



CAEMaestro

User Guide - Lucina

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SYSTEM REQUIREMENTS

This section describes the minimum and optimal requirements to run the simulator.

Software and Hardware

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

Note: 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.

These requirements also apply to devices running Maestro Standalone.

CAE Maestro Software

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

Document	Document Version	Software Version
CAE Maestro for Lucina	905K472352 v1.0	CAE Maestro (Lucina) v2.7

Windows[®] Operating System

	Minimum Requirements
Software	<ul style="list-style-type: none"> Win 10 Pro
Hardware	<ul style="list-style-type: none"> Surface Pro Intel Pentium Gold Processor 4425Y 4 GB DDR3 RAM 32 GB Hard Drive space available 1920x1280 screen resolution USB-C Wireless 802.11 a/b/g/n/ac/ax

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INTRODUCING 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.

Instructor Tablet

This section describes the tablet CAE Maestro operates on. Maestro can also be installed on a tablet/laptop as standalone software. For more information, see the *System Requirements* section of this user guide.

Microsoft Surface Pro 7

A Surface Pro instructor tablet is used to run the software.

The Surface Go 2 provides the capabilities of a laptop in an ultra-portable tablet. This mobile workstation features a Windows 10 Pro operating system with an Intel Pentium Gold Processor, a 12.3 in (31.2 cm) touchscreen, and up to 10.5 hours of battery life. The Surface Pro tablet comes equipped with pre-installed instructor software.



Surface Pro Instructor Tablet

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

Simulation Mode Comparison

On the Fly vs. SCE

There are two ways to run a simulation in Maestro: On the fly and Simulated Clinical Experience (SCE). Users can start a simulation or choose to design content for the simulation and save it as an SCE.

When operating On the fly, no content is authored ahead of time and the simulation is simply controlled in real-time by the instructor.

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 also make changes On the Fly as needed.

Run on the Fly

Running simulations on the fly includes no predetermined scenarios or intended progression of events, and provides facilitators with a simple way to run a simulation with no advanced programming. 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.

Note: Only systems that include the CAE Physiology (optional on some simulators) can be run in Modeled mode.

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.

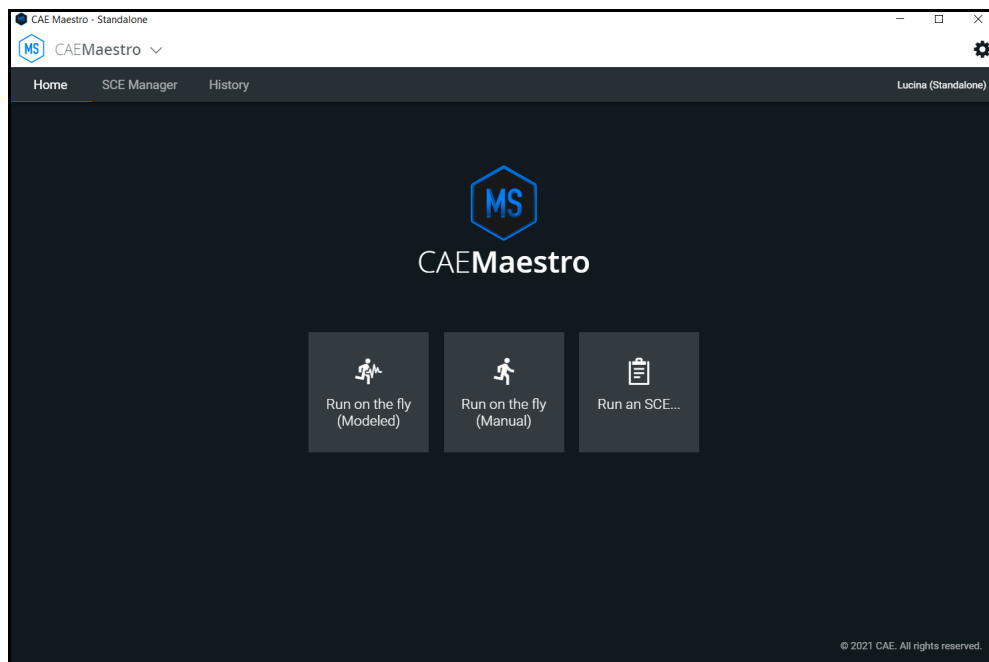
USING CAE MAESTRO

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.



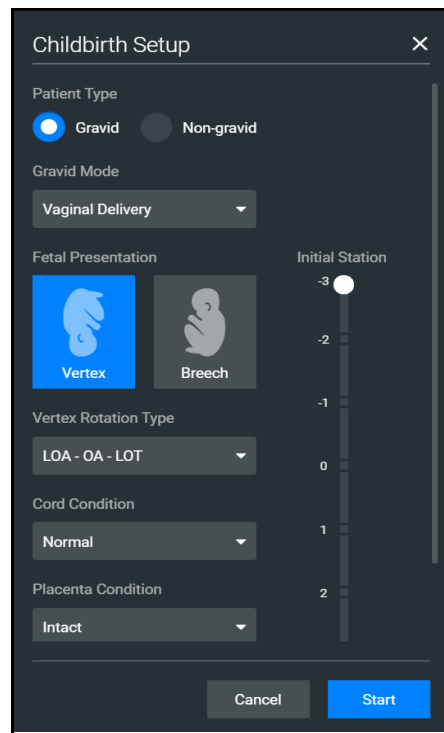
CAEMaestro Home Screen

Run on the Fly Simulations

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

To begin a Run on the fly simulation:

1. From the Home Screen, tap a **Run on the fly** button.



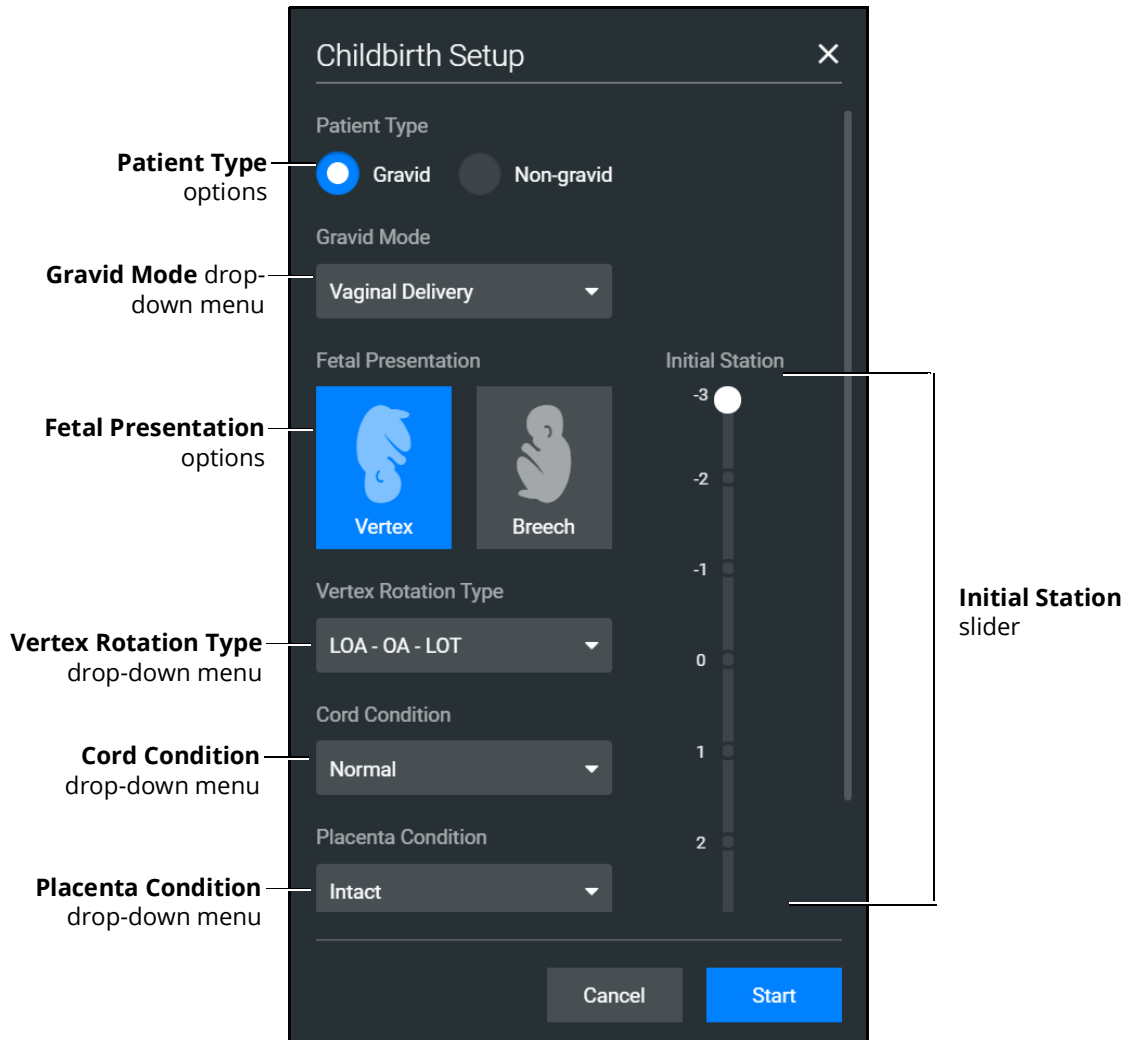
Childbirth Setup Screen

2. Modify the parameters on the Childbirth Setup screen as needed for the desired birthing scenario. See *Childbirth Setup* section for more information.
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.

Childbirth Setup

After selecting Run on the fly (Manual or Modeled), the Childbirth Setup screen appears.



Childbirth Setup (Postpartum Uterine State not pictured)

This screen allows for customizing of the birthing scenario conditions prior to beginning the simulation. Childbirth Setup settings include Patient Type, Gravid Mode, Initial Station, Fetal Presentation, Vertex Rotation, Cord Condition, Placenta Condition, and Postpartum Uterine State.

The Childbirth Setup screen is also available from the Patient profile in the SCE Editor when creating a new SCE.

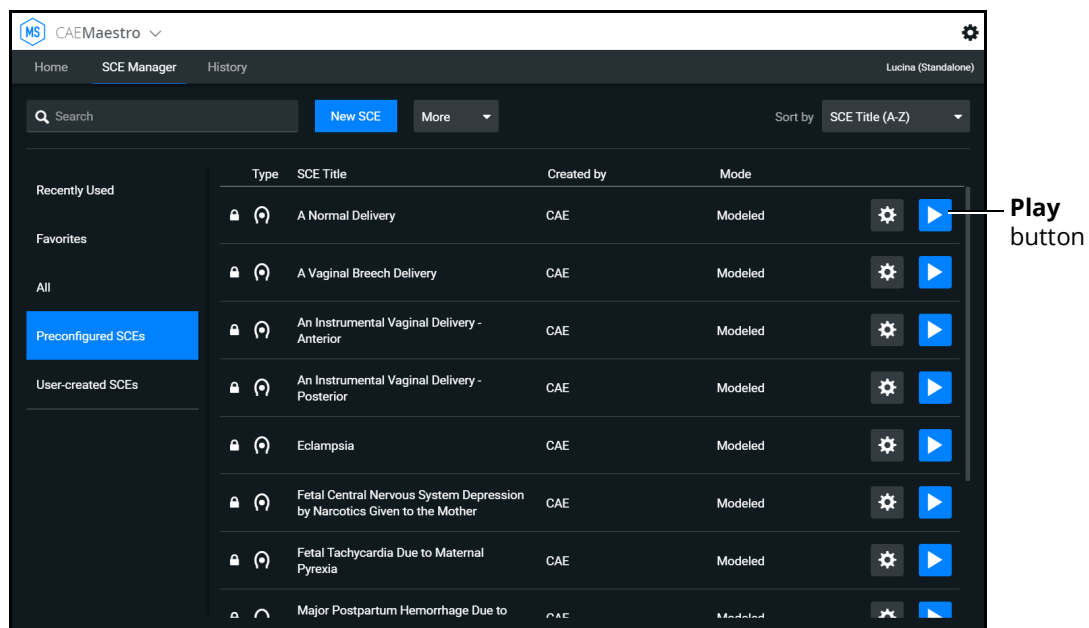
For more information about the Childbirth parameter controls, see the *Changing the Childbirth Status* section of this user guide.

Run an SCE

From the SCE Manager, various simulations are available.

To run an SCE:

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

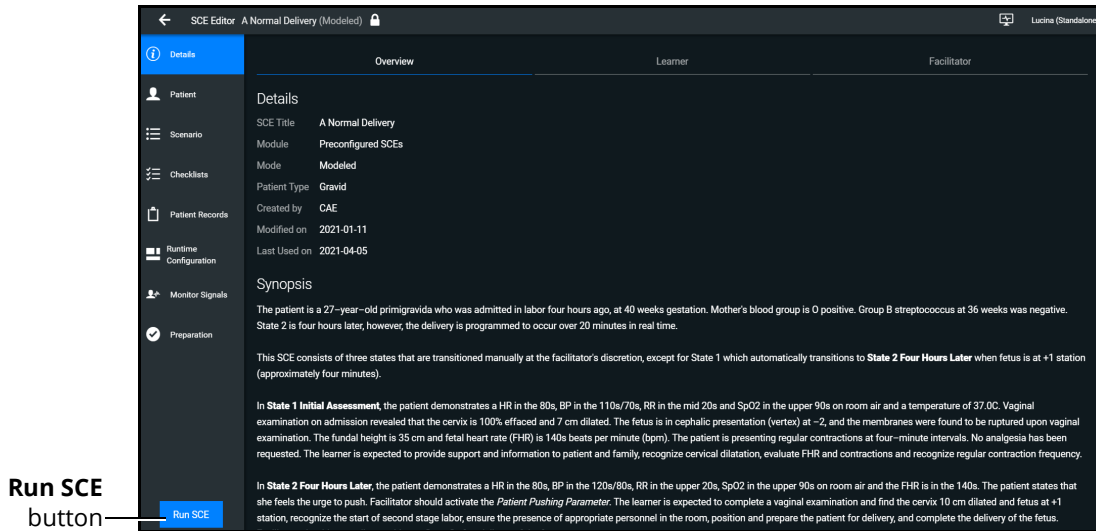


SCE Manager Screen - Preconfigured SCEs

There are two ways to start an SCE:

- Tap the **Play** button.
- OR
- Tap on the SCE title to view SCE details before launching.

3. Tap the **Run SCE** button to start an SCE.



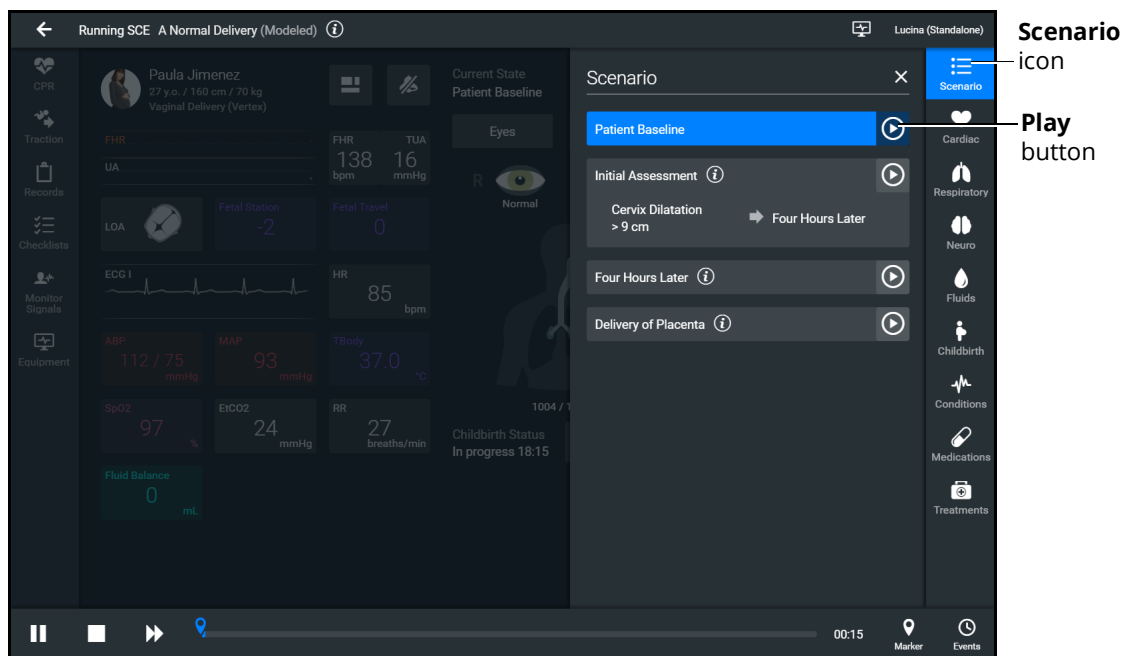
SCE Manager Details Screen - Run SCE Button

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.

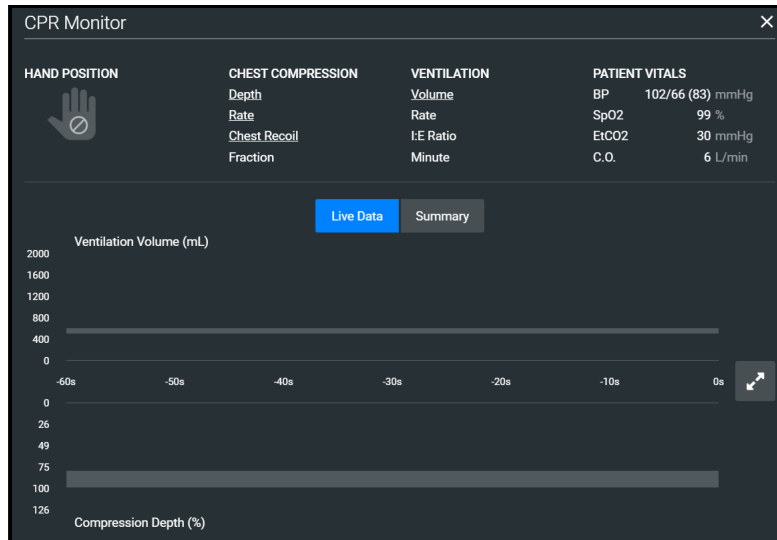
The CPR Monitor

The CPR Monitor is used to monitor the efficacy of CPR interventions and is available from the Run Screen.

Note: The CPR Monitor is only active while running Maestro on a simulator.

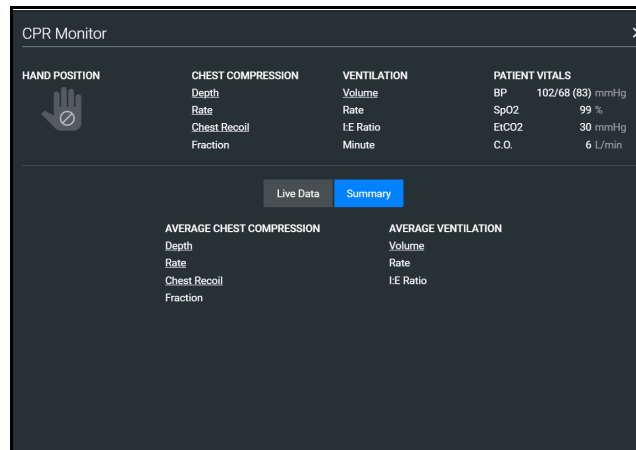
To use the CPR monitor:

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.

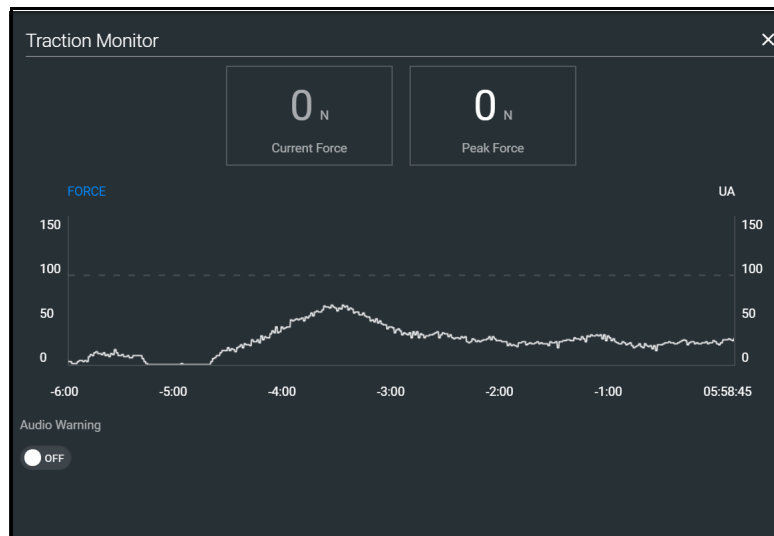
The CPR Monitor displays several statistics, including current hand position, compression and ventilation rates, compression depth, ventilation volume, and compression-ventilation ratio.

CPR data is recorded in the Event Log.

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

Traction

Tap the **Traction** icon to view the amount of traction applied to the fetus' head during delivery and enable/disable the audio warning. This window also displays the maternal contractions to assess if traction to the fetal head is applied at the correct time.



Fetal Traction Monitor Data

Note: The Traction data for the fetus is only active while running Maestro and with the fetus connected to the simulator.

Records

You can display patient records while an SCE is running.

To display a patient record:

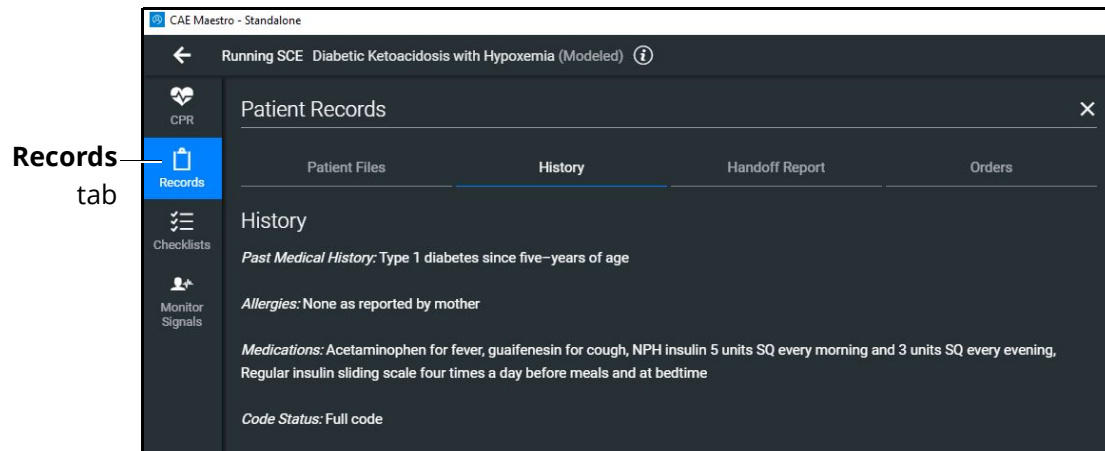
1. From the Maestro Run screen, tap **Records**.

The Patient Files tab displays by default.

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

The list appears with all available patient records appears.

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



Patient Records - History

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

To stop displaying a patient record in the Patient Monitor, on the patient record tap **Remove from Patient Monitor**.

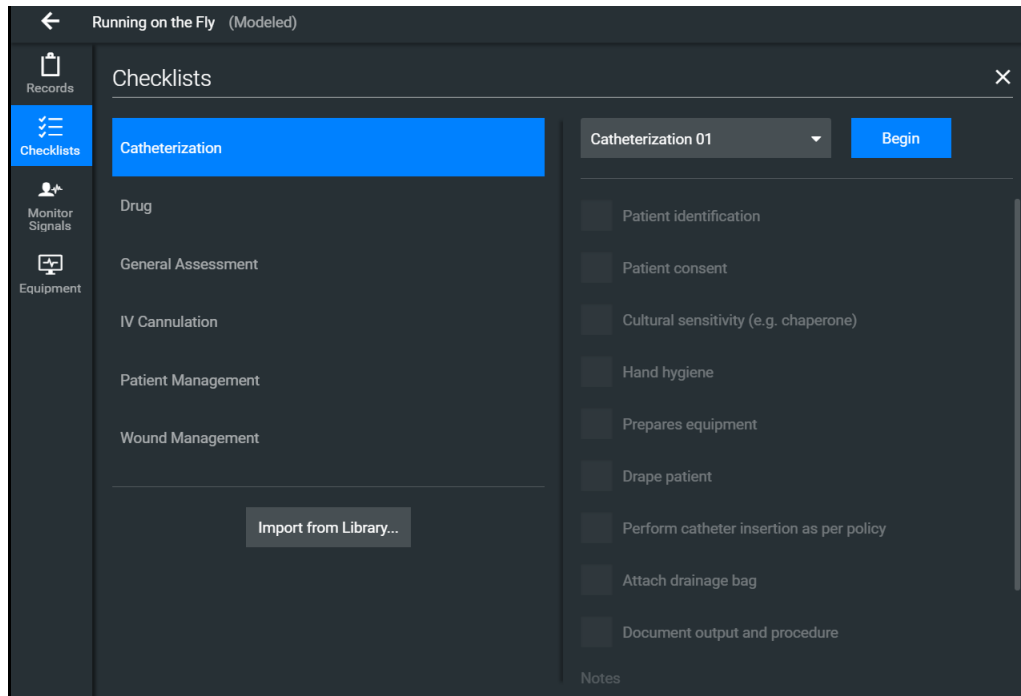
To close the Patient Record list, tap **Records**.

Checklists

To access learner checklists:

1. Tap **Checklist** tab.
2. Tap **Begin** to launch the first checklist and start verifying steps performed by learner.

When a checklist is selected it is highlighted in blue and the content of the checklist is displayed in the right panel.



The Checklists Popup Screen

3. 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.

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

Monitor Signals

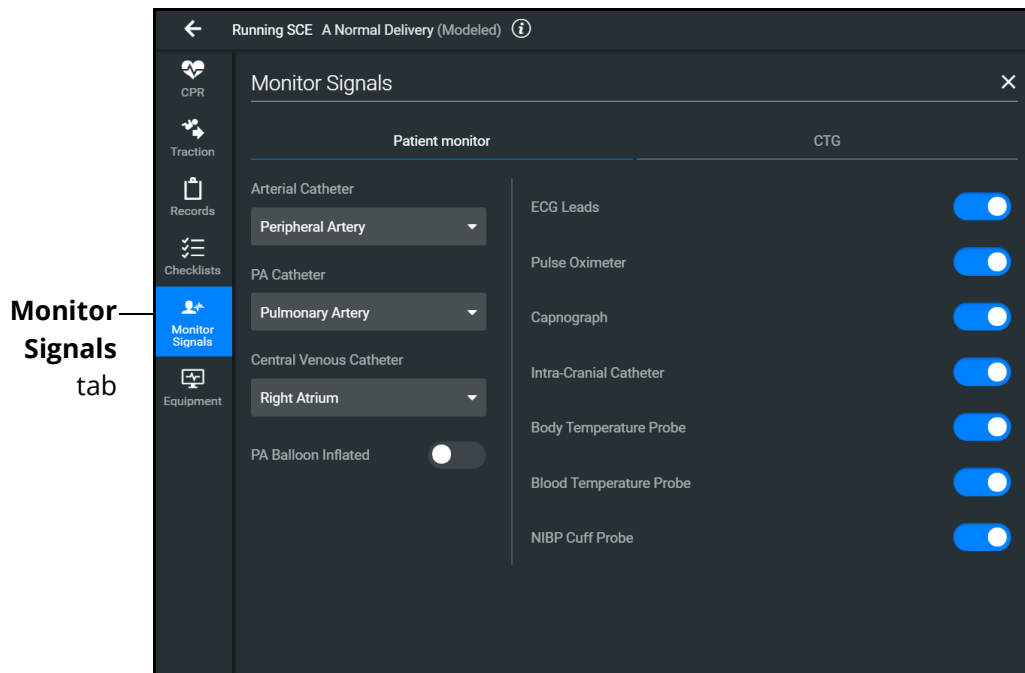
The Monitor Signals tab gives the users control over the values and signals that appear on the simulated Patient Monitor.

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 on the patient monitor.

Use the toggles to turn the various invasive pressure monitoring 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 TBody values
Blood Temperature	Hides the TBlood values
NIBP Cuff Probe	Prevents the user from measuring NIBP on TouchPro

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

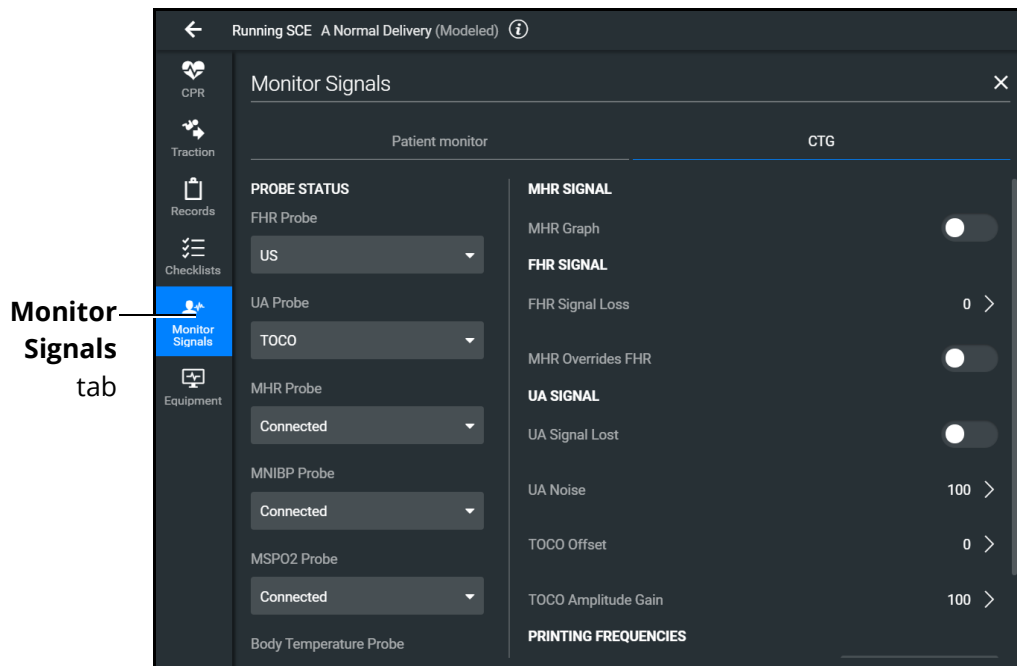
- Arterial Catheter
- PA Catheter
- Central Venous Catheter

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.

CTG Monitor Signals

Tap the CTG tab to view the CTG Monitor Signal settings.



CTG Monitor Settings

The CTG Monitor Signals include the readings of the probes specific to fetal and maternal monitoring.

