Apollo™
User Guide

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Müse System Requirements

Operating System Support

Müse 2.3 - 2.4 Supports	Müse 2.6 Supports	Müse 2.7 Supports
Windows 7 and 8	Windows 7, 8, and 10	Windows 7, 8, and 10
Mac OS X 10.6 - 10.12	Mac OS X 10.6 - 10.12	Mac OS X 10.9.2 - 10.12

Minimum Requirements

Any computer (Instructor Workstation) used to operate Müse or TouchPro must meet the following minimum requirements.

Any computer NOT associated with a simulator (SCE Development Workstation) used to operate Müse or TouchPro must also meet the following requirements, with the exception of ethernet/network connectivity.

Windows® Operating System:

- Windows 7
- Firefox 45+ ESR or Internet Explorer 9
- Adobe Flash Player® 24
- Adobe Reader DC 2015+
- Hardware
- Intel Core 2 Duo, 2.0 GHz, 4 GB DDR3 RAM
- 8 GB Hard Drive space available
- 1366x768 screen resolution
- USB 2.0
- Wireless 802.11b/g/n Ethernet card
- 100BASE-T Ethernet Adapter

Mac® Operating System:

- Mac OS X 10.9.2 (Mac OS X 10.6 for Müse 2.6 or older)
- Firefox 45+ESR
- Adobe Flash Player® 24, Adobe Reader DC 2015+
- Hardware
- Intel Core 2 Duo, Intel Core i5 2.5 GHz, 4 GB DDR3 RAM
- 8 GB Hard Drive space available
- 1280x800 screen resolution
- USB 2.0
- Wireless 802.11b/g/n Ethernet card
- 100BASE-T Ethernet Adapter

IMPORTANT: *If your Mac operating system has been updated after installing Müse, please download and run the Muse patch utility available here:* www.caehealthcare.com/images/uploads/documents/Muse-Patch-Utility.pdf .

Note: Mac is a registered trademark of Apple Inc. Windows is a registered trademarks of the Microsoft Corporation in the United States and/or other countries. Chrome is a registered trademark of the Google. Adobe Flash Player is a trademark of Adobe Systems Inc.

APOLLO SPECIFICATIONS

Size

Manikin/Simulator 74" H x 26" W x 11" D (188cm x 66cm x 28cm)

Weight

Manikin/Simulator 100lbs (45.4kg)

Environmental Requirements

Ambient Temperature Range

Manikin/Simulator

Operation: 40°F to 104°F (4°C to 40°C)

Storage: 40°F to 122°F (4°C to 50°C)

Relative Humidity: 0% to 90% non condensing

Power

Manikin/Simulator

AC Input: AC 90 – 240VAC, 50/60Hz

Consumption: 70W nominal

Internal Batteries: 18.5V lithium-ion, rechargeable

Run Time: 4 hours (Typical)

Communications

Simulator Network

Wired: 10/100 Ethernet or

Wireless: IEEE 802.11g

Wireless Voice

537 MHz to 819MHz (Country Specific)

Electrotherapy

Defibrillation: 20 to 360 joules (Monophasic, Biphasic)

Pacing : 20ma to 180ma

Air Supply

When using the optional external compressed air kit in conjunction with the facility supply source and facility wall adapter.

Maximum pressure: 50 psi to 120 psi

CO$_2$ Supply

When using the optional external CO$_2$ kit in conjunction with the facility CO$_2$ source and facility wall adapter.

Maximum pressure: 30 psi to 120 psi

CAUTIONS AND WARNINGS

Please read and understand these cautions and warnings before you begin using the Apollo system.

USE OF THIS EQUIPMENT IN AN UNSPECIFIED MANNER, MAY IMPAIR DESIGNED PROTECTION.

Your safety is in your hands. Be sure to follow the instructions on the proper setup, breakdown and use of the Fidelis system.

SHOCK HAZARD

Electrical Safety

- This product must be connected to an electrical outlet that is properly grounded. Precautions should be taken so that grounding or polarization is not defeated

- Do NOT place defibrillator paddles on or adjacent to the ECG patient electrodes. Contact between defibrillator paddles and the electrodes may cause injury to the user and damage to the equipment

- Always use the supplied power cords. Do NOT substitute.

