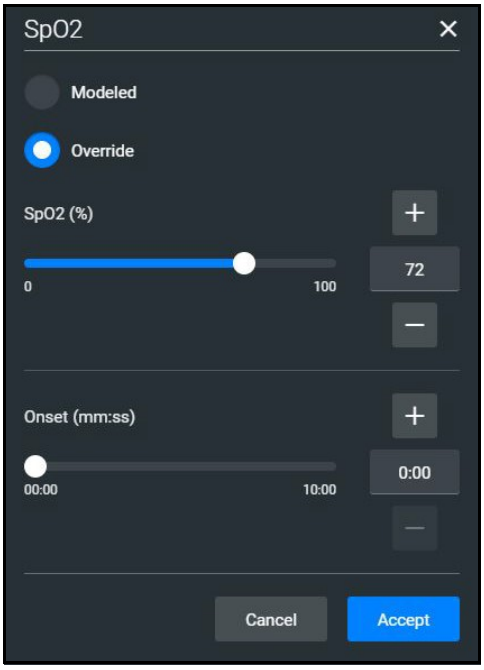
You can edit parameters in one of two ways:

- Parameter Editor
- Quick Edit

To edit a parameter in the Parameter Editor controls:

1. Tap on a waveform or vital sign widget to open the Parameter Editor controls.
2. Tap on the radio button to Override.

3. Use the sliders, text fields, or (+) and (-) to adjust parameters.

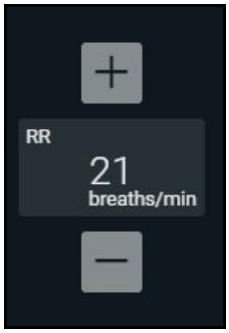


Parameter Editor Controls

4. Tap **Accept**.

To edit a parameter using Quick Edit:

1. Tap and hold a waveform or vital sign widget until (+) and (-) icons appear over the widget.



Plus/Minus Widget

2. Tap the (+) or (-) signs to adjust the parameter.
3. Tap outside of the Quick Edit area to save the changes and close the editor.

Panels, accessed from the Run screen, allow the application of conditions, medications and treatments during simulation. Once applied, changes are reflected in the patient's physiology and logged.

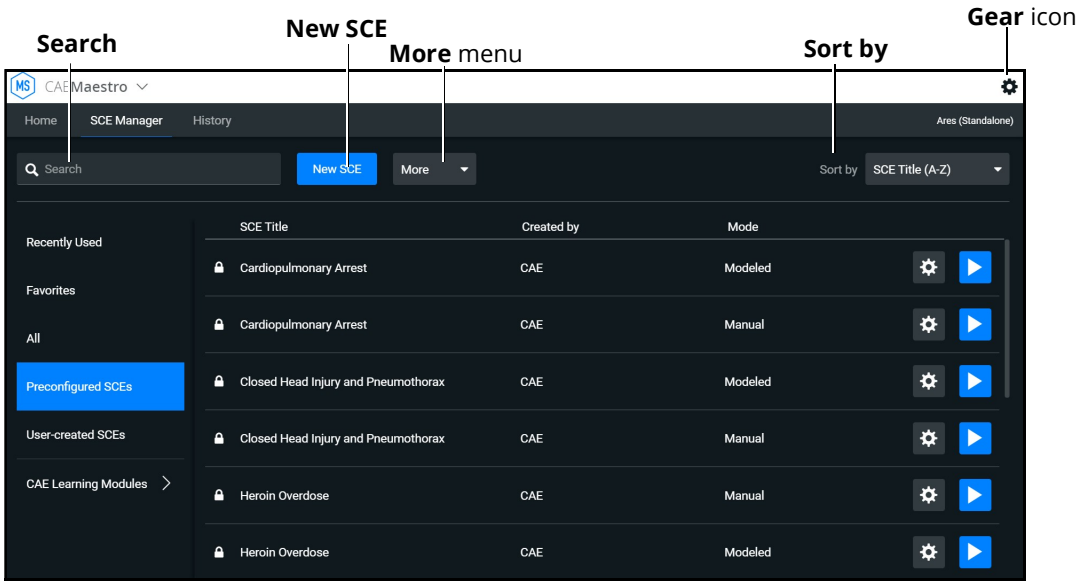
Managing SCEs

The Maestro SCE Manager is where you can view and print information for all SCEs. You can also create, edit, copy, or delete custom SCEs and Learning Modules.

To access the SCE Manager screen, from the Maestro Home Screen click **SCE Manager**.

There are three ways to locate SCEs or modules from the SCE Manager screen:

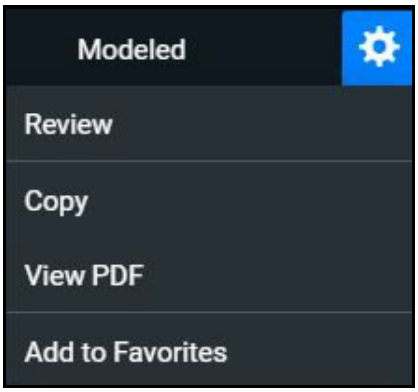
- In the left column, select either **Favorites**, **All**, **Preconfigured SCEs**, **User-created SCEs** or **User-created Modules**.
- In the **Search** field, type part or all of the name of an SCE or module.
- Tap or click on the **Sort by** drop-down to filter the list by ascending or descending order.



SCE Manager Screen

Review an SCE

To review details about an SCE, tap or click the name of an SCE, or tap or click the **Gear** icon and select **Review** from the drop-down menu.



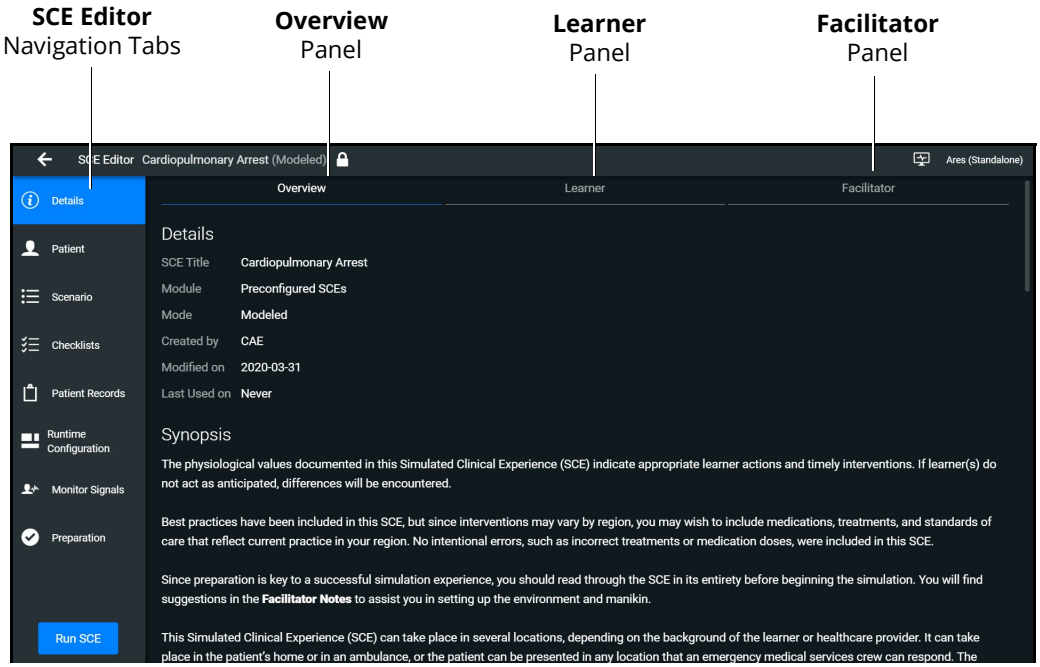
SCE Gear Drop-down Menu Options

The SCE Editor screen appears.

View SCE Details

From the SCE Editor screen, you can select a tab or panel to view details.

The SCE Editor screen is where users can enter specific details for custom SCEs. For more information on entering SCE details into a new SCE, see *Create a Custom SCE* section of this user guide.



SCE Editor Screen - Overview Panel

SCE Editor Navigation Tabs

- **Details:** Lists relevant information about the SCE. Allows access to the Overview, Learner, and Facilitator panels

  For more information, see *SCE Editor Panels*.

- **Patient**: Includes the patient profile information
- **Scenario:** Includes states pertaining to the SCE
- **Checklists:** Includes checklists related to learner milestones for the SCE
- **Patient Records:** Stores patient records including but not limited to:
  - Lab reports
  - X-rays
  - Medical history
  - Healthcare Provider's orders
  - Handoff reports
- **Runtime Configuration:** Allows the creation of Quicklinks for conditions, medications, and treatments
- **Monitor Signals:** Allows users to enable or disable parameters to be displayed on the patient monitor at the start of the scenario
- **Preparation:** Lists recommended equipment and supplies needed to run the SCE and manikin setup notes

SCE Editor Panels

- **Overview**: Includes information about the SCE synopsis and descriptions of the states
- **Learner**: Displays learning objectives, performance measures for each state, and preparation questions
- **Facilitator**: Includes notes, debriefing points, teaching questions and answers, as well as clinical references about the SCE

Create a Custom SCE

You can quickly create an SCE by copying an existing SCE, or by creating a new SCE and entering all of the details. Custom SCEs can be used alone or in a Learning Module. For more information, see *Learning Modules* section of this user guide.

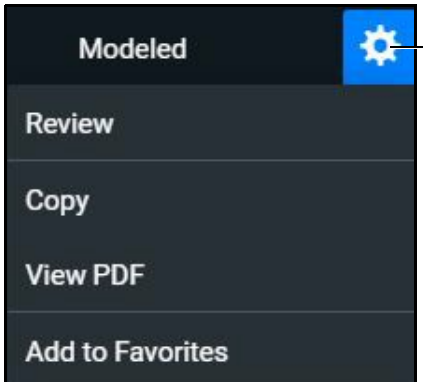
Note: The Lock icon on any screen indicates the SCE was installed by CAE and cannot be edited or deleted.

Copy an SCE

One way to create a new SCE is to make a copy of a preconfigured (locked) SCE and then edit that as desired. To create the SCE from an existing SCE.

To copy an SCE:

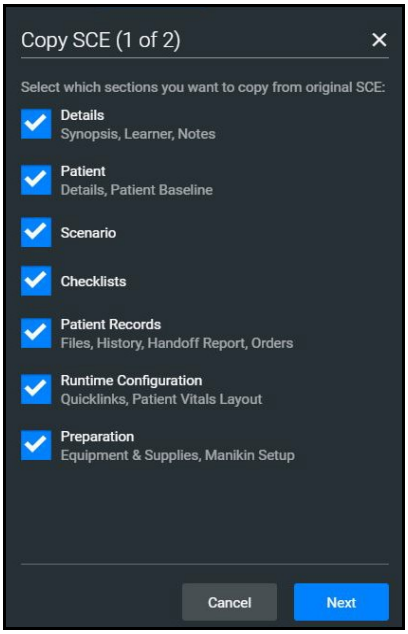
1. On the SCE Manager screen, tap or click the **Gear** icon on the right of the desired SCE.



SCE Gear Drop-down Menu Options

2. Tap or click **Copy**.

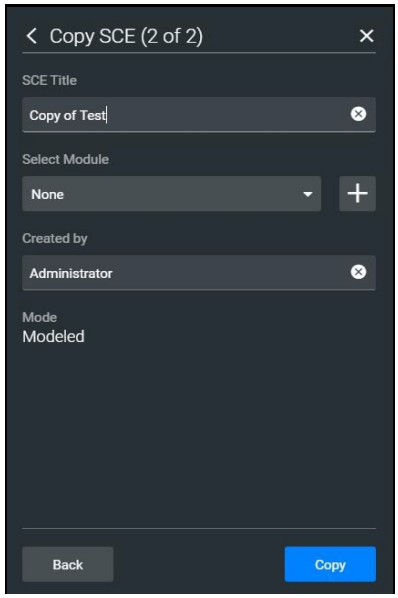
   The Copy SCE panel appears and lists sections of the SCE you can copy.



Copying SCE

3. Select the elements of the SCE to copy. When finished, tap or click **Next**. In the **SCE Title** field, enter a new SCE name.

4. (Optional) Assign the SCE to a Module using the drop-down menu.
5. Tap or click **Copy**.



Saving Copied SCE

The new SCE is copied and available for selection from the SCE Manager.

Creating a New SCE

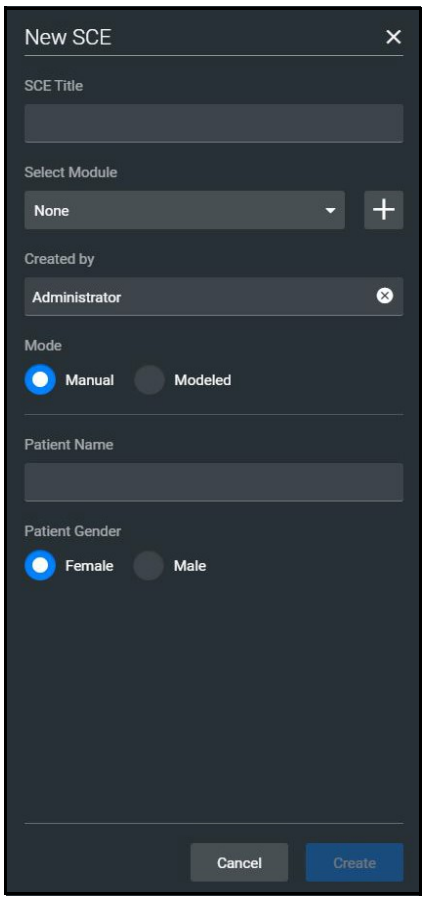
Creating a new SCE is a two-step process.

1. Create the SCE in the SCE Manager as described in this section.
2. Enter details about the SCE in the SCE Editor as described in *Using the SCE Editor* section of this user guide.

To create an SCE:

1. From the SCE Manager screen, tap or click on **New SCE.**

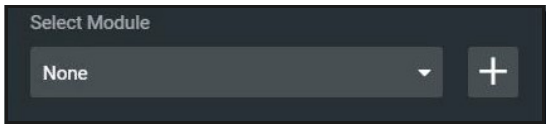
   The New SCE panel appears.



New SCE Window

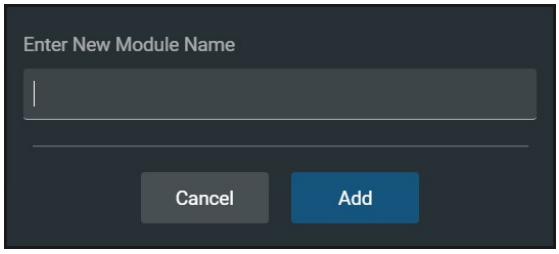
2. Type a title for the SCE in the **SCE Title** field.

3. (Optional) To add an SCE to a module, tap or click the drop-down arrow and select a module. Or, click the **+** icon to create a new module.



Select Module

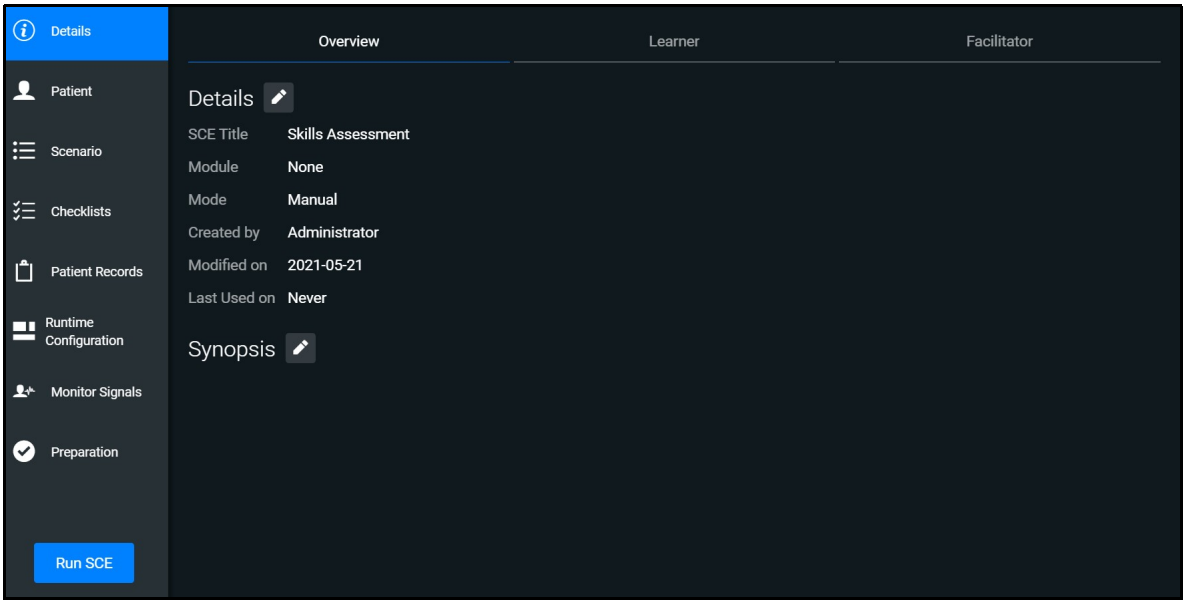
4. Type a name for the module in the Enter New Module Name screen and tap or click **Add**.



New Module Name Screen

5. Complete the remaining fields in the New SCE screen or select options as required. When finished, tap or click **Create**.

   The SCE Editor screen appears with the **Details** tab displayed.



SCE Editor - Details Tab

6. In the **Overview**, **Learner**, and **Facilitator** panels, tap or click the **Edit** icons to enter additional information.

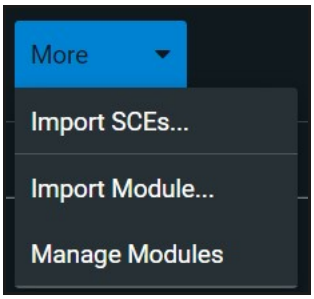
7. Tap or click the navigation tabs to enter additional details about the SCE as needed. To learn more, see *Using the SCE Editor* section of this user guide.

Import or Export an SCE

SCEs can be imported from an external device or the hard disk drive where the SCE file is saved. The SCE file extension is *msce*.

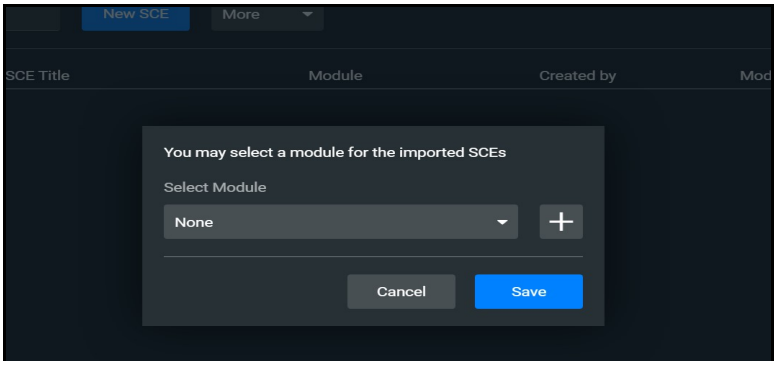
To import from the SCE Manager screen:

1. Tap or click the **More** drop-down menu and tap or click **Import SCEs**.



More Drop-down Menu Options

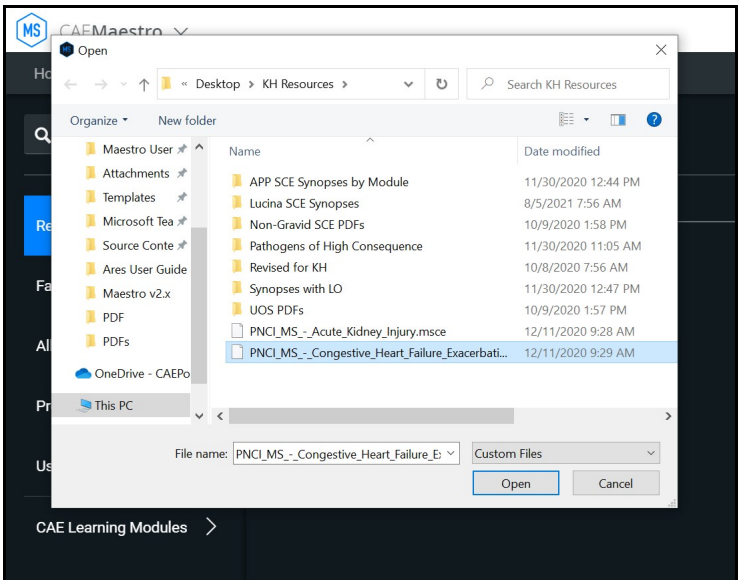
A window opens with the option to add the SCE to an existing learning module.