Probe Status	Options
FHR Probe	Select Disconnected, US, or FECG
UA Probe	Select Disconnected, TOCO, or IUP
MHR Probe	Select Disconnected, Connected, or Not Available
MNIBP Probe	Select Disconnected, Connected, or Not Available
MSPO2 Probe	Select Disconnected, Connected, or Not Available
Body Temperature Probe	Select Disconnected, Connected, or Not Available

MHR Signal	Options
MHR Graph	Hides the Maternal Heart rate from the CTG Patient Monitor

FHR Settings	Options
FHR Signal Loss	Set percentage of signal loss and duration of onset

FHR Settings	Options
MHR Overrides FHR	Hides Fetal Heart Rate and replaces with Maternal Heart Rate

UA Signal	Options
UA Signal Lost	Set percentage of signal loss and duration of onset
UA Noise	Set percentage of volume and duration of onset
TOCO Offset	Set offset value of mmHg and duration of onset
TOCO Amplitude Gain	Set percentage of gain and duration of onset

Printing Frequencies	Options
MNIBP Printing Frequency	Set how frequently to print out the MNIBP readings
MSpO2 Printing Frequency	Set how frequently to print out the MSpO2 readings

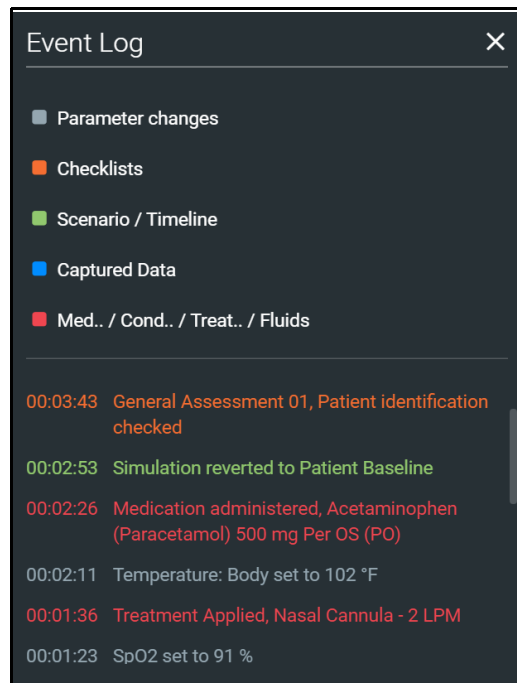
For more information about monitor signals, see *Appendix A - Parameter Descriptions*.

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.

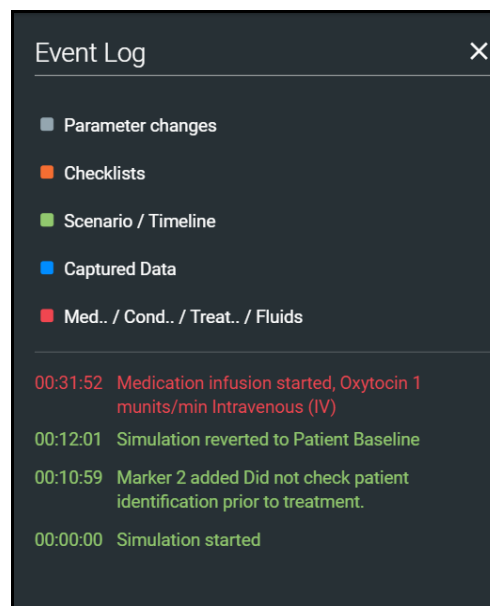
To access the Event Log, tap the **Events** button in the bottom-right corner of the Run Screen.

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.



Medication Information in Event Log

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 for:

- Cardiac
- Respiratory
- Neuro
- Fluids
- Childbirth

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 in 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**.



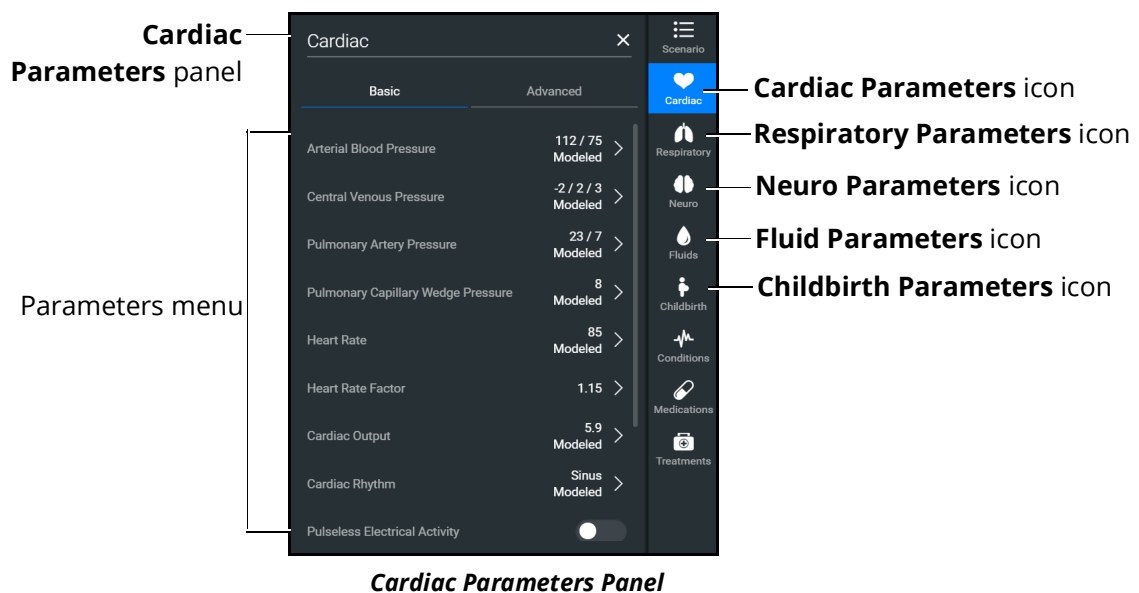
Bronchial Occlusion Parameter

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.



Cardiac Parameters panel

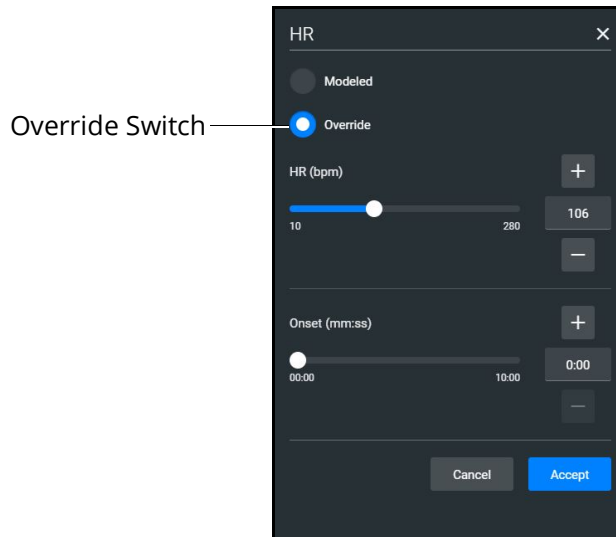
Parameters menu

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

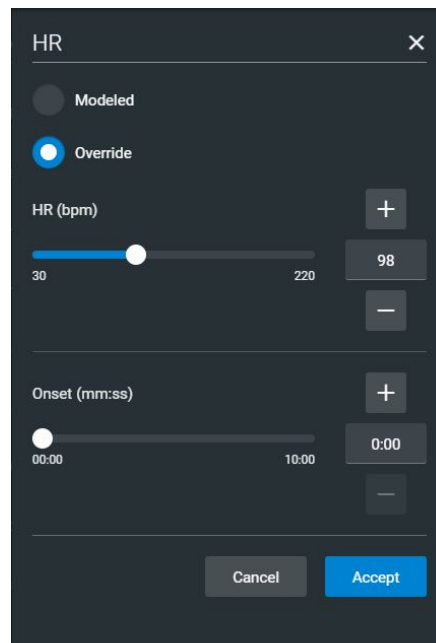
screen. Turn on the Override switch to adjust settings as desired, then tap the **Accept** button.



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 waveforms.

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

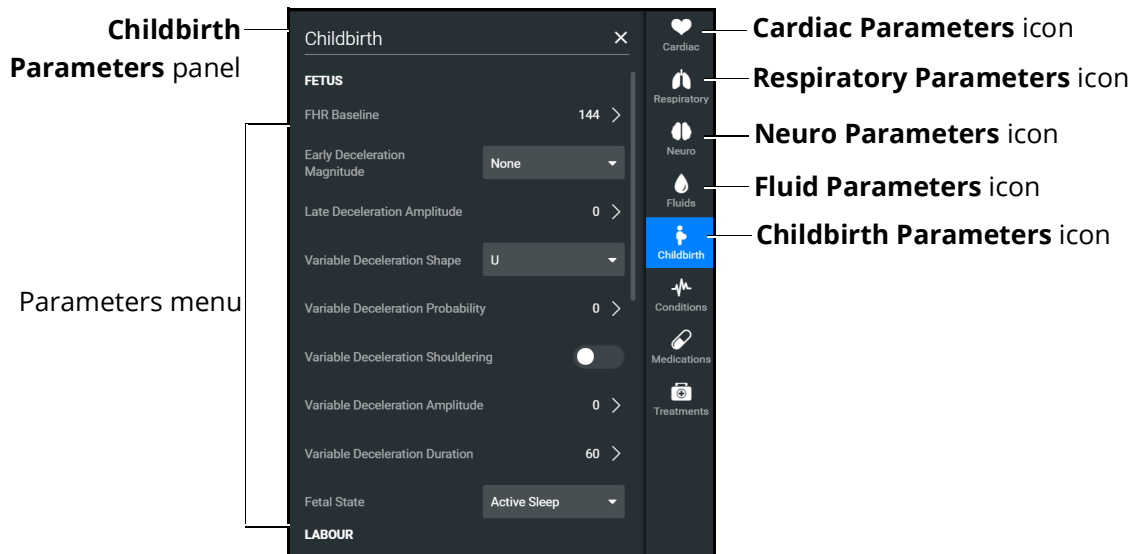


Heart Rate Parameter Controls

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

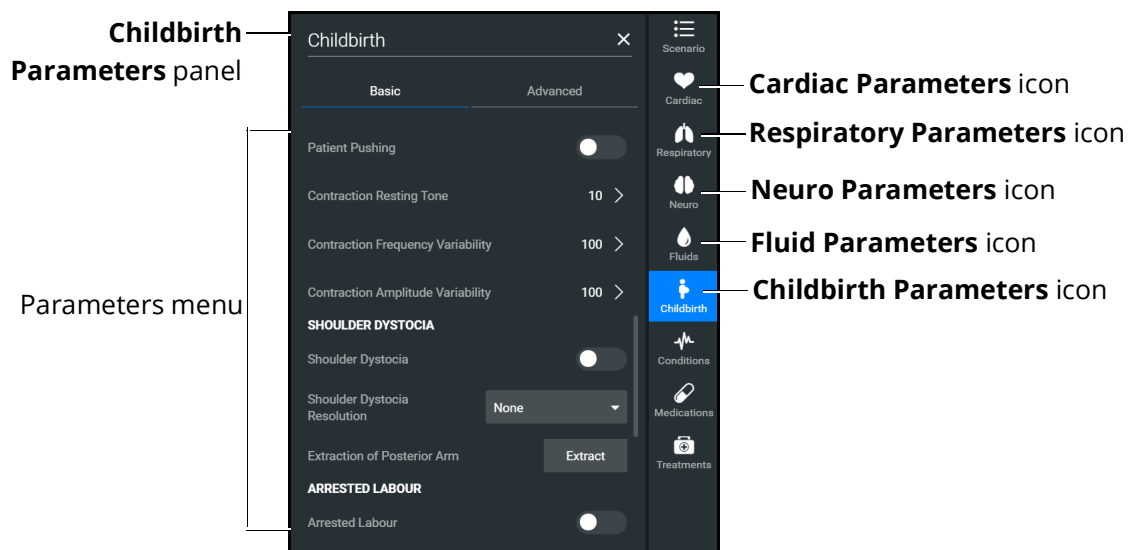
Changing Childbirth Parameter Controls

The Childbirth Parameter Controls are specific to the Lucina simulator and affect the physiology of the baseline Lucina patient. Tap the **Childbirth Parameters** icon to access the parameter controls. The Fetus and Labour parameters are available in Manual mode.



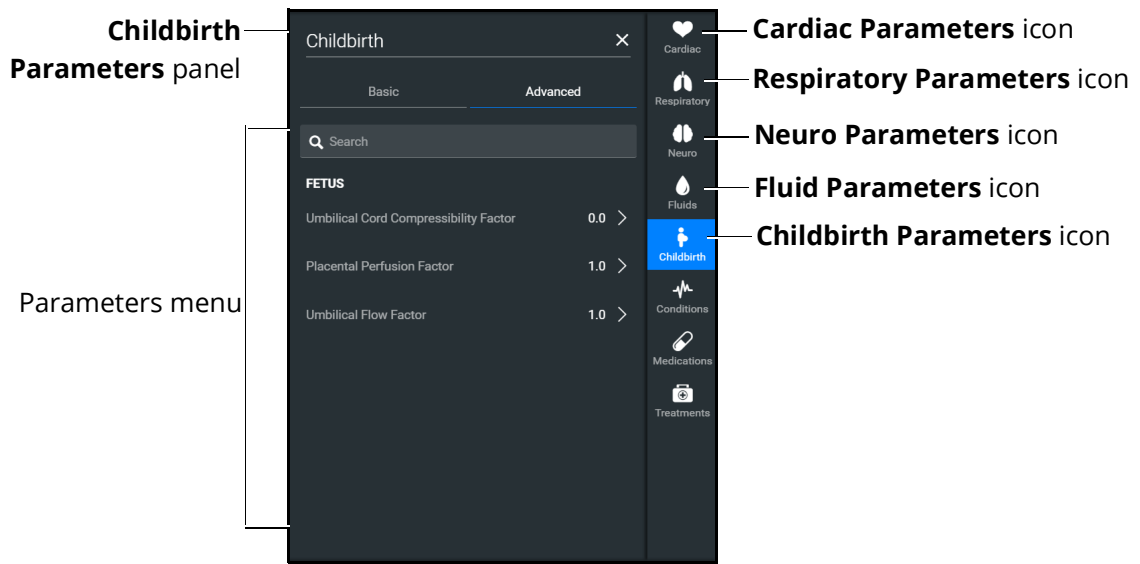
Childbirth Parameters Panel - Manual Mode

The Modeled mode contains both Basic and Advanced parameters. In addition to **Fetus** and **Labour** parameter controls, the **Shoulder Dystocia**, **Arrested Labour**, and **Postpartum** parameters can be enabled and modified in the Basic tab.



Childbirth Parameters Panel - Modeled Mode

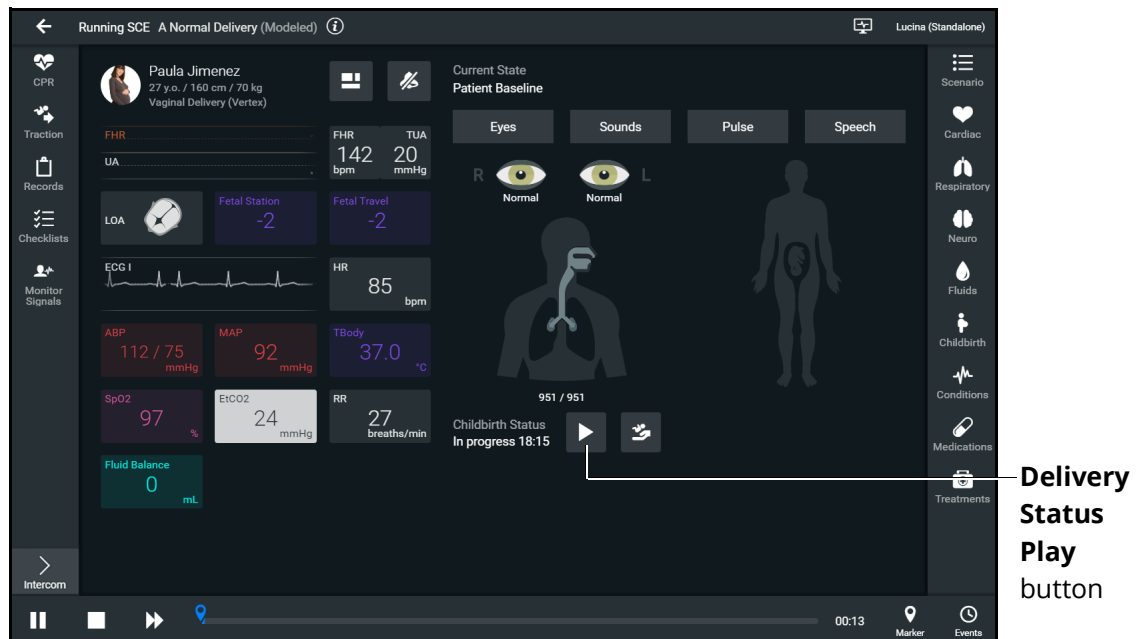
The Advanced tab contains umbilical cord and placenta controls to modify the simulated fetus' physiology during a scenario.



Childbirth Parameters - Advanced Controls

Childbirth Status on Run Screen

The Delivery phase of Childbirth Status can be initiated on the Run screen by tapping the **Play** button underneath the Respiratory pictograph.



Run Screen Childbirth Status

Upon tapping the **Childbirth Status Play** button, several changes can be noted in the software:

- The delivery resumed notification appears and is logged in the Event log.
- The Play button changes to a Pause button.
- The fetal station, fetal travel and orientation patient status widgets change reflecting the fetus' progression as the delivery progresses.

To speed up the simulation, including patient physiology, use the **Fast-Forward** button on the Timeline.

Note: Using the Fast-Forward button to speed up the delivery process causes the patient vital signs to also run at 4 times or 8 times their normal speed. This is NOT the recommended way to speed up the delivery process. To speed up the delivery process, tap the Childbirth parameters icon, and increase the **Rate of Descent** parameter.

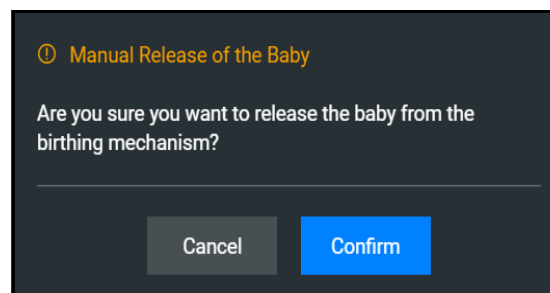
Delivering the Baby

When the baby is ready to be fully delivered, the facilitator should prepare learners for their positions and tasks.

If the simulation requires the facilitator to manually release the baby from the birthing mechanism prior to delivery:

1. Tap the **Manual Release of the Baby** button.

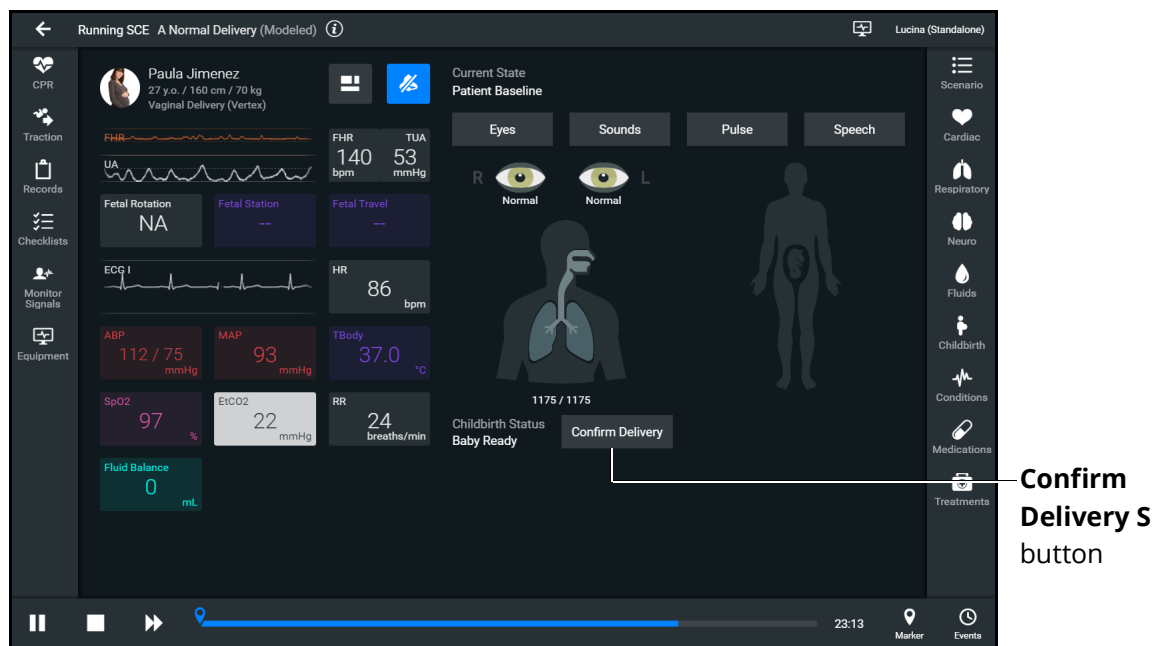
The Manual Release of the Baby prompt appears.



Manual Release of the Baby Prompt

2. Tap **Confirm**.

The Childbirth Status changes to Baby Ready.

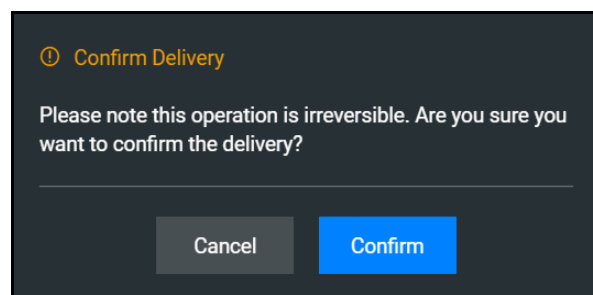


Run Screen Childbirth Status - Baby Ready

When the facilitator is ready to capture the learners full delivery of the baby in the software:

1. In the Childbirth Status, tap **Confirm Delivery**.

The Confirm Delivery prompt appears.

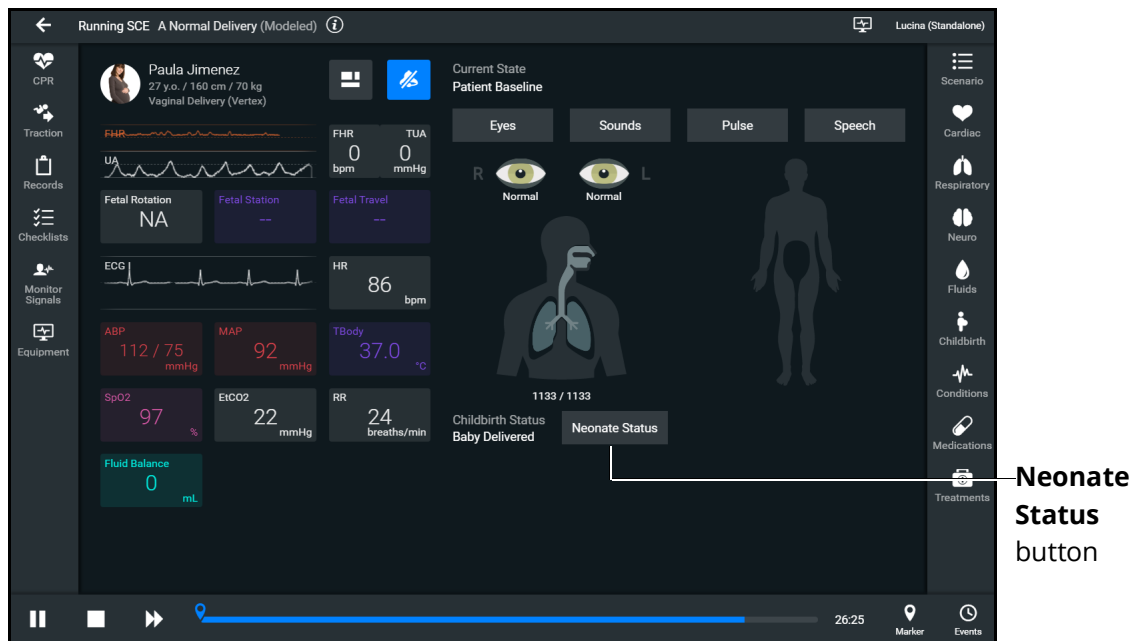


Confirm Delivery Prompt

2. Tap **Confirm**.

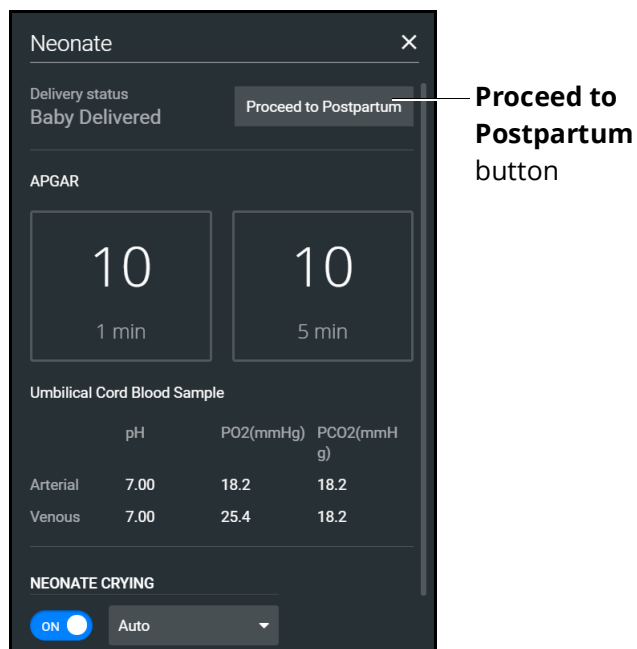
The baby is delivered and Childbirth Status changes to Baby Delivered.

3. Tap the **Neonate Status** button to view the APGAR scores and control the volume of the infant crying.



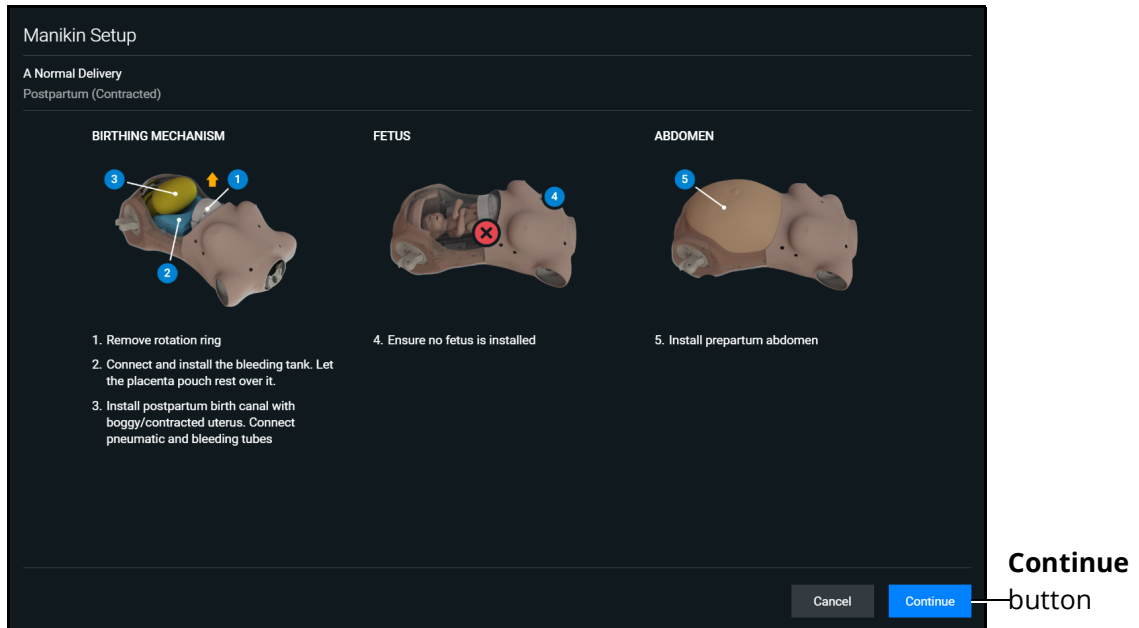
Run Screen Childbirth Status - Baby Delivered

4. From the Neonate screen, tap the **Proceed to Postpartum** button.



Run Screen Childbirth Status - Baby Delivered

The manikin setup screen for postpartum manikin configuration appears.



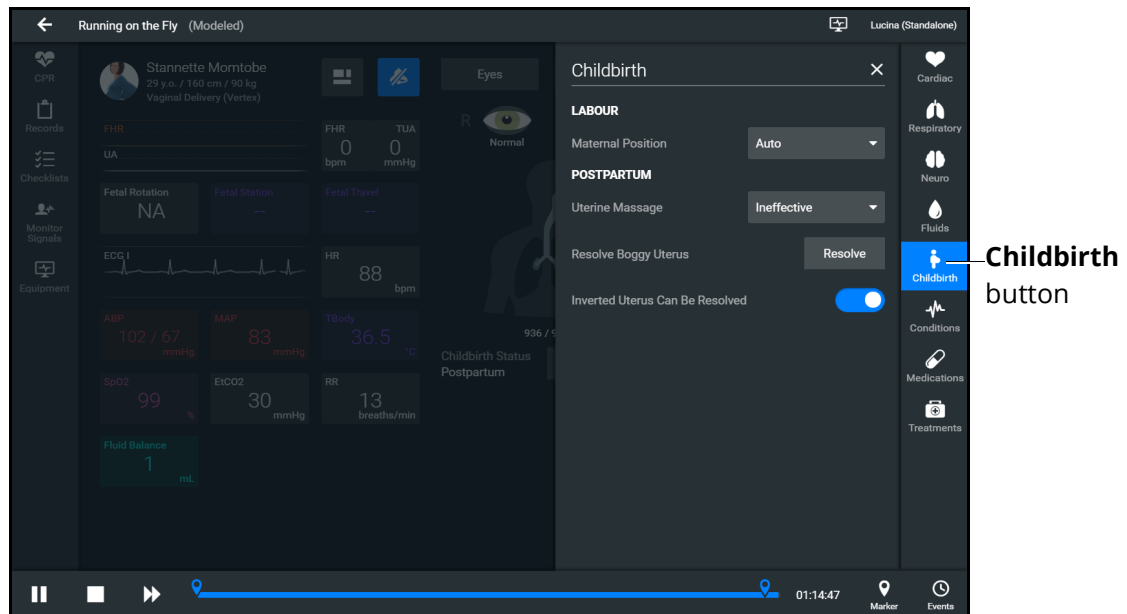
Manikin Setup - A Normal Delivery Postpartum

Configure the manikin as instructed by the onscreen setup steps for the desired postpartum scenario.

5. Tap **Continue** to access the Postpartum run screen.

For more information on Postpartum Manikin Setup screens, see the *Appendix G - Manikin Setup Screens*.

The Run Screen Childbirth Status changes to Postpartum and the Childbirth Parameters change to Postpartum.



Run Screen Childbirth Status - Postpartum

Modify the parameters as needed for postpartum scenario.

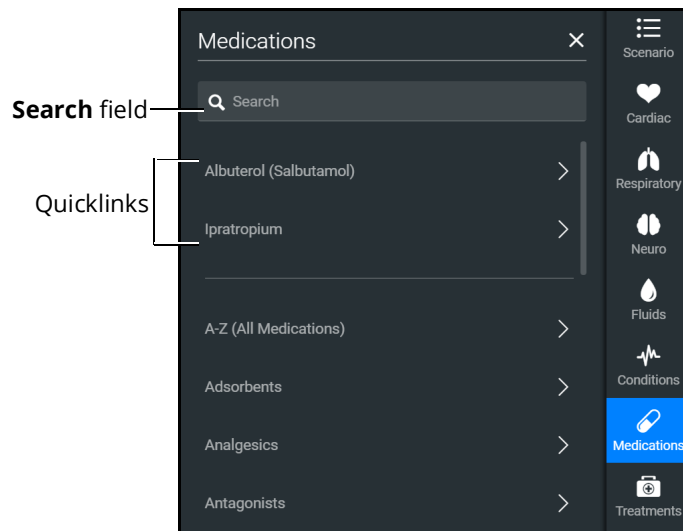
Applying Conditions and Interventions

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).

When programming an SCE, conditions, medications, and treatments likely to be used in a given simulation case 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.