- Operate the system from a power source with the following rating:

  ◦ 115VAC, 50/60 hertz (cycles per second) (e.g., North America, Japan)

  ◦ 230VAC, 50/60 hertz (cycles per second) (e.g., Europe)

- Do NOT allow excess fluids to flow on or into electronic parts

- Do NOT attempt to disassemble the simulator or service any of the electrical components other than changing of fuses

- Always remove the power cable and have simulator turned off when replacing fuses

- Always use the supplied power adapter to charge or run simulator from AC

Latex Warning

Certain components of the simulator, such as vein tubing and wound umbilicals, contain latex. Users with latex sensitivity should use caution when working with these components or during maintenance with exposure to latex on the simulator.

Electrical System

- Operate the system from a power source with the following rating:
  115VAC, 50/60 hertz (cycles per second) (e.g. North America, Japan), and 230VAC, 50/60 hertz (cycles per second) (e.g. Europe)

- Do NOT operate the Apollo system in rain. Apply water to the manikin only in accordance with the supported clinical procedures identified in this User Guide.

- Do NOT allow excess fluids to flow on or into electronic parts

CO_2 Production System

- Care must always be taken when using high-pressure equipment

- Do NOT disassemble or alter regulator

- Store CO2 canisters in dry location between 32° and 104° F. (0 to 40°C). Do NOT expose CO2 canister to heat above 140° F as rupture may occur.

- Never point CO2 canister towards your face or someone nearby

- Use only CAE specified CO2 canisters

- Wear protective gloves and eye protection when removing canister from regulator assembly

Bleeding and Secretion System

- DO NOT modify the tank or any assembly component

- ALWAYS protect eyes, skin and clothing against accidental exposure

- NEVER exceed 35 strokes while pressurizing the tank

- ALWAYS read and follow instructions for creating trauma fluids (e.g. blood). NEVER fill the tank with more than 6 liters (1.6 gallons) of fluid.

- After use, ALWAYS release pressure and clean the tank. DO NOT store liquids in the tank

- ALWAYS release tank pressure before servicing. NEVER transport or ship in a pressurized and/or full state or leave a pressurized tank unattended.

Manikin

- Do NOT disassemble factory-assembled parts of the manikin

- Do NOT clean the manikin with chemical solvents or abrasive pads. Use only water and a light soap solution only.

- Make sure that manikin is set up on a stable, sturdy work surface to avoid collapsing and causing injury to users

- Apollo should be operated in ambient temperatures below 104 degrees Fahrenheit (40 degrees Celsius). Prolonged operation (>4hrs) in ambient temperatures greater than 104 degrees Fahrenheit (40 degrees Celsius) may result in anomalous behavior and out of specification performance

- Do NOT introduce foreign substances into the airway - with the exception of small amounts of approved lubricant. Only perform invasive procedures supported by the system as described in the applicable sections of the User Guide.

- Do NOT pick the manikin up by the limbs — support head and leverage weight with torso. It may be necessary to have the help of a second person to lift and move Apollo

Transport

- Prior to using the stretcher packed with the shipping container, the manikin must be wrapped in a sheet. Failure to wrap the manikin in a sheet may result in permanent damage to the manikin skin.
- CAE is not responsible for damage to the manikin skin if the manikin is not wrapped in a sheet while using the stretcher

Battery

Apollo uses Li-ion batteries. Li-ion batteries have special requirements during handling to avoid hazardous situations.

- The Polymer Li-ion Battery pack should be stored indoors and be kept far from fire and high temperatures
- Do NOT store batteries with hairpins, coins, screws or other similar objects
- Do NOT heat the battery
- Do NOT throw the battery into a fire
- Do NOT use or leave the battery close to heat or flame
- Do NOT use the battery inside of a car where temperature may exceed 80˚C (176˚F). Also do NOT charge/discharge the battery in such conditions.
- Do NOT short-circuit the positive (+) and negative (-) terminals with other metals
- Do NOT place the battery in a device with the positive (+) and negative (-) terminals in the incorrect positions
- Do NOT strike the battery with force
- Do NOT step on, throw or drop or drop the battery to cause strong shock
- Do NOT disassemble or modify the battery
- Do NOT solder a battery directly
- Do NOT use a battery that has been damaged or deformed