Module Selection Window

2. Choose a module from the drop-down list, or choose **None**.
3. Tap or click **Save.**

The file explorer window opens.

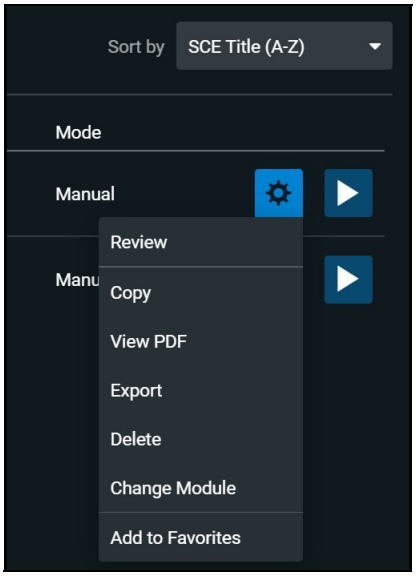


File Explorer Window

4. Choose the SCE file to import and tap or click **Open.**

To export an SCE:

1. In **SCE Manager**, tap or click the gear icon next to the desired SCE for the drop-down menu.



SCE Gear Drop-down Menu Options

2. Tap or click **Export**.

3. Select the desired location for the *msce* file in your File Explorer window and tap or click **Save**.

   The file is saved in the designated location. If using a tablet, the files can be exported to an external device via USB-C cable.

To view the PDF of an SCE:

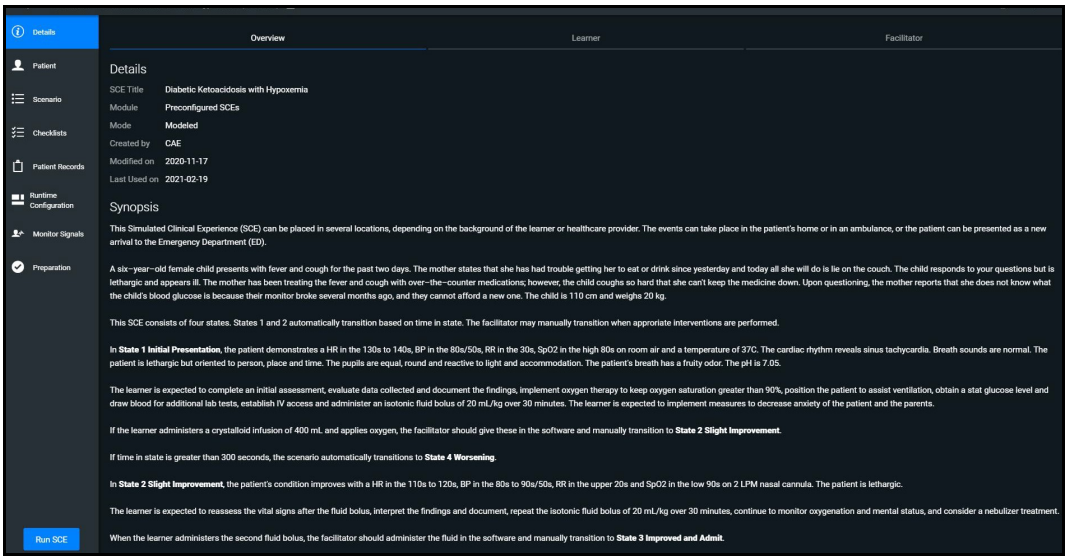
1. Tap or click **View PDF**.
2. In the window pop-up, identify where the PDF file should be saved to and select **Save**. The file can then be opened and viewed from that location.

   If using a tablet, the files can be exported to an external device via USB-C cable.

Using the SCE Editor

Use the SCE Editor to review or manage any purchased, preconfigured SCEs and to complete or edit information for custom SCEs. From the SCE Editor screen, you can also view checklists and patient records, or delete information as needed.

To access the SCE Editor, tap or click on the name of an SCE from the SCE Manager screen.



SCE Details

The buttons in the Navigation panel provide options to:

- Run the SCE.
- Edit the patient or scenario.
- Add checklists or patient records.
- Modify the runtime configuration including preparation information.

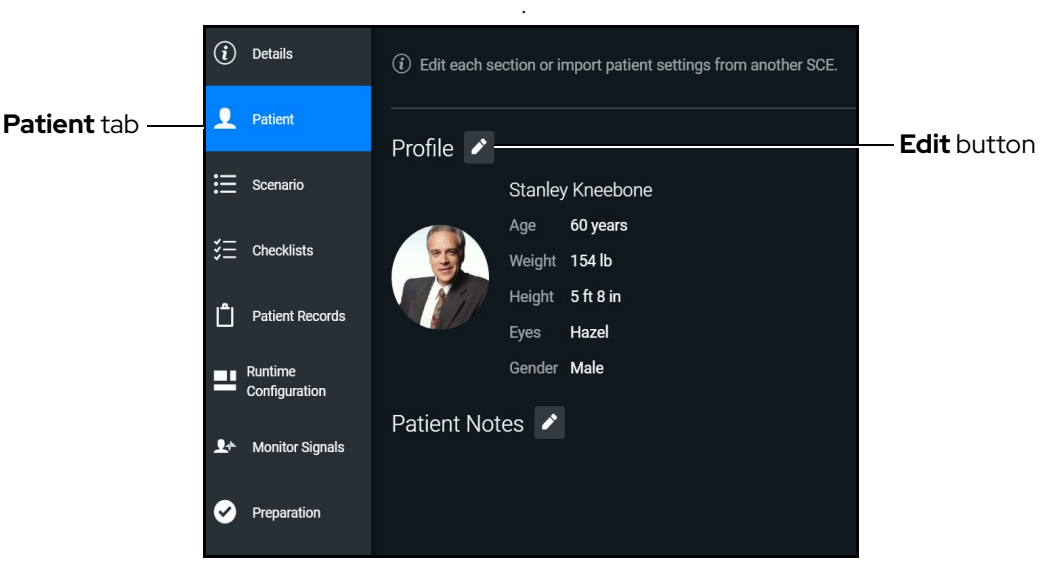
Some sections in the SCE Editor include a rich-text editor to allow free-form data entry.

Note: If the SCE is locked, you cannot modify or delete information.

Patient Profile

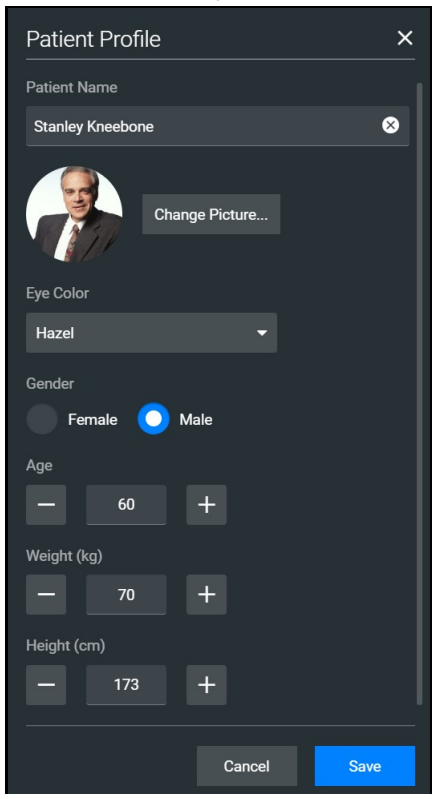
To edit the Patient Profile:

1. From the SCE Editor, tap or click on the **Patient** tab, then tap or click on the **Edit** button.



Patient Profile

The Patient Profile Editor appears.



Patient Profile

2. Modify the patient's name, eye color, age, gender, weight, and height in the appropriate fields.
3. Tap or click on **Change Picture** to change the patient's picture.
4. Tap or click on **Save**.

IMPORTANT: No part of the patient's profile can contain any special characters, such as / \ : * ? < > % | "

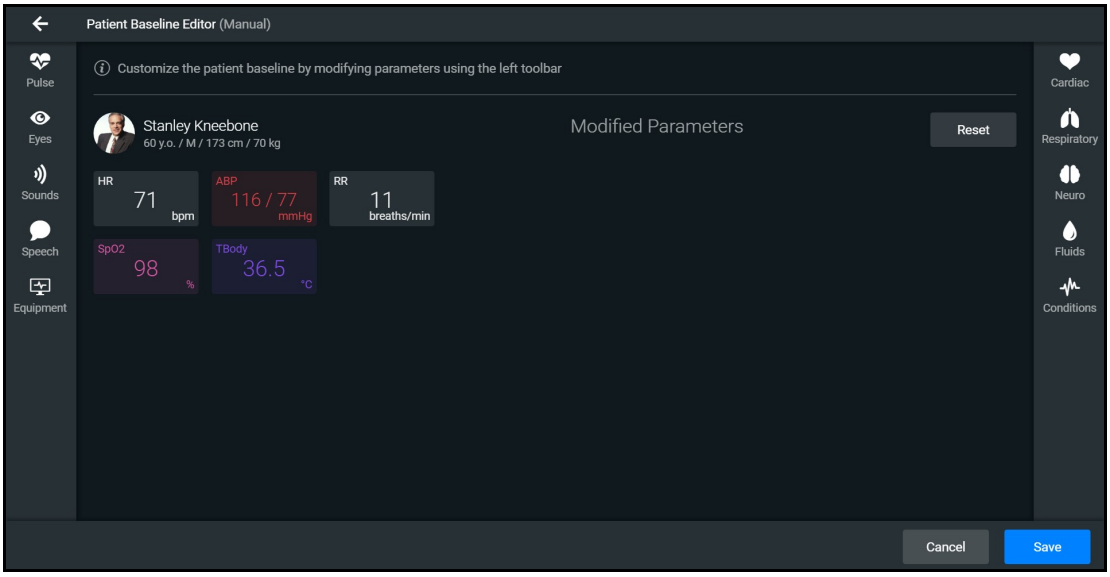
Setting a Patient's Baseline

The patient baseline is the patient's initial status at the start of an SCE.

To set the Patient's Baseline:

1. In the **Patient** section, tap or click on the **Edit** button on the right of **Baseline.**

   The Patient Baseline Editor appears.



Patient Baseline Editor

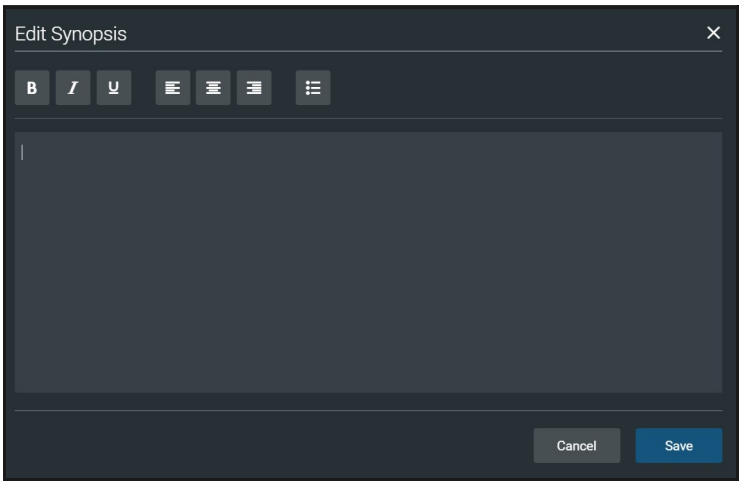
2. Set the Patient's baseline status by modifying the desired parameters and tap or click on **Save**.

   When the SCE begins, the Patient status reflects the selected baseline settings.

To use the text editor:

1. Where available, tap or click on the **Edit** button.
2. Enter or edit information as needed.

Note: Text can be copied into the fields from Text Editor or Notepad only.



Text Editor

3. When finished, tap or click on **Save**.

Note: Notes can also be added to each scenario state when editing a Scenario.

Scenarios

When creating a custom SCE, users can create new scenarios or modify an existing unlocked SCE using the Scenario Editor or Live Scenario Editor.

> **Note**: The live editor is only available within unlocked SCEs that use the optional Modeled Physiology, and allows live edits to the scenario while running the simulation.

To edit from the Scenario Editor:

1. From the SCE Manager screen, select an SCE to edit.

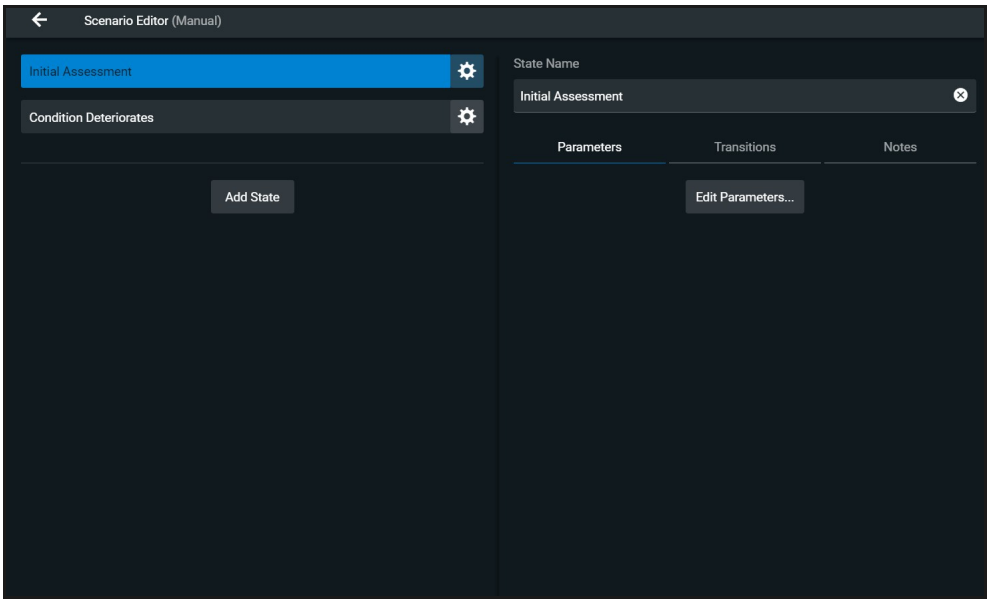
   The SCE Editor screen appears.

2. Tap or click on the **Scenario** tab.

3. Tap or click on the Scenario **Edit** icon.

   Note: If it is a brand new SCE, tap or click on the **Open Scenario Editor** button to open the Scenario Editor.

The Scenario Editor appears.



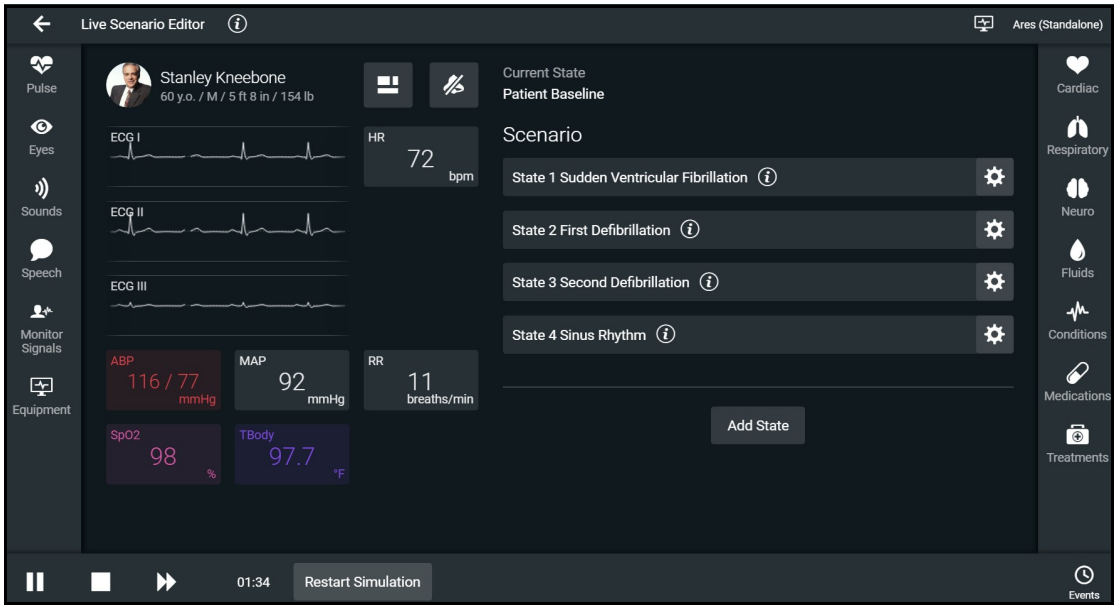
Scenario Editor

4. Tap or click on the **Gear** icon located on the side of a state to do one or more of the following:
    - **Rename**: to rename the state
    - **Copy:** to copy the state
    - **Delete:** to delete the state
    - **Edit Parameters:** to edit the state parameters without jumping to the specified state
    - **Add Transition:** to add a transition from one state to another
    - **Edit Note**: to add state notes

From the Live Scenario Editor, states can be added, modified, and deleted. Patient Profile and other SCE sections can only be modified in the SCE Editor.

To edit from the Live Scenario Editor:

1. From the Scenario Editor screen, tap or click on **Live Scenario Editor**. When the informational window appears, tap or click on **Close** and the Live Scenario Editor screen opens.



Live Scenario Editor

2. Tap or click on the **Gear** icon located on the side of a state. Then tap or click on one or more of the following:

    - **Jump to State:** allows users to jump to the desired state. It is possible to perform a live edit, by selecting the **Edit Live** button. Once completed, parameter changes will be applied to the state. This option allows users to edit state parameters and see the resulting physiological impact on the patient.
    - **Rename**: to rename the state.
    - **Copy**: to copy the state.
    - **Delete:** to delete the state.
    - **Edit Parameters**: to edit the state parameters without jumping to the specified state.
    - **Add Transition:** allows transitions to be added from one state to another.
    - **Edit Note:** to add state notes.

At any time, the simulation may be restarted by tapping or clicking on the **Restart Simulation** button at the bottom of the screen.

Add, Modify or Delete Scenario States

A scenario state is comprised of conditions and/or parameters. A state may also include automated transitions to other states and notes for the instructor.

For scenarios, users can:

- Create new states and options.
- Add conditions and/or parameters to a state, or copy a state into a new state.
- Modify or delete portions of a state such as conditions, parameters, transitions, or the entire state itself.
- Add and delete transitions.

Add Scenario States and Parameters

You can add states, conditions, and parameters in the Scenario Editor or Live Scenario Editor.

To add a scenario state:

1. In the Scenario Editor or Live Scenario Editor, tap or click on **Add State**.
2. In the window that appears, enter a name for the new state. tap or click on **Create**.

   The State window appears, where you can add parameters to the state.

New State

To add parameters in the Live Scenario Editor:

1. In the Live Scenario Editor, select the desired state, and then select **Jump to State**. All changes made to controls will be added to active state.
2. Tap or click on the **Gear** icon and select **Edit Live**.
3. Add as many parameters as needed.

   Parameters appear consecutively within the state.
4. Move to different states to add or edit parameters as needed using the **Jump to State** feature. Repeat this step as needed through multiple states.
5. When finished, tap or click on **Return** to save and exit the editor.

   IMPORTANT: If the physiology of any parameter conflicts with other parameters, Maestro will retain the last parameter entered.