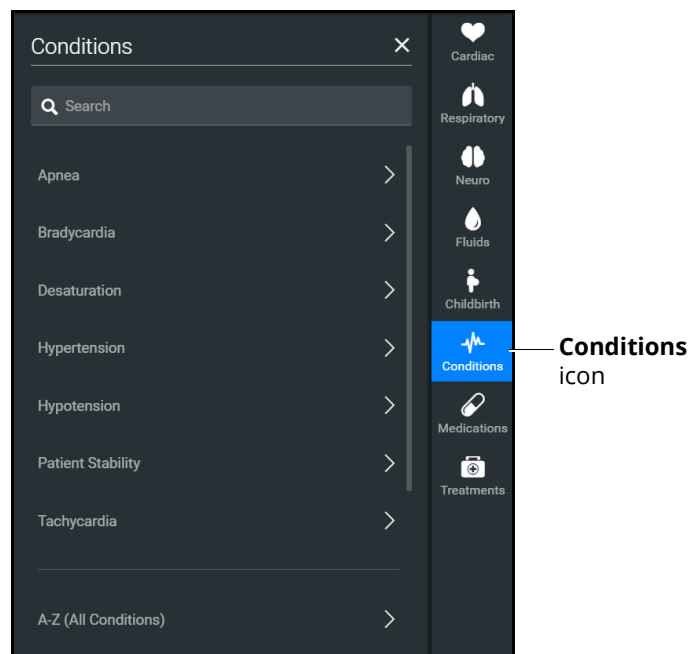
Medications Panel - Quicklinks

TIP: Tap on the appropriate icon to collapse or expand the control.

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.



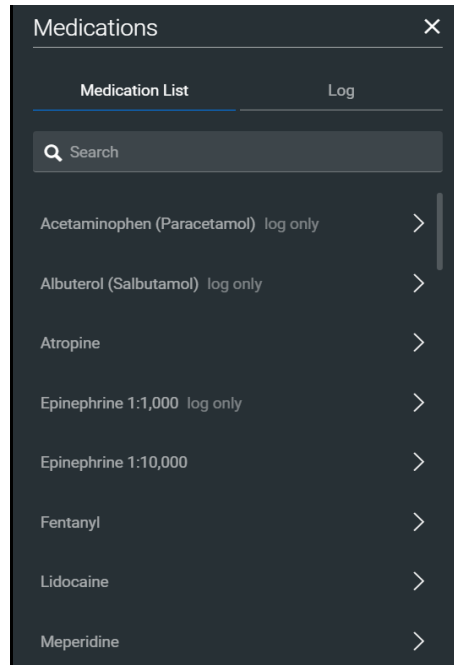
To apply a condition:

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 on the name of the desired condition and select a severity, if available.
3. Tap on **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.

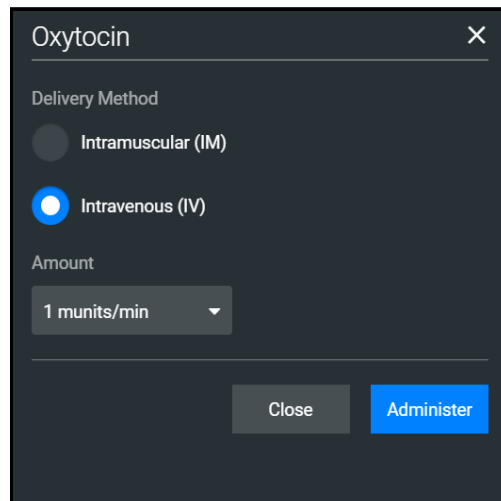


Medications Panel

A menu appears and shows the available medications.

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

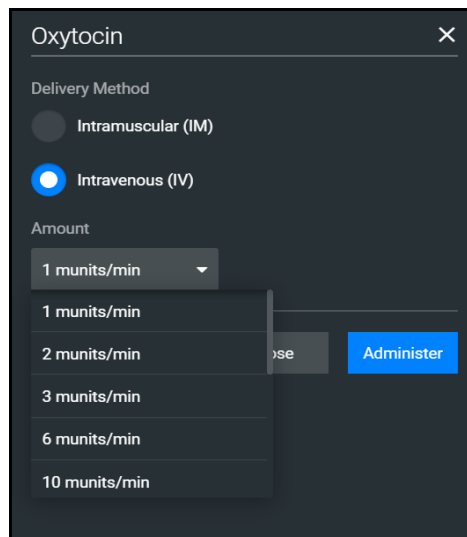
The medication controls appear. The delivery method and amount options, which include pre-defined doses and custom dose options, are displayed.



Medication Controls

Under **Delivery Method** options, tap on 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.

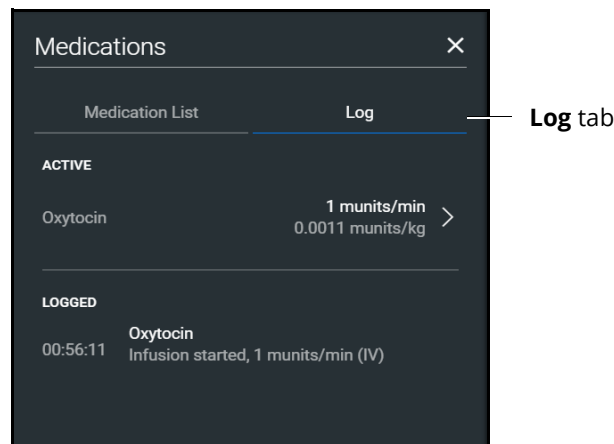
In Modeled mode, medications affect the patient's status unless labeled *log only*. Medications are also logged in the **Log** tab on the **Medications** panel.

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:

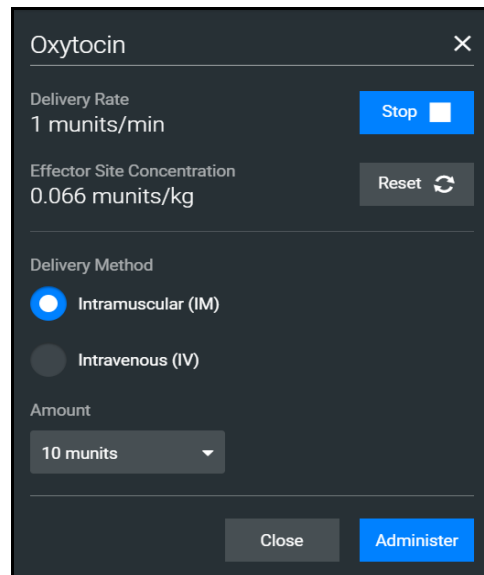
1. From the Run Screen, tap the **Medications** control.
2. Tap on the **Log** tab.



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 on an active medication to display medication information.



The screenshot shows a dark-themed dialog box titled "Oxytocin" with a close button (X) in the top right corner. The dialog contains the following information and controls:

- Delivery Rate:** 1 munits/min, with a blue "Stop" button and a white square icon to its right.
- Effector Site Concentration:** 0.066 munits/kg, with a grey "Reset" button and a circular refresh icon to its right.
- Delivery Method:** Two radio button options: "Intramuscular (IM)" (selected with a blue dot) and "Intravenous (IV)" (unselected with a grey dot).
- Amount:** A dropdown menu currently showing "10 munits".
- Bottom Buttons:** A grey "Close" button and a blue "Administer" button.

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:

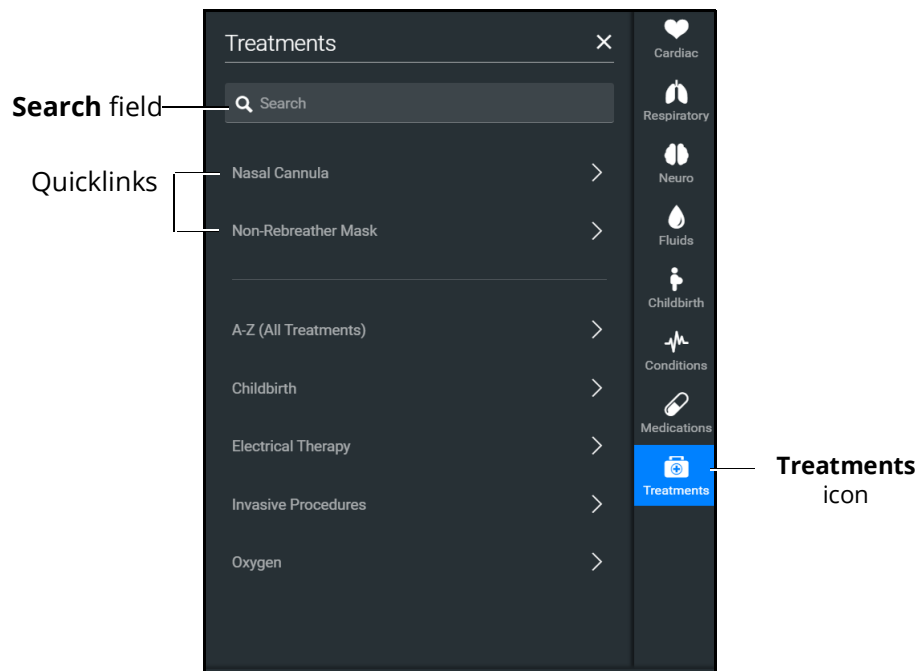
1. From the Medications Log, select an active medication.
2. From the medication information, tap **Reset**.
3. When the Reset Effector Site Concentration prompt appears, tap **Reset**.

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

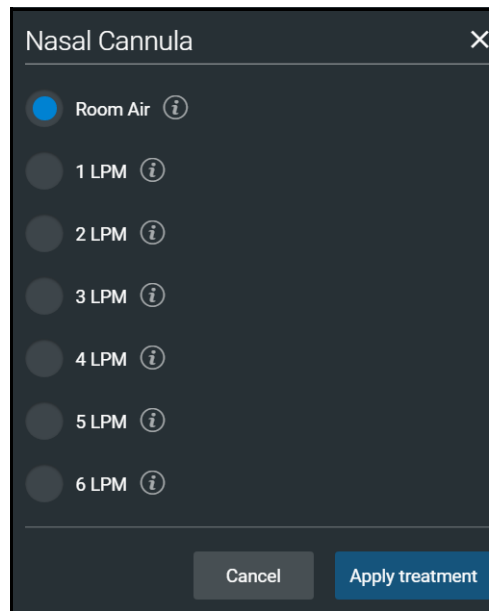
To apply a treatment:

1. Tap on 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.



Treatments Panel

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



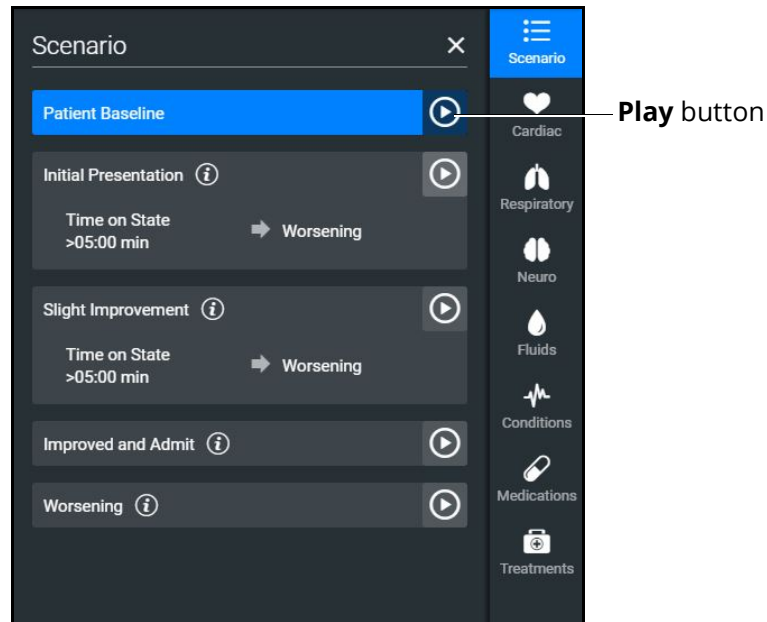
Treatments Menu

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.



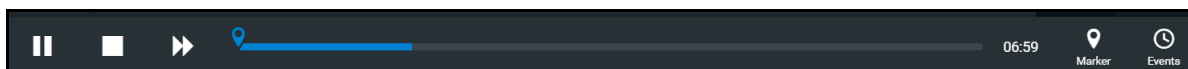
Scenario Management Panel

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

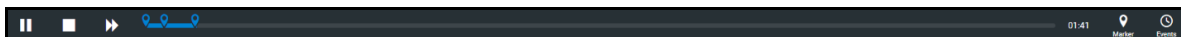
- The **Timeline** bar shows the amount of time that has elapsed and bookmarks that have been created.
- The **Marker** button creates a bookmark at the current point in the SCE. The marker can be used later to reset the patient’s physiology to what it was when the bookmark was created. For more information, 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 CTG, UA, and FHR 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

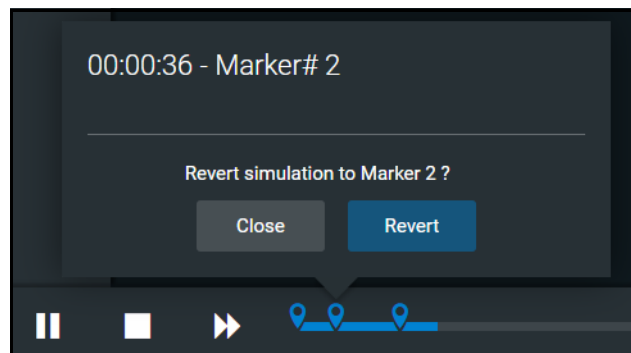
To annotate the timeline, click the **Marker** button. A marker appears on the **Timeline** bar.



Timeline with Markers

To return to the patient status at the time the marker was created, select the marker on the timeline and tap **Revert**.

Note: The SCE time continues moving forward and does not reset to the marker time.



Revert to Marker #2

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

PATIENT DISPLAY

The Patient Status appears whether you are running on the fly or running an SCE.

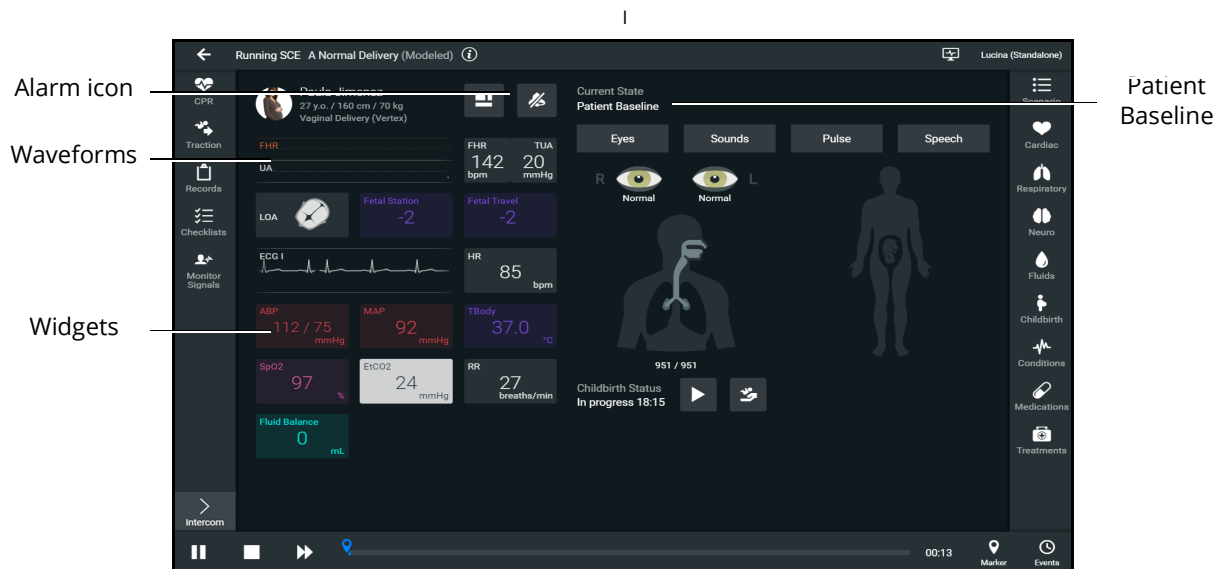
The Patient Status displays the same information except when running an SCE:

- 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 when running on the fly or running an SCE.

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



Patient Status Display

From this screen, you can:

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

Patient Controls

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

- Eyes
- Sounds
- Pulse
- Speech
- Respiratory

Eyes

To change Eye states:

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

The Eye states panel appears.

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

Sounds

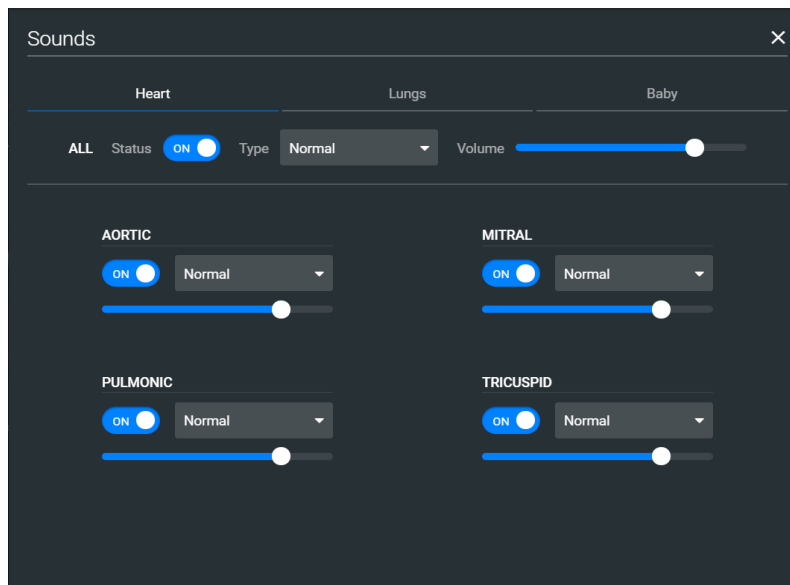
To change Sounds:

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



Patient Baseline - Sounds Button

2. Adjust Sounds including heart, lungs, bowel (non-gravid patient) or baby (gravid patient) 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.

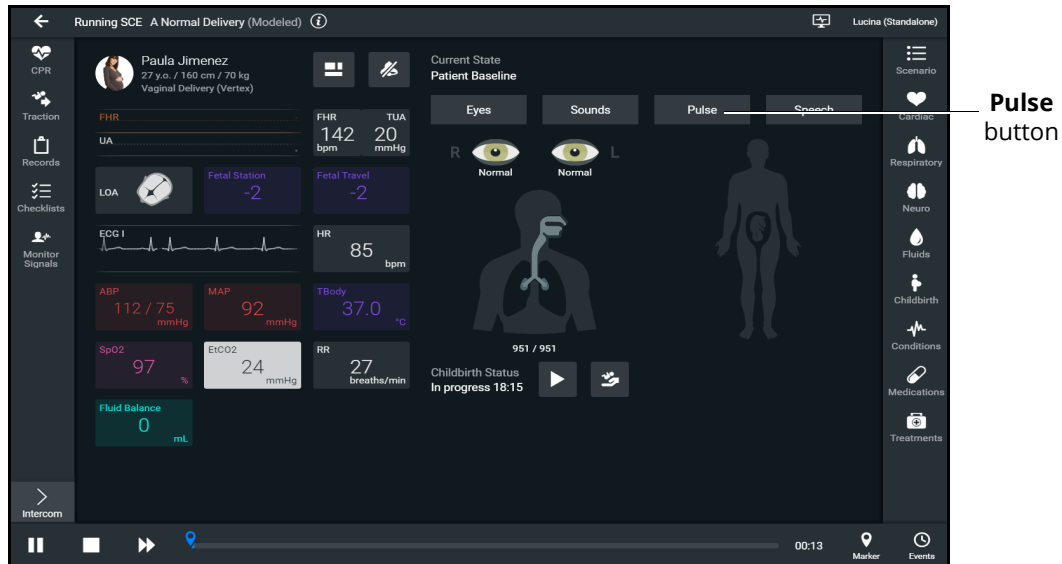


Patient Baseline - Sounds States Panel

Pulse

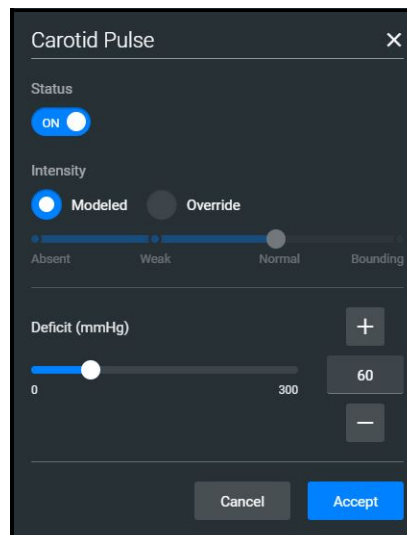
To change pulse parameters:

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



Patient Baseline - Pulse Button

2. The numeric widgets display the *pulse deficit value* for each associated location on the patient body diagram. 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. Tap a numeric widget, and the associated pulse parameter control window will open allowing you to adjust the pulse parameter controls. Tap the **Accept** button to apply the changes.



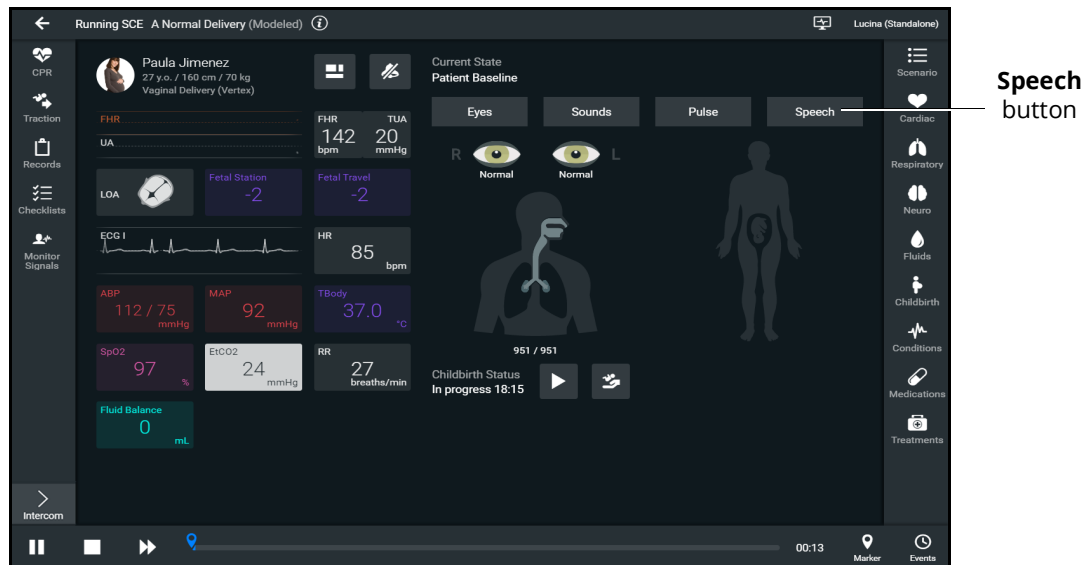
Carotid Pulse Parameter Controls

Speech

Lucina comes equipped with many speech options and vocal speech sounds. Speech can be turned on or off and volume can be adjusted.

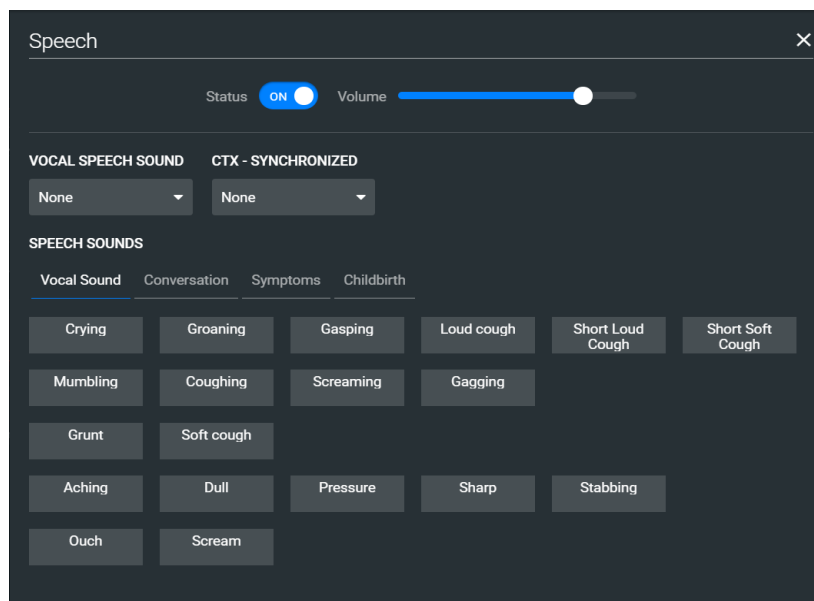
To choose speech and vocal speech sounds:

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



Patient Baseline - Speech Button

The Speech panel appears.



Speech Panel

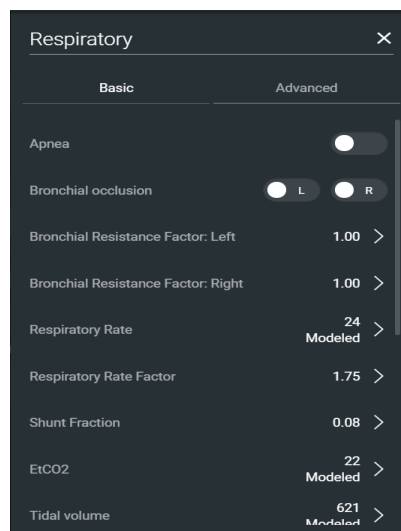
2. To turn the speech on or off, tap on the **Status** toggle. Adjust the slider next to the Status toggle to control the speech volume.
3. Tap the **Vocal Speech Sound** drop-down box to open the menu and select an option as desired.
4. Tap the CTX-Synchronized drop-down box to open the menu and select an option as desired. The selected sound will automatically play whenever the manikin is experiencing a contraction.
5. Tap **Vocal Sound, Conversation Symptoms, or Childbirth** to view the list of speech options. Click on a speech option as desired.

Respiratory

To adjust respiratory parameter controls:

1. From the Patient Status Display screen, tap the respiratory pictogram.

The Respiratory Parameter Controls panel appears.



Respiratory Parameter Controls

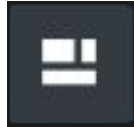
2. Adjust the respiratory parameter controls as desired. Close the panel (by tapping the **X**) to apply the changes.

Change the Control Widget Layout

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

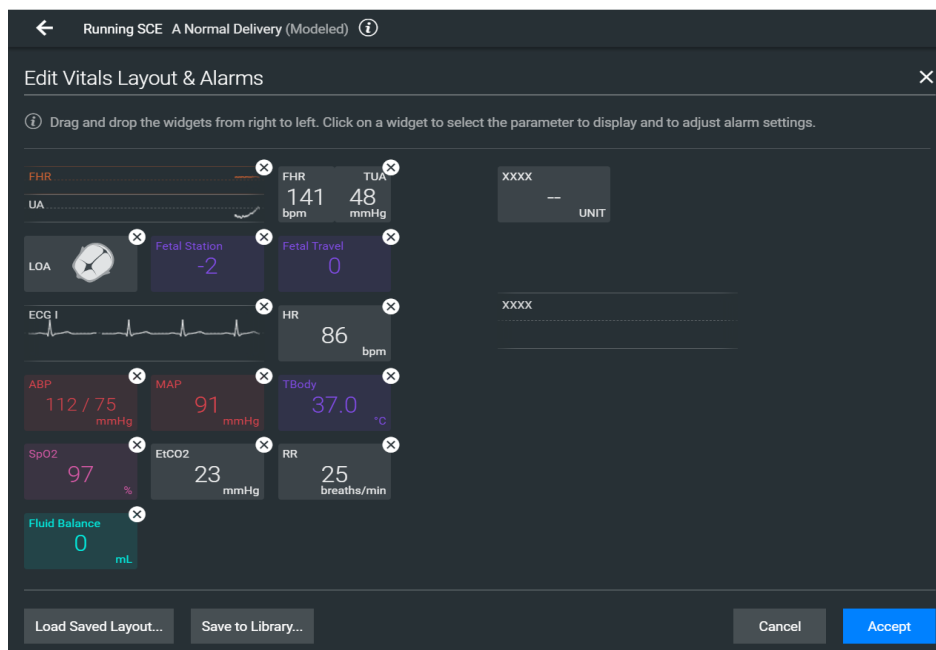
To change the control widget layout:

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 on 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 moved to another simulator.

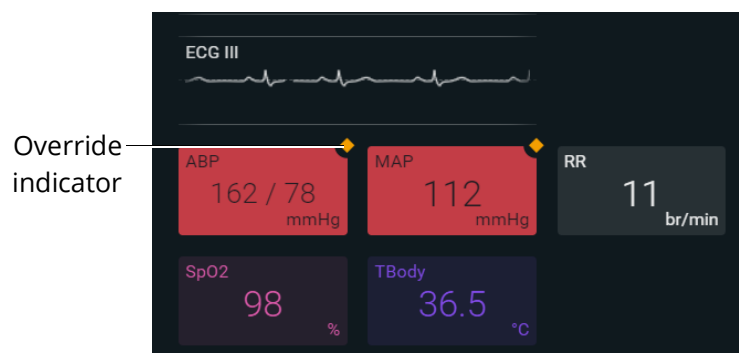
Onset and Override Indicators

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

When an alarm is not muted and a value reaches critical state, the associated widget flashes.

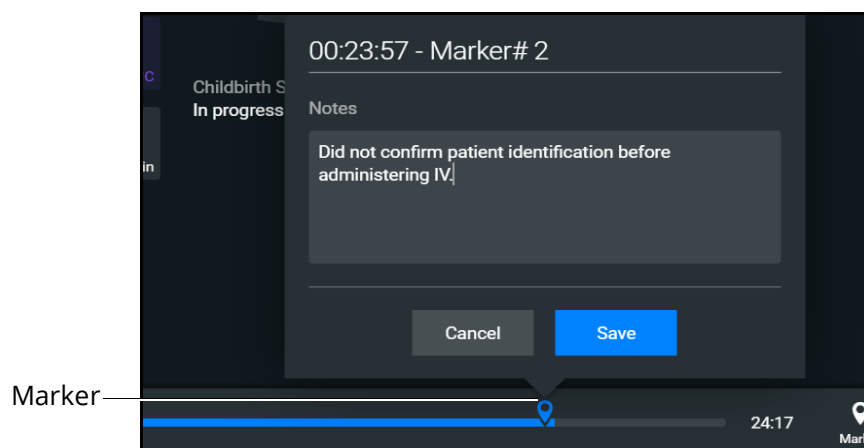


Alarm State Button - Unmuted

To mute the alarms, tap the **Alarm State** button.

Markers

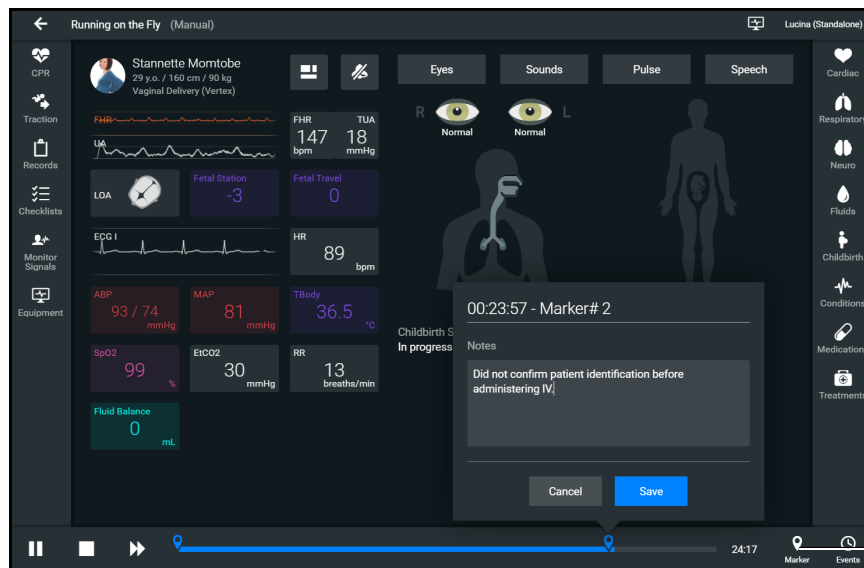
The use of markers in the timeline of the SCE helps indicate significant events or notes to revisit when debriefing the simulated clinical experience with the learner.