Additional Warnings

- Stop charging the battery if the battery has not completed charging within the specified time
- When leakage or foul odor is detected, do NOT use and keep away from heat or flame
- Immediately wash thoroughly with fresh water if liquid leaks onto your skin or clothes
- If liquid leaking from the battery gets into your eyes, do NOT rub your eyes. Immediately wash eyes completely with clean water and seek medical attention
- If the amount of time the battery is able to power the equipment diminishes significantly, the battery life is at an end. Replace the battery with a new battery of the exact same make and model.
- Immediately remove a battery whose life cycle has expired from the equipment
- When the battery is thrown away, apply vinyl tape to the positive (+) and negative (-) terminals to avoid short circuits
- When not using battery for an extended period, remove it from the equipment and store it in a place with low humidity and temperature
- In all instances, keep the battery away from objects or materials with static electric charges
- The battery can be used within the following temperature range. Do NOT exceed this range:
  - Charge temperature range: 0˚C (32˚F) to 45˚C (113˚F)

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INTRODUCTION

Apollo Nursing and Prehospital simulators give you all the power of CAE's cutting edge simulation technology with more of what you want. Apollo Nursing was created by nurses to teach the fundamentals of nursing practice, and Apollo Prehospital was built for medics by medics. Both simulators are less expensive than other simulators, are easy to use and have everything you need with nothing you don't.

Apollo

Apollo is fully wireless with on-board fluid, pneumatic and electrical systems and is built tough to withstand a wide variety of real-life, indoor and outdoor learning environments. Apollo comes with extensive clinical features and capabilities designed specifically for emergency medical personnel and nurses.

The simulator can be placed on standard operating room tables, on an ICU bed, on the ground or even in a vehicle (in the case of a simulated accident). Apollo can also be seated in an upright position.

Apollo

In addition, Apollo has the assessment, cardiovascular, genitourinary and trauma features familiar to CAE customers plus an SpO_2 finger probe, fluids on board, bilateral noninvasive blood pressure and IV access. Wireless and tetherless, Apollo takes simulation education to an exciting level of realism.

EQUIPMENT OVERVIEW

Apollo has been designed to be used in any learning environment. Apollo's standard features are easily integrated into a laboratory setting or remote locations. Apollo comes with standard equipment as well as optional equipment. Optional equipment refers to items which are available for purchase to enhance the simulation experience and additional accessories refers to consumable items which are available for purchase as they may need to be replaced.

Laptop Instructor Workstation

The laptop Instructor Workstation is a computer that utilizes Müse or Vivo software to operate as the main simulation control center. Instructors control the simulation session from the workstation by running Simulated Clinical Experiences (SCEs) that meet their learning objectives, or on the fly with Vivo.

IMPORTANT: All CAE computer components are preconfigured for use with the simulator. There are no software installation steps required. Only approved CAE applications should be installed or run with the simulator.

Battery Charger and External Power Supply

The simulator is rechargeable using the **Battery Charger** provided.

CO$_2$ Canisters (Prehospital Only)

Four CO$_2$ canisters are included with Apollo to supply the on-board CO$_2$ exhalation feature.

Scan or click the QR code to access the Using A CO$_2$ Cannister video tutorial on caehealthcare.com.

Inventory Kit

Apollo comes with a number of accessories and replacement components.

Included in the Inventory Kit are:

- Start-Up Kit (Quick Start Chart and Setup Map)
- Priming syringe
- Roll (4 ft) of VHB tape and roll of 2 inch wide red tape (for cricothyrotomy)
- BP adapter kit
- Silicone lubricant
- ECG posts
- Pacing/Defibrillation disks
- Condensation drain
- Chest Tube prime tubing
- Female genitalia
- CO_2 Cartridge Kit
- Arm IV tubing
- Hospital gown
- Battery charger

Wireless Microphone

The wireless receiver enables the user to communicate through the simulator using a microphone. The clip-on microphone is attached to a transmitter that may be attached to a belt or waistband.

Wireless Microphone

The microphone is battery-operated and has a power switch on the top to turn it on and off.

Wireless Voice Link

The wireless voice link replaces the wireless microphone feature in some Apollo simulators and comes packaged separately. Refer to the section *Wireless Voice Link* for more information.

Trauma Fill Tank

Fluids are supplied to the simulator using a trauma fill tank. One tank is supplied and can be used for distilled water mixed with red food coloring to create simulated blood.

Disassembled Trauma Fill Tank

Assembled Trauma Fill Tank

Trauma Fill Tank (Disassembled and Assembled)

This tank should be cleaned after each use.

Scan or click the QR code to access the Cleaning the Trauma Fill Tank video tutorial on caehealthcare.com.

Optional Equipment

Optional equipment is available to accommodate special customer requirements. For example, options like an air compressor and FX Simulated Wound Kit enable instructors to create real-life scenarios at authentic locations.