To add parameters in the Scenario Editor:

1. In the Scenario Editor, select the desired state.
2. On the right side of the screen, tap or click on **Edit Parameters**.
3. Add conditions or parameters as needed by selecting them from the list on the left side of the screen. Once added, they appear on the right side of the screen.

Modify or Delete Scenario States or Parameters

To modify a scenario state:

1. In the Scenario Editor or Live Scenario Editor, select the desired scenario state. Then, tap or click on **Edit Parameters**.
2. Make necessary changes. tap or click on **Save**.

To delete a scenario state in the Scenario Editor or Live Editor, tap or click on the **Gear** icon, then tap or click on **Delete**.

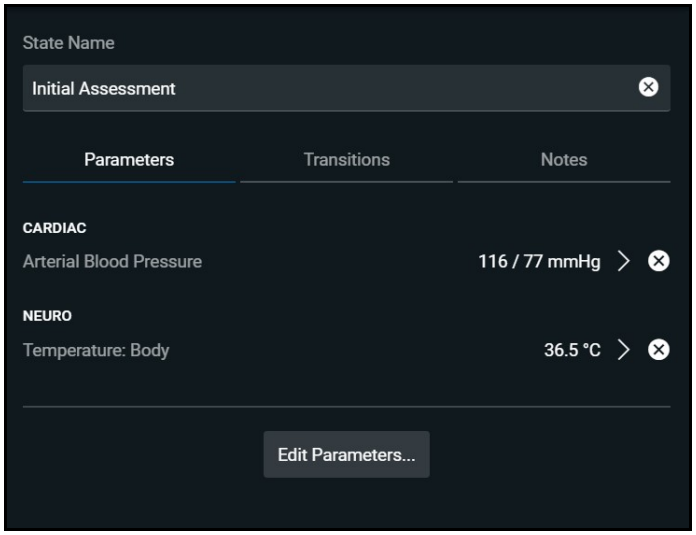
To delete parameters:

1. In the Scenario Editor or Live Scenario Editor, tap or click on the **Information** icon to expand the state.

Information Icon

2. Tap or click on the **Parameters** tab. tap or click on the **X** icon next to the parameter to delete.

3. Tap or click **Save**.



Parameters Tab

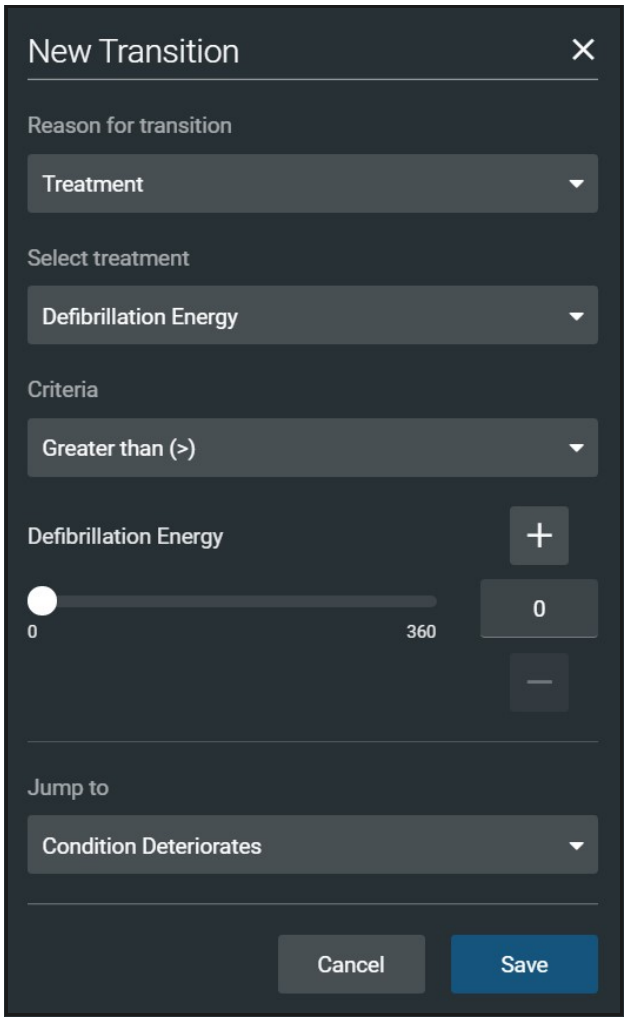
Add and Delete Transitions

To add transitions, the scenario must have both an original state and a state that results from the transition. Add or delete transitions from the Scenario Editor or Live Scenario Editor.

To add transitions:

1. In the Scenario Editor or Live Scenario Editor, Tap or click on the **Gear** icon next to the desired state.
2. Tap or click on **Add Transition**.

The New Transition panel appears.



New Transition Panel

3. Select a Reason for Transition from the list, then select additional options as prompted.

   Example: If the administration of medication is the desired reason for transition, select Medications, then select the desired medication from the list that appears.

4. Once the transition option is selected (ex: Medication), enter the criteria, transition value, and state that results from the transition.

5. Multiple transitions may be entered for a state to create alternate pathways. Follow the same steps to make selections and assign values to the Treatment, Assessment, Vitals, Medication concentration, Fluids, Time in Scenario, and Time in State variable types.

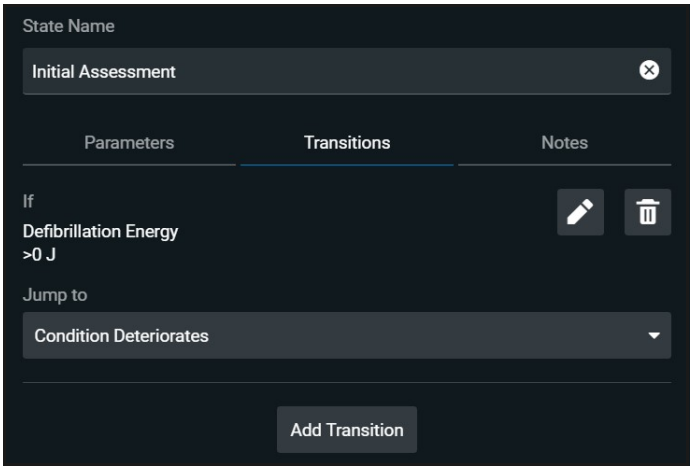
6. When finished, tap or click on **Save**.

To delete a transition in the Scenario Editor or Live Scenario Editor:

1. Tap or click on the **Information** icon next to the state.

Information Icon

2. Select the **Transitions** tab, then tap or click on the **Trash** button next to the transition to delete.



Scenario Editor - Transition Tab

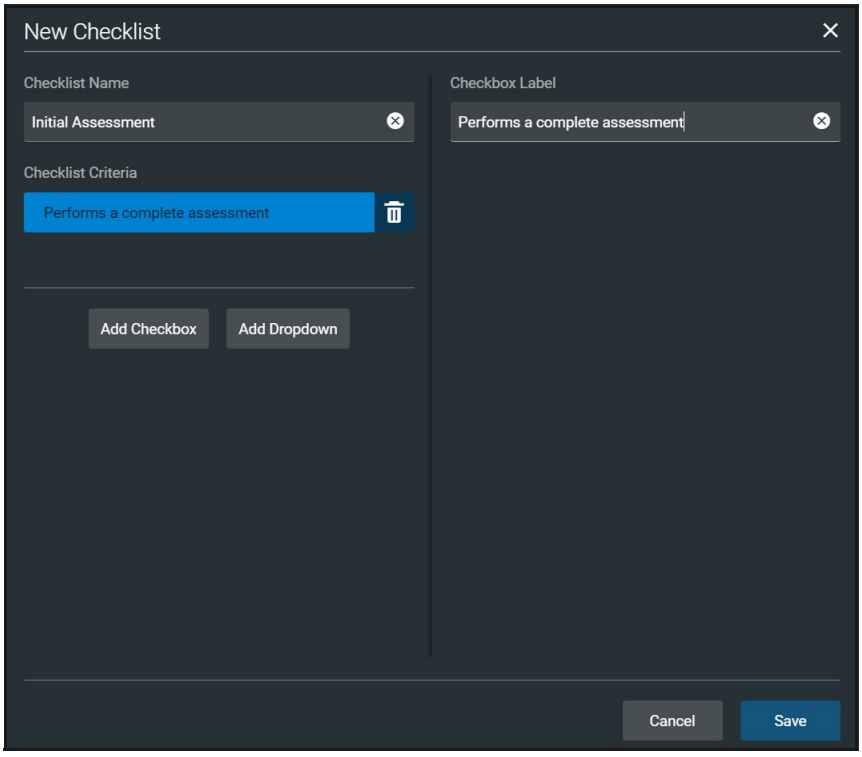
Checklists

You can create new checklists or import existing checklists from the library.

To create a new checklist:

1. In the SCE Editor, tap or click on the **Checklists** tab.
2. When the Checklists panel appears, tap or click on **Create New**.

   The New Checklist panel appears.



New Checklist Panel

3. Enter a name for the checklist in the Checklist Name field.
4. (Optional) tap or click on **Add Checkbox** to add a checkbox to the checklist.
   a. Enter a label name in the Checkbox Label field.
   b. (Optional) Tap or click on **Add Checkbox** to continue entering labels as needed.
   c. Tap or click on **Save**.
5. (Optional) tap or click on **Add Dropdown** to add list items to the checklist.
   a. Enter a name for the dropdown list in the Dropdown Label field.
   b. Tap or click on **Add Option** to provide items that can be selected from the dropdown list.
   c. Enter a name for the list item in the Dropdown Options field.

d. (Optional) Tap or click on **Add Dropdown** to continue entering dropdown lists as needed.

e. Tap or click on **Save**.

6. (Optional) Rearrange the checklist order by dragging individual checklists up or down as desired

7. (Optional) Tap or click on the checklist Gear icon next to the created checklist to Save to Library (or to Rename, Edit, Copy, or Delete).

8. (Optional) Use the Edit function to:

   a. Edit the Checklist Name.

   b. Edit the Checkbox Label.

   c. Rearrange the order of the Checklist Criteria by dragging any criteria up or down.

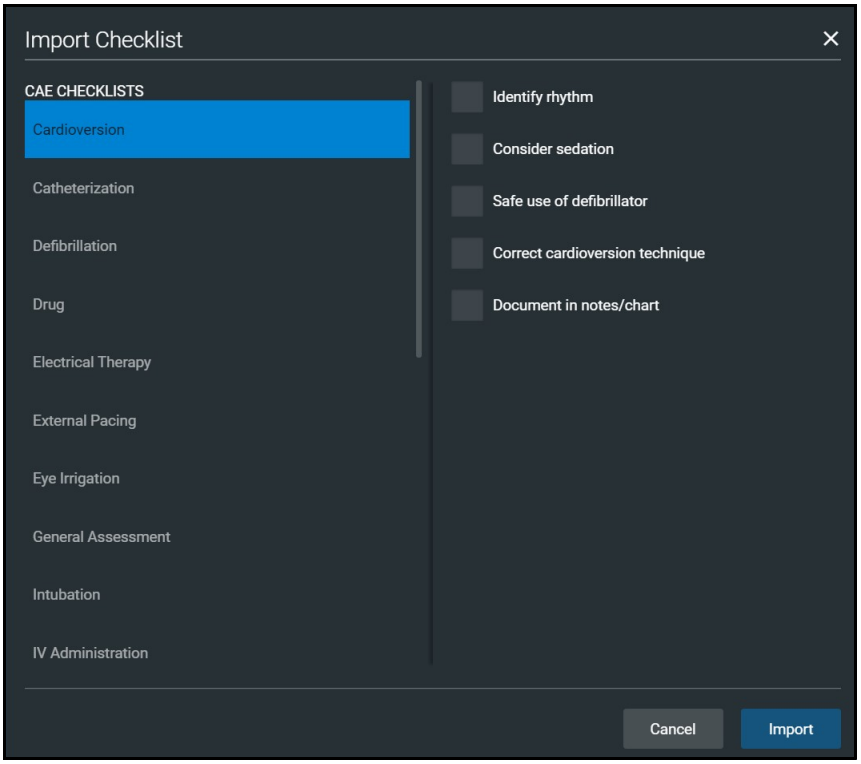
   d. Add a Checkbox or Dropdown.

To import a checklist:

1. In the SCE Editor, tap or click on the **Checklists** tab.

2. When the Checklists screen appears, tap or click on **Import from Library**.

   The Import Checklist panel appears and displays all checklists from all SCEs in the system.



Import Checklist Panel

3. Highlight the checklist.

4. Tap or click on **Import**.

Patient Records

Patient records can be uploaded into Maestro for display in the CAE Patient Monitor software. Once uploaded, a patient record is available for use with the SCE.

Note: A single patient record file cannot exceed 20MB.

To ensure adequate space, delete patient records that are no longer needed.

To access a patient record:

1. From the SCE Editor screen, tap or click on the **Patient Records** tab.

   The Patient Records list appears with all available patient records shown.

2. (Optional) To preview a patient record before sending to the Patient Monitor, select the record, and tap or click on the **Preview** button.

Preview Button

3. Select a patient record, then tap or click on **Send to Patient Monitor**.

Upload Patient Records

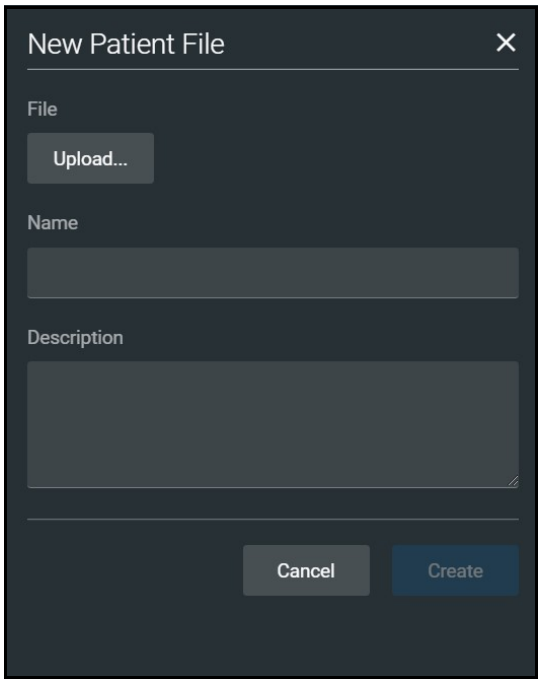
You can upload the following file types:

- GIF, JPG, PNG, and XPS images
- MPEG and MOV videos
- PDF documents
- MP3 audio Files

To upload a patient record:

1. In the SCE Editor, tap or click on the **Patient Record** tab.
2. In the panel that appears, tap or click on **Patient Files > Add File**.

The New Patient File panel appears.



New Patient File - Upload Panel

3. Tap or click on **Upload**. Select the desired file and tap or click on **Open**.
4. When the file name and description appear, modify as needed in the text fields to reflect the desired file name and description.
5. Tap or click on **Create**.

Edit or Delete Patient Records

You can only change the name or description of the patient record. You cannot edit the content of the record from the Patient Record tab.

To edit a patient record name:

1. From the list of Patient Files, tap or click on the **Gear** icon next to the desired file.
2. Tap or click on **Edit**. Change the **Name** or **Description** as needed.
3. Tap or click on **Save**.

To delete a patient record:

1. From the list of Patient Files, tap or click on the **Gear** icon next to the desired file.
2. Tap or click on **Delete**.
3. When the message appears to confirm your selection, tap or click on **Delete**.

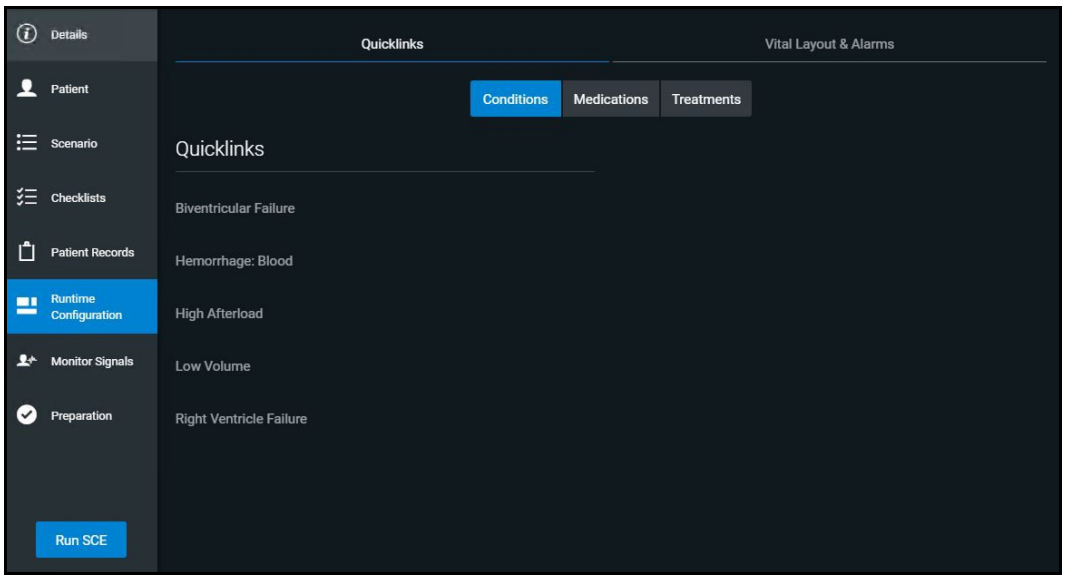
Runtime Configuration

Tap or click on **Runtime Configuration** to access the Quicklinks setup as well as the Vitals Layout & Alarms setup screen.

Quicklinks

From the **Quicklinks** screen within the SCE Editor, conditions, medications, and treatments can be preconfigured for the SCE by creating Quicklinks. For more information about using Quicklinks, see the *Quicklinks* section of this user guide.

To navigate through available conditions, medications, and treatments, tap or click on the **Conditions**, **Medications** and **Treatments** buttons.



Runtime Configuration Quicklinks Screen

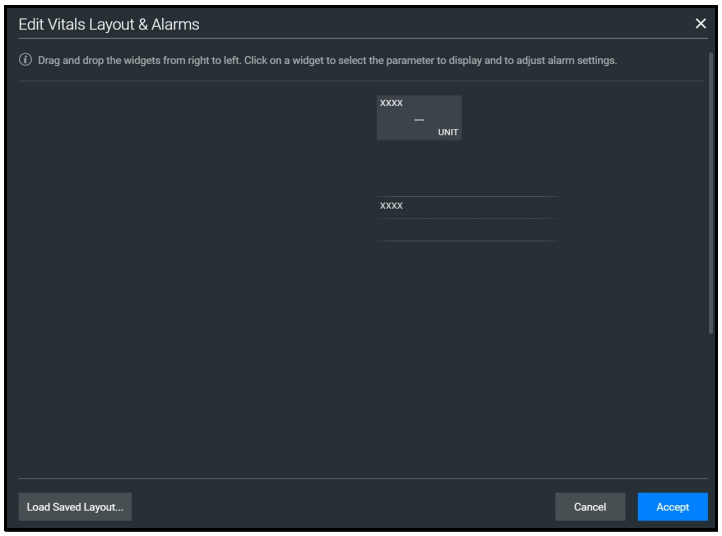
To create a Quicklink, select an item from the **Conditions**, **Medications**, or **Treatments** lists.

To remove a Quicklink, deselect the option.