Markers

To add a marker:

1. Tap the **Marker** icon.
A timestamp window will appear. You can add a note if desired.
2. Tap **Save**.



Marker icon

Timestamp Window

Editing Parameters

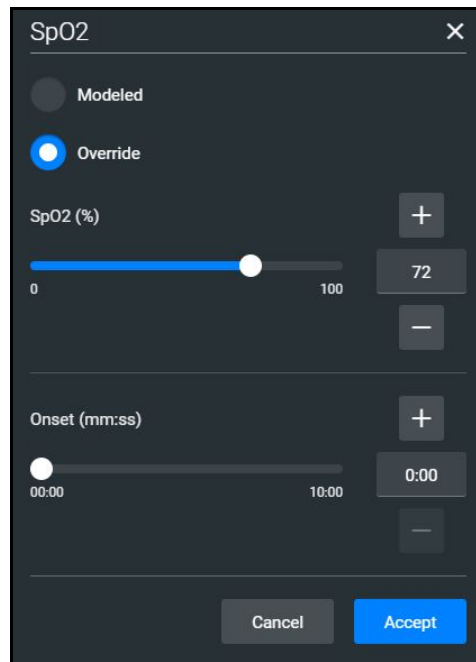
You can edit parameters in one of two ways:

- 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 toggle to Override.

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

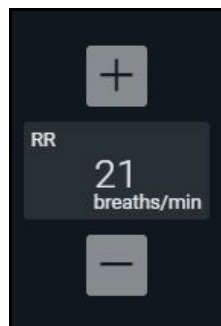


Parameter Editor Controls

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

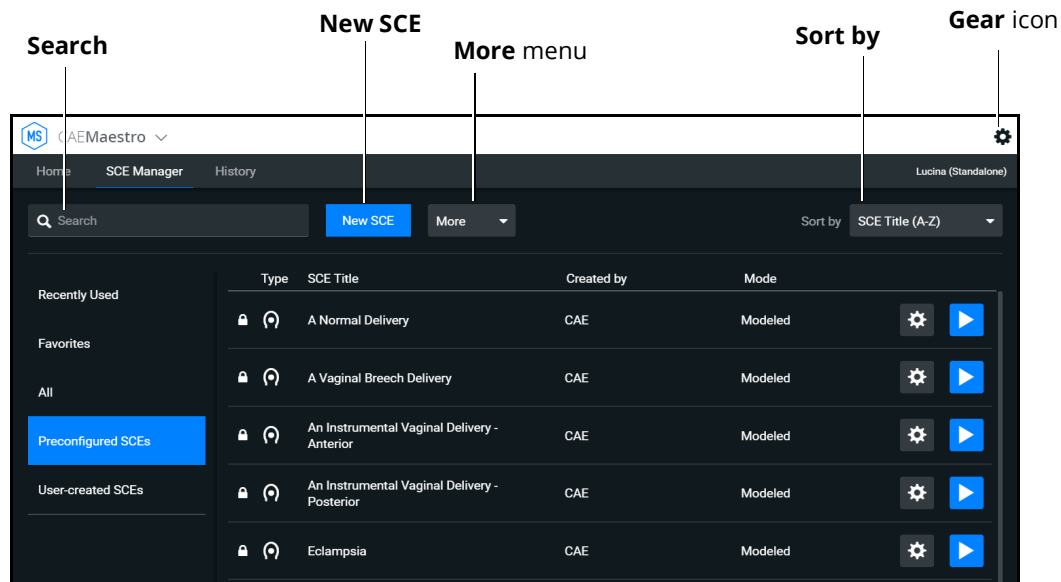
2. Tap the (+) or (-) signs to adjust the parameter.
3. Tap outside of the Quick Edit area to save the changes and close the editor.

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**.



SCE Manager Screen

The default screen shows Recently Used SCEs but you can easily locate any SCE and Module in the SCE Manager.

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

- In the left column, tap 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 the **Sort by** drop-down to filter the list by ascending or descending order.

Review an SCE

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

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 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.

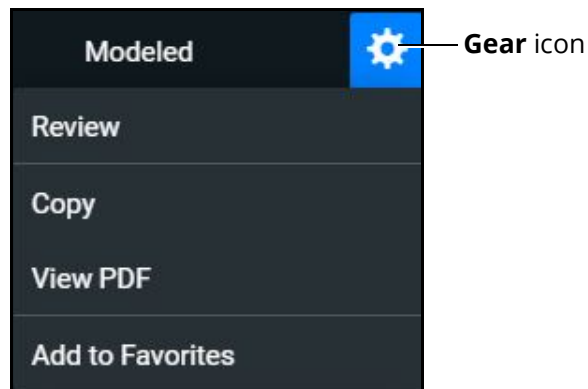
Note: The Lock icon on any screen indicates the SCE was installed by CAE and cannot be edited or deleted.

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:

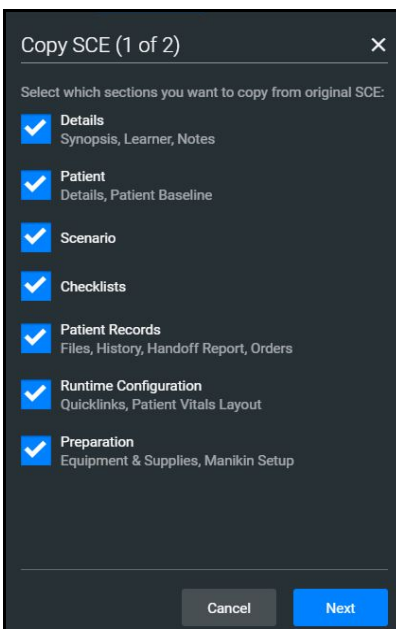
1. On the SCE Manager screen, tap the **Gear** icon on the right of the desired SCE.



SCE Gear Drop-down Menu Options

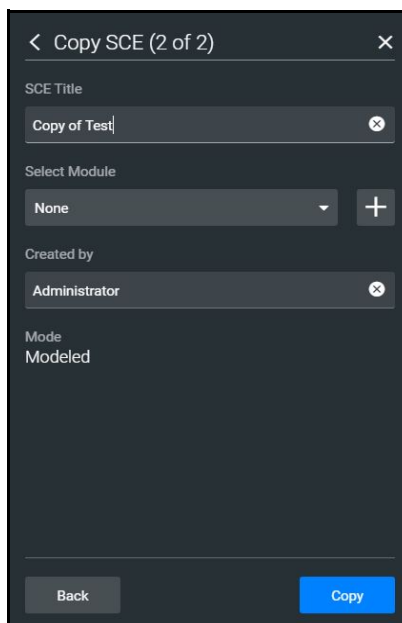
2. Tap **Copy**.

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 **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 **Copy**.



Saving Copied SCE

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

Creating a New SCE

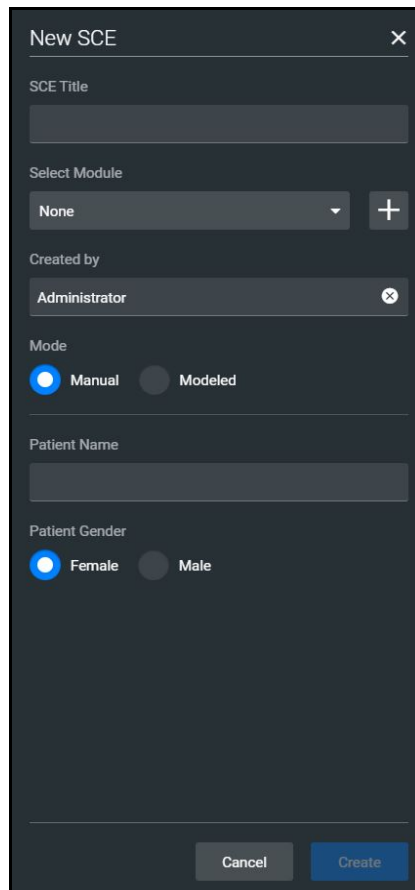
Creating a new SCE is a two-step process.

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 **New SCE**.

The New SCE panel appears.



The screenshot shows a dark-themed 'New SCE' dialog box. It contains the following fields and options: 'SCE Title' (text input), 'Select Module' (dropdown menu with 'None' selected and a '+' icon), 'Created by' (text input with 'Administrator' and a close icon), 'Mode' (radio buttons for 'Manual' and 'Modeled', with 'Manual' selected), 'Patient Name' (text input), and 'Patient Gender' (radio buttons for 'Female' and 'Male', with 'Female' selected). At the bottom are 'Cancel' and 'Create' buttons.

New SCE Window

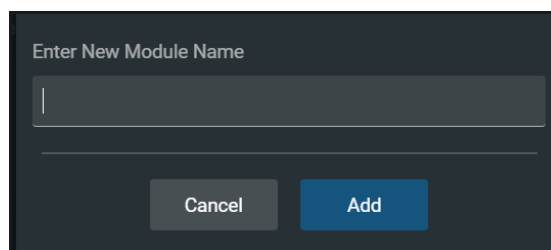
2. Type a title for the SCE in the **SCE Title** field.

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



Select Module

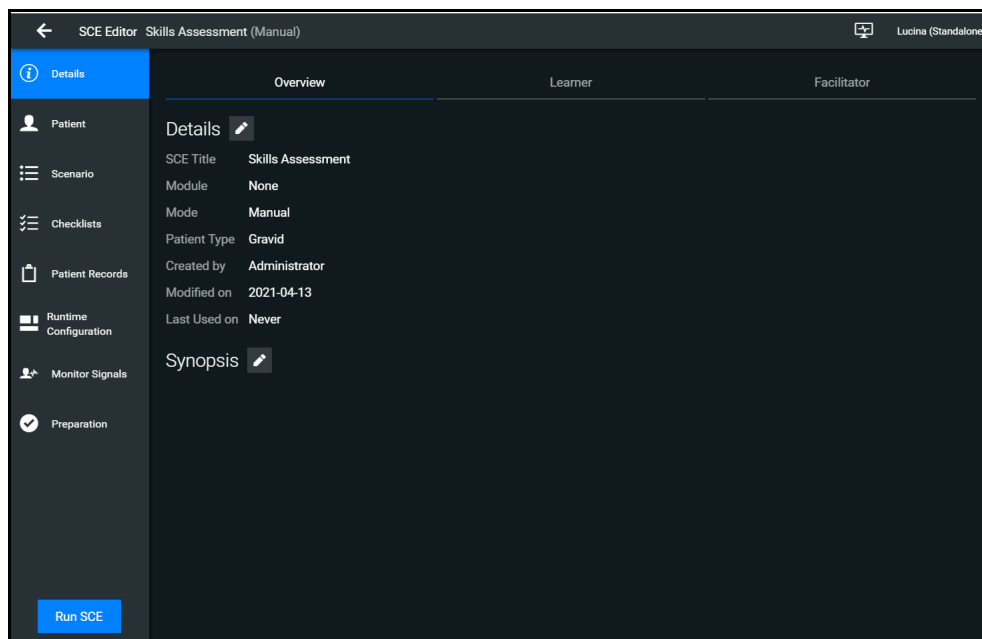
- Type a name for the module in the Enter New Module Name screen and tap **Add**.



New Module Name Screen

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

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



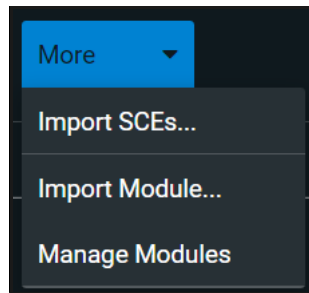
SCE Editor - Details Tab

- In the **Overview**, **Learner**, and **Facilitator** panels, tap the **Edit** icons to enter additional information.
- Tap 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*.

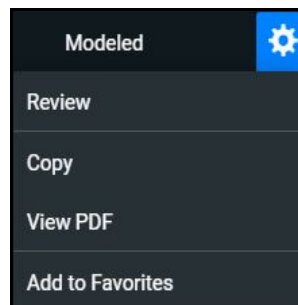
To import from the SCE Manager screen, tap the **More** drop-down menu and tap **Import SCEs**.



More Drop-down Menu Options

To export an SCE:

1. In the **SCE Manager**, tap the gear icon next to the desired SCE.



SCE Gear Drop-down Menu Options

2. Tap **Export**.
3. Select the desired location for the *msce* file in your File Explorer window and tap **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 **View PDF**.
2. Select the desired location for the *msce* file in your File Explorer window and tap **Save**.

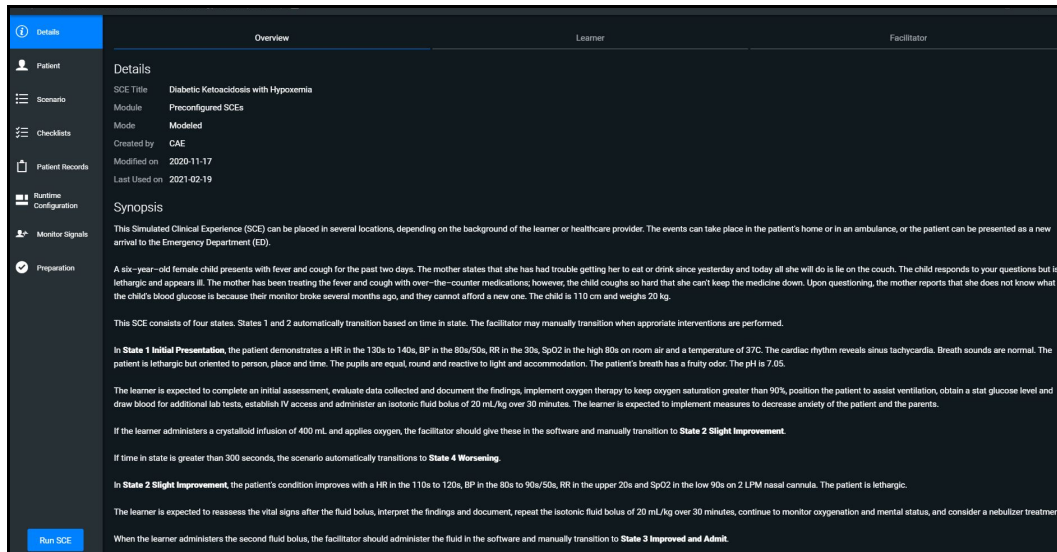
The file is saved in the designated location. If using a tablet, the files can be exported to an external device via USB-C cable.

For information on managing learning modules, see the *Learning Modules* section this user guide.

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 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.

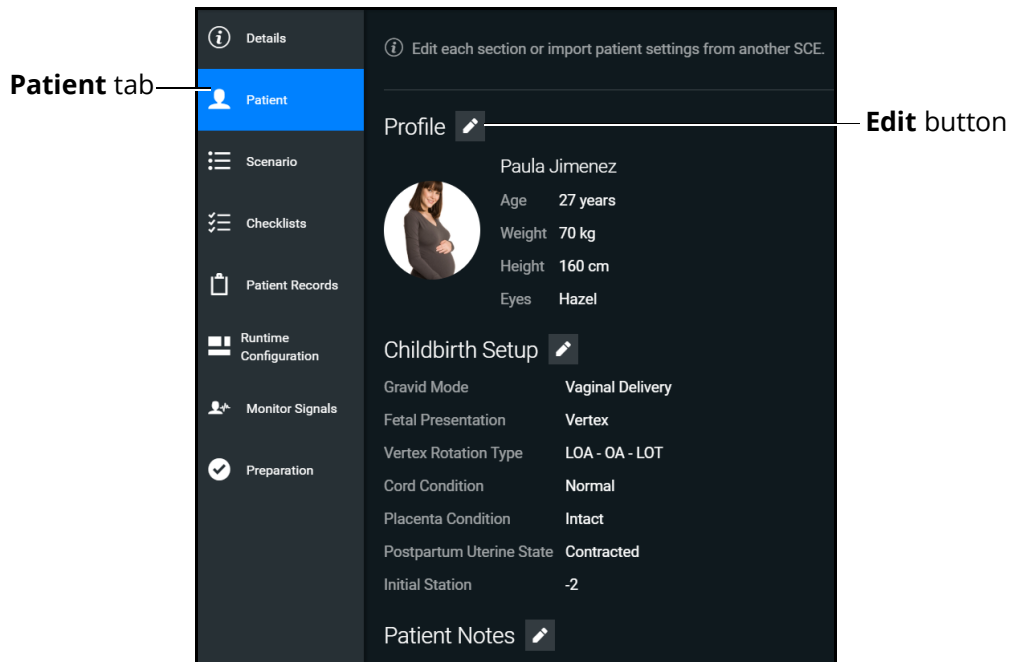
Some sections in the SCE Editor include a rich-text editor to allow free-form data entry.

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

Patient Profile

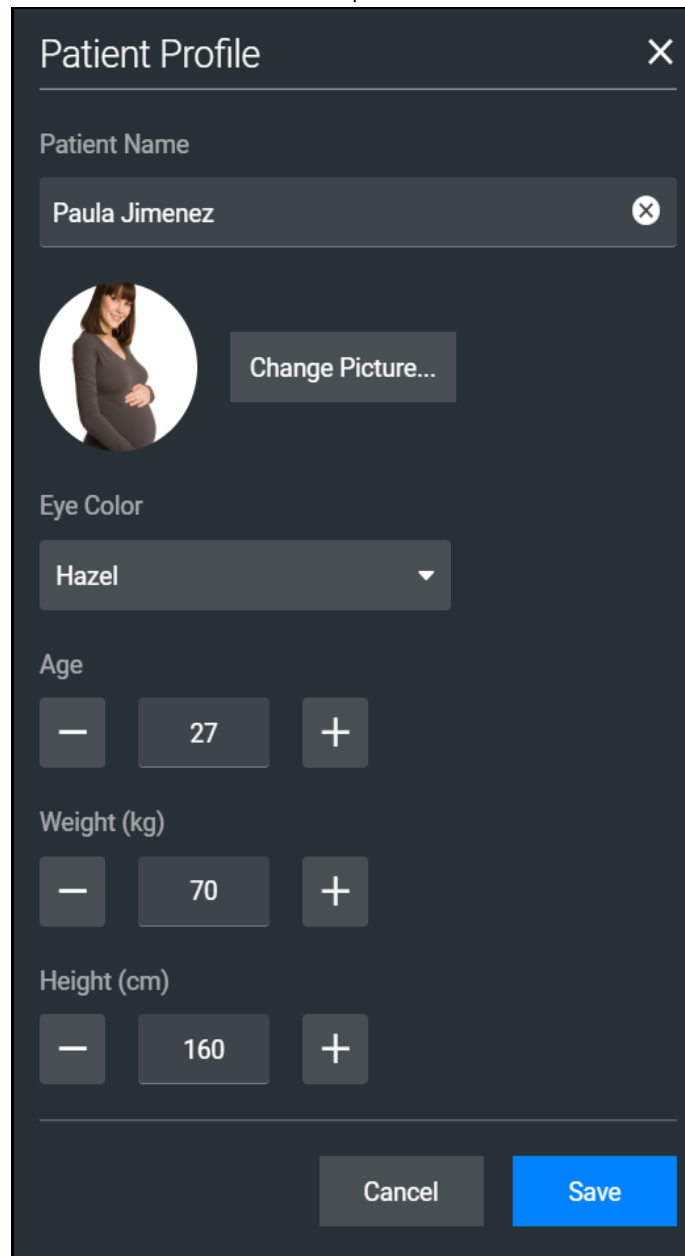
To edit the Patient Profile:

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



The Patient Profile Editor appears.

2. Modify the patient's name, eye color, age, gender, weight, and height in the appropriate fields.



Patient Profile

3. Tap **Change Picture** to change the patient's picture.
4. Tap **Save**.

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

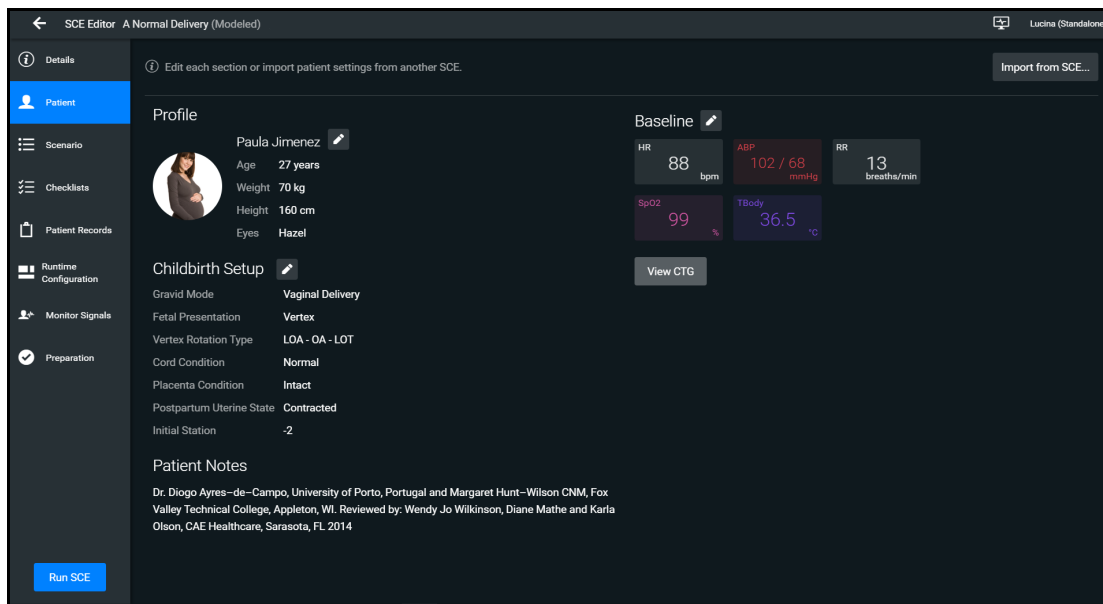
Setting a Patient's Baseline

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 the **Edit** button on the right of **Baseline**.

The Patient Baseline Editor appears.



Patient Baseline Editor

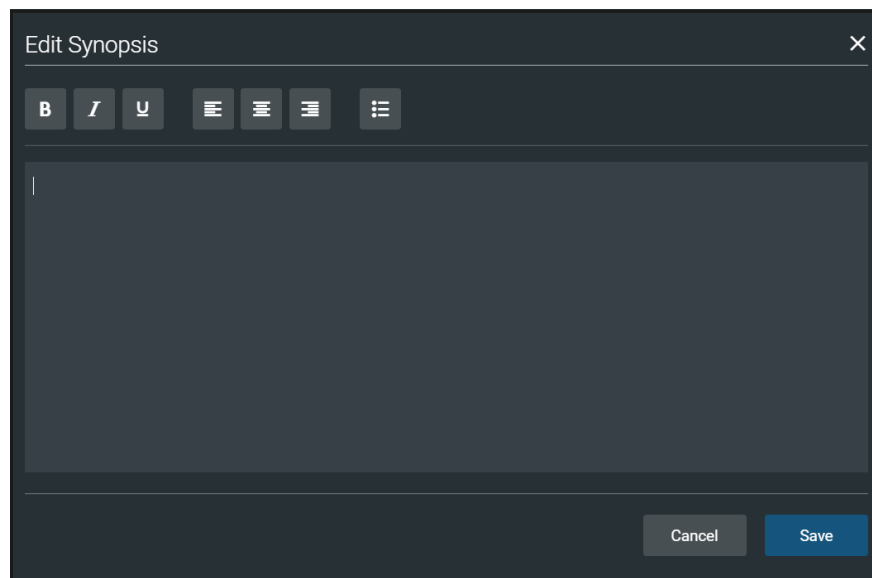
2. Set the Patient's baseline status by modifying the desired parameters and tap **Save**.

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

To use the text editor:

1. Where available, tap 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 **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.

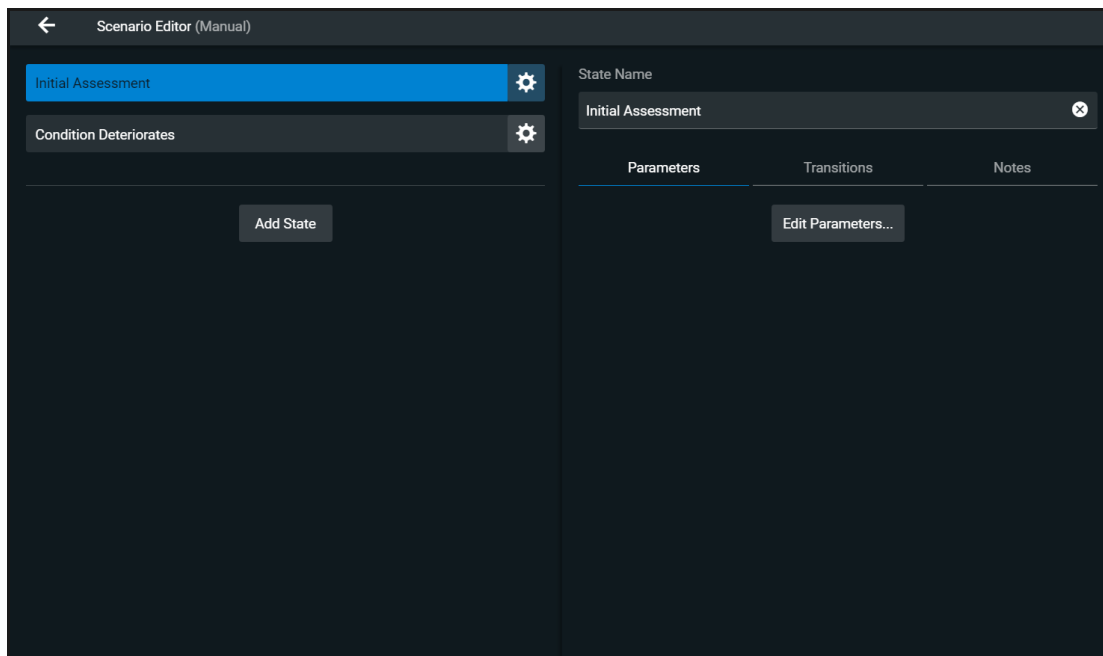
Note: The live editor is only available within unlocked SCEs that use the optional Modeled Physiology, and allows live edits to the scenario while running the simulation.

To edit from the Scenario Editor:

1. From the SCE Manager screen, select an SCE to edit.
The SCE Editor screen appears.
2. Tap the **Scenario** tab.
3. Tap the Scenario **Edit** icon.

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

The Scenario Editor appears.



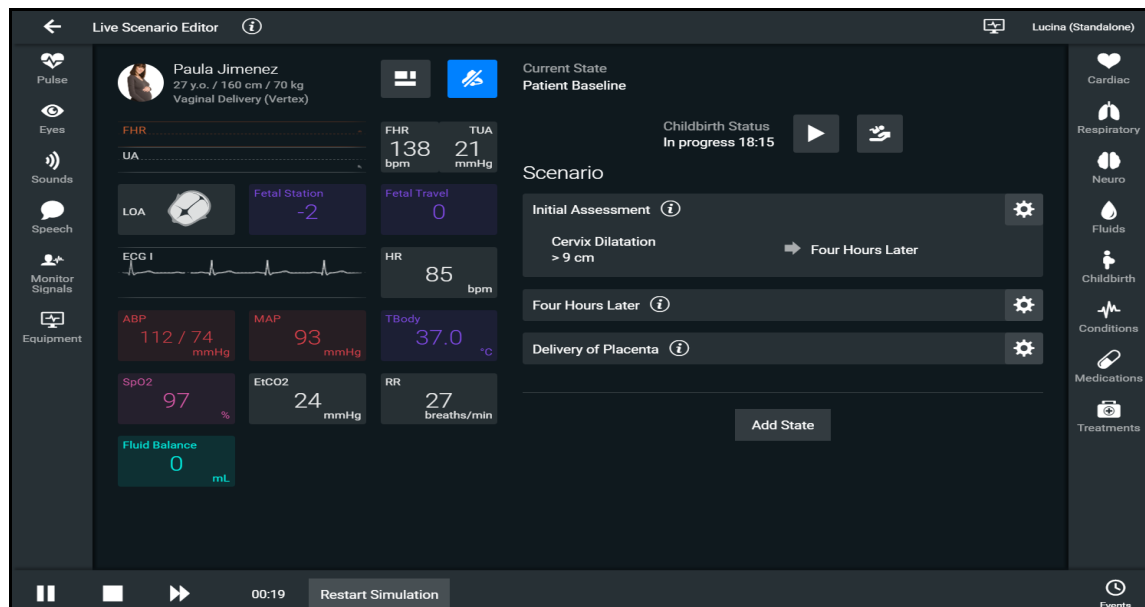
Scenario Editor

4. Tap 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

To edit from the Live Scenario Editor:

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.

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



Live Scenario Editor

2. Tap the **Gear** icon located on the side of a state. Then tap 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 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 **Add State**.
2. In the window that appears, enter a name for the new state. Tap **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 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 **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 **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 **Edit Parameters**.
2. Make necessary changes. Tap **Save**.

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

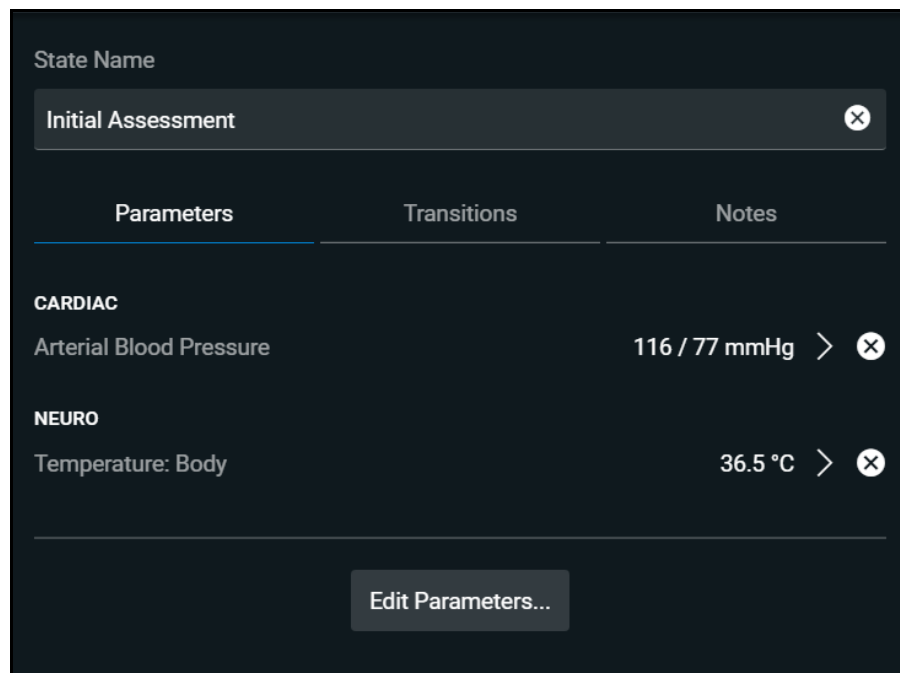
To delete parameters:

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



Information Icon

2. Tap the **Parameters** tab. Tap the **X** icon next to the parameter to delete.
3. Tap **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 the **Gear** icon next to the desired state.
2. Tap **Add Transition**.

The New Transition panel appears.

The screenshot shows the 'New Transition' panel with the following settings:

- Reason for transition: Treatment
- Select treatment: Defibrillation Energy
- Criteria: Greater than (>)
- Defibrillation Energy: 0 (range 0 to 360)
- Jump to: Condition Deteriorates

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 (for example 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 **Save**.