Optional Equipment
Additional Instructor Workstation (Laptop, Vivo Tablet, or Instructor Workstation Tablet PC)
TouchPro Patient Monitor
Apollo Replacement Lithium Battery
External Compressed Air Kit
External CO_2 Kit
Air Compressor
Hands-Free Training Cables
Apollo Learning Modules and Training Courses
Tool Kit
FX Simulated Wound Kit
Moulage Kit

Contact CAE Customer Service at 866-462-7920 if there are any questions or if optional equipment is needed.

Additional Instructor Workstation:

Laptop, Vivo Tablet, or Instructor Workstation Tablet PC

The Instructor Workstation is a computer that utilizes Müse Software or Vivo to operate as the main simulation control center. Instructors control the simulation session from the Workstation by running Simulated Clinical Experiences (SCEs) that meet their learning objectives, or on the fly with Vivo.

IMPORTANT: All CAE computer components are preconfigured for use with the simulator. There are no software installation steps required. Only approved CAE applications should be installed or run with the simulator.

Scan or click the QR code to access the Getting Started With an Instructor Workstation video tutorial on caehealthcare.com.

Apollo Replacement Lithium Battery

Under normal usage, a battery pack should last up to two years.

External Compressed Air Kit

The External Compressed Air Kit gives the user the ability to connect Apollo to a CAE compressor, tank or wall air using the kit's hose and fittings. When connecting to wall air, the kit attaches to the customer's wall adapter.

External Compressed Air Kit

The internal pump turns off automatically when external compressed air is sensed.

The External Compressed Air Kit includes a flexible 30 ft (9 m) hose attached to a preset air regulator, a fitting for air compressors and adapters for wall or tank air.

External CO$_2$ Kit

The External CO$_2$ Kit gives the user the ability to connect Apollo to an external source of CO$_2$ (30-120 psi). The External CO$_2$ Kit includes a flexible 30 ft (9 m) hose attached to a preset air regulator and an adapter for wall or tank fittings.

Air Compressor

An air compressor (product #AIR-003) designed for quiet operation is available for same-room use, and an alternative air compressor (product #AIR-002) is available for situations where the compressor resides in a location, such as a storage room, set apart from the simulator.

Both Air Compressors are AC powered and include a regulator and an air hose with the appropriate connector fitting.

A 220VAC/50 Hz version of the Quiet In-Room Air Compressor (product #AIR-004) is also available.

Hands-Free Training Cables

Hands-Free Training Cables connect to most popular defibrillators and cardiac pacing units and take the place of non-reusable electrode pads.

Hands-Free Training Cables

Three different cable designs are available to support the most popular defibrillation and pacing equipment. Each cable kit includes posts that attach to the defibrillator or pace locations on Apollo.

Physio-Control (Medtronic, Inc.)
Product #ACC-005

Zoll (Zoll Medical Corporation)
Product #ACC-006

Philips (Koninklijke Philips Electronics, N.V.)
Product #ACC-007

Apollo Educational Development

Apollo Patient Simulator Essentials and Programming with Physiology courses offer learners at all levels in-depth instruction in the setup, operation, development of scenarios and maintenance related to the use of Apollo.

- The Apollo Patient Simulator Essentials course provides learners with an overview of the system and its components, as well as an introduction to patient creation and scenario design.
- Apollo Patient Simulator Essentials - two days at CAE facility.
- Apollo Patient Simulator Essentials On-Site - two days at learner-defined facility.
- Apollo Patient Simulator Essentials On-Site Physician Instructor - two days at learner defined facility with physician-led instruction.

The Apollo Programming with Physiology course builds upon the concepts introduced in the prerequisite Patient Simulator Essentials course. After a quick review of the Patient Simulator Essentials course, Programming with Physiology instruction spends the majority of the day providing learners with the ability to design patients and scenarios that can be used immediately upon completion of the course.

- Apollo Programming with Physiology - one day at CAE facility.
- Apollo Programming with Physiology On-Site - one day at learner-defined facility.
- Apollo Programming with Physiology On-Site Physician Instructor - one day at learner defined facility with physician-led instruction.

Apollo Learning Modules

CAE Learning Modules enhance the use of the simulator by providing pre-programmed scenarios and corresponding support documentation (i.e., Learning Objectives, Facilitator Notes) that can be readily integrated into a lesson plan, a specific curriculum, or an educational program.