Vital Layout & Alarms

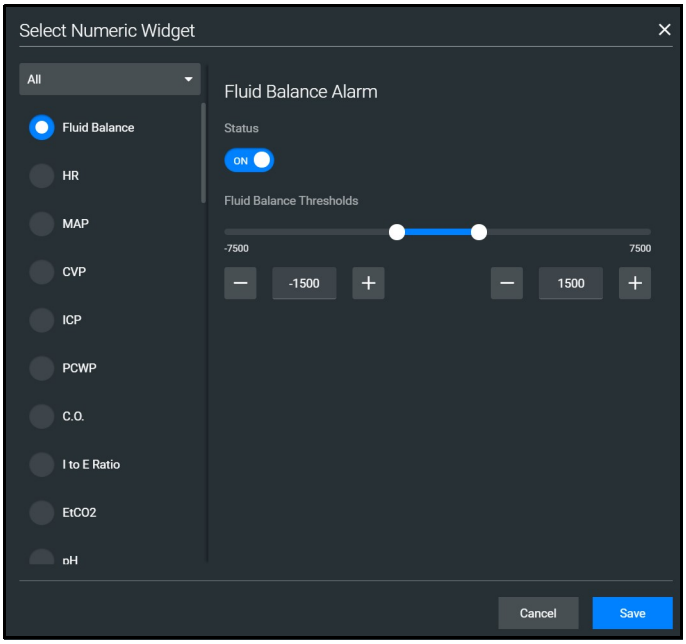
To edit the vital layout and alarms, tap or click on the **Vital Layout & Alarms** tab.

Any current vital widgets and alarms appear. If the SCE is new, click the **Edit** button to the right of **Vital Layouts & Alarms** and add by dragging the desired widget from the right side of the screen to the left.



Runtime Configuration Edit Vitals Layout & Alarms

Once in place, the Select Numeric Widget or Select Waveform box appears. Select from the available options, modify alarms and thresholds as desired, and tap or click **Save** when complete.



Select Numeric Widget

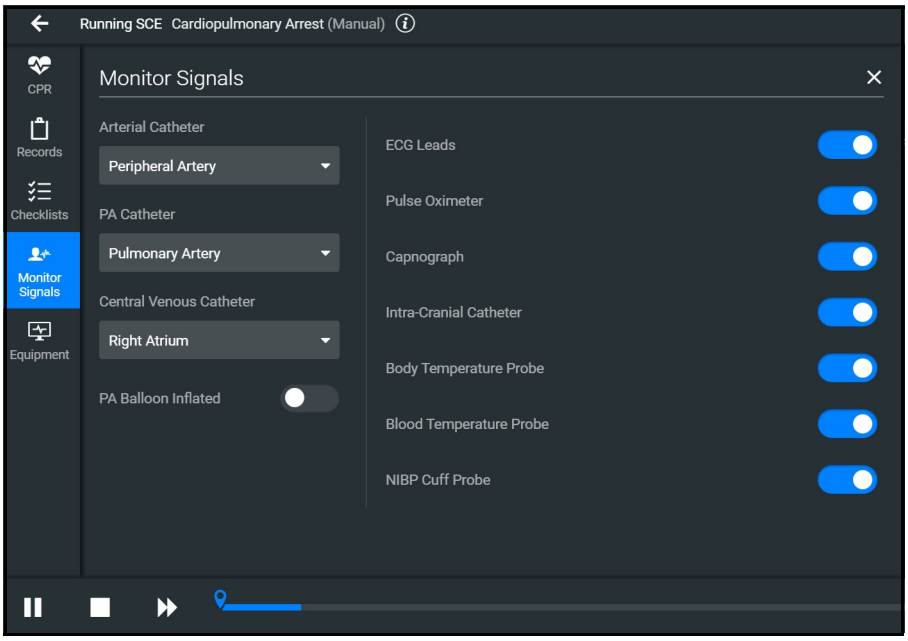
The option to load a saved layout is also available by selecting the **Load Saved Layout** button.

When all modifications are complete, select **Accept**.

Monitor Signals

The Monitor Signals can be modified on the run screen or on the SCE Editor screen. To modify the presence of different vitals and alarms on the patient monitor, select the **Monitor Signals** tab.

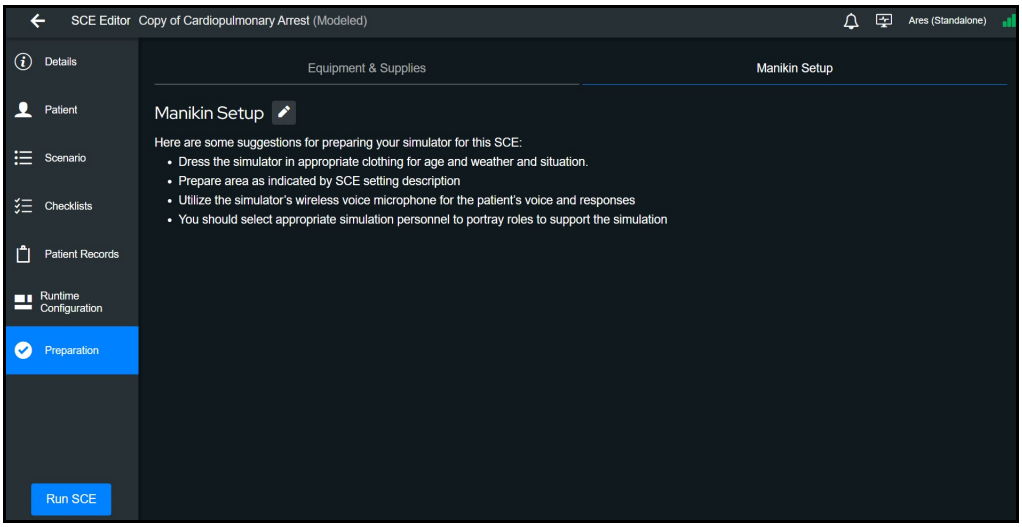
The **Patient Monitor** options are displayed by default.



Monitor Signals Screen

Preparation

Tap or click on **Preparation** to view the Preparation screen. Users can create a list of equipment and supplies, or notes about preparing the manikin for the SCE.



Preparation Screen

To create a list preparation items:

1. Tap either **Equipment & Supplies** or **Manikin Setup.**
2. Tap the **Edit** button and enter items.
3. Tap **Save**.

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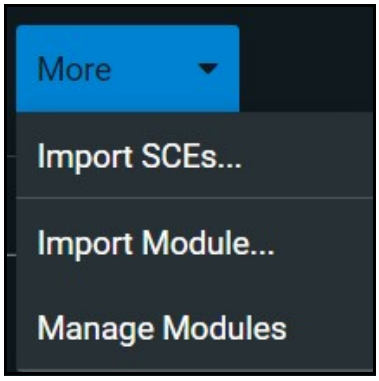
Learning Modules

Learning Modules are comprised of multiple SCEs. You can import or delete existing Learning Modules, or create new Learning Modules in Maestro.

Import a Learning Module

To import a learning module in Maestro:

1. From the SCE Manager screen, tap or click **More > Import Module.**



More Button

2. Locate the correct learning module file on the local or external storage where the learning module is located. The file extension is ***mlm***.

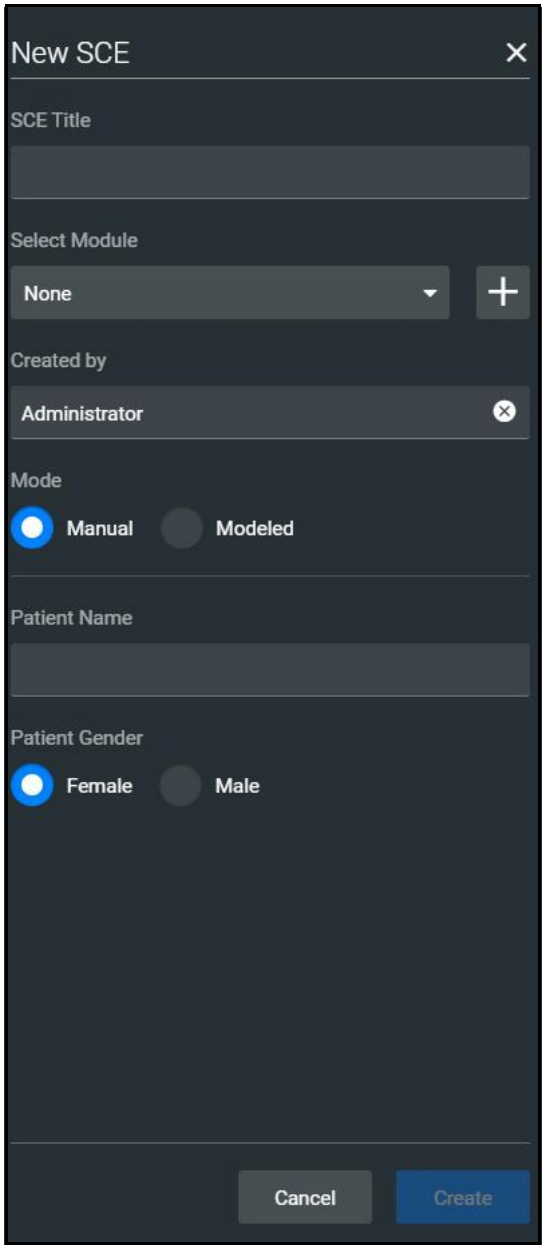
3. Select the file. Tap or click **Open**.

Create a Learning Module

To create a Learning Module:

1. From the SCE Manager screen, tap or click **New SCE.**

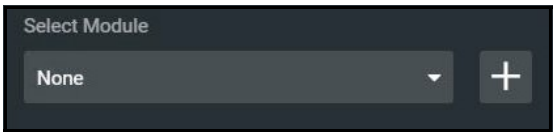
   The New SCE panel appears.



New SCE Panel

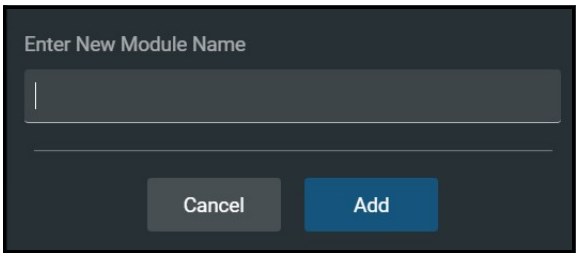
2. Type a title for the SCE in the **SCE Title** field.

3. To select a module to add the SCE to, tap or click the drop-down arrow, then select a module or tap or click the **+** icon to create a new module.



Select Module

- If creating a new module, type a name for it in the Enter New Module Name window. Then, tap or click **Add**.



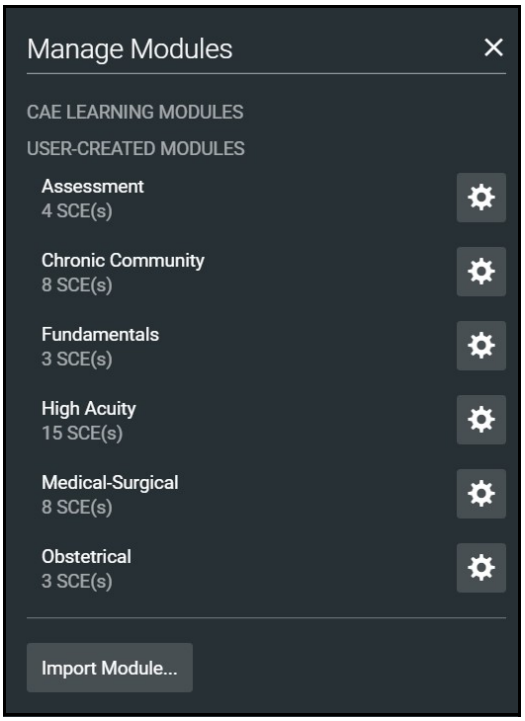
New Module Name Screen

4. Complete the remaining fields on the New SCE window or select options as required.
5. Tap or click **Create**.

Delete a Learning Module

To delete a Learning Module from Maestro:

1. From the SCE Manager screen, tap or click **More > Manage Modules.**



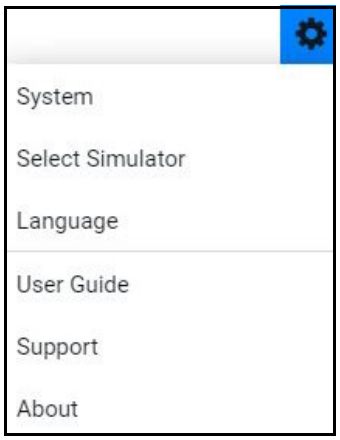
Example of Manage Modules Panel

2. Tap or click the **Gear** icon next to the module you want to delete.
3. Select **Delete** from the dropdown list.
4. When the message appears for you to confirm your selection, tap or click **Delete All**. All of the SCEs in the learning module will be deleted.

   CAUTION: This action cannot be undone.

Administrative Tools

The Maestro software includes administrative tools to access and manage system settings, preferences, and additional information such as historical data about simulation sessions.



Administrative Tools

Access administrative tools via the **Gear** icon located on the upper-right corner of the Maestro screen.

Gear Icon

Select one or more of the following to access system settings:

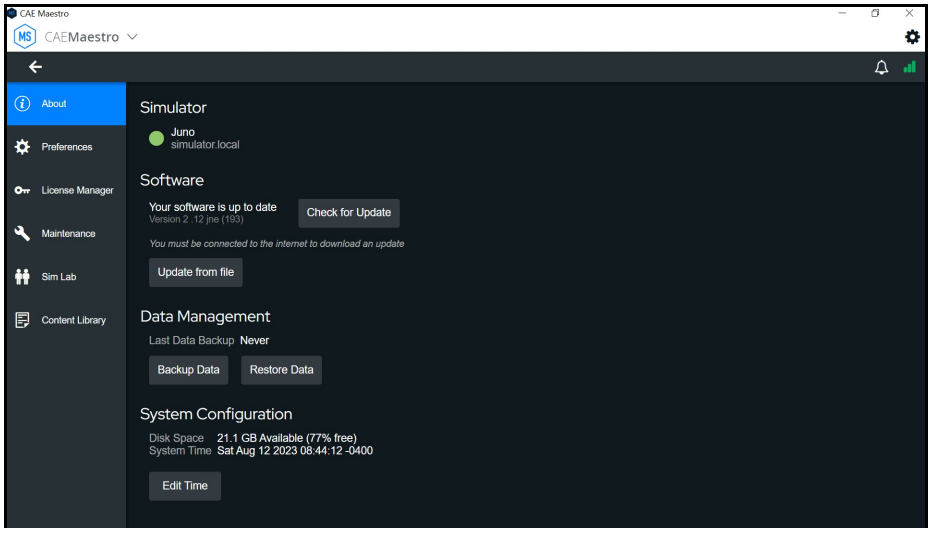
- **System:** Access information about the type of simulator, the Maestro software version, the type of simulator, Data Management, System Configuration, Preferences, Performance Metrics, License Manager, and Content Library.
- **Select Simulator:** Change the simulator (only available when using Maestro Standalone)
- **Language:** Change the Maestro language
- **User Guide:** Access the user guide (English version). Go to: **www.caehealthcare.com** and click the **Support** link
- **Support**: Access CAE Support contact information
- **About:** Access information about the CAE Maestro software version, the type of simulator and the serial number.

System Administration

From the System Administration screen, you can access system information, set preferences, and manage licenses and performance metrics for CAE Maestro.

System Information and Settings

To access the System Settings, from the Home screen, tap or click the **Gear** icon. Then select **System**.



System Administration

From this screen, you can select:

- **About**: to view software version and system configuration, check for updates, or update the software from a downloaded file. Updates can be found at *caehealthcare.com/support*. Under Data Management, you can backup and restore data through the **Backup Data** and **Restore Data** buttons respectively.

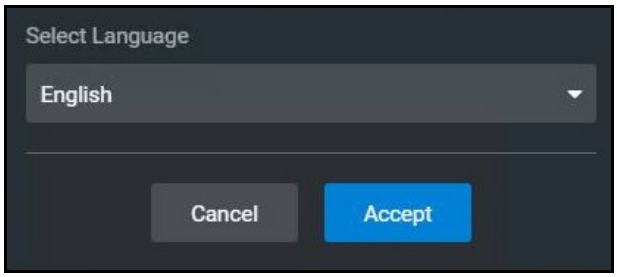
  CAUTION: Restoring data permanently replaces all current data on the device.

- **Preferences**: to change settings to different software features
  - **General Preferences**: to adjust language, sweeper speed, units of measure (metric or imperial), pressure, temperature, energy (electrical therapy), airway pressure, CO2 units, O2 units, Anesthetic Gas Pressure, and color preference
- Performance Metrics: to change settings to CPR Training Target Values, including compression rate, compression depth, and ventilation volume
- **License Manager:** to access license information (from here, you can start a trial of the Maestro software, and activate or deactivate the license)
- **Maintenance:** a passcode is required to access this section to modify the simulator connection. See the *Optional Setup: Connect to Organizational Network* section
- **Sim Lab (CAE Juno only):** to manage Multi-Sim functionality
- **Content Library:** to access and create new Patient Files and Custom Speech Files

Set the Default System Language

To set Maestro's language:

1. From the Home screen, tap or click the **Gear** icon.
2. Tap or click on **Language**.



Select Language Window

3. Select a language from the drop-down menu.
4. Tap or click **Accept**.

   Note: Language can also be set from **System > Preferences**.

Additional Administrative Tools

You can access the CAE Maestro User Guide, support information, or system information.

From the Home screen, tap or click the **Gear** icon, then select one of the following:

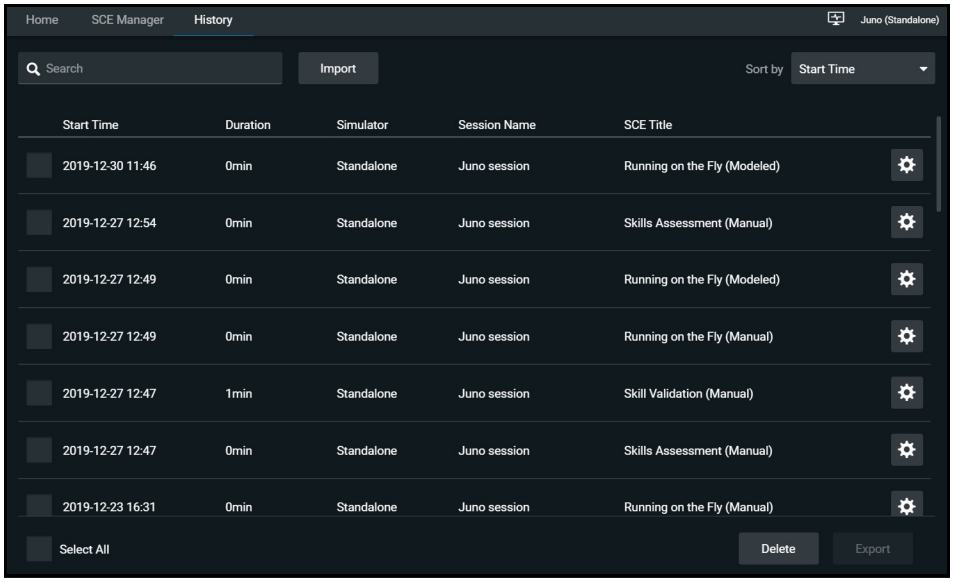
- **User Guide:** to download the English-language user guide (Go to: **www.caehealthcare.com** and click the **Support** link)
- **Support**: for CAE Support contact information
- **About:** to access information about the CAE Maestro software version, the type of simulator, and the serial number

SCE Management

The SCEs in Maestro are managed in the SCE Manager screen. For more information on managing and modifying settings of the SCEs using the SCE Manager, see *Using Maestro* section of this user guide.

Session History - History Screen

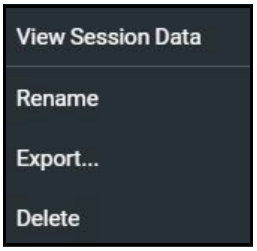
The History screen displays a log of simulation event data.



History Screen

To view session data:

1. Tap or click the **History** tab.
2. Tap or click the **Gear** icon for the desired simulation session, then select **View Session Data**.



History Log Options

The Event Log, Physiological Data, CPR Data (if available), and Checklists appear. Tap or click the Physiological Data for a session to view all physiological data that occurred during the SCE.

You can export data to a CSV or MSS file (session file in Maestro format) and store it on an external device.

To export data from the History screen, tap or click the **Gear** icon for the desired simulation session, then tap or click **Export**.