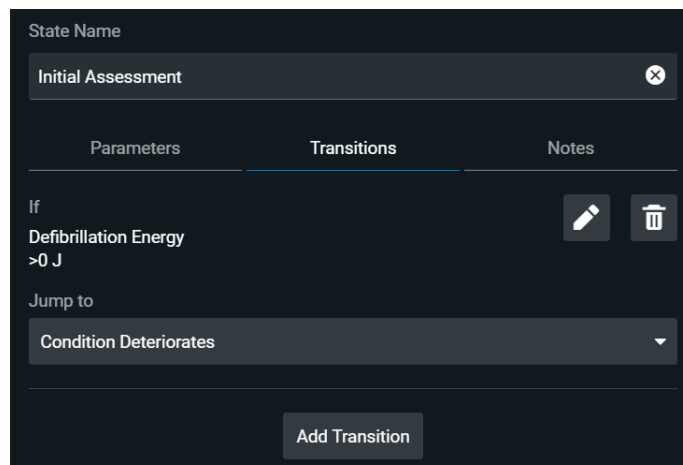
To delete a transition in the Scenario Editor or Live Scenario Editor:

1. Tap the **Information** icon next to the state.



Information Icon

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



Scenario Editor - Transition Tab

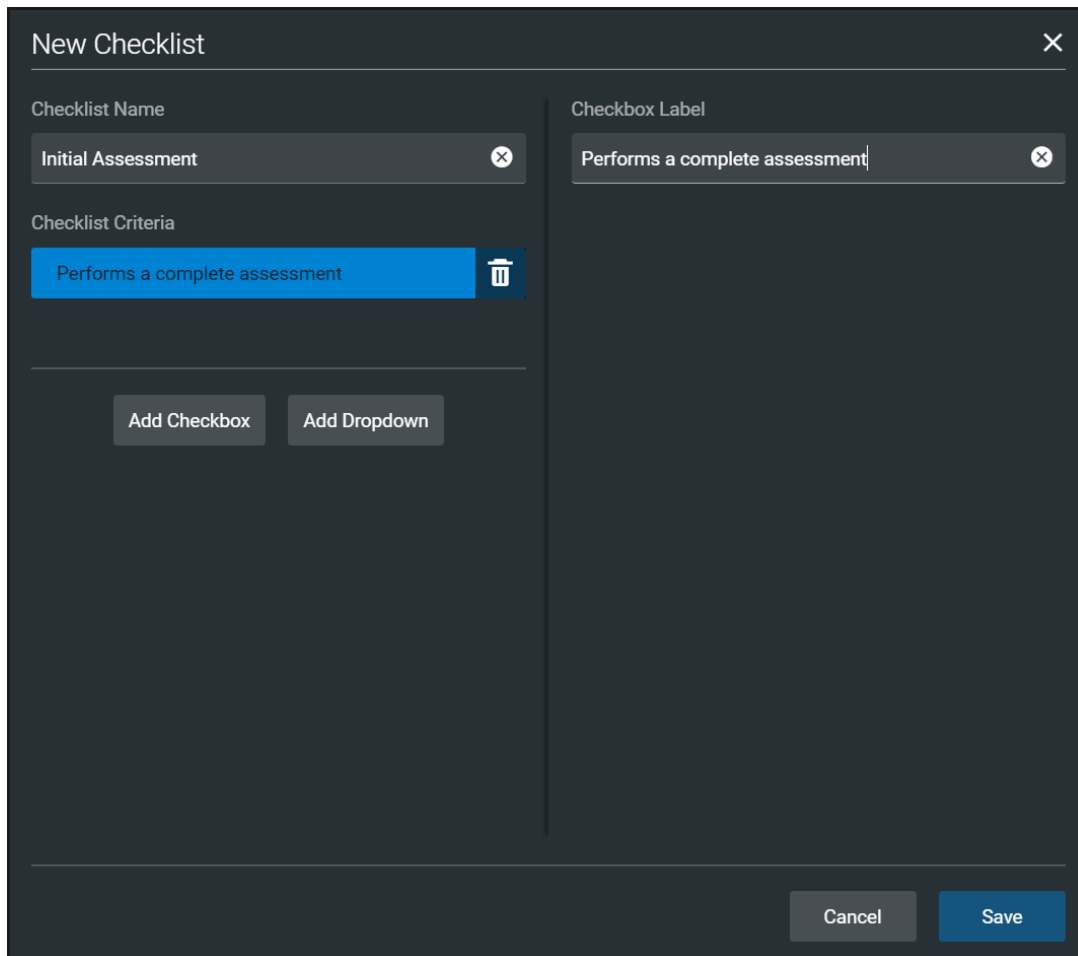
Checklists

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

To create a new checklist:

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

The New Checklist panel appears.



New Checklist Panel

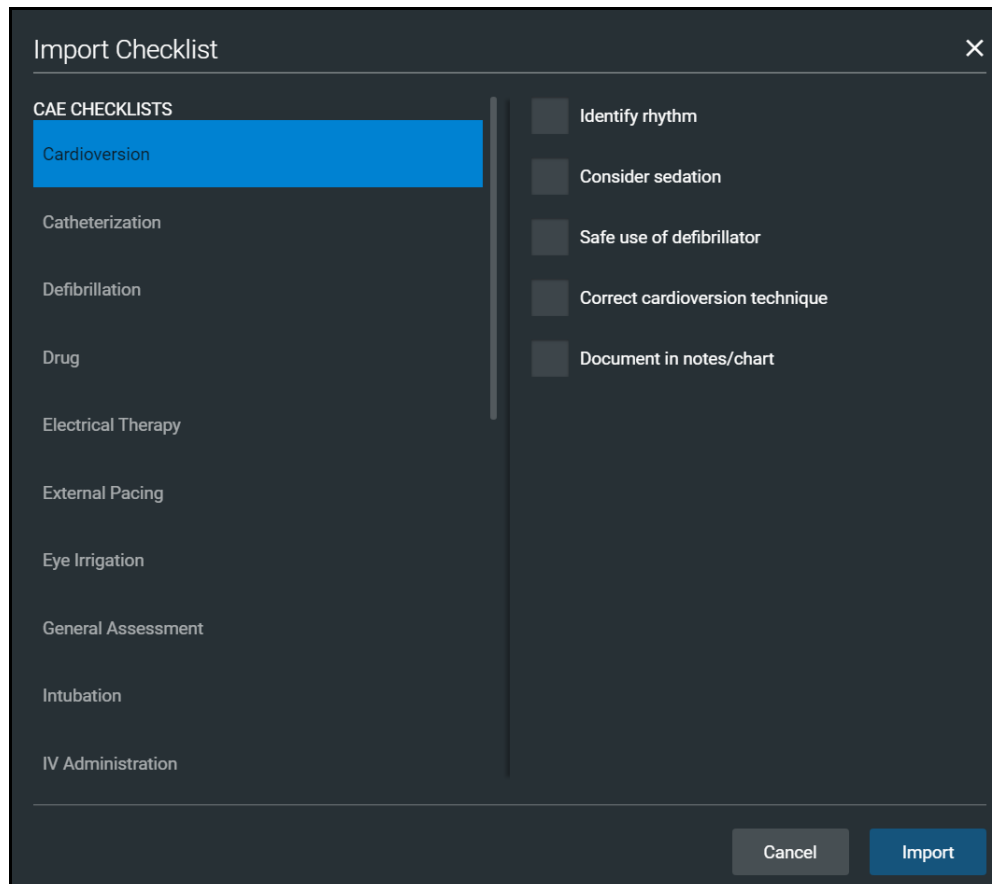
3. Enter a name for the checklist in the Checklist Name field.
4. (Optional) Tap **Add Checkbox** to add a checkbox to the checklist.
 - a. Enter a label name in the Checkbox Label field.
 - b. (Optional) Tap **Add Checkbox** to continue entering labels as needed.
 - c. Tap **Save**.
5. (Optional) Tap **Add Dropdown** to add list items to the checklist.
 - a. Enter a name for the drop-down list in the Dropdown Label field.

- b. Tap **Add Option** to provide items that can be selected from the drop-down list.
 - c. Enter a name for the list item in the Dropdown Options field.
 - d. (Optional) Tap **Add Dropdown** to continue entering drop-down lists as needed.
 - e. Tap **Save**.
6. (Optional) Rearrange the checklist order by dragging individual checklists up or down as desired
7. (Optional) Tap 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 the **Checklists** tab.
2. When the Checklists screen appears, tap **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 **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.

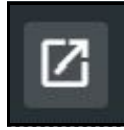
To ensure adequate space, delete patient records that are no longer needed.

To access a patient record:

1. From the SCE Editor screen, tap 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 the **Preview** button.



Preview Button

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

Upload Patient Records

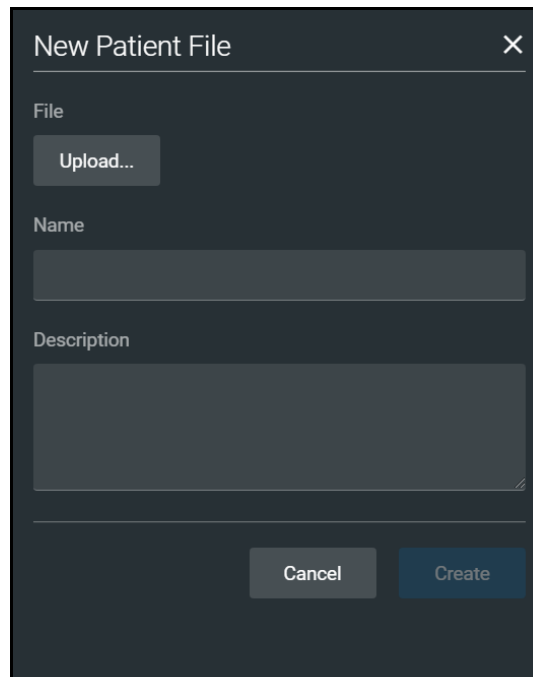
You can upload the following file types:

- 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 the **Patient Record** tab.
2. In the panel that appears, tap **Patient Files > Add File**.

The New Patient File panel appears.



New Patient File - Upload Panel

3. Tap **Upload**. Select the desired file and tap **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 **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 the **Gear** icon next to the desired file.
2. Tap **Edit**. Change the **Name** or **Description** as needed.
3. Tap **Save**.

To delete a patient record:

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

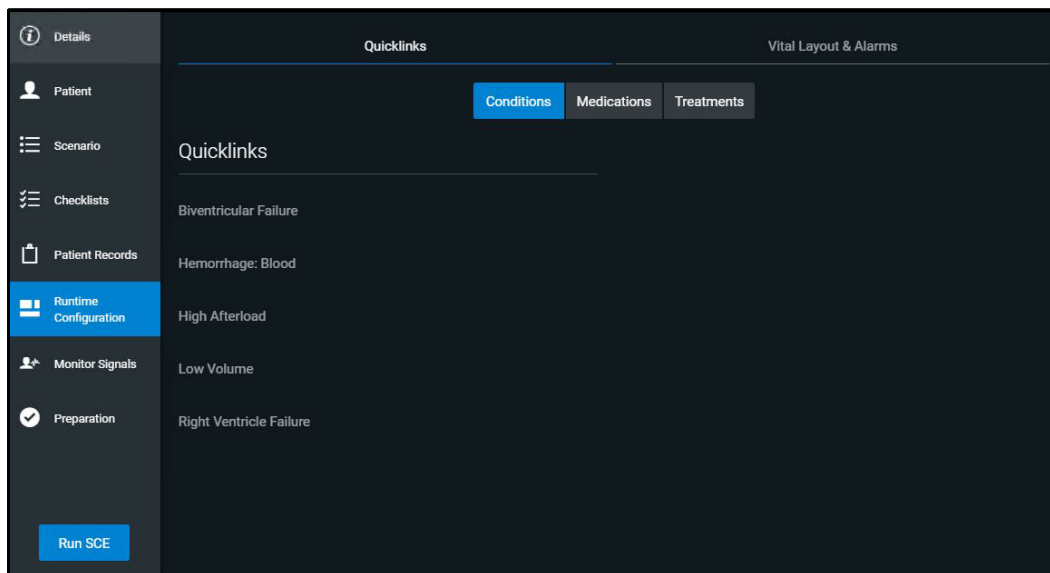
Runtime Configuration

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

Quicklinks Setup

From the Quicklinks Setup 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 the **Conditions**, **Medications** and **Treatments** buttons.



Runtime Configuration Quicklinks Setup Screen

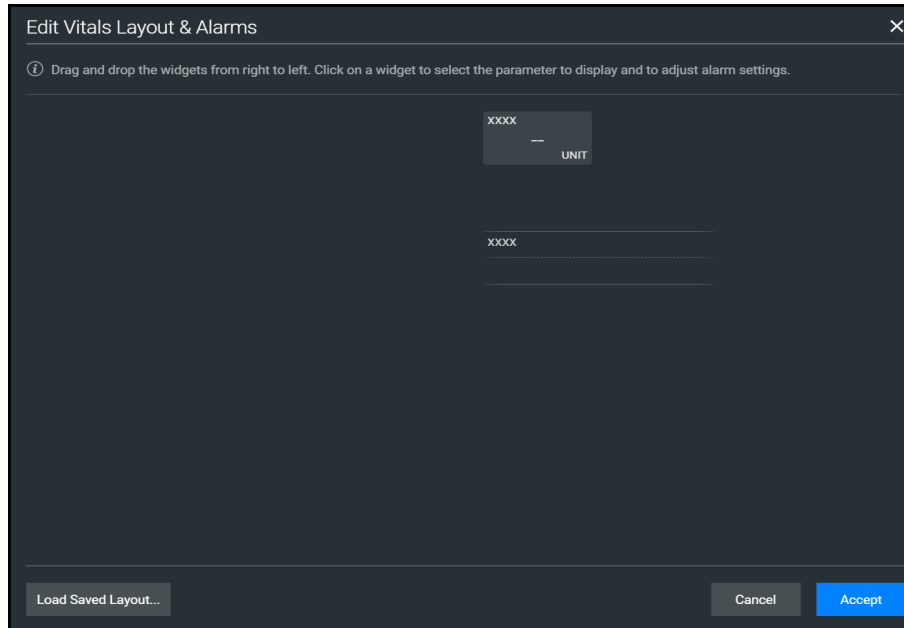
To create a Quicklink, select an item from the **Conditions**, **Medications**, or **Treatments** lists.

To remove a Quicklink, deselect the option.

Edit Vital Layout & Alarms

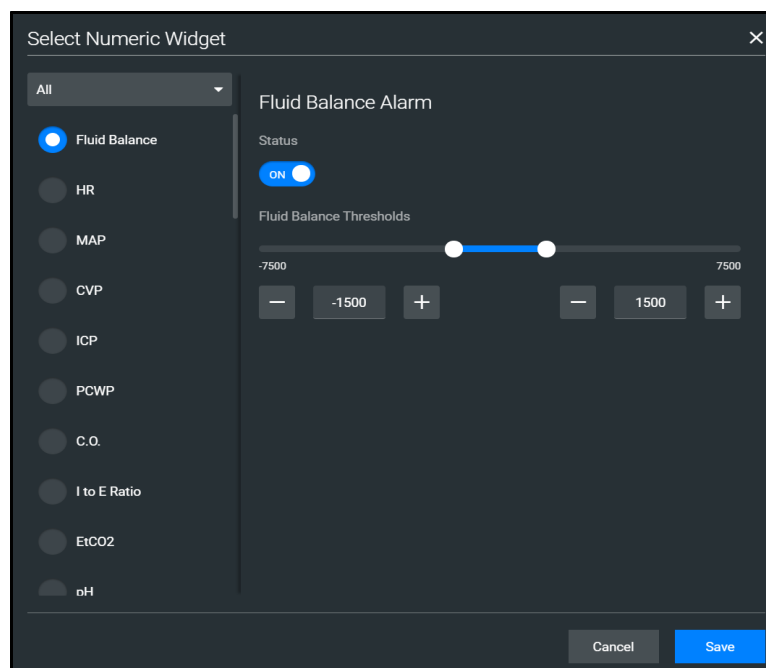
To edit the vital layout and alarms, tap the **Vital Layout & Alarms** tab.

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



Runtime Configuration Vital Layout & Alarms Screen

Upon dragging the widget, the Select Numeric Widget or Select Waveform box will appear. Select the desired vital or waveform from the available options, modify alarms and thresholds as desired, and tap **Save** when complete.



Select Numeric Widget

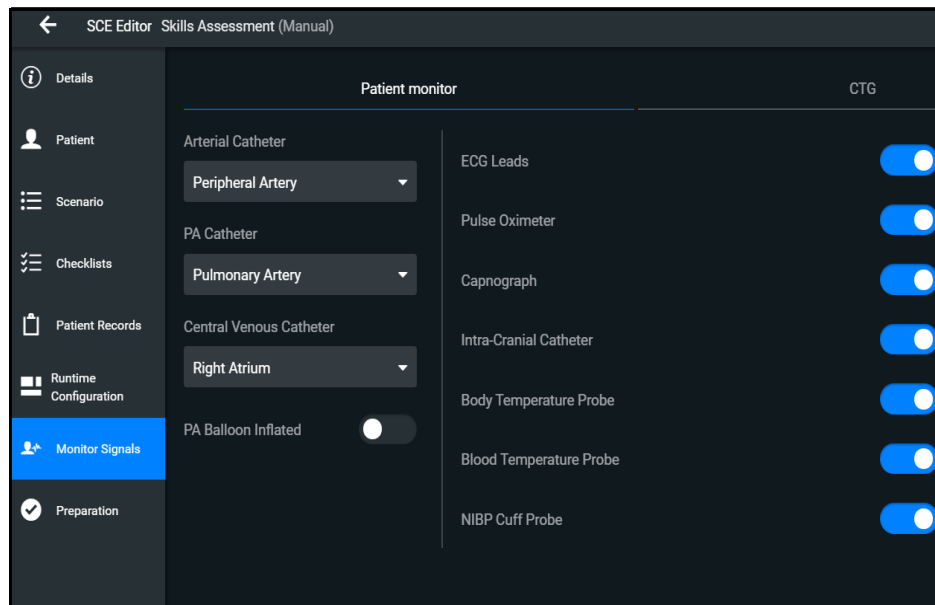
The option to load a saved layout is also available by selecting the **Load Saved Layout** button.

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

Monitor Signals

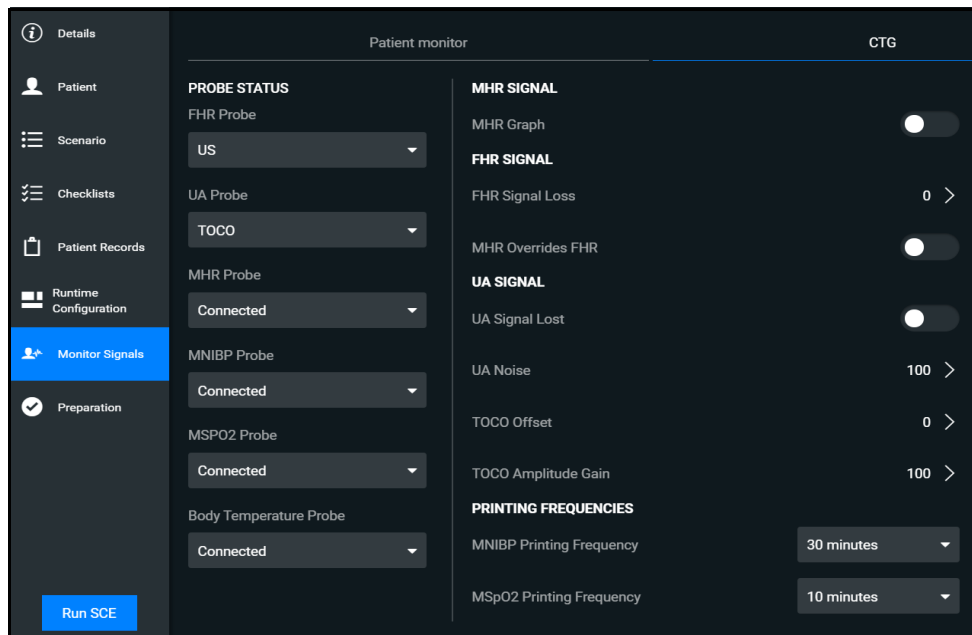
The Monitor Signals can be modified on the run screen or on the SCE Editor screen. To modify the presence of different vitals and alarms on the patient monitor, select the **Monitor Signals** tab.

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



Monitor Signals Screen

Select the **CTG** tab to modify the presence of the CTG monitor readings.



Monitor Signals Screen - CTG Tab

Preparation

From the Preparation tab, users can create a list of equipment and supplies, or notes about preparing the manikin for the SCE.

To create a list preparation items:

1. From the SCE Editor, tap the **Preparation** tab. Tap either **Equipment & Supplies** or **Manikin Setup**.
2. Tap the **Edit** button and enter items.
3. Tap **Save**.

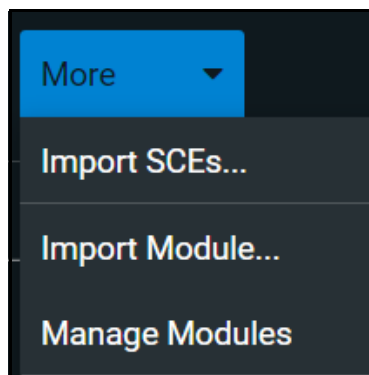
LEARNING MODULES

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 **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 **Open**.

Create a Learning Module

To create a Learning Module:

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

The New SCE panel appears.

New SCE

SCE Title

This field is required.

Select Module

None

Created by

Administrator

Mode

Manual Modeled

Patient Type

Gravid Non-gravid

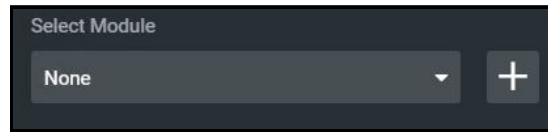
Patient Name

Cancel Create

New SCE Panel

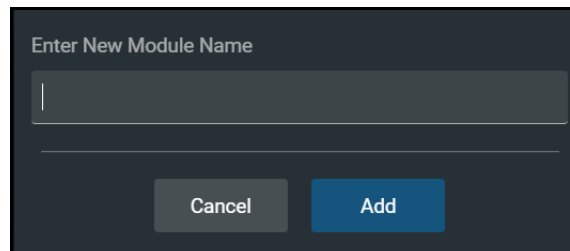
2. Type a title for the SCE in the **SCE Title** field.

3. To select a module to add the SCE to, tap the drop-down arrow, then select a module or tap 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 **Add**.



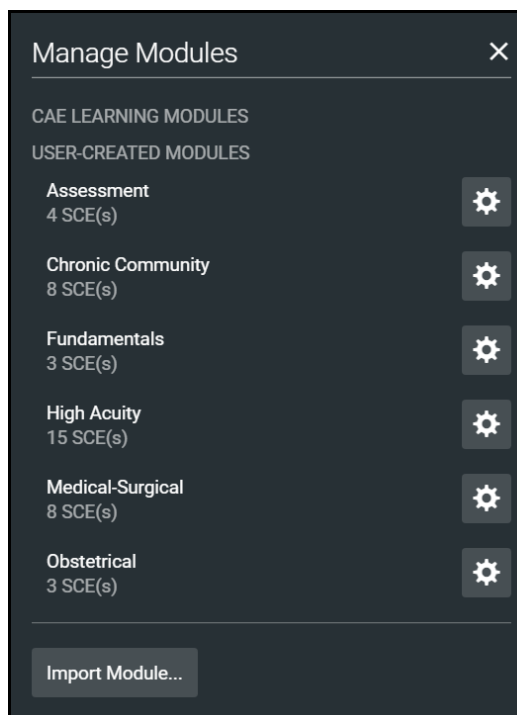
New Module Name Screen

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

Delete a Learning Module

To delete a Learning Module from Maestro:

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



Example of Manage Modules Panel

2. Tap 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 **Delete All**. All of the SCEs in the learning module will be deleted.

CAUTION: This action cannot be undone.

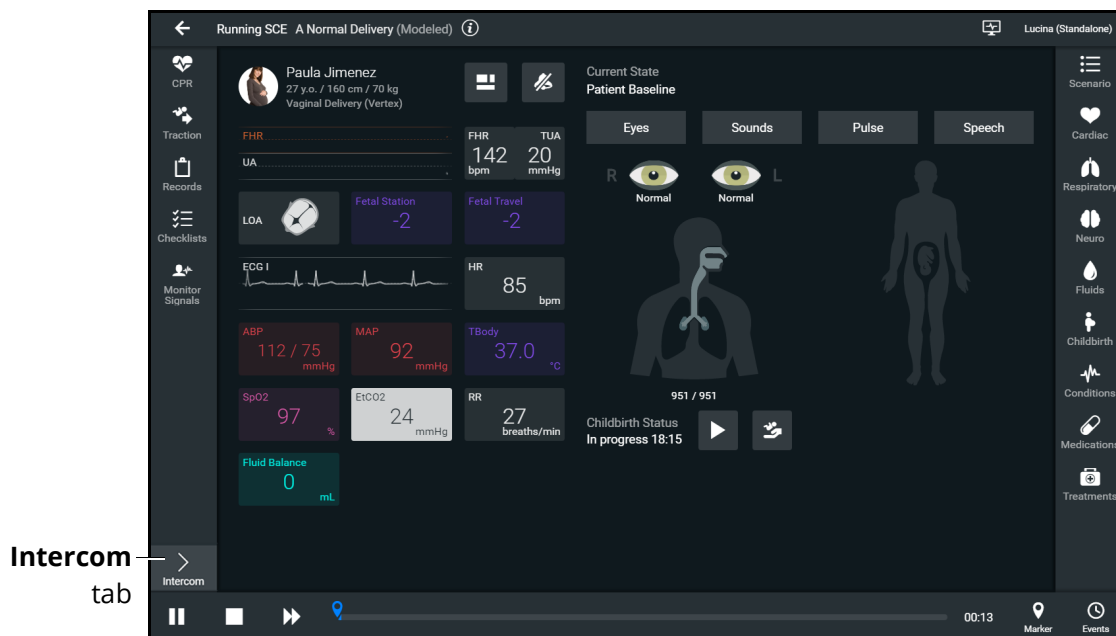
USING THE INTERCOM

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

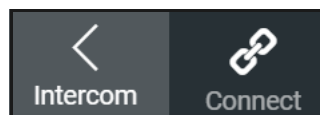
To use the intercom:

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



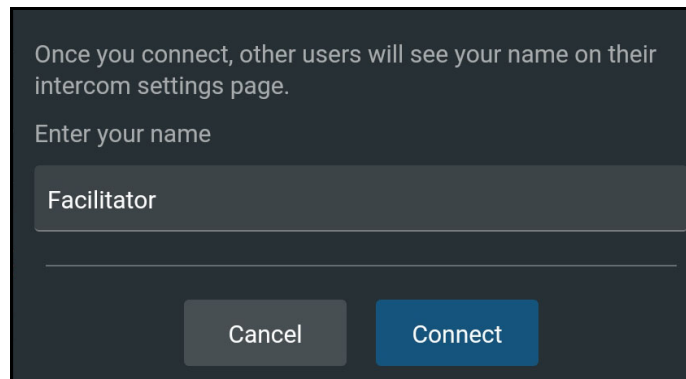
Run Screen

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



Connect Button

The Connect Window appears.

A dark-themed dialog box titled "Connect Window". It contains the text "Once you connect, other users will see your name on their intercom settings page." followed by "Enter your name". Below this is a text input field containing the word "Facilitator". At the bottom are two buttons: "Cancel" and "Connect".

Once you connect, other users will see your name on their intercom settings page.

Enter your name

Facilitator

Cancel Connect

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 and hold the **Patient** button to speak through the manikin's vocal speakers. Release the button to mute the intercom

Note: When **Patient** button is not pressed, facilitators will continue to hear the participants via the manikin's microphone.

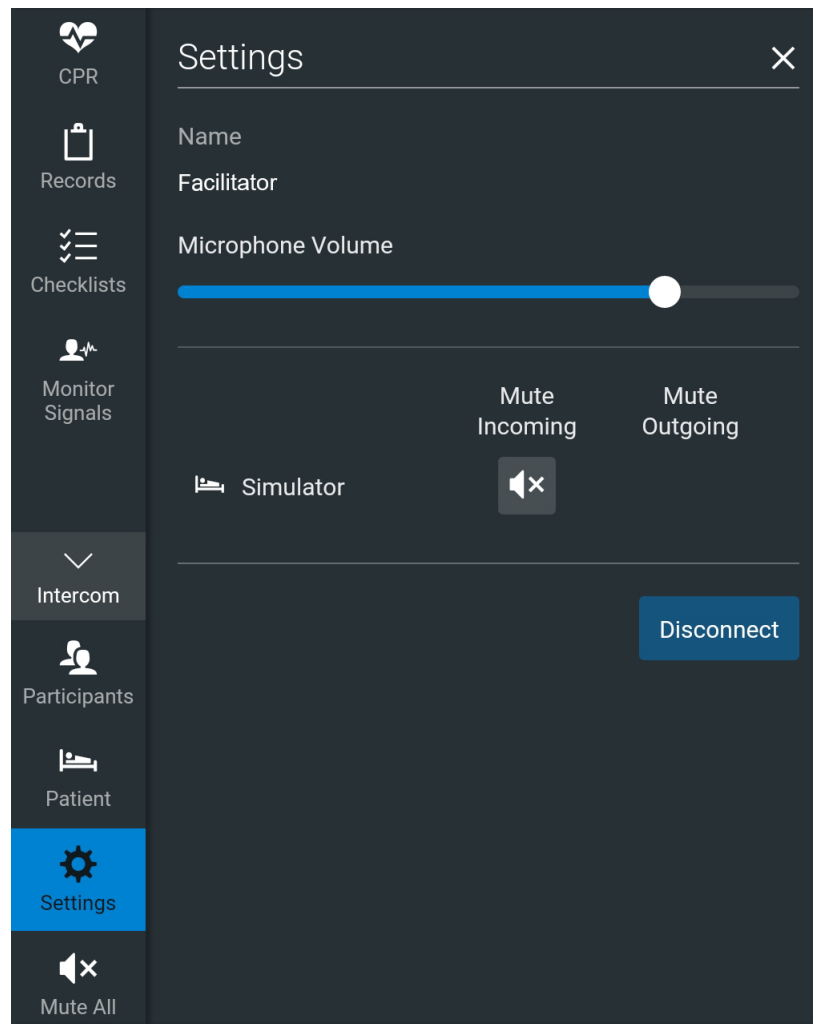
To mute all communications between facilitator and participants, on the Intercom Tools menu, tap **Mute All**.