Apollo Prehospital/Nursing
- Adult Nursing
- Foundations of Nursing Practice

Apollo Prehospital
- Advanced Cardiac Life Support (ACLS)
- Airway Management Module I
- Airway Management Module II
- Cardiopulmonary Critical Situations (CCS)
- Disaster Medical Readiness (DMR)
- Emergency Medical Services (EMS Modules 1, 2, 3, 4 & 6)
- Patient-Centered Acute Care Training (PACT)
- Perioperative Management
- Rapid Assessment and Intervention (RAI)
- Respiratory Education Simulation Program (RESP I, II & III)
- Tactical Medical Care - Military (TMC)

The Program for Nursing Curriculum Integration (PNCI)

PNCI is a full learning package that integrates pre-licensure nursing curriculum with high-fidelity patient simulation. With 100 evidence based Simulated Clinical Experiences (SCEs), PNCI can be used with both CAE patient simulators and other brands. Includes the Joint Commission's National Patient Safety Goals, and the Quality and Safety Education for Nurses (QSEN) competencies.

Tool Kit

To simplify common adjustments and periodic repairs, CAE has put together a kit containing tools selected for use with the simulator (product #TOL-001).

Tool Kit

FX™ Simulated Wound Kit

Lifelike moulage wounds to fully immerse learners in trauma situations. Developed with the assistance of the U.S. Army, FX is a complete, turnkey moulage simulation solution that comes in a convenient flight-case with organized product compartments. Optional components include amputations, degloving of the hand, and impalement.

FX Simulation

Moulage Kit

The kit provides the materials needed to create wounds on METIman (product #MODS-999).

Moulage Kit

The Moulage Kit may also be ordered separately.

APOLLO SETUP

The following pages will guide you through assembling and configuring Apollo. Below is a list of steps required to prepare Apollo for operation.

Apollo	Operation Steps
1	Place Apollo in the Work Area
2	Power On Apollo
3	Power On the Instructor Workstation (Laptop, Vïvo Tablet, or Instructor Workstation Tablet PC)
4*	Connect to the Apollo Network*
	Connect the SpO_2 Probe (Optional)
	Connect the External Air (Optional)
	Insert the CO_2 Canister (Optional, Prehospital Only)
	Detach the Arms (Optional)
	Prepare the Bleeding System (Optional)
	Connect the TouchPro (Optional)

*If you are using the Vïvo tablet, skip Step 4 and refer to the *Using Vïvo* section of this guide.

Before Beginning Setup

Proper operation of the Apollo simulator requires correct configuration. Before setting up the system, keep in mind these basic guidelines:

Understand the Cautions and Warnings information located in the Introduction section of this User Guide.

- Follow the sequence of steps carefully
- Complete all steps in order
- Do not power on any components until instructed in the text
- KEEP all original shipping materials, including BOXES — warranty and repair items must be return shipped to CAE in their original packaging

When unpacking Apollo for the first time, careful use of a box cutter protects both the packaging and the product.

A Setup Map, included with the unit, covers these same steps in abbreviated fashion.

Scan or click the QR code to access the Unpacking METIman video tutorial on caehealthcare.com.

Step 1: Place Apollo in the Work Area

Select a work area with enough room for all equipment, providing ample space for easy access to the simulator. At a least 10' x 12' (3 meter x 4 meter) work area is recommended for movement and positioning of components around the simulator.

Apollo

Apollo and the Laptop or Tablet Instructor Workstation can be operated from their batteries, allowing for wireless use.

In a lab environment, make sure a multi-plug AC power outlet exists within the workspace to recharge the simulator's battery and its powered components.

Before placing the simulator on a surface, be certain the surface can easily support 200 pounds.

NEVER lift the simulator by the LIMBS. When lifting, be sure to support the torso and head of the simulator while lifting.

Prior to using the stretcher packed with the shipping container, the manikin must be wrapped in a sheet. Failure to wrap the manikin in a sheet may result in permanent damage to the manikin skin. CAE is not responsible for damage to the manikin skin if the manikin is not wrapped in a sheet while using the stretcher.

Step 2: Power On Apollo

a. Locate the ON/OFF button beneath the skin covering Apollo's left hip

The **ON/OFF** Button

Apollo's ON/OFF Button

b. Press and hold the ON/OFF button for one second. The power light blinks, indicating the system is busy. In approximately one minute, the light stops blinking and remains solid, indicating the simulator is now ready.

Note: Apollo can be operated continuously for approximately four hours without recharging the battery.