Using the CAE Patient Monitor

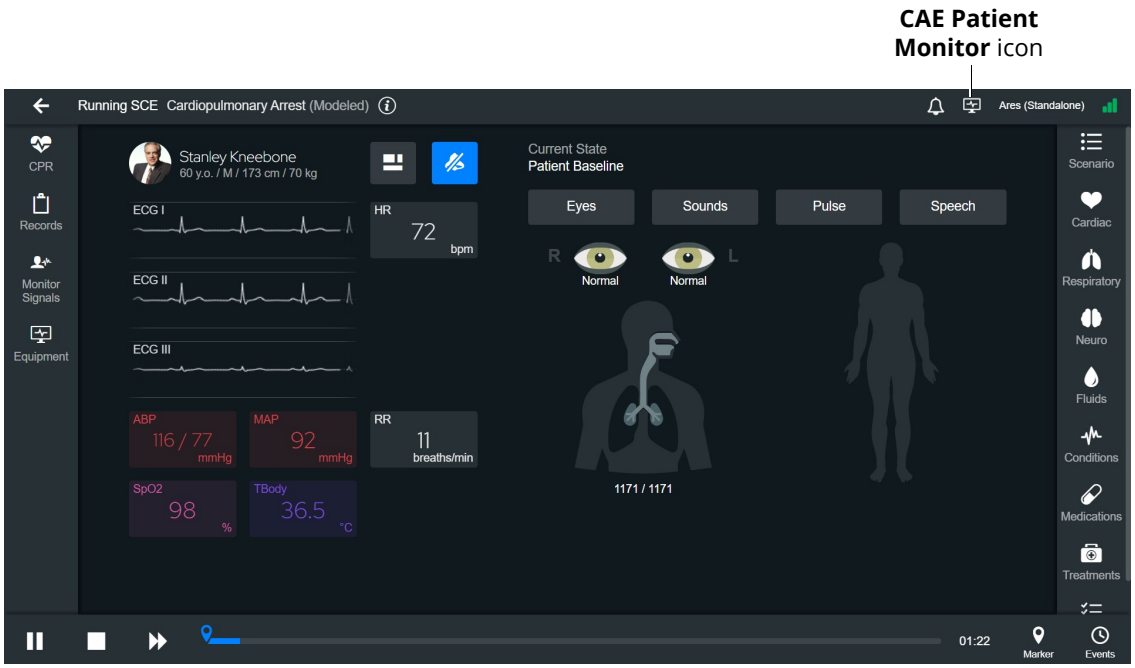
CAE's Patient Monitor is one of the many types of equipment applications that CAE offers to enhance the simulation learning experience. The patient monitor emulates a typical bedside monitor and allows you to view the patient's physiology expressed in waveforms and numeric values. In this User Guide, information is provided to access and configure the Patient Monitor software.

The software can be launched from the CAE Maestro Instructor Tablet, or another computing device, provided it has joined the simulator's wireless network and meets the minimum system requirements. Refer to the *System Requirements* section of this User Guide.

Accessing the Patient Monitor

To launch Patient Monitor:

1. With an SCE running, tap or click the **CAE Patient Monitor** icon in the upper-right corner of the SCE Run screen.



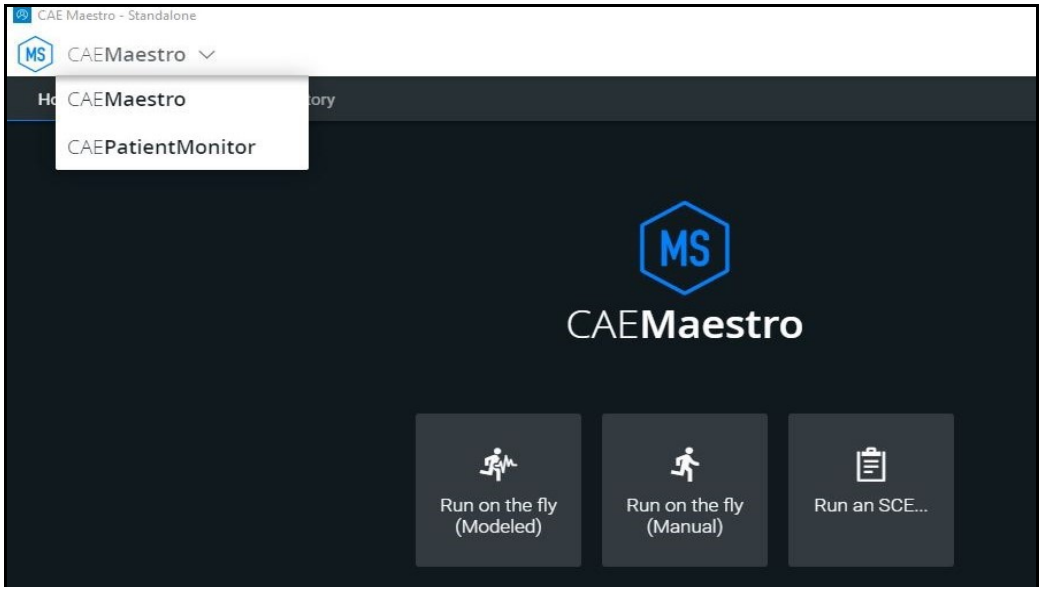
SCE Run Screen - CAE Patient Monitor Icon

The patient monitor screen appears.

CAE Patient Monitor

2. The CAE Patient Monitor can also be accessed from the CAE Maestro Home screen. Tap or click the CAE Maestro Application drop-down menu in the upper-left corner of the screen and select **CAE Patient Monitor**.

Note: An SCE must be running in the Maestro software for any physiological data to appear on the monitor. The CAE Patient Monitor can only show one patient at a time.



CAE Maestro Application Drop-down Menu

Select a Preconfigured Layout

Different layouts may be selected to support a variety of simulation needs. A lockout feature is available to prevent learners from changing the layout selection or any other settings of the Patient Monitor.

The following are the preconfigured CAE Healthcare Layouts for the patient simulator:

- **ICU-Arterial Line Only** - preconfigured with waveform and numeric readouts for ECG Lead II, ECG Lead V, ABP, Pleth, and a numeric readout for Body Temperature
- **EMS-ED-Telemetry** - preconfigured with waveform and numeric readout for ECG Lead II and numeric readouts for SpO_2, and Non-Invasive Blood Pressure (NIBP)
- **ICU-OR No CVP** - preconfigured with waveform and numeric readouts for ECG Lead II, ECG Lead V, ABP, PAP and Pleth, and numeric readouts for NIBP, Blood Temperature, and Body Temperature
- **ICU-OR** - preconfigured with waveform and numeric readouts for ECG Lead II, ECG Lead V, ABP, PAP, CVP and Pleth, and numeric readouts for NIBP, Blood Temperature, and Body Temperature
- **Saturation-Pulse** - preconfigured with numeric readouts for SpO_2 and pulse

To select a preconfigured layout:

1. Tap or click the **Layout** drop-down menu in the upper-right corner of screen.

CAE Patient Monitor Layout Dropdown Menu

   The Layout menu appears.

2. Select a desired layout.

Settings

CAE Patient Monitor settings options allow for configuration preferences. The available lockout feature will also prevent settings changes.

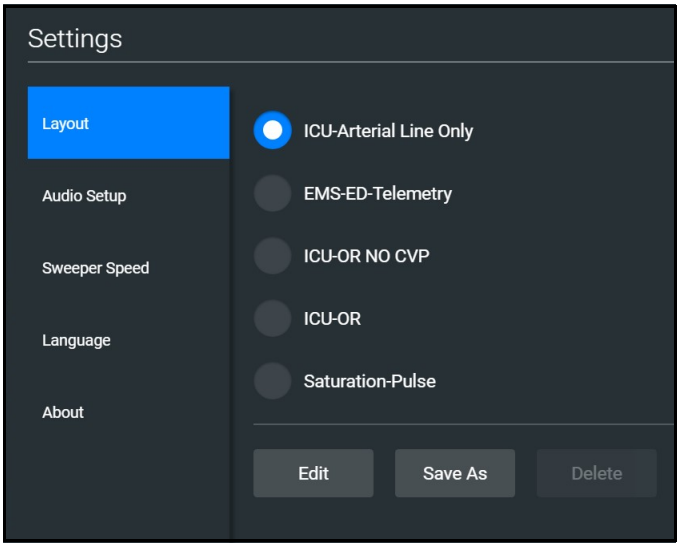
The following selections are available on the settings panel:

- Layout - customize specific vital signs, colors, waveforms, numerics and specific location of the parameters on the display
- Audio Setup- specify alarm ranges and suspension times
- Sweeper Speed - adjust interavals from 3 to 60 seconds for sweeper speed
- Language - select preferred language

To access the Settings panel:

1. Tap or click **Settings** in the lower-right corner of the screen.

   The Settings menu appears. The **Layout** tab is displayed by default.



Settings Panel - Layout Options

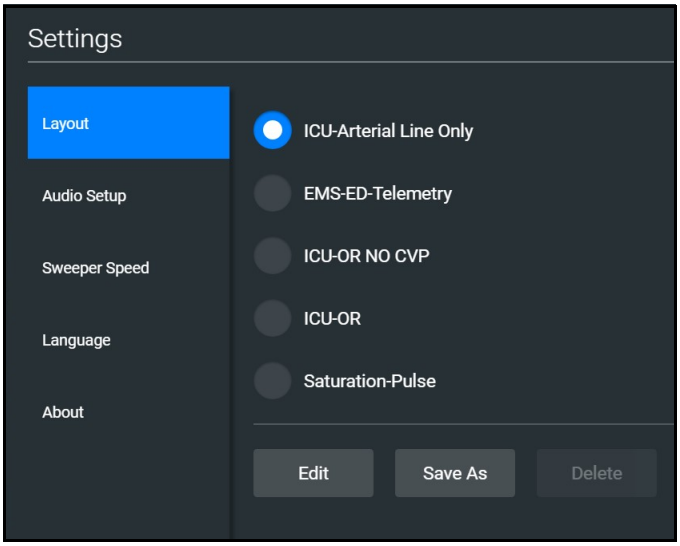
Layout

To access the Layout options in CAE Patient Monitor:

1. Tap or click the **Settings** tab at the lower-right corner of the Patient Monitor screen. The Layout tab is displayed by default.

   Note: The lockout feature will prevent any changes to the layout.

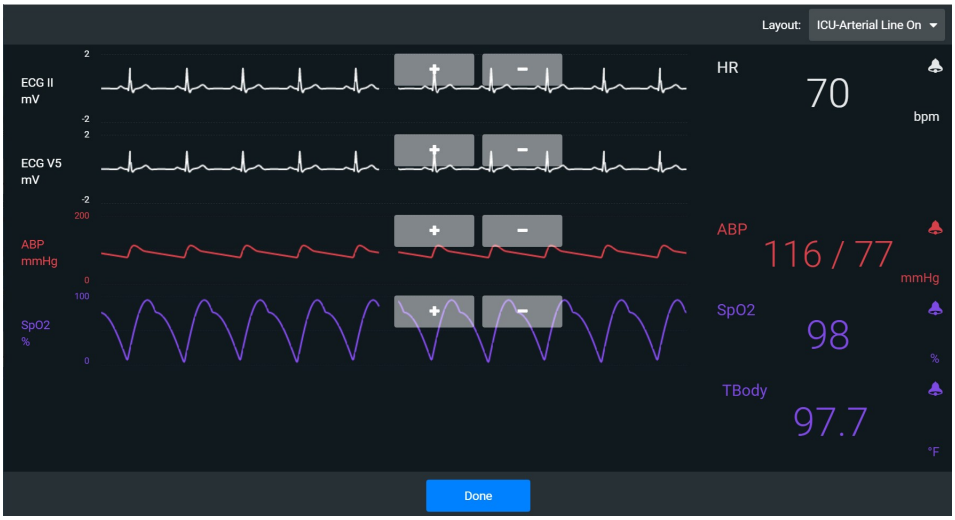
2. From the Layout options, select a layout.



Settings Panel - Layout Options

3. Tap or click **Edit**.

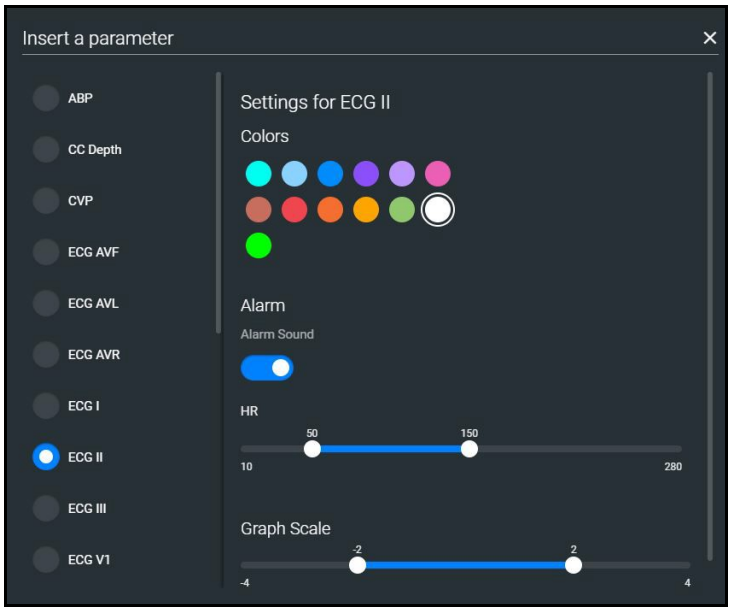
   The Layout Edit screen appears.



Layout Edit Screen

4. Select a signal to edit its parameters.

The Insert a parameter screen appears.



Insert a Parameter

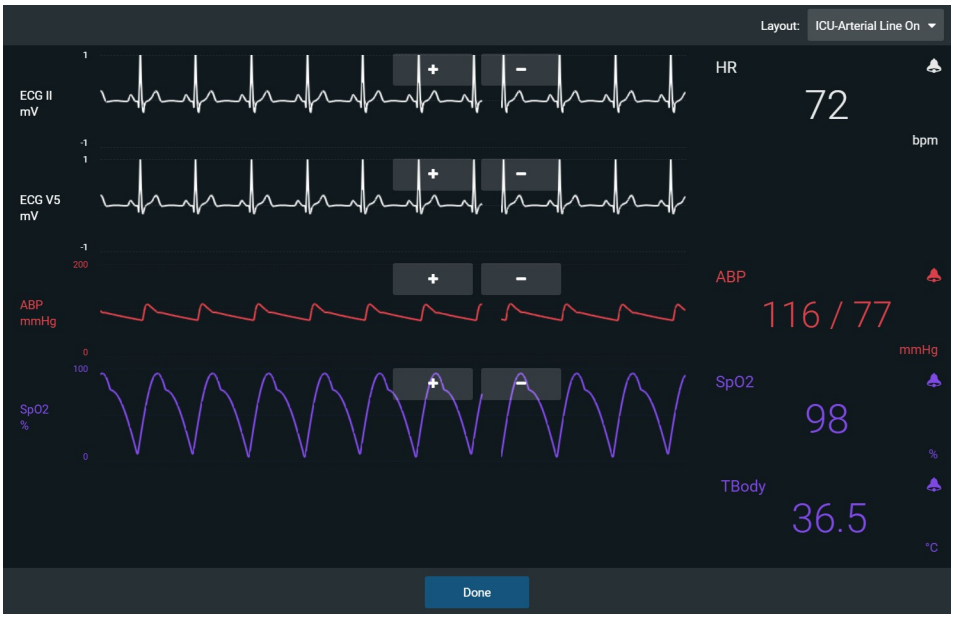
5. Adjust the signal's **Color**, **Alarm**, and **Graph Scale** parameters as desired,

   OR

   Select a parameter to insert it in the place of the selected parameter.

6. When finished, tap or click the **X** in the upper-right corner to close the panel.

The Layout Edit screen reappears.



Layout Edit Screen

7. Use the plus (**+**) buttons to add waveforms to the layout.

   Patient Monitor adds a line to the Layout.

8. Select the new line to open the Insert a Parameter window.
9. Select the parameter to display on the new line.
10. Set the parameter's **Color** and **Alarms.** When finished, close the parameter panel.
11. Tap or click **Done** to close the Layout Edit screen.

    The Settings Layout panel opens.

12. Tap or click **Edit** to resume editing the layout.
13. Tap or click **Save As** to save the layout.
14. Type a name for the layout, then tap or click **Save**.

NIBP Cycling

Most layouts offer Non-Invasive Blood Pressure (NIBP) cycling options. To select this option within the layout:

1. Tap or click **NIBP** at the bottom of the Patient Monitor screen.
2. Tap or click the NIBP Cycling drop-down menu to open.
3. Select a timeframe for automatic cycling of NIBP.

NIBP Cycling Option

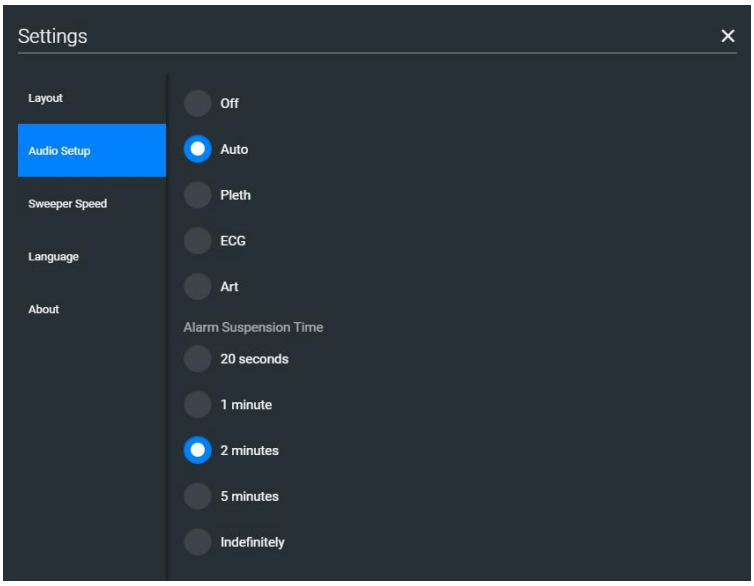
Sounds

To silence all sounds, tap or click the **Mute** button in the lower-left corner of the screen.

Mute Button

To set up the audio for Patient Monitor:

1. Tap or click **Settings** in the lower-right corner of the Patient Monitor screen.
2. From the Settings panel, select the **Audio Setup** tab.



Settings - Audio Setup Options

3. (Optional) Select a waveform to set it as the pulse sound trigger.
4. (Optional) Select an **Alarm Suspension Time** to disable the selected waveform for an indicated amount of time.
5. When finished, tap or click **X** to close the window.

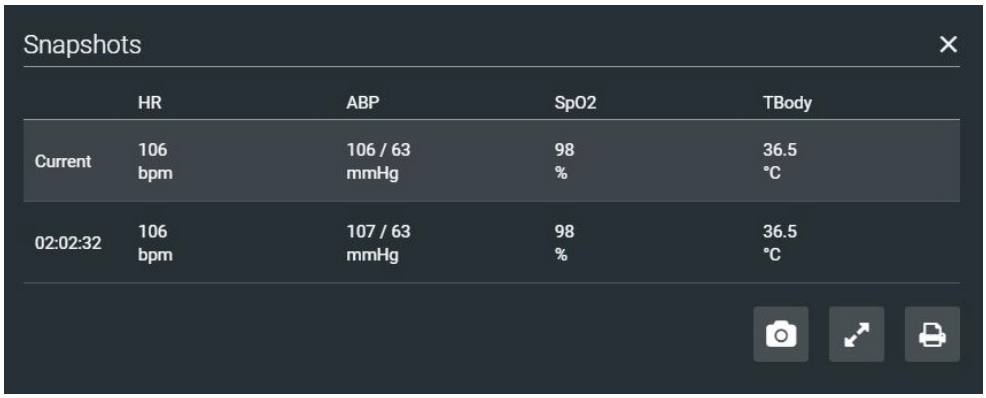
Snapshot

The snapshot tool captures an image of data on the screen, and then provides the ability to save it to a laptop or tablet. This function is unavailable if the device is connected to a wireless network where users cannot print a report.