Settings

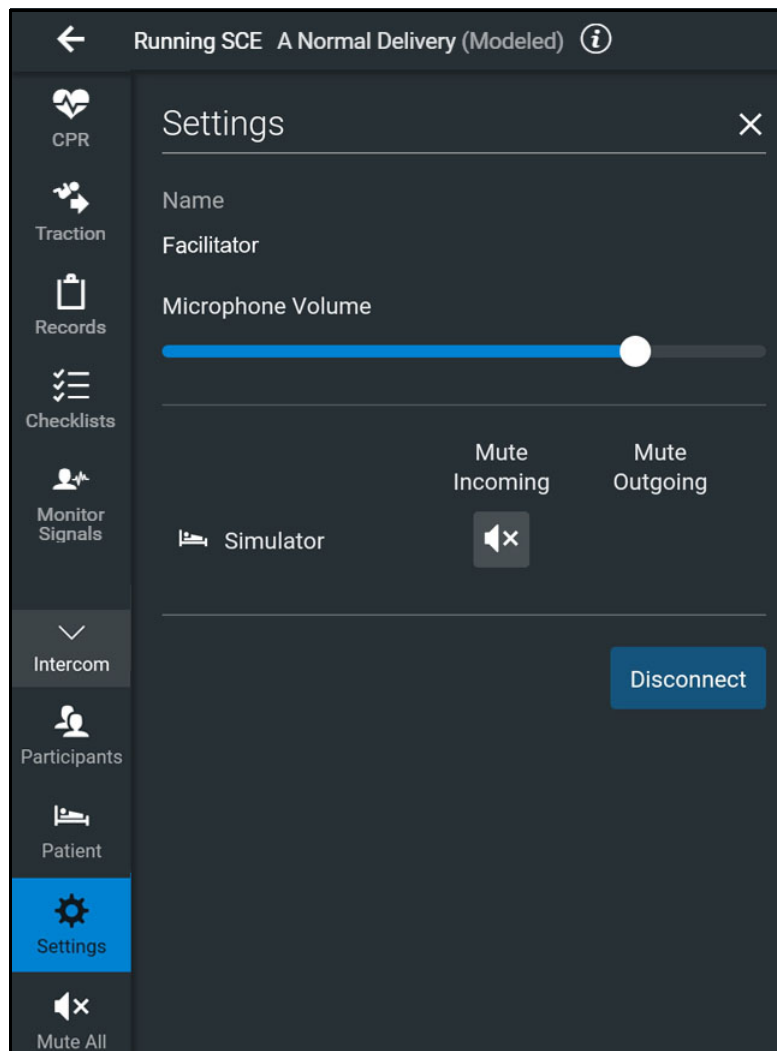
Settings allow users to control how the intercom functions. To modify settings:

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

The Settings pane appears.



Settings Panel

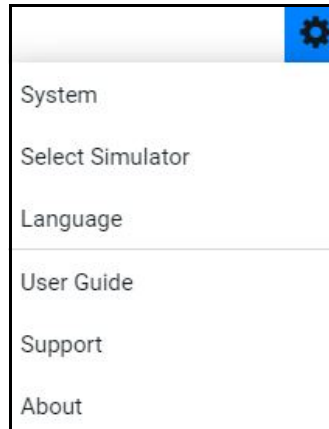


Settings Panel

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.

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 the **Gear** icon. Then select **System**.

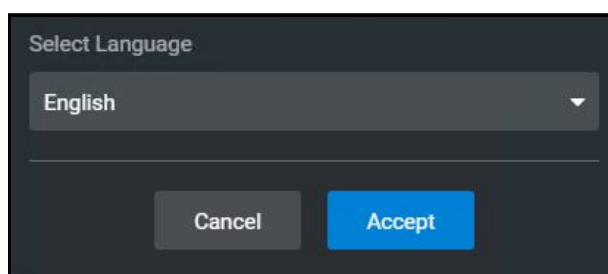
From this screen, you can select:

- **About:** to view software version and system configuration
 - 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; and to Childbirth Traction target values
- **License Manager:** to access license information (from here, you can start a trial of the Maestro software, and activate or deactivate the license)
- **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 the **Gear** icon and from the drop-down menu, select Language.



Select Language Window

2. Select the desired language from the drop-down menu.

3. Tap **Accept**.

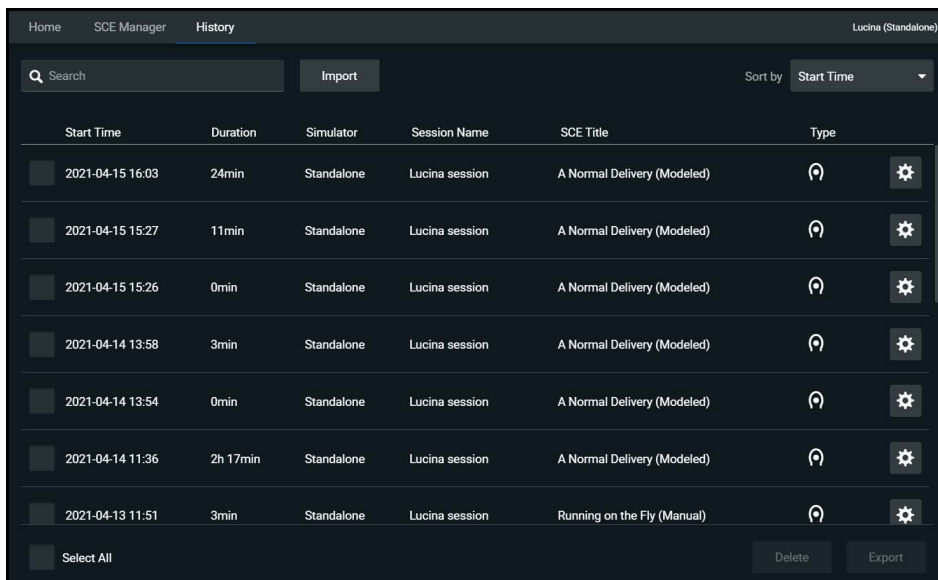
Note: Language can also be set from **System > Preferences**.

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.

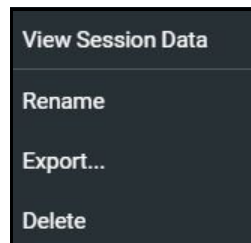


Start Time	Duration	Simulator	Session Name	SCE Title	Type
2021-04-15 16:03	24min	Standalone	Lucina session	A Normal Delivery (Modeled)	[Icon]
2021-04-15 15:27	11min	Standalone	Lucina session	A Normal Delivery (Modeled)	[Icon]
2021-04-15 15:26	0min	Standalone	Lucina session	A Normal Delivery (Modeled)	[Icon]
2021-04-14 13:58	3min	Standalone	Lucina session	A Normal Delivery (Modeled)	[Icon]
2021-04-14 13:54	0min	Standalone	Lucina session	A Normal Delivery (Modeled)	[Icon]
2021-04-14 11:36	2h 17min	Standalone	Lucina session	A Normal Delivery (Modeled)	[Icon]
2021-04-13 11:51	3min	Standalone	Lucina session	Running on the Fly (Manual)	[Icon]

History Screen

To view session data:

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



History Log Options

The Event Log, Physiological Data, CPR Data, CTG, and Checklists appear. Tap 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 the **Gear** icon for the desired simulation session, then tap **Export**.

USING CAEPATIENT MONITOR

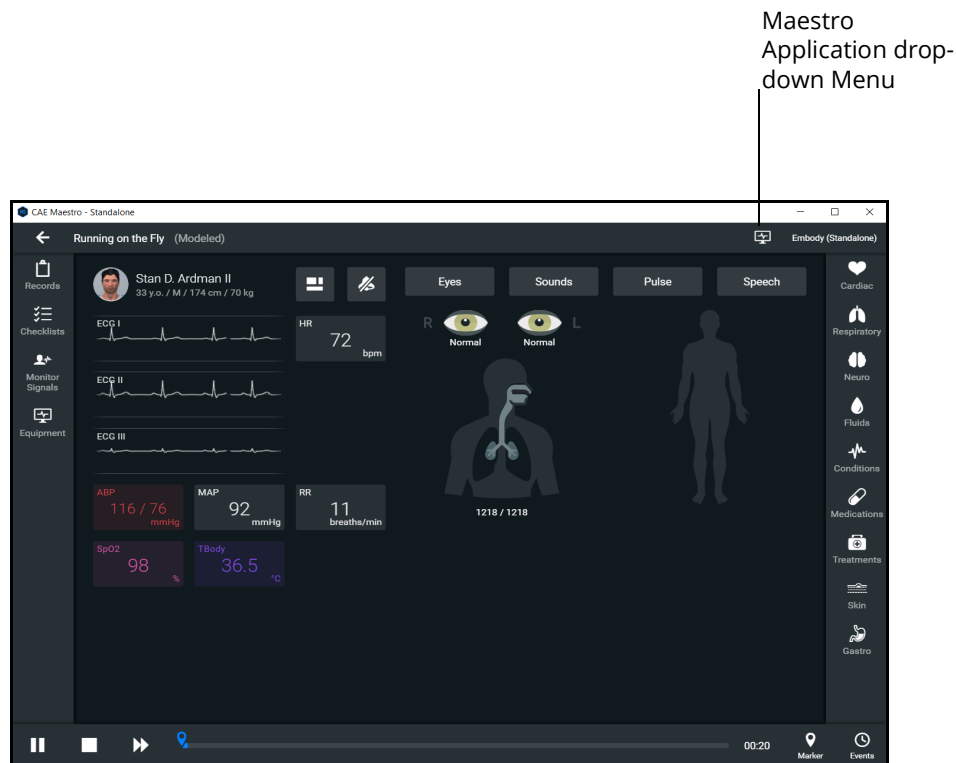
CAE's Patient Monitor is one of the many types of virtual equipment applications that CAE offers to enhance the simulation learning experience. This patient monitor emulates a typical bedside monitor and allows viewing the patient's physiology, expressed in waveforms and numeric values. In this User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

Patient Monitor may also be launched on an Instructor Tablet, or another computing device, provided it has joined the simulator's wireless network and meets the minimum system requirements.

Accessing the Patient Monitor

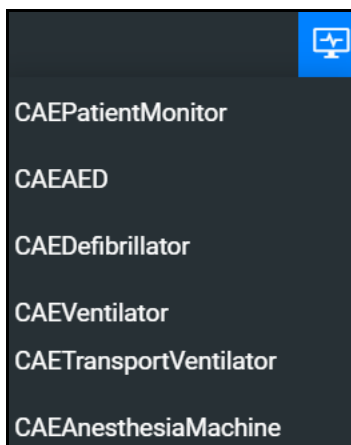
To launch Patient Monitor from the Instructor Tablet:

1. With an SCE running, select the **Maestro Application drop-down** menu in the upper-right corner of the screen.



SCE Run Screen

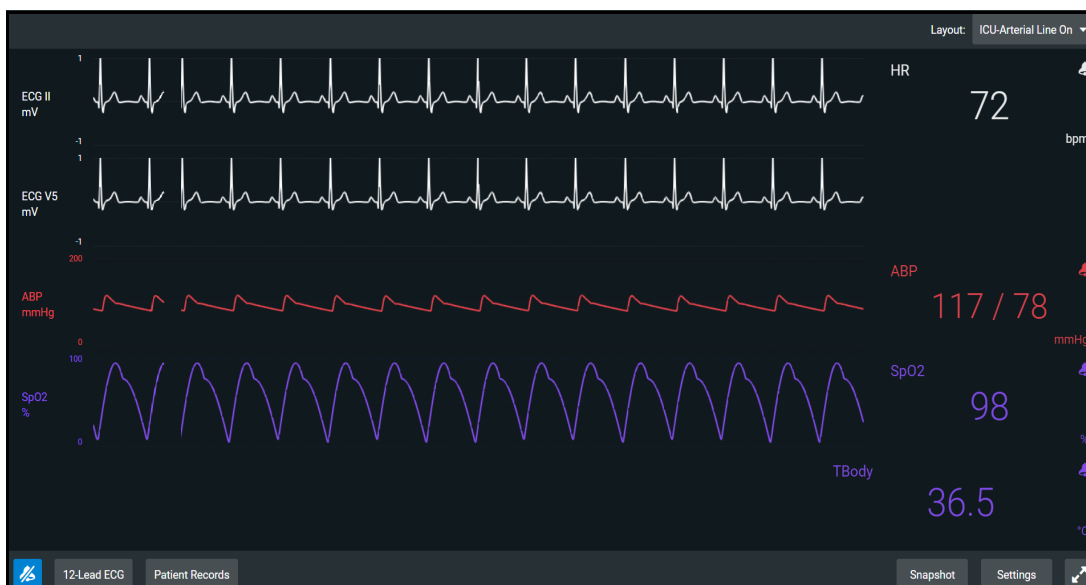
The Maestro Application drop-down menu appears.



Maestro Application Drop-Down Menu

2. Select **CAEPatient Monitor**.

The patient monitor screen appears.



CAE Patient Monitor

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

Editing Patient Monitor

To edit patient monitor layout without going into Settings, tap a waveform or a numeric panel along the bottom, select the desired parameter, like NIBP, selecting color and alarms, and tap the X.

Select a Preconfigured Layout

These are the preconfigured CAE Healthcare Layouts:

- **Labor and Delivery** - waveform and numeric readouts for ECG Lead II and numeric readouts for SpO₂, NIBP (noninvasive blood pressure), HR, and body temperature.
- **ICU-Arterial Line Only** - waveform and numeric readouts for ECG Lead II, ECG Lead V, ABP, Pleth, and a numeric readout for Body Temperature.
- **EMS-ED-Telemetry** - waveform and numeric readout for ECG Lead II and numeric readouts for SpO₂, and NIBP (noninvasive blood pressure).
- **ICU-OR No CVP** - 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** - 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** - numeric readouts for SpO₂ and pulse.

Note: Additional layouts may be available depending upon the simulator that is used.

To select a preconfigured layout:

1. Click the **Layout** drop-down menu in the upper-right corner of screen.



Layout Drop-down Menu

The Patient Monitor Settings menu appears.

2. Select a layout.

Settings

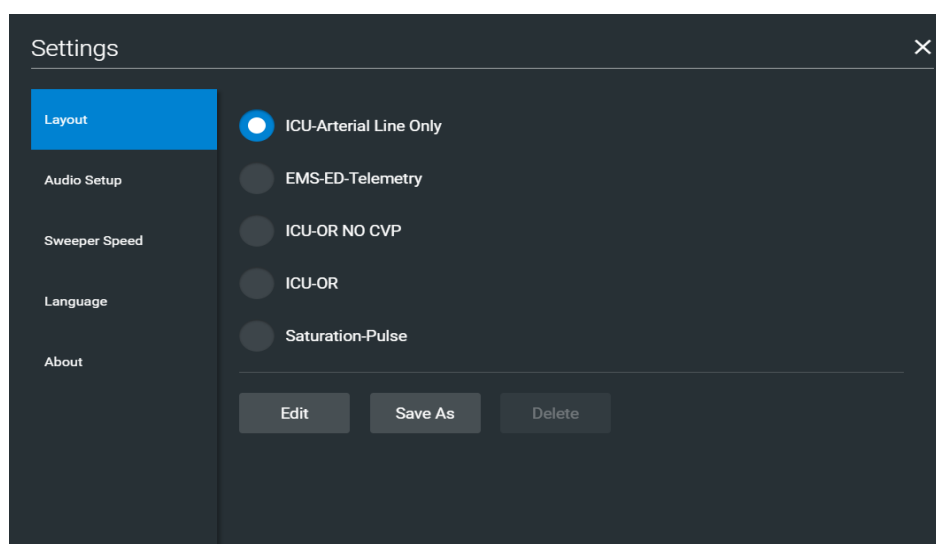
Patient Monitor settings options allow for configuration preferences. The following selections are available on the settings panel:

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

To access the Settings panel:

1. Click **Settings** in the lower-right corner of the screen.

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

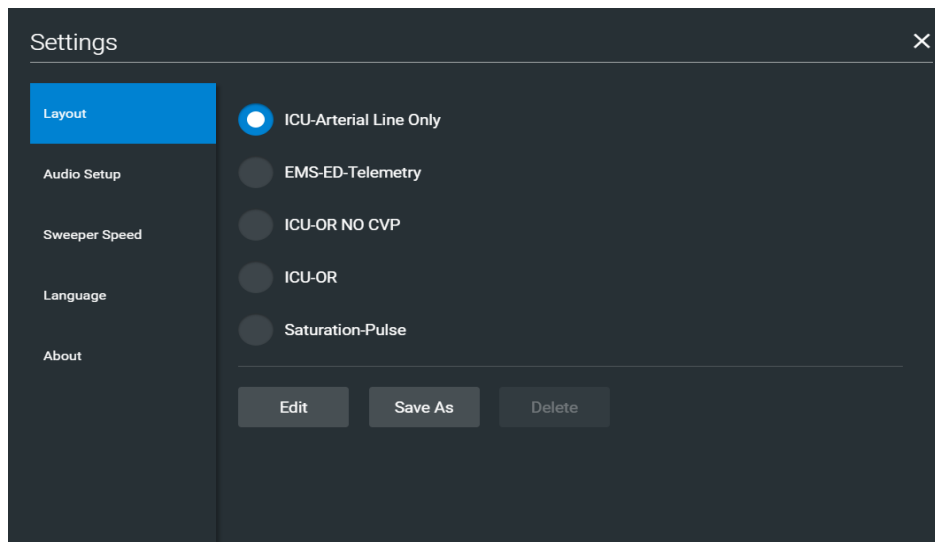


Settings Panel - Layout Options

Layout

To access the Layout options:

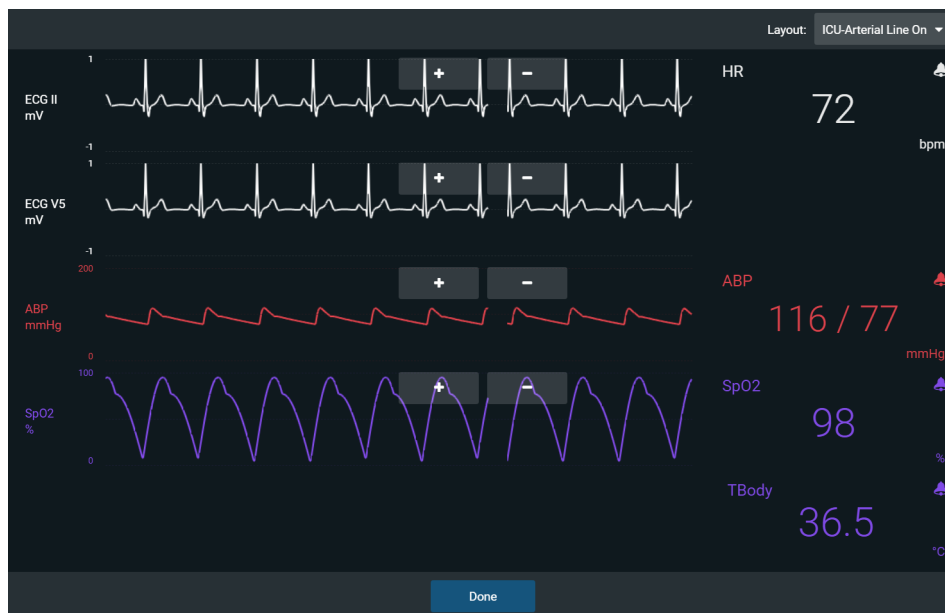
1. From the **Settings** panel, the **Layout** tab is displayed by default. From the Layout options, select a Layout. In this example, ICU-Arterial Line Only is selected.



Settings Panel - Layout Options

2. Click **Edit**.

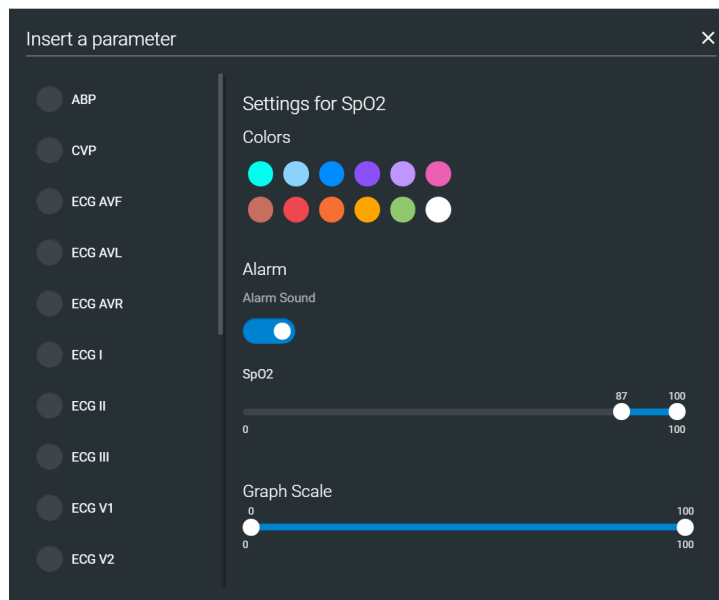
The Layout Edit screen appears.



ICU-Arterial Layout Edit Screen

3. Select a signal to edit its parameters.

The Insert a parameter screen appears.



Insert a Parameter

4. Adjust the signal's **Color**, **Alarm**, and **Graph Scale** parameters as needed.

OR

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

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

The Layout Edit screen reappears.

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

Patient Monitor adds a line to the Layout.

7. Select the new line to open the Insert a Parameter window.

8. Select the parameter to display on the new line.

9. Set the parameter's **Color** and **Alarms**. When finished, close the parameter panel.

10. Click **Done** to close the Layout Edit screen.

The Settings Layout panel opens.

11. Click **Edit** to resume editing the layout.

12. Click **Save As** to save the layout.

Type a name for the layout, then click **Save**.

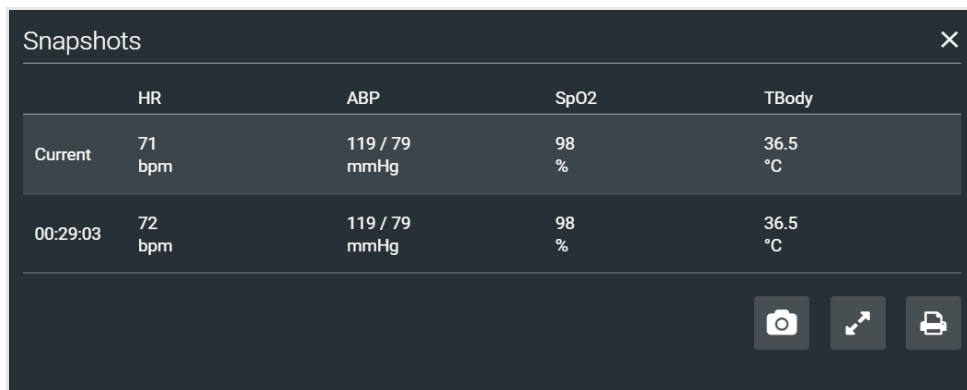
Snapshot

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 **Snapshot** at the lower-right corner of the Patient Monitor screen.

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



	HR	ABP	SpO2	TBody
Current	71 bpm	119 / 79 mmHg	98 %	36.5 °C
00:29:03	72 bpm	119 / 79 mmHg	98 %	36.5 °C

At the bottom right of the window, there are three icons: a camera icon for capturing a snapshot, a share icon, and a print icon.

Snapshots Window

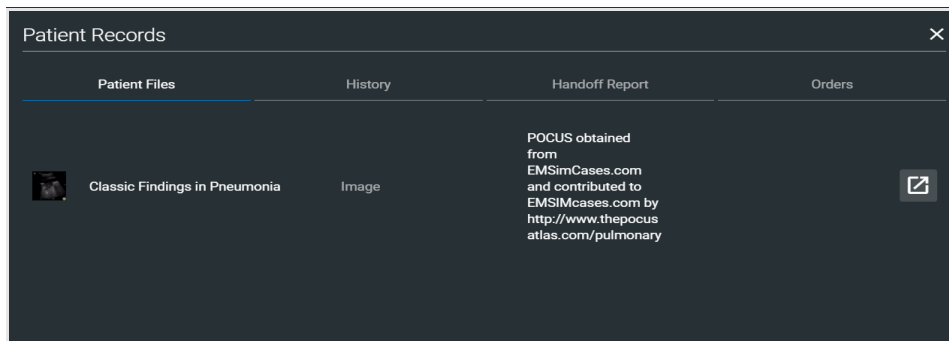
2. To take another snapshot, tap the **Capture Snapshot** (camera) button at the lower-right corner of the screen.
3. (Optional) Tap the **Full Screen View** button at the lower-right corner of the screen.

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

Patient Record

To view Patient Records, tap **Patient Record** from patient monitor controls at the lower-left of the screen.

The Patient Records window appears.



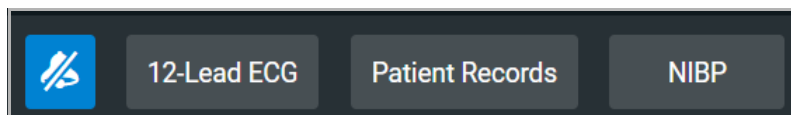
Patient Records Window

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

12-Lead ECG

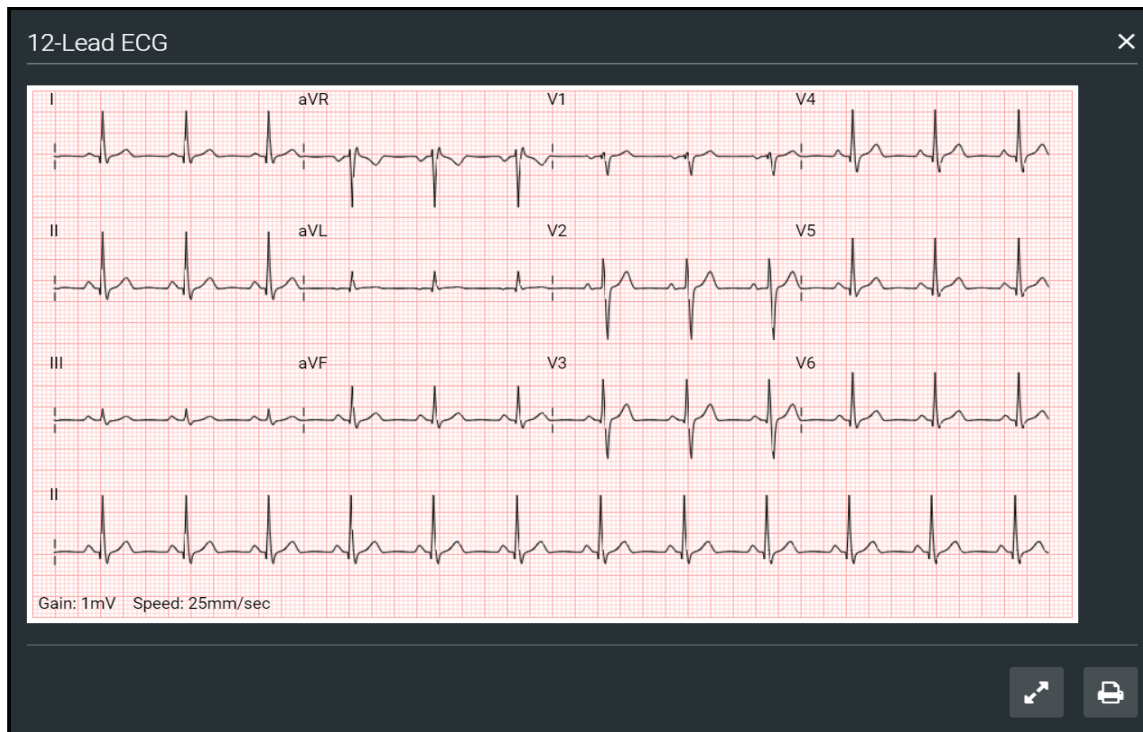
To view a 12-lead ECG report:

1. From patient monitor controls at the lower-left corner of the screen, select **12-Lead ECG** .



Patient Monitor Controls

The report appears.



12-Lead ECG Report

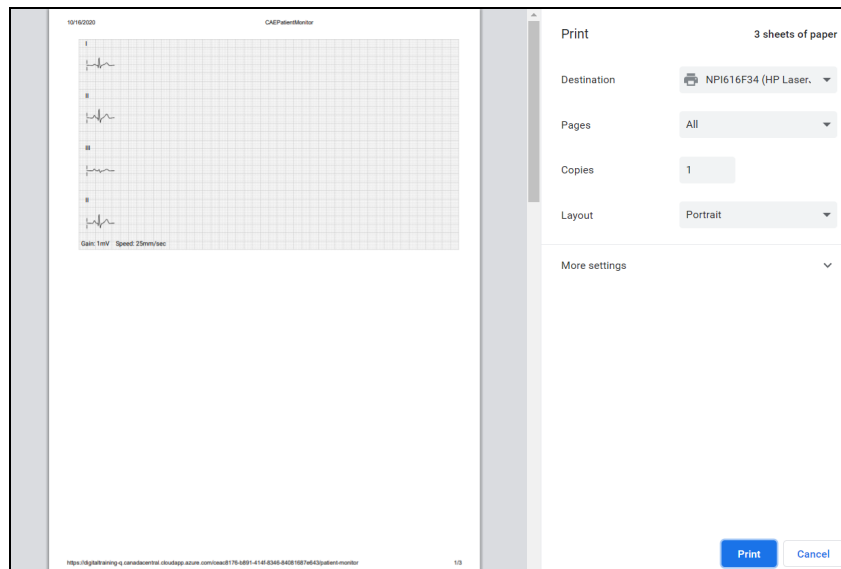
2. (Optional) To view the full screen, tap the **Full Screen View** button at the lower-right corner of the 12-lead ECG report.



Full Screen View and Print Buttons

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

USING THE CAE CTG

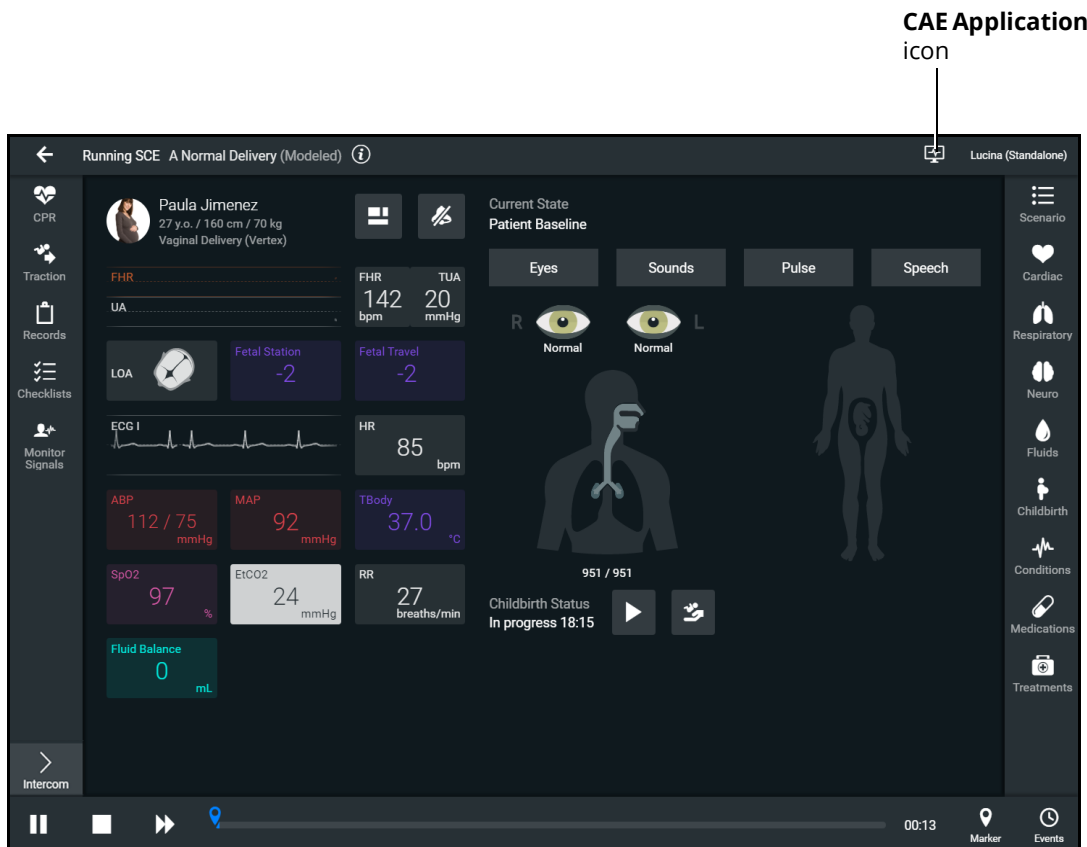
CAE’s CTG is one of the many types of equipment applications that CAE offers to enhance the simulation learning experience. The patient monitor emulates a typical bedside monitor and allows you to view the patient’s physiology, expressed in waveforms and numeric values. In this User Guide, information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

The software can be launched from the CAE Maestro Instructor Laptop, 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 CTG Monitor

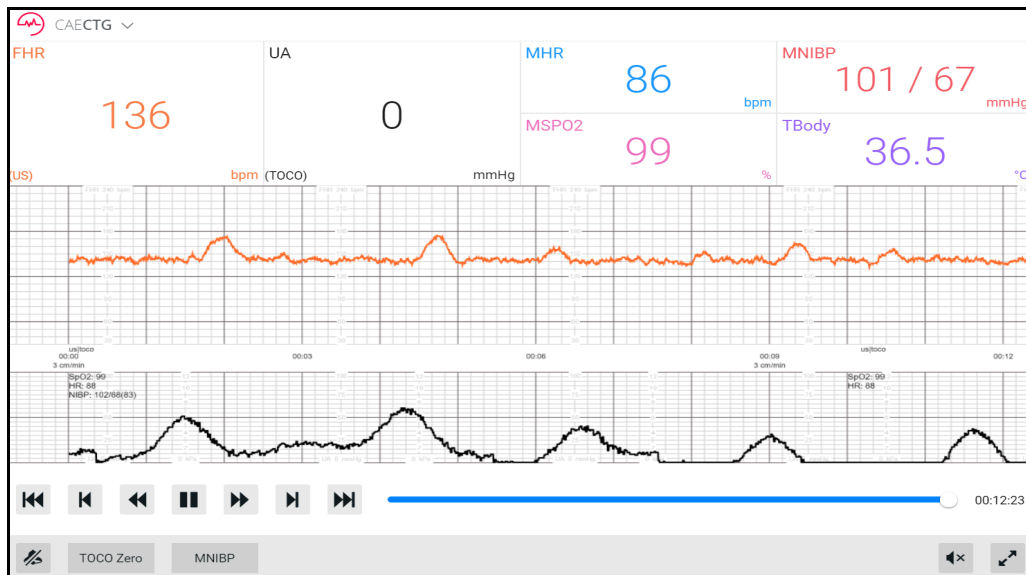
To launch CTG from the Instructor Workstation:

1. With an SCE running, select the **CAE CTG** icon in the upper-right corner of the SCE Run screen.



SCE Run Screen - CAE Software Icon

The patient monitor screen appears.