Step 3: Power On the Instructor Workstation

a. Place the Laptop or Tablet Instructor Workstation near Apollo in a convenient location

b. Ensure the Instructor Workstation battery is fully charged, or connect the AC adapter to the workstation and a surge-protected power outlet

c. Power on the Instructor Workstation

Note: If you are using the Vivo tablet, skip Step 4 and refer to the Using Vivo section of this guide.

Step 4: Connect to the Wireless Network

A) Connect to the METIman Network – Laptop Instructor Workstation (Macintosh) Option

a. Click the **AirPort** icon located in the top-right-hand corner of the screen

Clicking the AirPort Icon

b. If the **AirPort** is not on, select **Turn AirPort On**
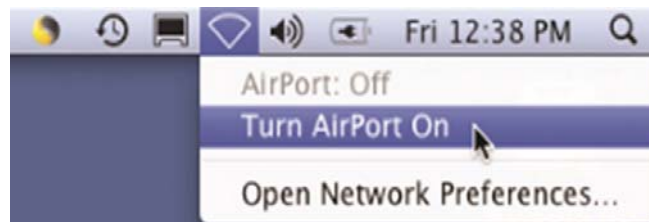
Activating the AirPort Card

c. Select the network (e.g., **MMPXXX** or **MMNXXX**, where XXX is the simulator's unit number)
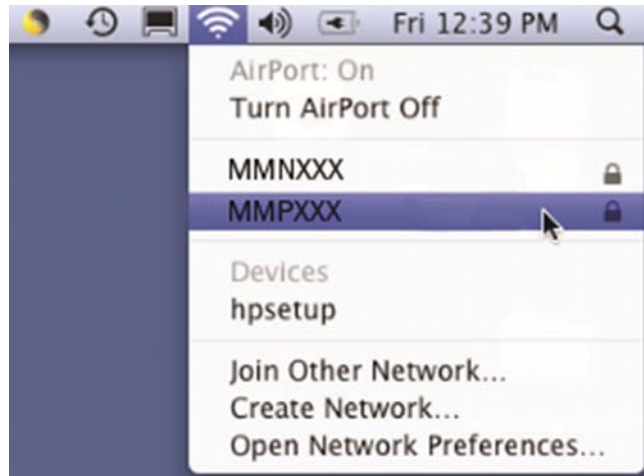
Selecting the Network

The AirPort dialog box appears.

The AirPort Dialog Box

d. Enter the password *metiadmin* into the **Password** field

e. Click **OK**

Connecting to the METIman Network

The Müse software can now be launched.

B) Connect to the METIman Network – Laptop or Tablet Instructor Workstation (Microsoft Windows)

Once METIman and the Instructor Workstation are both powered on, they automatically establish a wireless connection and, when the Internet Explorer browser is opened, the Müse software launches. If the auto-connect does not occur, perform the following steps:

1. Click or tap on the **Wireless Network** icon in the task bar

2. Select the METIman wireless network (e.g., MMPXXX or MMNXXX, where XXXX is the serial number for the unit). The network password is *metiadmin* and the password is case-sensitive.

3. Click or tap the **Connect** button

    The wireless connection is established. The Müse software can now be launched using Internet Explorer.

Optional: Connect the SpO2 Probe

Connect and attach the SpO2 probe to Apollo.

1. Locate the SPO2 port on Apollo's left hip
2. Connect the SpO2 probe to the SPO2 port
3. Place the SpO2 probe on Apollo

Attached SpO$_2$ Probe

Optional: Connect External Air

Using the External Air kit allows Apollo to be run by an external air source rather than the internal compressor. The air hose can be connected to or disconnected from Apollo at any time. When the external air pressure is sensed, the pump internal to Apollo turns off automatically. When you want to make Apollo mobile again, simply disconnect the hose.

The optional External Compressed Air Kit consists of a flexible 30 ft (9 m) hose attached to a preset air regulator and a fitting for air compressors and adapters for wall or tank air.