To capture an image:

1. Tap or click **Snapshot** at the lower-right corner of the Patient Monitor screen.

   The Snapshots window appears showing the live data available to capture.



Snapshots Window

2. To take another snapshot, tap or click the **Capture Snapshot** (camera) button at the lower-right corner of the screen.
3. (Optional) Tap or click the **Full Screen View** button at the lower-right corner of the screen.

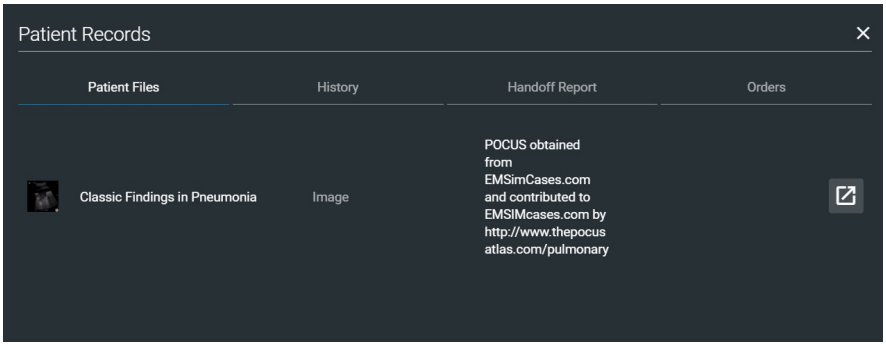
   Tap or click the **Esc** key to exit full screen view.

Patient Records

To view Patient Records:

1. Tap or click **Patient Record** from patient monitor controls at the lower-left of the screen.

   The Patient Records window appears.



Patient Records Window

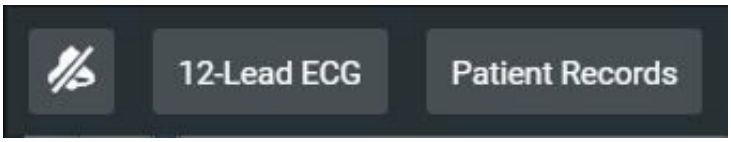
This information provides access to the same Patient Files, History, Handoff Report, and Orders information contained in Maestro.

Note: For this information to be visible in the Patient Monitor, the facilitator must send it from the Maestro software.

12-Lead ECG

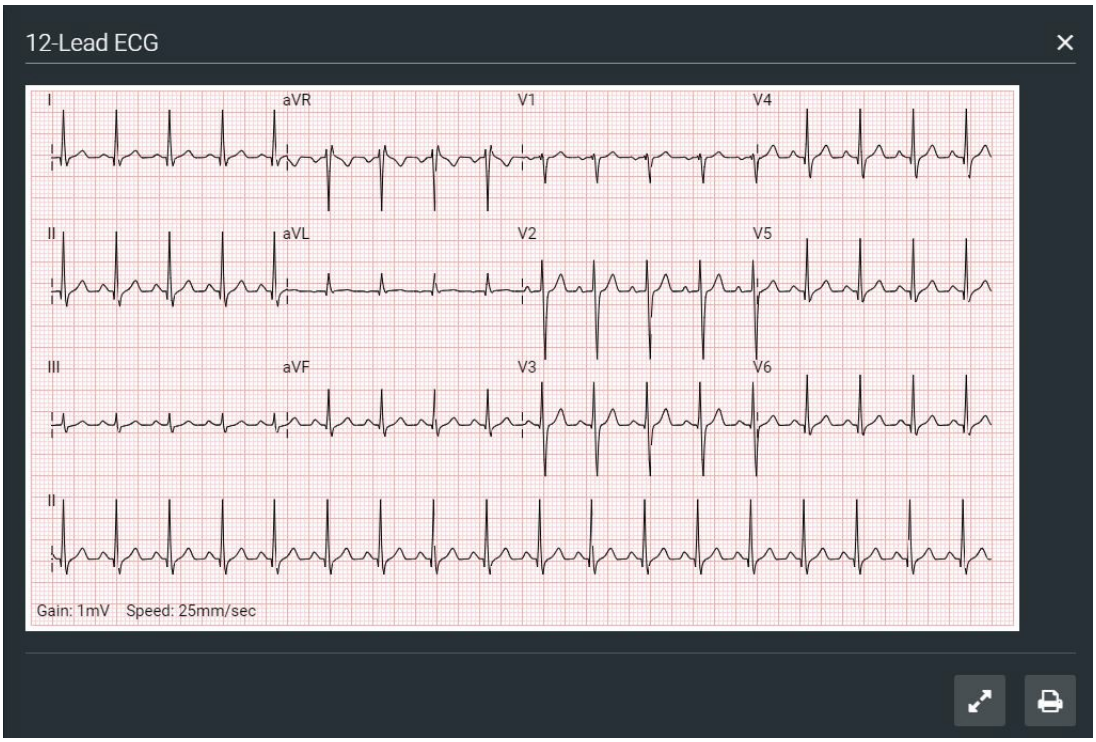
To view a 12-lead ECG report:

1. Tap or click **12-Lead ECG** from patient monitor controls at the lower-left of the screen.



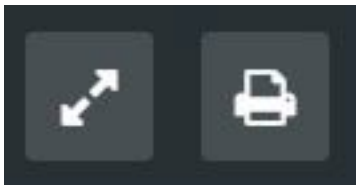
Patient Monitor Controls

The report appears.



12-Lead ECG Report

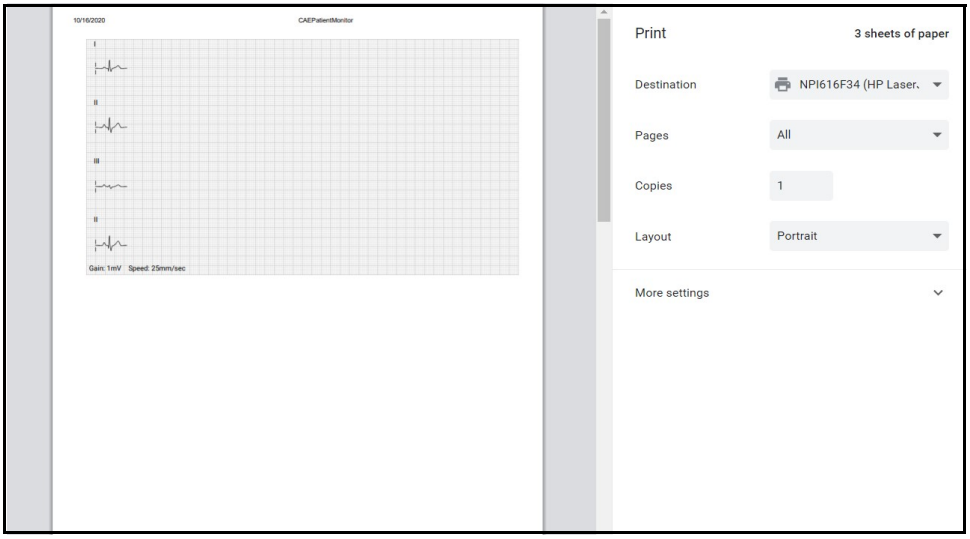
2. (Optional) To view the full screen, tap or click the **Full Screen View** button at the lower-right corner of the 12-lead ECG report.



Full Screen View and Print Buttons

3. Tap or click the **Esc** key to return to the inset view.
4. Tap or click the **Print** button to print the report.

The Print Settings window appears.



Print Settings Window

5. Select the print settings on the right side of the window.
6. Tap or click **Print** to print the report.

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Appendix A - Medication Information

The following table lists medications available for administration in the Maestro software, along with:

- Any effects on the patient's physiology (modeled or log-only)
- The medication category
- The predefined dosage choices
- The units used for custom dosages
- The route of administration (if more than one, each route is listed on a separate row.)

Medication	Modeled or Log Only	Category	Predefined Dosages	Custom Dosage Options	
				Units	Routes
Acetaminophen	L	Analgesic	10mg/kg 15 mg/kg	mg/kg	PO, PR, IV
Adenosine	M	Cardiovascular	0.05 mg/kg 0.1 mg/kg	mg/kg	IV/IO
Albumin 5%	L	Volume Expander	0.5 gram/kg	gram/kg	IV/IO
Albuterol	L	Bronchodilator	0.05 mg/kg 0.10 mg/kg 0.15 mg/kg	mg/kg	Nebulizer
Alprostadil	L	Cardiovascular	0.01 mcg/kg/min 0.05 mcg/kg/min 0.1 mcg/kg/min 0.4 mcg/kg/min	mcg/kg/min	IV/IO
Amiodarone	M	Cardiovascular	5 mcg/kg/min 10mcg/kg/min 15mcg/kg/min 5mg/kg	mg/kg mcg/kg/min	IV/IO
Atropine	M	Cardiovascular	0.02 mg/kg 0.04 mg/kg 0.05 mg/kg 0.06 mg/kg	mg/kg	IV/IO, IM, ET
Caffeine Citrate	L	Stimulant	5 mg/kg 10 mg/kg 20 mg/kg 25 mg/kg	mg/kg	IV, PO
Calcium Chloride 10%	L	Cardiovascular	10 mg/kg 20 mg/kg 50 mg/kg/hr	mg/kg mg/kg/hr	IV/IO
Calcium Gluconate	L	Mineral	100mg/kg 200 mg/kg	mg/kg	IV
Captopril	L	Cardiovascular	0.01 mg/kg 0.05 mg/kg 0.1 mg/kg	mg/kg	PO
Chloral Hydrate	L	Hypnotic	25 mg/kg 50mg/kg	mg/kg	PO, PR
Chlorothiazide	L	Diuretic	5 mg/kg 10 mg/kg 20 mg/kg	mg/kg	IV, PO

Appendix A - Medication Information

Medication	Modeled or Log Only	Category	Predefined Dosages	Custom Dosage Options	
				Units	Routes
Curosurf	L	Respiratory	1.25 ml/kg 2.5 ml/kg	mL/kg	ET
Dexamethasone	L	Corticosteroid	0.25 mg/kg 0.5 mg/kg	mg/kg	IV, PO
Dextrose	L	Anti-Hypoglycemic	0.2 gram/kg 1 gram/kg	gm/kg	IV/IO
Diazepam	L	Hypnotic	0.1 mg/kg 0.2 mg/kg 0.3 mg/kg	mg/kg	IV, IM, PO
Digoxin	L	Cardiovascular	6 mcg/kg 8 mcg/kg 10 mcg/kg	mcg/kg	IV, PO
Diphenhydramine	L	Histamine Blocker	1 mg/kg 2 mg/kg	mg/kg	IV/IO, IM, PO
Dobutamine	M	Cardiovascular	2 mcg/kg/min 5 mcg/kg/min 10 mcg/kg/min 20 mcg/kg/min	mcg/kg/min	IV/IO
Dopamine	M	Cardiovascular	2 mcg/kg/min 5 mcg/kg/min 10 mcg/kg/min 20 mcg/kg/min	mcg/kg/min	IV/IO
Enalapril	L	Cardiovascular	0.04 mg/kg 0.1 mg/kg	mg/kg	PO
Enalaprilat	M	Cardiovascular	5 mcg/kg 10 mcg/kg	mcg/kg	IV
Epinephrine 1:10,000	M	ACLS/Cardiovascular	0.01 mg/kg (IV, IO) 0.05 mg/kg (ET) 0.1 mg/kg (ET)	mg/kg mcg/kg/min	IV,IO, ET
Esmolol	M	Cardiovascular	25 mcg/kg/min 50 mcg/kg/min 100 mcg/kg/min	mcg/kg/min	IV
Etomidate	M	Hypnotic	0.2 mg/kg 0.4 mg/kg	mg/kg	IV/IO
Fentanyl	M	Narcotic	1 mcg/kg 2 mcg/kg 3 mcg/kg 4 mcg/kg 1 mcg/kg/hr 2 mcg/kg/hr 3 mcg/kg/hr 4 mcg/kg/hr 5 mcg/kg/hr	mcg/kg mcg/kg/hr	IV
Flumazenil	L	Antagonist	0.01 mg/kg	mg/kg	IV
Furosemide	L	Diuretic	1 mg/kg 2 mg/kg	mg/kg	IV, IM
Hydralazine	L	Cardiovascular	0.1 mg/kg 0.2 mg/kg	mg/kg	IV, IM

Medication	Modeled or Log Only	Category	Predefined Dosages	Custom Dosage Options	
				Units	Routes
Hydrocortisone	L	Corticosteroid	1 mg/kg 2 mg/kg 3 mg/kg 4 mg/kg 5 mg/kg	mg/kg	IV
Indomethacin	L	Prostaglandin Inhibitor	0.1 mg/kg 0.2 mg/kg	mg/kg	IV
Infasurf	L	Respiratory	3 ml/kg	mL/kg	ET
Insulin	L	Hormone	0.05 u/kg 0.1 u/kg	units/kg	IV
Ipratropium bromide	L	Respiratory	25 mcg/kg/dose 175 mcg/dose	mcg mcg/kg	Nebulizer
Isoproterenol	M	Cardiovascular	0.05 mcg/kg/min 0.1 mcg/kg/min 0.15 mcg/kg/min 2 mcg/kg/min	mcg/kg/min	IV
Lidocaine	M	Cardiovascular	0.5 mg/kg 1.0 mg/kg 2 mg/kg 20 mcg/kg/min	mg/kg mcg/kg/min	IV/IO
Lorazepam	L	Hypnotic	0.05 mg/kg 0.1 mg/kg	mg/kg	IV
Magnesium Sulfate	L	ACLS	25 mg/kg 50 mg/kg	mg/kg	IV/IM
Mannitol	L	Diuretic	0.5 gm/kg 1.0 gm/kg	gm/kg	IV
Meperidine	L	Narcotic	0.2 mg/kg 0.5 mg/kg	mg/kg	IV, IM, PO,SQ
Methadone	L	Narcotic	0.05 mg/kg 0.1 mg/kg	mg/kg	PO, SC, IM, IV
Methylprednisolone	L	Corticosteroid	1 mg/kg	mg/kg	IV/IO, IM
Midazolam	M	Hypnotic	0.05 mg/kg 0.1 mg/kg 0.15 mg/kg 1 mcg/kg/min	mg/kg mcg/kg/min	IV
Milrinone	L	Vasodilator	50 mcg/kg 0.25 mcg/kg/min 0.5 mcg/kg/min 0.75 mcg/kg/min	mcg/kg mcg/kg/min	IV/IO
Morphine	M	Narcotic	0.05 mg/kg 0.1 mg/kg 0.01 mg/kg/hr 0.02 mg/kg/hr	mg/kg mg/kg/hr	IV
Naloxone	M	Antagonist	0.1 mg/kg	mg/kg	IV/IO, ET, IM, SC
Neostigmine	L	Neuromuscular Blockade	0.03 mg/kg 0.05 mg/kg 0.07 mg/kg	mg/kg	IV
Nitroglycerin	L	Cardiovascular	0.25 mcg/kg/min 0.5 mcg/kg/min	mcg/kg/min	IV/IO

Appendix A - Medication Information

Medication	Modeled or Log Only	Category	Predefined Dosages	Custom Dosage Options	
				Units	Routes
Nitroprusside	L	Cardiovascular	0.5 mcg/kg/min 1.0 mcg/kg/min 2.0 mcg/kg/min	mcg/kg/min	IV/IO
Norepinephrine	L	Cardiovascular	0.05 mcg/kg/min 0.1 mcg/kg/min	mcg/kg/min	IV/IO
Pancuronium	L	Neuromuscular Blockade	0.05 mg/kg 0.1 mg/kg	mg/kg	IV
Phenobarbital	L	Hypnotic	3 mg/kg 5 mg/kg 15 mg/kg 20 mg/kg	mg/kg	IV, IM, PO
Phenylephrine	L	Cardiovascular	0.1 mcg/kg/min 0.5 mcg/kg/min	mcg/kg/min	IV
Phenytoin	L	Anticonvulsant	5 mg/kg 15 mg/kg 20 mg/kg	mg/kg	IV, PO
Procainamide	M	Cardiovascular	7 mg/kg 10 mg/kg 20 mcg/kg/min 40 mcg/kg/min 80 mcg/kg/min	mg/kg mcg/kg/min	IV/IO
Propranolol	L	Cardiovascular	0.01 mg/kg 0.1 mg/kg 0.15 mg/kg 0.25 mg/kg	mg/kg	IV, PO
Racemic Epi	L	Bronchodilator	0.25 ml	mL	IN
Rocuronium	L	Neuromuscular Blockade	0.4 mg/kg 0.5 mg/kg 0.6 mg/kg	mg/kg	IV/IO
Sodium Bicarbonate 4.2%	L	Cardiovascular	1m Eq/kg 2m Eq/kg	mEq/kg	IV, IO
Succinylcholine	M	Neuromuscular Blockade	2 mg/kg	mg/kg	IV
Survanta	L	Respiratory	4 ml/kg	mL/kg	ET
Terbutaline	L	Respiratory	2 mcg/kg 10 mcg/kg 0.1 mcg/kg/min	mg/kg mcg/kg/min	IV/IO
Theophylline	L	Bronchodilator	2 mg/kg 5 mg/kg	mg/kg	PO
Vasopressin	L	ACLS/Cardiovascular	0.1 mu/kg 0.5 mu/kg 0.1 mu/kg/min 0.5 mu/kg/min	milliunits/kg milliunits/kg/min	IV/IO
Vecuronium	L	Neuromuscular Blockade	0.03 mg/kg 0.1 mg/kg 0.15 mg/kg	mg/kg	IV

Appendix B - Maestro Parameter Descriptions

The Maestro software has a number of parameters that control the patient status and software-controlled features of the simulator. Parameters are grouped by category: Cardiac, Respiratory, Neuro, Fluids, Eyes, Sounds, Pulse, Speech. Brief descriptions of each parameter are provided below.

Note: Parameter availability will vary depending on which simulator is connected to CAE Maestro. Explore your Maestro user interface and the information below to review the parameters for your simulator.

Additional childbirth-related parameters for CAE Lucina are found in the *CAE Maestro for Lucina Childbirth Supplement*.

Cardiovascular: Basic Parameters

Arterial Blood Pressure

The **Blood Pressure** parameter is used to set the value of the blood pressure (Manual mode) or override the physiological modeling for blood pressure in Modeled mode. The systolic and diastolic blood pressures can both be set to fixed numeric values, regardless of interventions performed.

Resetting the parameter to **Modeled** returns control of the underlying blood pressure to the physiological models. The set change can also be programmed to occur over time using the onset control.

Central Venous Pressure (CVP)

The **CVP** parameter is used to set the CVP baseline and atrial contraction amplitude to fixed numeric values. Once set, intravascular volume changes have no effect on the CVP. In addition, once an override is applied, changes in tidal volume have no effect on the CVP waveform with the exception of an apneic patient where the minimum and maximum would be the same value since there is no inspiration or expiration. Depending on the volume status of the patient, the minimum/maximum value can be shifted up or down.

For the override to take effect, the **Central Venous Catheter** must be set to the *Intrathoracic Vein*.

For example, with the minimum diastolic set to 5 mmHg, maximum diastolic set to 15 mmHg and pulse amplitude set to 2 mmHg, the CVP baseline is 15 mmHg, dipping to 5 mmHg with each inhalation, and the amplitude of the wave is 2 mmHg with each atrial contraction. The CVP baseline remains the same even in the event of intravascular volume changes and the depth of each dip due to inhalation remains at 5 mmHg even in the event of tidal volume changes. However, if the respiratory rate increases or decreases, the frequency of the dips will show a corresponding increase or decrease. The set change can also be programmed to occur over time using the onset control.