CAE CTG

The CAE CTG can also be accessed from the CAE Maestro Home screen. Click on the CAE Maestro Application drop-down menu in the upper-left corner of the screen and select **CAE CTG**.

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

Configuring CTG Alarms

There are three factors that determine CTG alarm behavior: alarm thresholds, alarm suspension time and audio settings.

Setting CTG Alarm Suspension Time

The alarm suspension time determines how long an alarm stays silent after it is manually muted using the Mute button in the lower-left corner of the display.

To adjust the alarm suspension time:

1. Tap **Settings** in the lower-right corner of the screen.
2. Tap **Alarm Suspension Time**.
3. Select the desired suspension time.
4. Tap the **Close** button.

Note: The alarm suspension time does NOT apply when all alarms are muted using the Mute button in the bottom left corner of the CTG monitor. When all alarms are muted, they remain muted until the user manually un-mutes them by pressing the Mute button in the bottom left corner of the CTG monitor a second time.

Setting CTG Alarm Thresholds

The CTG alarm thresholds define the acceptable ranges for the various parameters shown on the CTG monitor. When a parameter falls outside the acceptable range, the CTG alarm sounds.

The fetal heart rate (FHR) alarm only sounds when:

- FHR is below the acceptable range for at least 30 of the last 60 seconds.
- FHR is above the acceptable range for at least 150 of the last 300 seconds.
- An FHR probe is connected but no FHR data has been received for 90 of the last 180 seconds.

To set CTG alarm thresholds:

1. From the CTG Monitor, tap **Alarm** in the lower-left corner of the CTG display
2. From the Alarm Thresholds window, adjust the desired parameters using the **Increase** and **Decrease** buttons or the sliders next to parameters

Any parameter value that falls below the Low value or above the High value causes the CTG alarm to sound.
3. Tap anywhere outside the Alarm Thresholds window to close the window and return to viewing the CTG Monitor.

Adjusting Audio Settings

The CTG alarm sound can be changed or all alarms can be muted from the Audio Setup menu.

To change CTG audio settings:

1. Tap **Settings** in the lower-right corner of the screen.
2. Tap **Audio Setup**.
3. Select the desired alarm sound.
4. Tap the **Close** button.

MNIBP Cycling and Manual MNIBP

When maternal non-invasive blood pressure (MNIBP) displays, the MNIBP can be updated at specified intervals using MNIBP Cycling, or the current MNIBP can be displayed immediately.

To set MNIBP cycling to update the MNIBP at regular intervals:

1. Tap **Settings** in the lower-right corner of the CTG Monitor.
2. From the Settings menu, tap **MNIBP Cycling**
The Manual MNIBP screen opens.
3. Select the desired interval for the cycling. Tap **Start**.

Custom cycling is also available by selecting the Custom Cycling option from the MNIBP Cycling window.

To display the patient's current MNIBP, tap the **Manual MNIBP** button.

Note: Manual MNIBP can be used at any time during cycling. However, this turns off auto-cycling.

Viewing the CTG Strip

The lower portion of the CTG Monitor shows a CTG strip. This strip represents the paper strip that would be generated by a real CTG monitor.

To view CTG strip history, use the CTG strip navigation controls located in the lower-left corner of the CTG strip.

- **Back to Beginning:** skips back to the very beginning of the strip
- **Skip Back:** skips back one screen
- **Rewind:** moves the strip steadily backward so the user can view the strip as it moves along the monitor
- **Play:** causes the strip to move along the monitor at a normal speed, beginning from the currently displayed portion of the strip

Note: The Play button becomes a Pause button when the strip is running.

- **Fast-Forward:** moves the strip steadily forward so the user can view the strip as it moves along the monitor
- **Skip Forward:** skips forward one screen
- **Skip to End:** skips to the end of the strip

When the data on the screen is not current (e.g., the Rewind button has been used), the time bar turns blue.

When the strip returns to showing current data, the time bar turns white.

Changing the CTG Monitor Language

To change the language of the CTG Monitor:

1. Tap **Settings** in the lower-right corner of the CTG Monitor.
2. From the Settings menu, tap **Language Selection**.
The Languages screen opens.
3. Select a language. Tap **Accept**.

Resetting Tocography Noise

The tocography information can be adjusted to represent TOCO probe error. This is accomplished using the **TOCO Offset** parameter, accessed from the CTG Configuration Settings.

To eliminate probe error and restore TOCO Offset to the default zero value from the CTG Monitor, tap the **TOCO Zero** button in the lower-left corner of the CTG monitor.

Muting CTG Alarms

To mute CTG alarms, tap **Mute** in the lower-left corner of the CTG Monitor.

When all alarms are muted, they remain muted until the user manually un-mutes them by tapping Mute again.

Exiting the CTG Monitor

To exit the CTG monitor, tap **Settings** in the lower-right corner of the CTG Monitor. Tap **Shutdown**.

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APPENDIX A - PARAMETER DESCRIPTIONS

The Maestro software has a number of parameters that control the patient status and software-controlled features of the simulator.

The parameters are grouped by category: Cardiac, Respiratory, Neuro, Fluids, Childbirth, Eyes, Sounds,, and Speech.

The following is a brief description of each parameter. Each parameter description lists the default settings for the maternal patient as well as the ranges and/or controls for all patients.

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.

Default: Modeled or 93/74 (Manual mode)

Range:

- Systolic: 0 mmHg - 300 mmHg
- Diastolic: 0 mmHg - 300 mmHg

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.

The available CVP controls are as follows:

- Minimum Diastolic: Baseline of the CVP at the end of an inspiration
- Maximum Diastolic: Baseline of the CVP at the end of an exhalation
- Pulse Amplitude: Size of the CVP wave during atrial contraction

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.

- **Default:** Modeled or Manual mode as follows: Minimum Diastolic: -2 mmHg
- Maximum Diastolic: 2 mmHg
- Pulse Amplitude: 3 mmHg

Range:

- Minimum Diastolic: -10 mmHg - 25 mmHg
- Maximum Diastolic: -10 mmHg - 25 mmHg
- Pulse Amplitude: 0 mmHg - 50 mmHg

Pulmonary Artery Pressure (PAP)

The **PAP** parameter is used to set the pulmonary artery pressure. The systolic and diastolic pressures can both be set to fixed numeric values, regardless of interventions performed. The set change can also be programmed to occur over time using the onset control.

Default: Modeled or 15/10 (Manual mode)

Range:

- Systolic: 0 mmHg - 50 mmHg
- Diastolic: 0 mmHg - 50 mmHg

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.

Default: Modeled or 11 mmHg (Manual mode)

Range: -10 mmHg - 100 mmHg

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.

Default: Modeled or 89 bpm (Manual mode)

Range: 30 beats per minute - 220 beats per minute

Heart Rate Factor

The **Heart Rate Factor** parameter is used to change the baseline heart rate before physiological controls are taken into account. A value of 2 doubles the baseline heart rate, while a value of 0.5 decreases the heart rate by 50%. Use this parameter to raise or lower the heart rate.

Default: 1

Range: 0.10 - 4.00

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 occur over time using the onset control.

Default: Modeled or 5.9 L/min (Manual mode)

Range: 0 L/min - 30 L/min

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.

For cardiac rhythms without a number, the **Heart Rate Factor** parameter can be used to independently control the heart rate.

Default: Modeled or Sinus (Manual mode)

Options:

A

Asystole

Atrial Enlargement, Left

Atrial Enlargement, Right

Atrial Fibrillation

Atrial Flutter

Atrial Flutter 2:1

Atrial Flutter 4:1

Atrial Tachycardia

AV Block, First-Degree

AV Block, Second-Degree, Mobitz I

AV Block, Second-Degree, Mobitz II

AV Block, Third-Degree

AV Block, Third-Degree (Wide Complex)

B

Bundle Branch Block, Incomplete Right

Bundle Branch Block, Left

Bundle Branch Block, Right

H

Hypercalcemia

Hyperkalemia (Mild)

Hyperkalemia (Moderate)

Hyperkalemia (Severe)

Hypertrophy, Biventricular

Hypertrophy, Left Ventricular

Hypertrophy, Right Ventricular

Hypocalcemia

Hypokalemia

Hypothermia

I

Idioventricular

J

Junctional

L

Long QT Syndrome

M

Modeled

Myocardial Ischemia, Mild

Myocardial Ischemia, Moderate

Myocardial Ischemia, Severe

N

NSTEMI

P

Paroxysmal Junctional Tachycardia

Pericarditis

Premature Atrial Contraction

S

Sinus

Sinus Tachycardia

ST Elevation with Chest Pain

STEMI Anterior

STEMI Anterolatera

STEMI Inferior

STEMI Lateral

STEMI LBBB

STEMI Posterior

STEMI Septal

T

Torsade de Pointes

Trifascicular Block

V

Ventricular Fibrillation, Coarse

Ventricular Fibrillation, Fine

Ventricular Tachycardia

W

Wellen's Syndrome

Wide Complex Tachycardia

WPW Syndrome, Left Lateral Pathway

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.

Default: 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.

Default: Modeled or 0 (Manual mode)

Range: 0% - 90%

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.

Default: 30 bpm

Range: 10 to 50 bpm

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.

Default: Modeled or 11.8 (Manual mode)

Range: 10.0 g/dL - 20.0 g/dL

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.

Default: 1

Range: 0 - 10.00

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.

Default: 1

Range: 0 - 10.00

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.

Default: 0 ml

Range: 0 ml - 500 ml

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.

Default: ON

Options: ON/OFF

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.

Default: 1

Range: 1 - 1000

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.

Default: 1

Range: 1 - 1000

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.

Default: 1

Range: 0.10 - 10.00

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.

Default: 1

Range: 0.10 - 10.00

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.

Default: 1

Range: 1 - 1000

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.

Default: 1

Range: 0.10 - 100.00

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.

Default: 1

Range: 0.20 - 5.00

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.

Default: 1

Range: 0.20 - 5.00

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.

Default: 1

Range: 0.50 - 5.00

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.

Default: 1

Range: 0.20 - 5.00

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)].

Default: 1

Range: 0.10 - 100.00

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 maximum pressure and baroreceptor minimum pressure.

Default: 52 mmHg

Range: 20 mmHg - 160 mmHg

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 maximum pressure and baroreceptor minimum pressure.

Default: 112 mmHg

Range: 40 mmHg - 220 mmHg

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.

Default: 1

Range: 0.00 - 100.00

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.

Default: 1

Range: 0.00 - 10.00

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.

Default: 1

Range: 1.00 - 10.00

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.

Default: 0.45

Range: 0.10 - 5.00

Model-Driven ECG Rhythm	Ischemic Index (I.I.)
Normal Sinus Rhythm (NSR)	$I.I. \geq 0.90$
Mild ST Segment Depression	$0.90 > I.I. \geq 0.70$
Moderate ST Segment Depression	$0.70 > I.I. \geq 0.60$
Premature Ventricular Contractions (PVCs)	$0.60 > I.I. \geq 0.40$
Ventricular Tachycardia (VTach)	$0.40 > I.I.$

Model-Driven ECG Rhythm	Ischemic Index (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.

Default: 0.99

Range: 0.50 - 1.00

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.

Default: 0 Joules

Range: 0 Joules - 360 Joules

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.

Default: 50 mA

Range: 0 mA - 119 mA

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**.

Default: 0 mA

Range: 0 mA - 200 mA

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**.

Default: 80 beats per minute

Range: 0 beats per minute - 119 beats per minute

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.

Default: OFF

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.

Default: OFF

Bronchial Resistance Factor (Left and Right)

The **Bronchial Resistance Factor** parameter can be used to set the rate of left and right bronchial resistance individually. The rate of resistance can also be set to occur over time.

Default: 1

Range: - 250,000.00

Respiratory Rate

The **Respiratory Rate** parameter is used to set the respiratory rate to a given number of breaths per minute. 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.

Default: 13 (Manual mode)

Range: 0 breaths per minute - 40 breaths per minute

Respiratory Rate Factor

The **Respiratory Rate Factor** parameter (along with the **Tidal Volume Factor** parameter) is used to change the baseline respiratory rate (before the control-of-breathing and drug influences are taken

into account). A value of 2 doubles the baseline respiratory rate. A value of 0.5 decreases the baseline respiratory rate by 50%. Changing the respiratory rate using this parameter maintains the physiological models.

Default: 1

Range: 0.01 - 6.00

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

Shunt Fraction

The Shunt Fraction parameter is frequently used to assist in desaturating a patient. This parameter creates a physiologic “bypass” of the normal pulmonary circulation, resulting in changes in O₂, CO₂ and anesthetic gases at the alveolar level. Typically, values of 0.1 to 0.4 are needed to create large alveolar-arterial oxygen gradients sufficient to cause arterial hypoxemia.

Default: 0.02

Range: 0.00 - 0.50

TIP: If the parameter is set high (0.5), the patient desaturates rapidly and responds negatively to the administration of supplemental O₂.

EtCO₂

The EtCO₂ parameter is used to set the end-tidal CO₂ 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 CO₂ value. Setting the EtCO₂ has no effect on the arterial carbon dioxide values (PaCO₂), respiratory rate or tidal volume.

For example, when the EtCO₂ is set to 50 mmHg, the numeric end-tidal CO₂ will display a value of 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.

Default: Modeled

Range: 0 mmHg – 100 mmHg

Tidal Volume

The **Tidal Volume** parameter is used to set 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. In Manual mode, the set change can also be programmed to occur over time using the onset control.

Default: Modeled or 761 mL (Manual mode)

Range: 0 mL - 2500 mL

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.

Default: 2.0

Range: 0.5 - 7.0

Fraction of Inspired O₂ (FiO₂)

This parameter is used to simulate changes in the **FiO₂**, such as would occur with the administration of supplemental oxygen.

Default: 21%

Range: 0% - 100%

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.

Default: 0.0 cmH₂O

Range: 0.0 cmH₂O - 25.0 cmH₂O

SpO₂

The SpO₂ parameter is used to override the normal pulmonary circulation and set the SpO₂ at a fixed numeric value, regardless of the oxygen applied.

Default: 98%

Range: 0% - 100%

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%.

Default: 1

Range: 0.10 - 4.00

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

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

Default: 0 mL

Range: 0 mL - 2500mL

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**.

Default: 3900

Range: 1500 - 3900

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.

Default: 1

Range: 0.15 - 10.00

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)**.

Default: 1

Range: 0.10 - 10.00

Functional Residual Capacity

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

Default: 1840 mL

Range: 500 mL - 4000 mL

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.

Default: 1

Range: 0.15 - 10.00

PaCO₂ Set-point

The **PaCO₂ Set-point** parameter is a set-point for PaCO₂. The control-of-breathing model adjusts tidal volume and respiratory rate in order to bring the PaCO₂ toward this set-point. Factors that influence the success of this control effort include baseline tidal volume, baseline respiratory rate,

respiratory gain, O₂ 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 **PaCO₂ 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 PaCO₂ toward 50 mmHg. When the PaCO₂ reaches the new set-point, the simulator's respiratory rate and tidal volume should return to normal values.

Default: 30.9 mmHg

Range: 20.0 mmHg - 70.0 mmHg

PaO₂ Set-point

The **PaO₂ Set-point** parameter is a set-point for PaO₂. When PaO₂ 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 PaO₂ moving closer to the set-point. Factors that influence this control effort include baseline tidal volume, baseline respiratory rate, respiratory gain, O₂ 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 PaO₂ above the set-point.

For example, if **PaO₂ Set-point** is set to 100 mmHg and PaO₂ drops to 90 mmHg, ventilatory stimulation occurs. When the PaO₂ reaches the new set-point, the simulator's respiratory rate and tidal volume are again controlled to maintain PaCO₂ at the PaCO₂ set-point. Also, see **PaCO₂ Set-point**.

Default: 98.799mmHg

Range: 20.0 mmHg - 100.0 mmHg

PetCO₂ - PaCO₂ 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.

Default: 1

Range: 0.9 - 10.0

Respiratory Gain Factor

The **Respiratory Gain Factor** determines how strong an influence arterial CO₂ levels have on the simulated patient's tidal volume and respiratory rate. Under default conditions (value = 1), when arterial CO₂ 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 CO₂ 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.

Default: 1

Range: 0.00 - 10.00

Volume/Rate Control Factor

Ventilatory responses to increased arterial carbon dioxide or decreased arterial oxygen may take the form of increased tidal volume, increased respiratory rate, or both. The **Volume/Rate Control Factor** determines these relative changes. At a value of 1, increased and decreased ventilatory drive affect tidal volume and respiratory rate equally. When the **Volume/Rate Control Factor** is greater than 1, increased or decreased minute ventilation is predominantly achieved by changes in tidal volume. When the **Volume/Rate Control Factor** is less than 1, ventilatory changes are affected primarily by changes in respiratory rate.

For example, set the **Volume/Rate Control Factor** to 0.1 and increase the shunt fraction to 0.4 to decrease the arterial O₂. The patient responds to falling arterial oxygen levels with increased minute ventilation. Increasing the respiratory rate with minimal increase in tidal volume produces this.

Default: 1

Range: 0.1 - 10.0

Venous CO₂ Shift

The **Venous CO₂ Shift** parameter affects the partial pressure of CO₂ in the venous blood. Changing this parameter allows large and rapid shifts in total body CO₂ concentration. Increases in alveolar and arterial CO₂ follow rapidly in a physiologically correct magnitude and time course.

This parameter is useful for giving a "bolus" of CO₂ to the venous system. The alveolar and arterial CO₂ 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 CO₂. Therefore, the rise in CO₂ levels is only transitory. This parameter can be used to simulate external CO₂ administration such as that used during laparoscopy.

Note: *This parameter is only intended to be used 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 CO₂ Shift** parameter has been applied, unexpected behavior may occur when the SCE or patient is reloaded.*

Default: 0 mmHg

Range: 0.0 mmHg - 60.0 mmHg

pH Shift

Default: 0.8
Range: 0.70 - 1.10

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 CO₂ values. Under default conditions (PaCO₂ = 40 mmHg), the pH is approximately 7.4. Rising arterial CO₂ produces a subsequent drop in pH, while falling arterial CO₂ 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.

Default: -0.08

Range: -(0.50) - 0.50

O₂ Consumption

The **O₂ Consumption** parameter is used to change the rate of consumption of oxygen and production of carbon dioxide. When **O₂ Consumption** is increased and used with increased **Shunt Fraction**, profound levels of hypoxia can be achieved rapidly.

Default: 330 mL per minute

Range: 0 mL per minute - 2000 mL per minute

CO₂ Production Factor

The **CO₂ Production Factor** parameter allows for the manipulation of metabolic CO₂ production to simulate a variety of pathophysiological conditions. CO₂ production is determined by the **O₂ Consumption** and **Respiratory Quotient** settings. A CO₂ Production Factor value of 2 doubles the CO₂ production, while a value of 0.5 decreases the CO₂ production by 50%.

Default: 1

Range: 0.50 - 4.00

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.

Default: 0.8

Range: 0.70 - 1.10

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.

Default: Modeled

Range: 0.00% - 5.00%

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.

Default: 0%

Range: 0.00% - 5.00%

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.

Default: Modeled

Range: 0.00% - 5.00%

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.

Default: 0%

Range: 0.00% - 5.00%

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.

Default: 0.00%

Range: 0.00% - 80.0%

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.

Default: 0%

Range: 0.00% - 80.0%

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.

Default: Modeled

Range: 0.00% - 8.00%

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.

Default: 0%

Range: 0.00% - 8.00%

Neurological:

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.

Default: Modeled or 0 (Manual)

Range: 0% - 100%

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.

Default: Modeled or 9.1 mmHg (Manual mode)

Range: 0 mmHg - 65.0 mmHg

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.

The 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.

Default: 36.5°C

Range: 32.0°C - 42.0°C

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.

Default: 37°C

Range: 32.0°C - 42.0°C

Convulsions

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

Default: OFF

Childbirth: Basic Parameters

FETUS

FHR Baseline

The **FHR Baseline** parameter determines the baseline of the fetal heart rate signal. When set to modeled, the baseline will be dependent on the fetus’ oxygen levels and arterial blood pressure.

When overridden, the fetal heart rate will still be susceptible to accelerations and early decelerations. This parameter is defined in beats per minute (bpm).

Default: Modeled

Range: 30 bpm - 240 bpm

Early Deceleration Magnitude

The **Early Deceleration Magnitude** parameter determines the magnitude of the early decelerations in the fetal heart rate signal. The selectable options are None, Mild, Moderate and Severe.

Default: None

Late Deceleration Amplification Factor

Fetal heart rate (FHR) late decelerations associated with uterine contractions (UCs) are attributed to reductions in oxygen supply from the mother. The **Late Deceleration Amplification Factor** parameter allows for greater control over the amplitude of late decelerations in conditions where they would be expected, notably for the fetal patient with placental insufficiency. In addition, use of this parameter allows the instructor to demonstrate late decelerations for the normal fetus in the cases of maternal hypotension and uterine hyperactivity.

The Late Deceleration Amplification Factor is a multiplicative factor applied to the oxygen distribution in the fetus. Values above 1.0 speed up the propagation of reduced oxygen levels from the placenta to the fetal arteries.

Default: 1.0

Range: 1.0 – 5.0

Variable Deceleration Shape (Manual Mode Only)

The Variable Deceleration Shape parameter, the user can control the morphology of variable decelerations without affecting their amplitude. The user can select from the options “U”, “V”, and “W”, which resemble the resulting shape.

Default: U

Options:

- U
- V
- W

Variable Deceleration Probability (Manual Mode Only)

The Variable Deceleration Probability parameter, the user can control the probability of a variable deceleration occurring with a given uterine contraction. This parameter also controls how likely it is to see a variable deceleration occur independently of uterine contractions. The unit is %.

Default: 0

Range: 0 - 100

Variable Deceleration Shouldering (Manual Mode Only)

The Variable Deceleration Shouldering parameter, the user can control whether or not the variable decelerations will be preceded and followed by small accelerations in the fetal heart rate.

Default: OFF

Variable Deceleration Amplitude (Manual Mode Only)

The Variable Deceleration Amplitude parameter, the user can control the size of variable decelerations relative to baseline. The units are bpm.

Default: 0

Range: 0 - 60

Variable Deceleration Duration (Manual Mode Only)

The Variable Deceleration Duration parameter the user can control the duration of variable decelerations. This duration does not include the duration of the shoulders, if present. The units are seconds.

Default: 60

Range: 15 - 120

Fetal State

The **Fetal State** parameter determines the state of the fetus during labor and can be set to **Calm Sleep**, **Active Sleep** or **Active Vigilance**.

Default: Active Sleep

FHR Variability Coefficient

The **FHR Variability Coefficient** parameter determines the variability present in the fetal heart rate signal. When set to modeled, the variability will be dependent on the fetus' oxygen levels and the fetal state. This parameter is not defined in bpm, it is a unitless factor.

Default: Modeled

Range: 0 - 5

FHR Acceleration Amplitude

The **FHR Acceleration Amplitude** parameter determines the amplitude of the accelerations in the fetal heart rate signal. When set to modeled, it is dependent on the fetus' oxygen levels and the fetal

state. The acceleration amplitude has some variability associated with it. This parameter is defined in bpm.

Default: Modeled

Range: 0 bpm - 20 bpm

FHR Acceleration Interval

The **FHR Acceleration Interval** parameter determines the interval between the accelerations in the fetal heart rate signal. When set to modeled, it is dependent on the fetal state. The acceleration interval has some variability associated with it. This parameter is defined in minutes.

Default: Modeled

Range: 1 min - 40 min

FHR Acceleration Duration

The **FHR Acceleration Duration** parameter determines the duration of the accelerations in the fetal heart rate signal. When set to modeled, it is dependent on the fetal state. The acceleration duration has some variability associated with it. This parameter is defined in seconds.

Default: Modeled

Range: 20 sec - 60 sec

LABOUR

Rate of Descent

The **Rate of Descent** parameter controls the rate of fetal descent during labor (cm/minute). The fetus descends only during contractions. Therefore, if there are no contractions, even if the rate of descent is set to maximum, the fetus will remain at the same position.

Default: 1.0 cm/minute

Range: 0 cm/minute – 15 cm/minute

Maternal Position

The **Maternal Position** parameters indicates the maternal position. By default, maternal position is set to **Auto**.

In **Auto**, the system is capable of detecting the following maternal positions:

- Unknown
- Supine
- Left Lateral Tilt
- Trendelenburg
- Reverse Trendelenburg

Three additional positions that need to be manually set are:

- Hands and Knees
- Squatting
- Sitting

Note: *Ensure the abdomen is installed on the torso whenever the manikin is positioned upright.*

Contraction Frequency

The **Contraction Frequency** parameter determines how often uterine contractions occur. This parameter is defined as the number of contractions per ten minutes. The contraction frequency parameter has some variability. The magnitude of the variability is determined by the **Contraction Frequency Variability** parameter, found in the Fetal & Labor Additional Parameters.

Default: 3 ctx/10 min

Range: 1 ctx/10 min - 7 ctx/10 min

Contraction Amplitude

The **Contraction Amplitude** parameter determines the amplitude of the uterine contractions. This parameter is defined in units of mmHg. The contraction amplitude has some variability. The magnitude of the variability is determined by the Contraction Amplitude Variability parameter found in the Fetal & Labor Additional Parameters.

Default: 50 mmHg

Range: 0 mmHg - 120 mmHg

Contraction Duration

The **Contraction Duration** parameter determines the length of the uterine contractions and is defined in units of seconds.

Default: 80 sec

Range: 0 sec - 120 sec

Patient Pushing

The **Patient Pushing** parameter determines whether the patient will be pushing during contractions. When this parameter is activated (On), there will be increased variability and increased peak height of both the intrauterine pressure and transabdominal uterine activity signals during a large contraction.

Default: OFF

Contraction Resting Tone

The **Contraction Resting Tone** parameter determines the uterine pressure level when there are no active contractions. This parameter is defined in units of mmHg. The contraction resting tone has some variability. The magnitude of this variability is determined by the UA Noise parameter.

Default: 10 mmHg

Range: 0 mmHg - 100 mmHg

Contraction Frequency Variability

The **Contraction Frequency Variability** parameter determines the variability present in the frequency of uterine contractions. This parameter is defined as a percentage.

Default: 100%

Range: 0% - 100%

Contraction Amplitude Variability

The **Contraction Amplitude Variability** parameter determines the variability present in the amplitude of uterine contractions. This parameter is defined as a percentage.

Default: 100%

Range: 0% - 100%

SHOULDER DYSTOCIA

Shoulder Dystocia

The **Shoulder Dystocia** parameter needs to be set to **ON** to activate the condition of Shoulder Dystocia. When **Enabled**, fetal descent will be interrupted when the fetal head has been delivered and restituted. Shoulder Dystocia will be logged in the event log, and the numeric station indicator in the Graphic widget will display.

When **Shoulder Dystocia** is enabled, a specific maneuver can be selected that will resolve the shoulder dystocia.

Default: OFF

Shoulder Dystocia Resolution

Shoulder Dystocia Resolution Parameter

The **Shoulder Dystocia Resolution** parameter determines what maneuver, if any, will resolve shoulder dystocia. Six options are available: None, McRoberts, Suprapubic Pressure, Rotation of Posterior Shoulder, Rotation of Anterior Shoulder, and Zavanelli. By default, shoulder dystocia resolution is set to None.

McRoberts Option

The **McRoberts** option activates the automatic resolution of shoulder dystocia upon the detection of the McRoberts maneuver performed correctly. Upon detection, "*McRoberts maneuver was performed*" and "*Shoulder dystocia condition resolved*" will be logged in the event log. Once shoulder dystocia is resolved, the fetus continues to be pushed, during the contractions, through the birth canal until reaching the final position. At the final position, the fetus is released from the birthing mechanism and is ready to be manually delivered.

Suprapubic Pressure Option

The **Suprapubic Pressure** option activates the automatic resolution of shoulder dystocia when suprapubic pressure applied. The right force needs to be applied for at least 5 seconds to resolve the condition. Upon detection, "*Suprapubic pressure was applied*" and "*Shoulder dystocia condition resolved*" will be logged in the event log. Once shoulder dystocia is resolved, the fetus continues to be pushed, during the contractions, through the birth canal until reaching the final position. At the final position, the fetus is released from birthing mechanism and is ready to be manually delivered.

Rotation of Posterior Shoulder Option

The **Rotation of Posterior Shoulder** option activates the automatic resolution of shoulder dystocia upon detection of proper rotation of the posterior shoulder. Upon detection, "*Posterior shoulder rotation maneuver was performed*" and "*Shoulder dystocia condition resolved*" will be logged in the event log. Once shoulder dystocia is resolved, the fetus is released from the birthing mechanism and can be manually delivered. Proper rotation of the posterior shoulder requires that the posterior shoulder is rotated at least 35°. Improper rotation of the posterior shoulder is prevented.

For example, if after restitution, the fetus is in LOT position, automatic resolution of shoulder dystocia requires that the posterior shoulder is rotated clockwise at least 35°. In LOT position, rotating the posterior shoulder counter-clockwise is prevented.

Rotation of Anterior Shoulder Option

The **Rotation of Anterior Shoulder** option activates the automatic resolution of shoulder dystocia upon detection of proper rotation of the anterior shoulder. Upon detection, "*Anterior shoulder rotation maneuver was performed*" and "*Shoulder dystocia condition resolved*" will be logged in the event log. Once shoulder dystocia is resolved, the fetus is released from the birthing mechanism and can be

manually delivered. Proper rotation of the anterior shoulder requires that the anterior shoulder is rotated at least 35°. Improper rotation of the anterior shoulder is prevented.

For example, if after restitution, the fetus is in LOT position, automatic resolution of shoulder dystocia requires that the anterior shoulder is rotated counter-clockwise at least 35°. In LOT position, rotating the anterior shoulder clockwise is prevented.