To connect the air hose:

1. Connect the External Compressed Air Kit to a CAE compressor using the Quick Coupler attached to the regulator. (Other compressed air sources have their own adapters. Locate the adapter for your compressed air source.)
2. Connect the other end of the External Compressed Air Kit to the **EXTERNAL AIR** port on the left shoulder

The **External Air** port

Apollo Prehospital's Left Shoulder

The **External Air** port
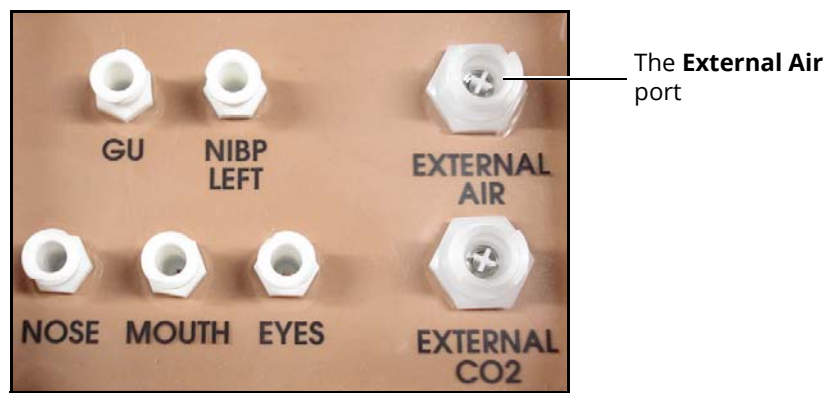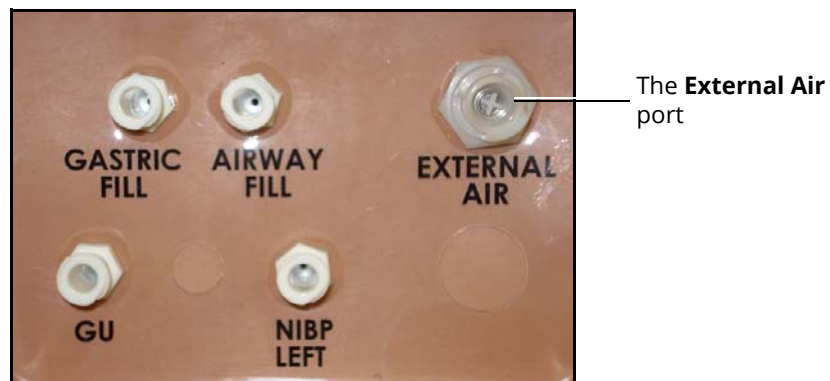
Apollo Nursing's Left Shoulder

Insertion of the CO_2 Canister (Prehospital Only)

To insert the CO2 canister:

1. Lift the chest skin at the waist and lift the abdominal insert
2. From the simulator's right midsection, remove the pull pin and disconnect the blue CO2 hose

Remove the pull pin

The Pull Pin

3. Remove the regulator from the simulator
4. While holding the regulator firmly, carefully twist the CO2 canister into the regulator as far as it will go. The final turns puncture the CO2 canister, which is necessary for correct operation.
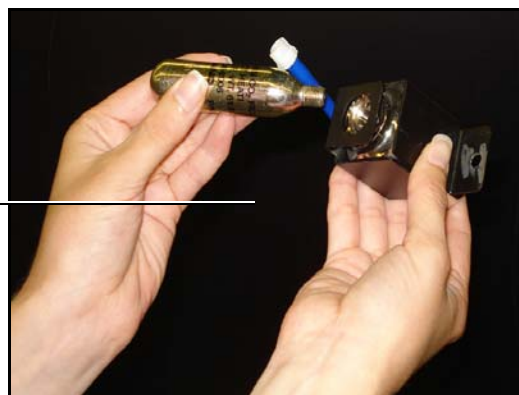
Insert the CO_2 canister into the regulator

Connecting the CO_2 Canister

CAUTION: Do not loosen the canister once it has been inserted into the regulator assembly until the contents are exhausted and pressure relieved.

CAUTION: Removing the canister before it is empty results in the sudden release of all high-pressure gas with a possibility of liquid CO2 spray. Unprotected skin could receive freezing burns.

5. Place the CO2 canister, regulator and hoses inside the simulator. Use the pull pin to secure this assembly to the tray. A properly installed assembly will have the CO2 canister pointed down toward the rear of the simulator.

Place the canister, regulator and hoses inside the simulator

Placing the Canister, Regulator and Hoses

6. Attach the blue CO2 hose to the connection on the regulator

7. Carefully reposition the abdominal insert and pull the skin back over the simulator to its original location

Once the canister and regulator assembly are in place, CO2 is measurable with a disposable ETCO2 detector during positive pressure ventilation.

Based on the training environment, a CO2 canister may last from 10 minutes (rapid ventilation) to 25 minutes.