Pulmonary Artery Pressure (PAP)

The **PAP** parameter is used to set the pulmonary artery pressure in Manual mode or to override the physiological modeling for pulmonary artery pressure in Modeled mode. The systolic and diastolic pressures can both be set to fixed numeric values, regardless of interventions performed. Resetting the parameter to **Modeled** returns control of the underlying pulmonary artery pressure to the physiological model. The set change can also be programmed to occur over time using the onset control.

Pulmonary Capillary Wedge Pressure (PCWP)

The **PCWP** parameter is used to display the patient's pulmonary capillary wedge pressure. It is used to simulate the pressure as measured by wedging a pulmonary catheter with an inflated balloon into a small pulmonary arterial branch. The set change can also be programmed to occur over time using the onset control.

Heart Rate

The **Heart Rate** parameter is used to set the heart rate to a given (fixed) number of beats per minute. Once the heart rate is set to a numeric value, administered drugs or intravascular volume changes have no effect on the heart rate, but continue to influence other components of the physiological models (in Modeled mode). Use this parameter to “fix” or set the heart rate to a specific number. In Manual mode, the set change can also be programmed to occur over time using the onset control.

Cardiac Output

The **Cardiac Output** parameter displays the volume of blood pumped by the heart per minute. **Cardiac Output** is a function of heart rate (the number of heart beats per minute) and stroke volume (the volume of blood pumped out of the heart with each beat). **Cardiac Output** does not affect the rest of the physiology. For example, if cardiac output is set to zero, it will be shown on the CAE Patient Monitor as zero, but the patient will still have a blood pressure and pulses. In Manual mode, the set change can also be programmed to occcur over time using the onset control.

Cardiac Rhythm

The **Cardiac Rhythm** parameter is used to change the patient’s underlying cardiac rhythm displayed on the Patient Status Display or the CAE Patient Monitor. To change the cardiac rhythm, click the **Cardiac Rhythm** parameter and select the desired rhythm from the available list. If a number appears following the cardiac rhythm on the list, this overrides the heart rate to the rate indicated.

Pulseless Electrical Activity

The **Pulseless Electrical Activity** parameter triggers a clinical condition characterized by unresponsiveness and lack of palpable pulse in the presence of organized cardiac electrical activity. It is either ON or OFF.

PVC Probability

The **PVC Probability** parameter represents the percentage of cardiac cycles containing a premature ventricular contraction (contraction of the ventricles that occurs earlier than usual due to abnormal electrical activity of the ventricles).

The **PVC Probability** is used to set the frequency of PVCs within any cardiac rhythm. The set change can also be programmed to occur over time using the onset control.

Ventricular Escape Rate

The **Ventricular Escape Rate** parameter is used to set the rate of ventricular escape beats. Ventricular escape rate does not affect the rest of the physiology. The set change can also be programmed to occur over time using the onset control.

Hemoglobin

The **Hemoglobin** parameter is used to set a fixed hemoglobin value. Hemoglobin does not affect the rest of the physiology. The value set will be shown on the CAE Patient Monitor if selected in one of the numeric fields. In Manual mode, the set change can also be programmed to occur over time using the onset control.

Cardiovascular: Advanced Parameters

Ventricle Contractility Factor: Left

The **Ventricle Contractility Factor: Left** parameter adjusts the contractility of the left ventricle and

has a direct effect on cardiac output and blood pressure. Use this parameter to raise or lower the cardiac output.

Ventricle Contractility Factor: Right

The **Ventricle Contractility Factor: Right** parameter adjusts the contractility of the right ventricle and has a direct effect on cardiac output and blood pressure. Use this parameter to raise or lower the cardiac output.

Tamponade Volume

The **Tamponade Volume** parameter is used to set the amount of fluid or blood that is building up in the space between the myocardium and the pericardium, causing a cardiac tamponade.

Chest Compression Efficacy

The **Chest Compression Efficacy** parameter is used to determine the effectiveness of chest compressions administered by the caregiver. The ON/OFF setting indicates that chest compressions are completely effective, while the 0% setting prevents them from having any effect on intrathoracic pressure.

Resistance Factor: Aortic Valve

The **Resistance Factor: Aortic Valve** parameter is used to adjust the resistance to blood flow across the aortic valve. Increasing the value to greater than 1 corresponds to increased resistance to blood flow through the aortic valve.

Resistance Factor: Mitral Valve

The **Resistance Factor: Mitral Valve** parameter is used to adjust the resistance to blood flow across the mitral valve. Increasing the value to greater than 1 corresponds to increased resistance to blood flow through the mitral valve.

Resistance Factor: Systemic Vascular

The **Resistance Factor: Systemic Vascular** parameter adjusts the baseline systemic vascular resistance. Raising the value increases the systemic vascular resistance while lowering the value decreases the vascular resistance.

Raising the parameter value is analogous to increasing the resistance to blood flow through the systemic vasculature. Under such conditions, the arterial blood pressure (ABP) increases, and the heart rate may decrease due to feedback from the physiological control mechanisms.

Resistance Factor: Pulmonary Vasculature

The **Resistance Factor: Pulmonary Vasculature** parameter adjusts the baseline pulmonary vascular resistance. Raising the value increases the pulmonary vascular resistance, while lowering the value decreases the vascular resistance.

Raising the parameter value is analogous to increasing the resistance to blood flow through the pulmonary vasculature. Under such conditions, the pulmonary artery pressure (PAP) and central venous pressure (CVP) increase due to back-pressure through the right side of the heart.

Resistance Factor: Pulmonic Valve

The **Resistance Factor: Pulmonic Valve** parameter is used to adjust the resistance to blood flow across the pulmonic valve. Increasing the value to greater than 1 corresponds to increased resistance to blood flow through the pulmonic valve.

Resistance Factor: Venous Return

The **Resistance Factor: Venous Return** parameter adjusts the resistance between the extrathoracic and intrathoracic venous compartments. Raising the value increases the resistance, while lowering the value decreases the resistance.

With less blood returning to the heart, there is a reduced volume entering the ventricles prior to ventricular contraction. This results in a drop in the cardiac output and decrease in arterial blood pressures. The heart rate increases due to feedback from the physiological control mechanisms in an attempt to maintain adequate blood pressures.

Compliance Factor: Left Ventricle

The **Compliance Factor: Left Ventricle** parameter adjusts the pulse pressure (difference between systolic and diastolic pressures) of the simulated patient's left ventricle.

Compliance Factor: Right Ventricle

The **Compliance Factor: Right Ventricle** parameter adjusts the pulse pressure (difference between systolic and diastolic pressures) of the simulated patient's left ventricle.

Compliance Factor: Systemic Arteries

The **Compliance Factor: Systemic Arteries** parameter adjusts the pulse pressure (difference between systolic and diastolic pressures) of the simulated patient's systemic blood pressure. Increases in the compliance factor result in a decreased (narrower) pulse pressure, while smaller values increase the pulse pressure. Additionally, when the pulse pressure increases as a result of a reduced compliance factor, both systolic and diastolic pressures increase. Conversely, with a narrower pulse pressure (higher compliance factor), both the systolic and diastolic blood pressures also drop.

Compliance Factor: Pulmonary Arteries

The **Compliance Factor: Pulmonary Arteries** parameter adjusts the pulse pressure (difference between systolic and diastolic pressures) of the simulated patient's pulmonary blood pressure. Increases in the compliance factor decrease (narrow) the pulse pressure, while smaller values increase the pulse pressure. Additionally, when the pulse pressure increases as a result of a reduced compliance factor, both systolic and diastolic pulmonary pressures increase. Conversely, with a narrower pulse pressure (higher compliance factor) both the systolic and diastolic pulmonary pressures also drop.

Capacity Factor: Venous

The **Capacity Factor: Venous** parameter adjusts the volume of blood contained in the unstretched venous system without an increase in venous pressure. Raising the value decreases the venous

capacitance (vasodilatation and decreased vascular tone), while lowering the value increases the venous capacitance (vasoconstriction and increased vascular tone).

The volume of blood in the venous system has an inverse relationship to the blood pressure. Lowering the value is analogous to a "shift" in blood from the venous system to the arterial system, and this shift, when coordinated with increased systemic vascular resistance, results in an increase in blood pressure [arterial blood pressure (ABP), pulmonary artery pressure (PAP) and central venous pressure (CVP)].

Baroreceptor Minimum Pressure

Baroreceptor minimum pressure defines the mean arterial pressure (MAP) at which the baroreceptor inhibitory activity on the heart and systemic vasculature is minimal. When a simulated patient's MAP decreases below baseline pressure, the baroreceptor response exerts inhibitory controls on the MAP (e.g., increase in heart rate) in an attempt to return the MAP to the patient's baseline pressure.

However, these controls have a lower limit, and this "minimum pressure" is defined as the baroreceptor minimum pressure.

In other words, as the MAP decreases, the physiological controls (i.e., baroreceptor response) work to bring the pressure back toward baseline, primarily by increasing the heart rate. For every 5 mmHg decrease in MAP, the heart rate may increase by 2 beats per minute in an attempt to keep the MAP in check. However, there is a lower limit ("minimum pressure"), after which these controls are no longer effective. Once the MAP reaches the baroreceptor minimum pressure, there is no additional increase in heart rate if the pressure continues to fall. For example, should the pressure continue to fall, the heart rate would not show a corresponding increase.

The MAP set-point is exactly between baroreceptor minimum and maximum pressure.

Baroreceptor Maximum Pressure

Baroreceptor maximum pressure defines the mean arterial pressure (MAP) at which the baroreceptor inhibitory activity on the heart and systemic vasculature is maximal. When a simulated patient's MAP increases above baseline pressure, the baroreceptor response exerts greater inhibitory controls on the MAP (e.g., reduction in heart rate) in an attempt to return the MAP to the patient's baseline pressure. However,

these controls have an upper limit, and this "maximum pressure" is defined as the baroreceptor maximum pressure.

In other words, as the MAP increases, the physiological controls (i.e., baroreceptor response) work to bring the pressure back toward baseline, primarily by reducing the heart rate. For every 5 mmHg

increase in MAP, the heart rate may decrease by 2 beats per minute in an attempt to keep the MAP in check. However, there is an upper limit ("maximum pressure"), after which these controls are no longer effective. Once the MAP reaches the baroreceptor maximum pressure, there is no additional reduction in heart rate if the pressure continues to rise. For example, should the pressure continue to rise, the heart rate would not show a corresponding slowing.

The MAP set-point is exactly between baroreceptor minimum and maximum pressure.

Baroreceptor Gain Factor: Overall

The **Baroreceptor Gain Factor: Overall** parameter adjusts the influence of mean arterial pressure (MAP) on heart rate, contractility, systemic vascular resistance and venous capacity. Use this parameter to adjust how vigorously the heart and vasculature respond to blood pressure changes. The degree of increase in heart rate or vascular response is influenced by the baroreceptor gain (overall) factor.

For example, when blood pressure falls, the heart rate increases, the arteries increase their vascular tone (resistance) and there is less pooling of the blood in the venous system, all in an attempt to maintain adequate blood pressure. A baroreceptor gain (overall) factor value of less than 1 corresponds to baroreceptor depression. A baroreceptor gain (overall) factor value greater than 1 leads to a stronger response to MAP changes.

Baroreceptor Gain Factor: Cardiac

The **Baroreceptor Gain Factor: Cardiac** parameter selectively adjusts the influence of mean arterial pressure (MAP) on the heart rate and contractility, influencing how much the heart rate increases or decreases with changes in blood pressure. Use this parameter to adjust how vigorously the heart responds to blood pressure changes.

A baroreceptor gain (cardiac) factor of less than 1 corresponds to baroreflex depression (e.g., less heart rate response to MAP changes). A value greater than 1 leads to a stronger response to MAP changes.

Baroreceptor Gain Factor: Peripheral

The **Baroreceptor Gain Factor: Peripheral** parameter adjusts the influence of mean arterial pressure (MAP) on systemic vascular resistance and venous capacity, influencing how much the vasculature responds to changes in blood pressure.

For example, when blood pressure falls, the arteries increase their vascular tone (resistance), and there is less pooling of the blood in the venous system, in an attempt to maintain adequate blood pressure. A factor of less than 1 corresponds to baroreflex depression (e.g., less systemic vascular resistance response to MAP changes). A value greater than 1 leads to a stronger response to MAP changes.

Ischemic Index Sensitivity

The **Ischemic Index Sensitivity** parameter determines the relative sensitivity of the simulated patient to myocardial ischemia. A lower ischemic index sensitivity value corresponds to less sensitivity to an unfavorable oxygen supply/demand ratio (i.e., poor oxygenation with high heart rate). A patient with a low value is less sensitive to poor oxygenation, takes longer to go into the "death spiral" and, therefore, survives longer.

Model-Driven ECG Rhythm	Ischemic Index (I.I.)
Normal Sinus Rhythm (NSR)	I.I. ? 0.90
Mild ST Segment Depression	0.90 > I.I. ? 0.70
Moderate ST Segment Depression	0.70 > I.I. ? 0.60
Premature Ventricular Contractions (PVCs)	0.60 > I.I. ? 0.40
Ventricular Tachycardia (VTach)	0.40 > I.I.
Ventricular Fibrillation (VFib)	1 minute after VTach
Asystole	1 minute after VFib

The patient's response to myocardial ischemia may be altered using the **Ischemic Index Sensitivity** parameter found on the Cardiovascular view. To make the patient less sensitive to ischemia, lower the value below the default setting. To make the patient more sensitive, increase the value above the default setting. These changes are then reflected in the patient's Ischemic Index, as shown in the table above.

Ischemic Index Averaging

Ischemic index averaging determines how quickly myocardial ischemia develops in the presence of an unfavorable oxygen supply/demand ratio or how rapidly it resolves when myocardial oxygenation becomes favorable. By decreasing the averaging time (i.e., value toward 0.5), ischemia has a faster onset if there is a poor oxygen supply to the heart or a faster resolution with favorable oxygenation. Increasing the averaging time (i.e., value toward 0.99) means ischemia takes longer to develop or longer to resolve.

Use this parameter to speed up the recovery from the model-driven "death spiral." By setting the parameter to 0.5, a patient pulls out of the "death spiral" at a faster rate than with a setting of 0.99.

However, the favorable conditions (i.e., better oxygenation and/or lower heart rate) must exist before the number is made smaller. If not, the patient's descent increases at a faster rate.

Defibrillation Energy

The **Defibrillation Energy** parameter is used to simulate a specified amount of energy discharged via an external cardiac defibrillator. Setting this parameter results in the characteristic spike in the ECG, followed by a return to the pre-defibrillation rhythm. **Defibrillation Energy** has no direct effect on the electrical conduction system of the heart. Thus, synchronized cardioversion may be done "on the fly" or scripted using the Scenario Designer.

Pacing Capture Threshold

The **Pacing Capture Threshold** parameter determines the minimum pacing current necessary to pace the heart via an external cardiac pacer. Also see **Pacing Current**. Pacing current values below the pacing capture threshold have no effect on the patient's heart rate.

Pacing Current

The **Pacing Current** parameter is used to simulate a specified amount of current discharged via an external cardiac pacer. Setting this parameter results in the characteristic pacing signal on the ECG waveform when the pacing current is at or above the capture threshold. Also, see **Pacing Capture Threshold**.

Pacing Rate

The **Pacing Rate** parameter determines the cardiac rate (in beats/minute) when the pacing current is at or above the pacing capture threshold. Also, see **Pacing Current** and **Pacing Capture Threshold**.

Respiratory: Basic Parameters

Apnea

The **Apnea** parameter triggers a clinical condition characterized by no spontaneous breathing. Lung sounds and vocal sounds will cease when apnea is enabled. It is either ON or OFF.

Swollen Tongue

This parameter is used to create two degrees of tongue swelling: **Semi-Swollen** and **Swollen**. The **Not Swollen** setting returns the tongue to its normal anatomic state.

Airway Occluder

Using the **Airway Occluder** parameter, swelling of the posterior oropharynx can be activated to obstruct the view of the larynx and prevent intubation but allow mask ventilation of the patient's lungs, thereby creating a "cannot intubate, can ventilate" scenario.

Laryngospasm

Use the Laryngospasm parameter to simulate a laryngospasm. A laryngospasm actuator closes the patient's vocal cords and prevents both ventilation and intubation. When activated with the Airway Occluder parameter, a "cannot intubate, cannot ventilate" crisis scenario is achieved.

Bronchial Occlusion (Left and Right)

Turning on the **Bronchial Occlusion** parameter completely obstructs the right or left bronchi, simulating a lower airway obstruction (e.g., mucus plug).

Right and left bronchi can be occluded individually.

Improper intubation creates a mainstem occlusion, yielding an inability to ventilate the lungs. However, the right and left bronchi are not occluded individually.

Respiratory Rate

The **Respiratory Rate** parameter is used to set the respiratory rate to a given number of breaths per minute. In Modeled mode, when the Respiratory Rate is set, arterial oxygen and carbon dioxide values have no effect on the resulting respiratory rate, but continue to influence other components of the physiological models. The patient continues to breathe at the set number of breaths per minute, regardless of the arterial oxygen or carbon dioxide levels.

For example, when the respiratory rate is set to 10 breaths per minute, the respiratory rate remains at 10 breaths per minute, regardless of arterial oxygen or carbon dioxide levels. In such situations, the patient can only respond to arterial oxygen or carbon dioxide levels by altering the tidal volume, either automatically via the model-driven controls or when the **Tidal Volume** parameter is adjusted. The set change can also be programmed to occur over time using the onset control.

SpO_2

The SpO_2 parameter overrides the physiology and sets a fixed numeric value, regardless of the oxygen applied.

$EtCO_2$

The $EtCO_2$ parameter is used to set the end-tidal CO_2 to a fixed numeric value, measured in mmHg, regardless of the minute ventilation. The end exhalation point of the capnogram waveform will also reflect the set end-tidal CO_2 value. Setting the $EtCO_2$ has no effect on the arterial carbon dioxide values ($PaCO_2$), respiratory rate or tidal volume.

For example, when the $EtCO_2$ is set to 50 mmHg, the numeric end-tidal CO_2 will display 50 mmHg and the capnogram waveform rises to an end-tidal of 50 mmHg. However, the respiratory rate and tidal volume will remain the same unless the Respiratory Rate and/or the Tidal Volume parameter(s) is adjusted.

Tidal Volume

The **Tidal Volume** parameter sets the tidal volume to a given volume per breath. Once Tidal Volume is set to a numeric value, arterial oxygen and carbon dioxide values have no effect on the tidal volume, but continue to influence other components of the physiological models (in Modeled mode).

For example, with the tidal volume set to 600mL in the adult simulator, the tidal volume remains a constant (set) 600 mL even in the event of falling arterial oxygen levels. In such situations, the patient can only respond to arterial oxygen or carbon dioxide levels by altering the respiratory rate.

Tidal Volume Factor

The **Tidal Volume Factor** (along with the **Respiratory Rate Factor**) parameter is used to change the baseline tidal volume (before the control-of-breathing and drug influences are taken into account). A value of 2 doubles the baseline tidal volume. A value of 0.5 decreases the baseline tidal volume by 50%.

TIP: First decrease the respiratory gain factor to reduce the influence of the respiratory control mechanism on the respiratory rate and tidal volume.

I to E Ratio (1:X)

The **I to E Ratio (1:X)** parameter can be used to change the ratio of inspiratory time:expiratory time (I:E). The I to E Ratio does not affect physiology. The set change also be programmed to occur over time using the onset control.

Fraction of Inspired O_2 (FiO_2)

This parameter is used to simulate changes in the **FiO_2,** such as would occur with the administration of supplemental oxygen.

Intrapleural Volume (Vol): (Left and Right)

The **Intrapleural Vol** parameters allow intrapleural volume to accumulate, for example, as happens during pneumothorax, hydrothorax, or hemothorax.

To simulate pneumothorax, set corresponding **Intrapleural Vol** to greater than 0 mL. Breath sounds are automatically diminished on the appropriate side due to decreased ventilation of the affected lung.