Zavanelli Option

The **Zavanelli** option activates the automatic resolution of shoulder dystocia upon detection of proper Zavanelli performed. When in shoulder dystocia, the simulator allows the learner to manually push the fetus backwards through the birth canal, in between contractions. A successful Zavanelli maneuver is detected when the fetus is pushed up the descent mechanism a distance of approximately 6cm. Upon detection, "*Zavanelli maneuver was performed*" and "*Shoulder dystocia condition resolved*" will be logged in the event log.

The fetus must be powered on and connected to the simulator's wireless network and confirmed by the presence of a fetal battery charge status in the fetal battery status icon. The connection is required in order for the system to recognize the applied force to the head of the fetus as the learner attempts Zavanelli.

Extraction of Posterior Arm

The **Extraction of Posterior Arm** maneuver to resolve shoulder dystocia is not detected automatically. When a proper extraction has been performed, the Extraction of Posterior Arm parameter should be manually activated. Selecting the **Extract** button resolves shoulder dystocia and immediately releases the fetus that can now be manually extracted.

ARRESTED LABOUR

Arrested Labour

The **Arrested Labour** parameter should be set to **ON** to activate the condition of arrested labor. Enabling Arrested Labor leads to the interruption of fetal descent, once the fetus has reached the trigger station. The message "*Arrested labour set to On*" will be logged in the event log.

Default: OFF

Arrested Labour Trigger Station

The **Arrested Labour Trigger Station** parameter sets the fetal position at which the arrested labor condition will be applied. Arrested labor can be performed between station -3 and 3.

Default: 0

Range: -(3) - 3

Arrested Labour Resolved by Traction

The Arrested Labour Resolved by Traction parameter activates/deactivates (ON/OFF) the automatic resolution of arrested labor upon detection of the required traction force. Upon detection of an adequate force applied during uterine contractions, "Traction was applied to the fetus" and "Arrested labor condition resolved" will be logged in the event log.

Once the arrested labor condition resolved, the fetus can be pulled, during contractions, through the birth canal until reaching the final position. At the final position, the fetus is released from the birthing mechanism and is ready to be manually delivered.

Default: OFF

Traction Force Required to Resolve Arrested Labour

The **Traction Force Required to Resolve Arrested Labour** parameter sets the traction force required to resolve the arrested labor. Traction force is measured in Newtons.

Default: 50 N

Range: 10 N - 100 N

POSTPARTUM

Uterine Massage

The **Uterine Massage** parameter determines the effect of massage on the postpartum boggy/contracted uterus.

Possible choices are:

- **Ineffective** - Massage of the uterus does not cause it to contract
- **Effective** - With **Effective**, successful compression of the uterus will fully contract the boggy uterus. Five effective compressions are required before contraction occurs. The feel of the uterus will not change for the first four massages, i.e., the uterus stays fully boggy for massages one through four. With the fifth massage, the uterus fully contracts over approximately 90 seconds and the message "Boggy uterus was declared resolved" appears in the event log.
- A single massage/compression consists of pressing, holding, and releasing the uterus. With each successful massage, the message "Uterine compression was applied" is logged in the event log, independent of uterus mode (**Effective** or **Recurring atony**). In order to completely contract the uterus, one must execute five successful compressions in **Effective** or **Recurring atony** mode.
- Additionally, when **Vaginal Bleeding Severity** is active (Mild, Moderate, Severe, or Profuse), each massage will produce a gush of blood in addition to the bleeding enabled by the vaginal bleeding severity parameter (see **Vaginal Bleeding** in the *Using Fidelis Lucina* section of this guide). This gush of blood occurs every time one presses on the uterus,

whether or not the message "Uterine compression was applied" is logged in the event log, and is independent of the uterus mode (**Effective** or **Recurring atony**).

- **Recurring atony** - With **Recurring atony**, the function is similar to **Effective** (i.e., the boggy uterus contracts after five successful logged massages). However, 90 seconds after contraction the uterus returns to the boggy state, and the message "Boggy uterus was declared resolved" does not appear in the event log.

In this mode, if massage is interrupted for 90 seconds or longer before it fully contracts, the massage count is reset, even when the uterine compressions are marked as effective (i.e., logged as "Uterine compression was applied").

For example, if the learner applies three logged massages then waits 90 seconds or longer to apply the next massage, the 'massage count' resets. From this point, five effective consecutive massages (i.e., without interruption) are required before the uterus contracts.

Resolve Boggy Uterus

The **Resolve Boggy Uterus** parameter is relevant only for the postpartum boggy/contracted uterus.

Activation of this parameter causes the boggy uterus to contract, regardless of uterine massage. When contraction of the uterus is desired, the Resolve Boggy Uterus parameter should be manually activated.

Inverted Uterus Can Be Resolved

The **Inverted Uterus Can Be Resolved** parameter is relevant only for the postpartum inverted uterus. When set to **ON**, manual resolution of the inverted uterus is possible.

Default: ON

OTHER

Manual Release of the Baby

The **Manual Release of the Baby** parameter is used to manually release the fetus from the birthing mechanism at any time and make the fetus ready for delivery. Upon activation, a "Release now" confirmation button appears. Clicking the button immediately releases the fetus. Clicking anywhere else on the screen cancels the action.

Childbirth: Advanced Parameters

Umbilical Cord Compressibility Factor

The **Umbilical Cord Compressibility Factor** determines how susceptible the umbilical cord is to compression through uterine contractions. The primary use of this parameter is to introduce variable decelerations to the fetal heart rate signal due to uterine contractions. The parameter also allows for the scaling of these decelerations.

Default: 0

Range: 0 - 2.0

Placental Perfusion Factor

The **Placental Perfusion Factor** parameter determines how easily blood flows into the placenta from the maternal circulation. Lowering this factor results in a decreased blood flow and oxygen supply to the fetus, leading to a gradual decrease in fetal heart rate, and a general deterioration of the fetus' condition. The effect of this parameter is independent of uterine contractions.

Default: 1.0

Range: 0 - 10

Umbilical Flow Factor

The **Umbilical Flow Factor** parameter determines how easily blood flows into and out of the fetal side of the placenta. Lowering this factor results in a decrease in blood flow and oxygen supply to the fetus' heart, as well as an increase in the fetus' blood pressure, leading to a decrease in fetal heart rate, and a general deterioration of the fetus' condition. This effect occurs much quicker with this parameter compared to the Placental Perfusion Factor parameter. The effect of this parameter is independent of uterine contractions.

Default: 1.0

Range: 0 - 1.0

Fluids

There are three categories of fluids: BLEEDING and INFUSION.

BLEEDING

Fluid Loss Blood

When used, the **Fluid Loss Blood** parameter allows users to apply a decrease in total blood volume. Blood loss proportionally decreases both the red blood cell volume and the plasma volume according to the current hematocrit.

Range: 0 mL - 6000mL

Fluid Loss Plasma

When used, 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.

Range: 0 mL - 6000 mL

MANIKIN BLEEDING

Vaginal Bleeding Severity

This parameter is used to control the severity of vaginal bleeding when the **Vaginal Bleeding** parameter is turned **On**.

Default: None

Options:

- None
- Mild
- Moderate
- Severe
- Profuse

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.

Range: 0 mL - 6000 mL

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).

Range: 0 mL - 6000 mL

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.

Range: 0 mL - 6000 mL

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.

Range: 0 mL - 6000 mL

Eyes

The following Eyes settings apply to Lucina with SymEyes installed.

Blink Mode

The **Slow**, **Normal**, **Fast**, and **Rapid** 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.

Default: Normal

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.

Default: Disabled

Light Reactivity

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

Default: Brisk

Pupil Diameter

Settings allow the user to fix one or both pupils to a specific size.

Default: 5 mm

Range: 2 mm - 5 mm

Condition

Eight (8) eye conditions are available for selection in the neurological patient controls window.

Default: None

Options:

- Normal (both eyes)
- Jaundice (both eyes)
- Bloodshot (both eyes)
- Hemorrhage (right eye)
- Hemorrhage (both eyes)
- Keyhole Pupil (right eye)
- Droopy Eyelids (both eyes)
- Cataracts (both eyes)

Panning

Panning enables random eye movement (left to right).

Default: ON

Consensual Pupil Response

Setting the **Consensual Pupil Response** option to **ON** enables synchronized pupil reactivity between both eyes. When enabled (default action), shining a light in either eye will cause the opposite eye to also react. When disabled, only the pupil of the eye where light is shined will react.

Default: ON

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.

Locations:

- Aortic
- Mitral
- Pulmonic
- Tricuspid

To affect the heart sounds simultaneously in all anatomical regions, select **All** and the desired sound.

Default: Normal

Type:

- Normal
- S3
- S4
- S3 and S4
- Early Systolic Murmur
- Mid Systolic Murmur
- Late Systolic Murmur
- Late Diastolic Murmur

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**. The Lung Sounds menu will appear.

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

Locations:

- Left Upper
- Left Lower
- Right Upper
- Right Lower

To change breath sounds, select the desired sound from the **Lung Sounds** menu.

Default: Normal

Type:

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

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**. The Bowel Sounds menu will appear.

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

Type:

- Normal
- Hypoactive
- Hyperactive

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

Locations:

- Left Upper
- Right Upper
- Left Lower
- Right Lower

To affect the bowel sounds simultaneously in all anatomical regions, select **All Bowel Sounds** and the desired sound.

Default: Normal

Note: The volume control slider underneath each area may be used to adjust the amplitude of the sound. The volume control slider is only enabled while connected to a simulator.

Pulses

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.

The pulse intensity can be set to:

- Absent
- Weak
- Normal
- Bounding

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

Vocal Sounds and Speech

Vocal sounds are selected using this parameter.

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

Default: None

Vocal Sound Types:

- None
- Gagging
- Gasping
- Groaning
- Loud Cough
- Short Loud Cough
- Short Soft Cough
- Crying
- Wheezing
- Mumbling
- Screaming
- Coughing
- Grunt
- Soft Cough
- Aching
- Dull
- Pressure
- Sharp
- Stabbing
- Ouch
- Scream

Conversation Sound Types:

- Sorry, I didn't understand
- No
- Sometimes
- Yes
- Is everything ok?
- How much longer?
- I'll try
- Hello
- Yes I am
- Not at the moment
- Don't touch me
- What's happening?
- Yes, thank you
- Good afternoon
- Ok
- Could you say that again?
- 0
- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- 10, 9, 8, 7, 6...

Symptoms Sound Types:

- It's very hot in here
- My mouther feels tingly
- I can't feel my legs
- It's so cold in here
- It hurts
- I'm feeling dizzy
- My ears are ringing
- My back huts
- I'm not feeling very well
- I can't breathe
- My belly hurts
- My chest is tight
- My leg hurts
- Ow, that hurts
- My head hurts so...
- I'm feeling well
- Everything looks blurry
- My stomach hrts
- I'm really nervous
- I feel so nauesous
- I'm very tired
- OUCH!
- I feel very weak
- IT HURTS!

Childbirth Sound Types:

- I don't feel the baby
- I want to push. Can...
- It's like a tearing pain
- I want an epidural
- I'm starting to feel the urge
- THE BABY IS COMING!
- How far along am I?
- I feel like I am tearing
- I everything alright with...

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

CTG Configuration Parameters

FHR Probe

The **FHR Probe** parameter determines the type of probe used for fetal heart rate monitoring.

Possible selection includes:

- **Disconnected** – No probe is currently connected. The UA widget will display a “-” to indicate there is no probe and there will be no UA graph generated
- **US** – An external probe is in use
- **FECG** – An internal probe is in use
- **Default:** US

UA Probe

The **UA Probe** parameter determines the type of probe used for uterine activity.

Possible selection includes:

- **Disconnected** – No probe is currently connected. The FHR widget will display a “-” to indicate there is no probe and there will be no FHR graph generated
- **TOCO** – An external probe is in use. Noisy measurement
- **IUP** – An internal probe is in use. Accurate measurement
- **Default:** TOCO

MHR Probe

The **MHR Probe** parameter indicates if the emulated CTG has the capability to monitor the maternal heart rate and if the relevant probe is connected.

Possible selection includes:

- **Not Available** – The emulated CTG does **not** have the capability to display the maternal heart rate. No MHR widget is displayed on the CTG. Unused reserved space is reallocated to the available widgets to minimize visual impact.
- **Connected** – The emulated CTG **does** have the capability to display the maternal heart rate and a probe is connected. The MHR widget is displayed and provides live measurement of the maternal heart rate.
- **Disconnected** – The emulated CTG does have the capability to display the maternal heart rate but no probe is connected. The MHR widget is displayed but displays “-” to indicate no data is being received.
- **Default:** Connected

MSPO₂ Probe

The **MSPO₂ Probe** parameter indicates if the emulated CTG has the capability to monitor the maternal oxygen saturation and if the relevant probe is connected.

Possible selection includes:

- **Not Available** – The emulated CTG does **not** have the capability to display the maternal oxygen saturation. No SpO₂ widget is displayed on the CTG. Unused reserved space is reallocated to the available widgets to minimize visual impact.
- **Connected** – The emulated CTG **does** have the capability to display the maternal oxygen saturation and a probe is connected. The SpO₂ widget is displayed and provides live measurement of the maternal oxygen saturation.
- **Disconnected** – The emulated CTG does have the capability to display the maternal oxygen saturation but no probe is connected. The SpO₂ widget is displayed but displays “-” to indicate no data is being received.
- **Default:** Connected

MNIBP Probe

The **MNIBP Probe** parameter indicates if the emulated CTG has the capability to monitor the maternal blood pressure (non-invasive measurement) and if the relevant probe is connected.

Possible selection includes:

- **Not Available** – The emulated CTG does **not** have the capability to display the maternal blood pressure. No MNIBP widget is displayed on the CTG. Unused reserved space is reallocated to the available widgets to minimize visual impact.
- **Connected** – The emulated CTG **does** have the capability to display the maternal blood pressure and a probe is connected. The MNIBP widget is displayed and provides live measurement of the maternal non-invasive blood pressure.
- **Disconnected** – The emulated CTG does have the capability to display the maternal blood pressure but no probe is connected. The MNIBP widget is displayed but displays “-” to indicate no data is being received.
- **Default:** Connected

Temp Probe

The **Temp Probe** parameter indicates if the emulated CTG has the capability to monitor the maternal temperature and if the relevant probe is connected.

Possible selection includes:

- **Not Available** – The emulated CTG does **not** have the capability to display the maternal temperature. No Temp widget is displayed on the CTG. Unused reserved space is reallocated to the available widgets to minimize visual impact.
- **Connected** – The emulated CTG **does** have the capability to display the maternal temperature and a probe is connected. The temp widget is displayed and provides live measurement of the maternal temperature.
- **Disconnected** – The emulated CTG does have the capability to display the maternal temperature but no probe is connected. The Temp widget is displayed but displays “-” to indicate no data is being received.
- **Default:** Connected

FHR Signal Loss

The **FHR Signal Loss** parameter controls the overall quality of the fetal heart rate signal to emulate quality of the probe installation. This parameter indicates the relative amount of signal loss as a percentage. 0% is a clean signal with no loss. 100% results in no signal. Intermediary values create progressively larger gaps of data on the graph. The FHR widget displays “-” when there is no valid data. This parameter is applied, regardless of the probe type. Instructors can create various FHR signal quality scenarios by using this control and the probe type selection.

Default: 0

Range: 0 - 100

UA Signal Loss

The **UA Signal Loss** parameter controls the overall quality of the uterine activity signal. When set to “yes”, the uterine activity signal is set to 0 regardless of the probe type.

Default: No

TOCO Offset

The **TOCO Offset** parameter is applicable only if the UA probe selected is TOCO. This parameter is used to shift the uterine activity signal by adding/removing a fixed pressure offset to the uterine pressure. It is useful to emulate conditions such as a tight UA probe belt. The effect is only from the change, previous historical data is not changed.

Default: 0

Range: -(100) - 100

MHR Graph

The **MHR Graph** parameter activates the display of the maternal heart rate over the FHR display, when set to “on”. The maternal heart rate graph appears as a blue line.

Default: OFF

MHR Overrides FHR

The **MHR Overrides FHR** parameter activates the condition whereby the FHR probe picks-up the maternal heart beat rate, when set to “on”.

Default: OFF

MSPO₂ Printing Frequency

The **MSPO₂ Printing Frequency** parameter activates printing of the maternal SpO₂ value on the strip at the specified frequency selected. Printing occurs only if there is a connected SpO₂ probe.

Frequency selections include, in minutes: 1, 2, 3, 5, 10, 15, 30, 60, 90

Default: 10 minutes

MNIBP Printing Frequency

The **MNIBP Printing Frequency** parameter activates printing of the maternal MNIBP value on the strip at the specified frequency selected. Printing occurs only if there is a connected MNIBP probe.

Frequency selection includes, in minutes: 1, 2, 3, 5, 10, 15, 30, 60, 90

Default: 30 minutes

APPENDIX B - CONDITION GUIDELINES FOR PROGRAMMING LUCINA WITH MAESTRO

This section is intended to help you select Maestro conditions to achieve desired vital signs within each programmed state. All four conditions should be programmed into each state in the order presented below:

- Respiratory: Desaturation
- Cardiovascular: Blood Pressure
- Cardiovascular Heart Rate
- Respiratory: Respiratory Rate

The Maestro software is physiologically driven. When using multiple conditions (for example, Desaturation + Hypertension + Tachycardia + Tachypnea), physiological regulatory mechanisms such as the baroreceptor reflex and ventilatory control cause compensatory changes within parameters. To achieve the desired vital sign, select one condition level, above (greater) or below (less), to achieve the desired physiological effect.

Respiratory: Desaturation

Desaturation	SpO ₂ Value
Reset	98%
High 90s	96-97%
Mid 90s	94-96%
Low 90s	91-93%
High 80s	87-90%
Mid 80s	84-86%
Low 80s	80-83%
High 70s	77-80%
Mid 70s	74-77%
Low 70s	69-71%
Less than 70	<69%

Cardiovascular: Blood Pressure

Hypertension		Hypotension	
Reset	110s/70s	Reset	110s/70s
Increased	120s/80s	Decreased	100s/70s
Pre-Borderline	130s/80s	Pre-Borderline	100s/60s
Borderline	140s/90s	Borderline	90s/50s
Mild	150s/90s	Mild	80s/40s
Moderate	160s/100s	Moderate	70s/40s
Severe	170s/100s	Severe	60s/30s
Profound	190s/110s	Profound	50s/30s
Extreme	220s/120s	Extreme	40s/30s

Cardiovascular: Heart Rate

Tachycardia		Bradycardia	
Reset	70s	Reset	70s
Increased	High 70s	Decreased	Mid 60s
Elevated	80s	Pre-Borderline	Low 60s
Pre-Borderline	90s	Borderline	Mid 50s
Borderline	100s	Intermediate	Low 50s
Intermediate	110s	Mild	High 40s
Mild	120s	Moderate	Mid 40s
Moderate	130s	Severe	Low 40s
Severe	140s	Extreme	Mid 30s
Supra	150s	Acute	Low 30s
Profound	160s		
Extreme	170s		
Acute	High 170s		

Respiratory: Respiratory Rate

Tachypnea		Bradypnea	
Reset	11	Reset	11
Increased	15	Increased	10
Elevated	18	Intermediate	9
Borderline	20	Mild	7
Intermediate	22	Moderate	6
Mild	25	Severe	5
Moderate	28	Profound	3
Severe	31	Extreme	2
Profound	33		
Extreme	36		

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APPENDIX C - MEDICATION INFORMATION

The following table details the medications available for administration in the software specific to the Lucina simulator. Each medication is listed along with whether the medication affects the patient's physiology (modeled or log-only), the medication category and the application of the medication.

Medication	Mode M = Modeled, L = Log-only	Category	Lucina Simulator Application
Atosiban	M	Tocolytics	Used to suppress preterm labor [Does not have U.S. FDA approval]
Betamethasone	L	Corticosteroids	For preterm delivery Used to stimulate fetal lung maturity
Carboprost tromethamine	L	Uterine stimulants	Used in management of postpartum hemorrhage (PPH) due to uterine atony*
Dinoprostone	L	Cervical Ripening	Used to "ripen"*** the cervix prior to stimulation of uterine contractions
Ergonovine	L	Uterine Stimulants	Used in management of postpartum hemorrhage (PPH) due to uterine atony* [Not available in U.S.]
Hydralazine	L	Cardiovascular	Used to control severe hypertension in preeclampsia or eclampsia
Magnesium Sulfate	L	Tocolytics	Used to suppress preterm labor Used in preeclampsia and eclampsia to treat hyperreflexia (twitching) and prevent convulsions (seizures)
Methyldopa	L	Cardiovascular	Used to lower blood pressure in PIH or preeclampsia
Methylergonovine	L	Uterine Stimulants	Used in management of postpartum hemorrhage (PPH) due to uterine atony*
Misoprostol	L	Uterine Stimulants	Used for labor induction to "ripen"*** the cervix and promote uterine contractions Use in management of postpartum hemorrhage (PPH) due to uterine atony* [Not approved for labor induction in U.S.]

Medication	Mode M = Modeled, L = Log-only	Category	Lucina Simulator Application
Oxytocin	M	Uterine Stimulants	Labor induction and augmentation Used in management of postpartum hemorrhage (PPH) due to uterine atony* (1st line treatment for PPH)
Ritodrine	L	Tocolytics	Used to suppress preterm labor [Not available in the U.S.]
Salbutamol (Albuterol)	L	Tocolytics	Used to suppress preterm labor
Sulprostone	L	Uterine Stimulants	Used in management of postpartum hemorrhage (PPH) due to uterine atony* [Not available in the U.S.]
Urapidil	L	Cardiovascular	Used to lower blood pressure in PIH or preeclampsia [Does not have U.S. FDA approval]

*Uterine atony = loss of contractions

**Cervical ripening = effacement or thinning; make the cervix softer and more distensible

APPENDIX D - PATIENT DISPLAY DEFINITIONS

The Maestro Patient Status Display consists of waveform, numeric, and volume widgets, along with other special widgets for the maternal fetal simulator.

The various patient displays and feedback windows in Maestro, CAE Patient Monitor, and the CAE CTG Monitor use abbreviations to refer to the parameters displayed. The following is a list of parameters available for display and their abbreviations.

Waveform Widget Displays

Display	Physiological Variable
ABP	Arterial Blood Pressure
CO2	Capnogram
CVP	Central Venous Pressure
ECG aVF	ECG Lead aVF
ECG aVL	ECG Lead aVL
ECG aVR	ECG Lead aVR
ECG I	ECG Lead I
ECG II	ECG Lead II
ECG III	ECG Lead III
ECG V1	ECG Lead V1
ECG V2	ECG Lead V2
ECG V3	ECG Lead V3
ECG V4	ECG Lead V4
ECG V5	ECG Lead V5
ECG V6	ECG Lead V6
EtCO2	End Tidal Carbon Dioxide
PAP	Pulmonary Artery Pressure
SpO2	Oxygen Saturation
Ventilation Volume	Ventilation Volume (mL)
Pleth	Optoplethysmograph

Numeric Widget Displays

Display	Physiological Variable
Alveolar Enflurane	Alveolar Enflurane
Alveolar Halothane	Alveolar Halothane
Alveolar Isoflurane	Alveolar Isoflurane
Alveolar Nitrous Oxide	Alveolar Nitrous Oxide
Alveolar Sevoflurane	Alveolar Sevoflurane
BP	Blood Pressure
C.O.	Cardiac Output
Cervix Dilatation	Cervix Dilatation
CTG FHR	Cardiotocography Fetal Heart Rate
CVP	Central Venous Pressure
EtCO ₂	End Tidal Carbon Dioxide
FHR/IUP	Fetal Heart Rate / Intrauterine Pressure
FHR/TUA	Fetal Heart Rate / Transabdominal Uterine Activity
Fluid Balance*	Fluid Balance
Hb	Hemoglobin
Hematocrit	Hematocrit
HR	Heart Rate
ICP	Intracranial Pressure
Ischemic Index	Ischemic Index
MAP	Mean Arterial Pressure
PACO ₂	Alveolar Partial Pressure Carbon Dioxide
PaCO ₂	Arterial Partial Pressure Carbon Dioxide
PAO ₂	Alveolar Partial Pressure Oxygen
PaO ₂	Arterial Partial Pressure Oxygen
PAP	Pulmonary Artery Pressure
PCWP	Pulmonary Capillary Wedge Pressure
pH	pH
PvCO ₂	Venous Partial Pressure Carbon Dioxide
PvO ₂	Venous Partial Pressure Oxygen

Display	Physiological Variable
RR	Respiratory Rate
SpO2	Oxygen Saturation
TAxilla	Axillary Temperature
TBlood	Blood Temperature
TBody	Body Temperature
Travel	Travel of Fetus Down Descent Mechanism (-3 to +20)
TRectal	Rectal Temperature
UA-BE	Umbilical Arterial Base Excess
UA-CaO2	Umbilical Arterial Oxygen Content
UA-PCO2	Umbilical Arterial Partial Pressure Carbon Dioxide
UA-pH	Umbilical Arterial pH
UA-PO2	Umbilical Arterial Partial Pressure Oxygen
UV-BE	Umbilical Venous Base Excess
UV-CvO2	Umbilical Venous Oxygen Content
UV-PCO2	Umbilical Venous Partial Pressure Carbon Dioxide
UV-pH	Umbilical Venous pH
UV-PO2	Umbilical Venous Partial Pressure Oxygen
VT	Tidal Volume

***Note:** Rapid changes to the Baroreceptor Gain Factors (Overall, Cardiac, Peripheral) and Systemic Compliance Factor can have an impact on the volume reported by the Fluid Balance Widget.

Volume Widget Displays

Display	Physiological Variable
Intrapleural Vol	Intrapleural Volume
Lung Volume	Lung Volume

Obsterical Widget Displays

Display	Physiological Variable
FHR	Fetal Heart Rate
IUP	Intrauterine Pressure

Display	Physiological Variable
TUA	Transabdominal Uterine Activity
UA	CTG Uterine Activity
CTG FHR	CTG Fetal Heart Rate
CTG UA	CTG Uterine Activity
MHR	Maternal Heart Rate
MNIBP	Manual Non-Invasive Blood Pressure
MSPO2	Maternal Pulse Oximetry
TBody Alarm	Body Temperature
1 minute	APGAR 1 minute
5 minutes	APGAR 5 minutes

CPR Monitor

The following definitions apply to the parameters in the Maestro CPR Monitor window.

Display	Definition
Hand Position	Hand position
Chest Compression	
Compression Depth	Compression Depth (%)
Compression Rate	Compression Rate (per minute)
Chest Recoil	Compression Release (%)
Compression Fraction	Proportion of time in which chest compressions are performed (%)
Depth Variability	Standard Deviation of Compression Depth (%)
Ventilation	
Ventilation Volume	Ventilation Volume (mL)
Ventilation Rate	Ventilation Rate (breaths/min)
I:E Ratio	Inspiratory/Expiratory Ratio
Minute Ventilation	Minute Ventilation (L/min)
Alveolar Ventilation	Alveolar Ventilation (L/min)
Patient Vitals	
Blood Pressure	Arterial Blood Pressure

Display	Definition
CePP	Cerebral Perfusion Pressure
CoPP	Coronary Perfusion Pressure
SpO2	Oxygen Saturation
EtCO2	End Tidal Carbon Dioxide
CPR Live Data	
Compression Depth	Compression Depth (%)
Ventilation Volume	Ventilation Volume (mL)
CPR Summary	
Chest Compression Rate	Compression Rate (per minute)
Chest Compression Depth Average	Compression Depth Average (%)
Chest Compression Depth Variability	Standard Deviation of Compression Depth (%)
Chest Compression Recoil	Compression Release (%)
Chest Compression Fraction	Proportion of time in which chest compressions are performed (%)
Ventilation Volume Average	Ventilation Volume Average (L/min)
Ventilation Rate	Ventilation Rate (breaths/min)
Ventilation I:E Average	Inspiratory/Expiratory Ratio Average

Traction Feedback

Display	Definition
Current Force	Neck Traction Force in Newton (N)
Peak Force	Maximum Neck Traction Force in Newton (N)
Force	Neck Traction Force (graph)
UA	Uterine Activity (graph)

CAE PATIENT MONITOR

The CAE Patient Monitor display consists of numeric and volume widgets. A 12-lead ECG report can also be generated from the Patient Monitor software.

Numeric Widget Displays

Display	Physiological Variable
ABP	Arterial Blood Pressure
TAxilla	Axillary Temperature
TBlood	Blood Temperature
TBody	Body Temperature
CVP	Central Venous Pressure
C.O.	Continuous Cardiac Output
EtCO2	End Tidal Carbon Dioxide
HR	Heart Rate
ICP	Intracranial Pressure
MAP	Mean Arterial Pressure
NIBP	Non Invasive Blood Pressure
PACO2	Alveolar Partial Pressure Carbon Dioxide
PaCO2	Arterial Partial Pressure Carbon Dioxide
PAO2	Alveolar Partial Pressure Oxygen
PaO2	Arterial Partial Pressure Oxygen
PCWP	Pulmonary Capillary Wedge Pressure
PAP	Pulmonary Artery Pressure
Pulse	Pulse
PvCO2	Venous Partial Pressure Carbon Dioxide
PvO2	Venous Partial Pressure Oxygen
TRectal	Rectal Temperature
RR	Respiratory Rate
SpO2	Oxygen Saturation
Therm C.O.	Thermodilution Cardiac Output

Waveform Widget Displays

Display	Physiological Variable
ECG I	ECG Lead I
ECG II	ECG Lead II
ECG III	ECG Lead III
ECG V1	ECG Lead V1
ECG V2	ECG Lead V2
ECG V3	ECG Lead V3
ECG V4	ECG Lead V4
ECG V5	ECG Lead V5
ECG V6	ECG Lead V6
ECG aVL	ECG Lead aVL
ECG aVR	ECG Lead aVR
ECG aVF	ECG Lead aVF
ABP	Arterial Blood Pressure
PAP	Pulmonary Artery Pressure
CVP	Central Venous Pressure
Pleth	Optoplethysmograph
Capnogram	Capnogram

12-Lead ECG Report Parameters

Parameter	Physiological Variable
I	ECG Lead I
II	ECG Lead II
III	ECG Lead III
aVR	ECG Lead aVR
aVL	ECG Lead aVL
aVF	ECG Lead aVF
V1	ECG Lead V1
V2	ECG Lead V2
V3	ECG Lead V3
V4	ECG Lead V4
V5	ECG Lead V5
V6	ECG Lead V6

APPENDIX E - THE ISCHEMIC INDEX (DEATH SPIRAL)

The Ischemic Index is a measure of the myocardial ischemia modeled using classical determinants. When an unfavorable oxygen supply/demand ratio occurs, myocardial ischemia follows. The lower the Ischemic Index, the greater the myocardial ischemia. The Ischemic Index is derived through the underlying physiological models and cannot be measured clinically.

Favorable supply/demand ratios (slower heart rates, higher blood oxygenation levels) generally result in a higher Ischemic Index value, whereas unfavorable supply/demand ratios (faster heart rates, lower blood oxygenation levels) generally result in a lower Ischemic Index value.

The patient's Ischemic Index value can be viewed by selecting the Ischemic Index widget from the Patient Status Display.

The table below lists Ischemic Index values and their corresponding patient conditions.

Model-Driven ECG Rhythm	Ischemic Index (I.I.)
Normal Sinus Rhythm (NSR)	$I.I. \geq 0.90$
Mild ST Segment Depression	$0.90 > I.I. \geq 0.70$
Moderate ST Segment Depression	$0.70 > I.I. \geq 0.60$
Premature Ventricular Contractions (PVCs)	$0.60 > I.I. \geq 0.40$
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 in the **Cardiovascular** view (Additional Parameters). 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.

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For customer service, please contact CAE.

Customer Service Headquarters - United States

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Phone 1-866-462-7920

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Phone +49 (0) 6131 4950354

Email: ap.service@cae.com