Chest Tube Flow: (Left and Right)

The **Chest Tube Flow** parameter is used with the chest tube feature of the simulator. The Chest Tube Flow specifies the rate at which fluid can be removed from the simulated pleural space via a chest tube drainage system. As the chest tube drains, the volume is automatically subtracted from the set amount of Intrapleural Volume.

Respiratory: Advanced Parameters

Chest Wall Capacity

The **Chest Wall Capacity** parameter sets the total (combined) intrapleural and lung volumes at which the chest wall is considered distended. Also, see **Chest Wall Compliance Factor** and **Distended Chest Wall Compliance Factor**.

Chest Wall Compliance Factor

The **Chest Wall Compliance Factor** parameter describes the interaction of the chest wall with the lungs. The **Chest Wall Compliance Factor** parameter defines the volume-pressure relationship in the normal operating lung volumes. Once distended, however, the chest wall rapidly becomes much less compliant (i.e., much "stiffer") and resistant to further inflation.

Distended Chest Wall Compliance Factor

The **Distended Chest Wall Compliance Factor** parameter, along with the **Chest Wall Compliance Factor** parameter, describes the interaction of the chest wall with the lungs. The **Chest Wall Compliance Factor** parameter defines the volume-pressure relationship in normal lung volumes. Once distended, however, the chest wall rapidly becomes much "stiffer" and resistant to further inflation.

The **Distended Chest Wall Compliance Factor** parameter must be set to a low value for increased intrapleural volumes to result in elevated inspiratory pressures with positive pressure ventilation. Also, see **Intrapleural Volume (Vol): (Left and Right).**

Functional Residual Capacity

The **Functional Residual Capacity** parameter sets the combined left and right lung volume remaining at the end of normal, spontaneous exhalation. This parameter influences speed of desaturation during apnea.

Lung Compliance Factor: (Left and Right)

These two parameters independently set the left and right lung compliance. **Lung Compliance Factor** determines how easily the lungs inflate. Low compliance factors (less than 1) create "stiff" lungs (such as in acute respiratory distress syndrome or pulmonary edema) requiring more pressure for expansion. High compliance factors (greater than 1) create "loose" lungs that easily inflate with less pressure.

$PaCO_2$ Set-point

The **$PaCO_2$ Set-point** parameter is a set-point for $PaCO_2$. The control-of-breathing model adjusts tidal volume and respiratory rate in order to bring the $PaCO_2$ toward this set-point. Factors that influence the success of this control effort include baseline tidal volume, baseline respiratory rate, respiratory gain, O_2 consumption, respiratory quotient, lung compliances, chest wall compliance, bronchial resistances, the presence of artificial airways in the simulator and the inspired gas mixture.

When the **$PaCO_2$ Set-point** is set to a new value, the physiological controls adjust the simulator's respiratory pattern in an attempt to attain the desired set-point. For example, when the set-point is raised from 40 to 50 mmHg, there is a transitory decrease in respiratory rate and tidal volume, as the physiological controls attempt to drive the $PaCO_2$ toward 50 mmHg. When the $PaCO_2$ reaches the new set-point, the simulator's respiratory rate and tidal volume should return to normal values.

PaO_2 Set-point

The **PaO_2 Set-point** parameter is a set-point for PaO_2. When PaO_2 is below the set-point value, progressive stimulation of spontaneous minute ventilation occurs. Both tidal volume and respiratory rate rise, which under appropriate conditions results in PaO_2 moving closer to the set-point. Factors that influence this control effort include baseline tidal volume, baseline respiratory rate, respiratory gain, O_2 consumption, respiratory quotient, lung compliances, chest wall compliance, bronchial resistances, the presence of artificial airways in the simulator and the inspired gas mixture. Minute ventilation is not affected for PaO_2 above the set-point.

For example, if **PaO_2 Set-point** is set to 100 mmHg and PaO_2 drops to 90 mmHg, ventilatory stimulation occurs. When PaO_2 reaches the new set-point, the simulator's respiratory rate and tidal volume are again controlled to maintain $PaCO_2$ at the $PaCO_2$ set-point. Also, see **$PaCO_2$ Set-point**.

$PetCO_2$ - $PaCO_2$ Factor

The **PetCO2 - PaCO2 Factor** adjusts the end-tidal CO2 relative to the PaCO2. At the default value of 1, PetCO2 very closely approximates PaCO2. When **PetCO2 - PaCO2 Factor** is set at a value of 2, PetCO2 is approximately one half of PaCO2. PetCO2 depends on CO2 production and alveolar ventilation.

Because the alveolar dead space is not modeled physically in the hardware, the responses to changes in mechanical ventilation settings may not be exact. The use of the Onset feature (e.g., onset over a 1- minute period) is recommended for this parameter.

Respiratory Gain Factor

The **Respiratory Gain Factor** determines how strong an influence arterial CO_2 levels have on the tidal volume and respiratory rate. Under default conditions (value = 1), when arterial CO_2 levels rise, the patient's respiratory rate and tidal volume show a transitory increase in an attempt to return the patient to the physiological control CO_2 set-point. If the **Respiratory Gain Factor** is increased to more than 1, the patient has a more pronounced response, while values less than 1 correspond to a blunted response.

Venous CO_2 Shift

The **Venous CO_2 Shift** parameter affects the partial pressure of CO_2 in the venous blood. Changing this parameter allows large and rapid shifts in total body CO_2 concentration. Increases in alveolar and arterial CO_2 follow rapidly in a physiologically correct magnitude and time course.

This parameter is useful for giving a "bolus" of CO_2 to the venous system. The alveolar and arterial CO_2 levels rise rapidly in response to the added carbon dioxide but soon return to "pre-bolus" levels as increased

ventilation efforts work to eliminate the added CO_2. Therefore, the rise in CO_2 levels is only transitory. This parameter can be used to simulate external CO_2 administration such as that used during laparoscopy.

Note: This parameter is intended to be used only while running an SCE. SCEs and patients should NOT be saved once the parameter has been applied. If an SCE or patient is saved after the **Venous CO_2 Shift** parameter has been applied, unexpected behavior may occur when the SCE or patient is reloaded.

Venous Oximetry

To adjust the SvO2 percentage manually, from the Respiratory view, tap **Venous Oximetry**. The SvO2 slider appears. Set the rate by dragging the slider left or right. Click Accept to exit and save the changes. To return to the programmed physiologic model, click the switch and turn the **Override** switch to **Modeled**.

pH Shift

The **pH Shift** parameter is used to create a metabolic acidosis or metabolic alkalosis under script control.

The default pH value displayed on the Patient Status Display or TouchPro software is dependent on respiratory arterial CO_2 values. Under default conditions ($PaCO_2$ = 40 mmHg), the pH is approximately 7.4. Rising arterial CO_2 produces a subsequent drop in pH, while falling arterial CO_2 levels result in rising pH values.

To simulate pH changes with metabolic changes (acidosis or alkalosis), the **pH Shift** value is a mathematical addition to (or subtraction) from the displayed pH value to that which is desired.

O_2 Consumption

The **O_2 Consumption** parameter is used to change the rate of consumption of oxygen and production of carbon dioxide. When **O_2 Consumption** is increased and used with increased **Shunt Fraction**, profound levels of hypoxia can be achieved rapidly.

CO_2 Production Factor

The **CO_2 Production Factor** parameter allows for the manipulation of metabolic CO_2 production to simulate a variety of pathophysiological conditions. CO_2 production is determined by the **O_2 Consumption** and **Respiratory Quotient** settings. A CO_2 Production Factor value of 2 doubles the CO_2 production, while a value of 0.5 decreases the CO_2 production by 50%.

Respiratory Quotient

Respiratory Quotient is the rate of carbon dioxide production divided by the rate of oxygen consumption. Changes to the **Respiratory Quotient** parameter alter the rate of carbon dioxide production relative to the rate of oxygen consumption.

Positive End Expiratory Pressure (PEEP)

The PEEP parameter specifies the amount of positive end expiratory pressure applied during mechanical ventilation. Setting this parameter results in clinically appropriate intrathoracic pressures and hemodynamic responses. **PEEP** must be set both in the software and on the ventilator.

Alveolar Enflurane

The **Alveolar Enflurane** parameter is used to simulate the presence of enflurane in the alveolar space without using real anesthetic vapors. The enflurane percentage is input to the drug models to achieve the expected pharmacodynamic effects (e.g., respiratory depression).

Using this parameter bypasses pharmacokinetics, real and instructor-specified inspired fractions, venous content, lung perfusion and ventilation. This parameter can be used to focus on cardiorespiratory effects (pharmacodynamics).

Note: Maestro does not verify a 100% sum of all fractions, because this would require all fractions to be set.

Fraction of Inspired Enflurane

The **Fraction of Inspired Enflurane** parameter is used to simulate the amount of enflurane set in the anesthetic vaporizer and is used to calculate alveolar enflurane.

This parameter has a faster effect on physiology than anesthesia machine settings, because mixing in the breathing circuit is not simulated.

Note: Maestro does not verify a 100 % sum of all fractions, because this would require all fractions to be set.

Alveolar Halothane

The **Alveolar Halothane** parameter is used to simulate the presence of halothane in the alveolar space without using real anesthetic vapors. The halothane percentage is input to the drug models to achieve the expected pharmacodynamic effects (e.g., respiratory depression).

Using this parameter bypasses pharmacokinetics, real and instructor-specified inspired fractions, venous content, lung perfusion and ventilation. This parameter can be used to focus on cardiorespiratory effects (pharmacodynamics).

Note: Maestro does not verify a 100 % sum of all fractions, because this would require all fractions to be set.

Fraction of Inspired Halothane

The **Fraction of Inspired Halothane** parameter is used to simulate the amount of halothane set in the anesthetic vaporizer and is used to calculate alveolar halothane.

This parameter has a faster effect on physiology than anesthesia machine settings, because mixing in the breathing circuit is not simulated.

Note: Maestro does not verify a 100% sum of all fractions, because this would require all fractions to be set.

Alveolar Isoflurane

The **Alveolar Isoflurane** parameter is used to simulate the presence of isoflurane in the alveolar space without using real anesthetic vapors. The isoflurane percentage is input to the drug models to achieve the expected pharmacodynamic effects (e.g., respiratory depression).

Using this parameter bypasses pharmacokinetics, real and instructor-specified inspired fractions, venous content, lung perfusion and ventilation. This parameter can be used to focus on cardiorespiratory effects (pharmacodynamics).

Note: Maestro does not verify a 100 % sum of all fractions, because this would require all fractions to be set.

Fraction of Inspired Isoflurane

The **Fraction of Inspired Isoflurane** parameter is used to simulate the amount of isoflurane set in the anesthetic vaporizer and is used to calculate alveolar isoflurane.

This parameter has a faster effect on physiology than anesthesia machine settings, because mixing in the breathing circuit is not simulated.

Note: Maestro does not verify a 100 % sum of all fractions, because this would require all fractions to be set.

Alveolar Nitrous Oxide

The **Alveolar Nitrous Oxide** parameter is used to simulate the amount of nitrous oxide set in the anesthetic vaporizer and is used to calculate alveolar nitrous oxide.

Using this parameter bypasses pharmacokinetics, real and instructor-specified inspired fractions, venous content, lung perfusion and ventilation. This parameter can be used to focus on cardiorespiratory effects (pharmacodynamics).

Note: Maestro does not verify a 100 % sum of all fractions, because this would require all fractions to be set.

Fraction of Inspired Nitrous Oxide

The **Fraction of Inspired Nitrous Oxide** parameter is used to simulate the amount of nitrous oxide set in the anesthetic vaporizer and is used to calculate alveolar nitrous oxide.

This parameter has a faster effect on physiology than anesthesia machine settings, because mixing in the breathing circuit is not simulated.

Note: Maestro does not verify a 100 % sum of all fractions, because this would require all fractions to be set.

Alveolar Sevoflurane

The **Alveolar Sevoflurane** parameter is used to simulate the presence of sevoflurane in the alveolar space without using real anesthetic vapors. The sevoflurane percentage is input to the drug models to achieve the expected pharmacodynamic effects (e.g., respiratory depression).

Using this parameter bypasses pharmacokinetics, real and instructor-specified inspired fractions, venous content, lung perfusion and ventilation. This parameter can be used to focus on cardiorespiratory effects (pharmacodynamics).

Note: Maestro does not verify a 100% sum of all fractions, because this would require all fractions to be set.

Fraction of Inspired Sevoflurane

The **Fraction of Inspired Sevoflurane** parameter is used to simulate the amount of sevoflurane set in the anesthetic vaporizer and is used to calculate alveolar sevoflurane.

This parameter has a faster effect on physiology than anesthesia machine settings, because mixing in the breathing circuit is not simulated.

Note: Maestro does not verify a 100 % sum of all fractions, because this would require all fractions to be set.

Neurological

Diaphoresis

When enabled, the **Diaphoresis** parameter is used to simulate the presence of diaphoresis on the forehead of the simulator. At this time, diaphoresis is not linked with the physiological models.

Eyes

Blink Mode

In **Auto** mode the eyes are normally blinking. However, the eyes will automatically close under any of the following conditions:

- SpO2 < 75%
- Spontaneous minute ventilation < 1500
- mL Neuromuscular blockade (NMB) > 30%
- Non-pulsatile cardiac rhythm

The **Slow**, **Normal,** and **Fast** parameters control the eyelid blinking frequency. Presently, blinking frequency is not linked to the physiological models. However, the response can be done "on the fly" or scripted using the Scenario Designer.

Control Eyes Together

Both eyes can be controlled together by enabling the **Control Eyes Together** parameter. When this option is selected, any change made to one eye, will automatically be made to the other eye.

Light Reactivity

The **Light Reactivity** parameter determines the speed at which the eyes react to light. **Light Reactivity** can be set to **None**, **Brisk, or Sluggish**.

NOTE: If **Brisk** or **Sluggish** is selected, the **Pupil Diameter** parameter will be unavailable. Pupil diameter selections are available only when the light reactivity is set to **None**.

Pupil Diameter

The Pupil Diameter parameters are used to control the diameter of the pupils in the eyes. Each eye has changeable pupils for changeable parameter conditions.

NOTE: This function is available only when **Light Reactivity** is set to None.

Neuromuscular Blockade (NMB)

The pharmacokinetic and pharmacodynamic models based on the neuromuscular blocking agents administered and the time course of their injection automatically determines the degree of NMB. For some educational applications, however, the instructor may wish to set a fixed degree of neuromuscular blockade that remains stable for an indefinite period. This can be accomplished using the **NMB** parameter. The default setting instructs the pharmacologic models to determine the degree of neuromuscular blockade based upon the drugs injected and their pharmacologic properties.

When a numeric value is assigned to this parameter, the degree of NMB is set to that level. For example, 80% NMB causes the simulator to set the degree of NMB to 80%, regardless of the presence (or absence) of neuromuscular blocking drugs. Clinically, the spontaneous tidal volume is markedly reduced. If NMB is set to greater than 30%, the eyes will automatically close when in the Auto mode.

Intracranial Pressure (ICP)

The ICP parameter is used to set the ICP displayed as a numeric value on the Patient Status Display and on the CAE Patient Monitor.

Temperature: Body

The temperature measured at the body surface can be set using this parameter and can be displayed on the Patient Status Display and the CAE Patient Monitor. Body temperature is not linked to the physiologic models, however, changes can be made "on the fly" or scripted using the Scenario Designer. The set change can also be programmed to occur over time using the onset control.

Temperature: Blood

The arterial blood temperature can be set using the **Temperature: Blood** parameter. The arterial blood temperature can then be displayed on the Patient Status Display and the CAE Patient Monitor. The set change can also be programmed to occur over time using the onset control.

Convulsions

The **Convulsions** parameter is used to simulate the presence of convulsions. It is either **ON** or **OFF**.

Fluids

There are three categories of fluids: Bleeding, Manikin Bleeding, and Infusion.

Bleeding

Fluid Loss Blood

The **Fluid Loss Blood** parameter applies a decrease in total blood volume. Blood loss proportionally decreases both the red blood cell volume and the plasma volume per the current hematocrit. The loss of volume can be a one time loss or a loss over time. A custom volume amount and rate can also be set.

Fluid Loss Plasma

The **Fluid Loss Plasma** parameter reflects a decrease in plasma volume. Plasma loss decreases the plasma volume without changing the red blood cell volume. It refers collectively and generically to all fluid losses, including evaporative, transcellular, bowel, and third space fluid losses. The loss of volume can be a one time loss or a loss over time. A custom volume amount and rate can also be set.

Manikin Bleeding

Bleeding Lower

Use the **Bleeding Lower** parameter to activate bleeding from the Lower Moulage port (located in the right hip). Select the type (**Venous** or **Arterial**), then use the drop-down menu to select the amount of bleeding from the options: **None**, **Small**, **Medium**, or **Large**.

Bleeding Upper

Use the **Bleeding Upper** parameter to activate bleeding from the Upper Moulage port (located in the right shoulder). Select the type (**Venous** or **Arterial**), then use the drop-down menu to select the amount of bleeding from the options: **None**, **Small**, **Medium**, or **Large**.

Infusion

Colloid Infusion

When used, the **Colloid Infusion** parameter reflects an addition to the plasma volume without changing the red blood cell volume. Colloids include modified fluid gelatin starch solutions, dextran and human albumin. The volume selected can be administered as an immediate bolus or as an infusion over time. A custom bolus amount or infusion rate can also be set.

Crystalloid Infusion

When used, the **Crystalloid Infusion** parameter reflects an addition to the plasma volume without changing the red blood cell volume. The term crystalloid is used to describe salt solutions for infusion (e.g., normal saline, dextrose in water, Ringer's Lactate). The volume selected can be administered as an immediate bolus or as an infusion over time. A custom bolus amount or infusion rate can also be set.

PRBC Infusion

Packed red blood cells are a preparation of 70% red blood cells and 30% liquid plasma, often administered in severe anemia to restore adequate levels of hemoglobin and red cells without overloading the vascular system with excess fluids. The volume selected can be administered as an immediate bolus or as an infusion over time. A custom bolus amount or infusion rate can also be set.

Whole Blood Infusion

The term whole blood is used to refer to blood that has not been separated into its various components. It represents a preparation of 40% red blood cells and 60% liquid plasma. The volume selected can be administered as an immediate bolus or as an infusion over time. A custom bolus amount or infusion rate can also be set.

Pulse

All pulses are enabled by default, unless altered by an SCE. To change a pulse setting, tap the **Pulse** icon on the Run screen. Tap the desired pulse location on the image.

The pulse can be turned ON or OFF, and the pulse intensity can be set.

The pulse deficit can be changed from the default to another value. When the systolic pressure falls below the set pulse deficit, the pulse will turn off.

Sounds

A variety of simulated sounds are available to create a realistic experience. Click the **Sounds** button on the Run screen to access the Sounds controls.

Heart Sounds

Heart sounds can be adjusted by clicking on the Sound icon on the Run screen. When the Sounds panel appears, select **Heart Sounds**. The Heart Sounds menu will appear.

Independent control of the type and volume of heart sounds may be selected in each anatomical region.

Note: The volume control slider can be used to adjust the amplitude of the sound.

Lung Sounds

Normal and abnormal breath sounds are selected using this parameter. Breath sounds are synchronized with ventilation of the left and right lungs.

Breath sounds can be adjusted by clicking on the Sound icon on the Run screen. When the Sounds panel appears, select **Lung Sounds**. Independent control of the type and volume of heart sounds may be selected in each anatomical region.

Bowel Sounds

Bowel sounds can be adjusted by clicking on the Sound icon on the Run screen. When the Sounds panel appears, select **Bowel Sounds**. Independent control of the type and volume of bowel sounds may be selected in each anatomical region, or affect the bowel sounds simultaneously in all anatomical regions by selecting All Bowel Sounds and the desired sound.

Normal, **Hypoactive**, **Hyperactive** and absent bowel sounds (**None**) are selected using this parameter.

Speech

Speech sounds and other vocalizations are selected using this parameter.

NOTE: When selected, the sound plays continuously until **None** is selected.

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CAE

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