Use of CO_2 Canisters

- Store the CO_2 canisters in a dry location between 32° and 104° F. (0° to 40°C)

- Do not expose the CO_2 canister to heat above 140° F, as rupture may occur

- Never point the CO_2 canister toward your face or someone nearby

- Use only CAE specified CO_2 canisters

- Do not remove the canister from the regulator base until empty. The canister end is punctured when screwed into the regulator base.

- Never ship the CO_2 canister attached to the regulator assembly

Assembly of the CO_2 Regulator

- Care must always be taken when using high-pressure equipment

- Do not disassemble or alter the regulator

- Dry completely if the regulator becomes wet

- Discontinue use of this equipment if leakage or visible damage is evident

Optional: Insert the CO_2 Canister (Prehospital Only)

Some SCEs include the simulation of CO_2 exhalation. The following instructions show how to safely connect the CO_2 canister to the simulator.

WARNING: *Careful handling, including the use of eye protection, is required when using CO_2 canisters. Please read and understand all the important cautions and warnings on removing canisters as well as safety steps that must be used when handling CO_2 canisters.*

Optional: Detach the Arms

Apollo's arms may be removed for use with trauma scenarios.

To detach Apollo's arms:

1. Unscrew and remove the locking pin at the elbow.

Removing the Locking Pin

2. Carefully separate the lower arm from the upper arm.

3. Twist to disconnect the four tubing connectors (white).
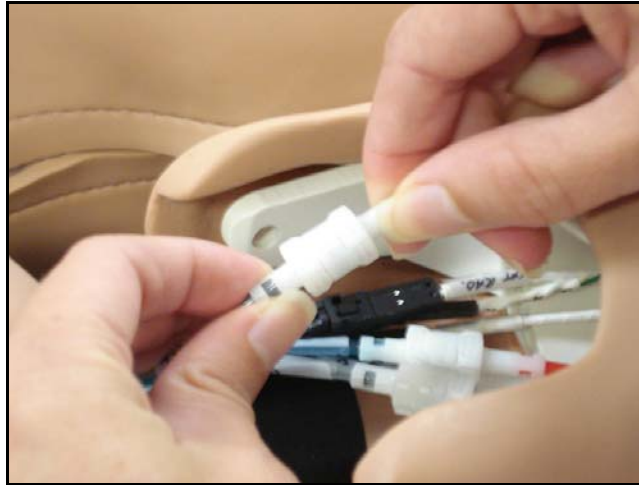
Disconnecting the Tubing

4. Squeeze to disconnect the three electrical connectors (black).
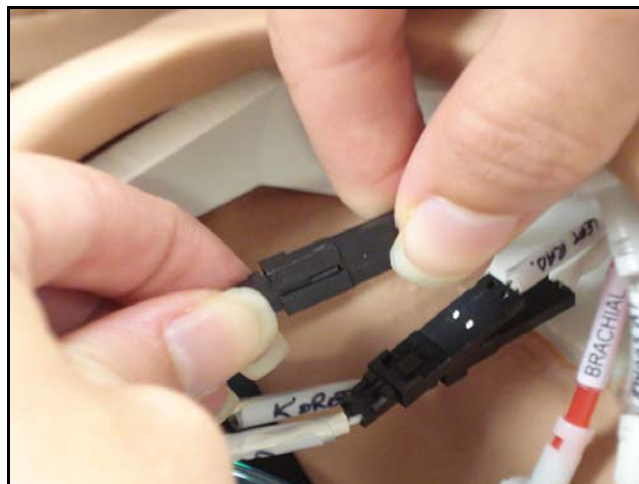
Disconnecting the Electrical Connectors

5. Place the loose connectors carefully within the upper arm.

Note: When replacing arms, ensure tubing and electrical connectors are matched using the color-coding.

Optional: Prepare the Bleeding System

ONLY distilled water or distilled water containing food coloring should be used with the secretion system.

A mixture of no more than 29 mL (1 oz) red food coloring with 3.8 liters (1 gallon) of distilled water should be used to create simulated blood. The blood mixture should be created in advance in a separate distilled water container.

Note: The higher the ratio of food coloring, the greater the possibility of staining.

Using the Trauma Fill Tank

The Trauma Fill Tank is used to fill the on-board blood reservoir.

CAUTIONS and WARNINGS

Carefully follow all instructions for using the Trauma Fill Tank. Pay particular attention to the following cautions and warnings:

- **ALWAYS** read and follow instructions for creating trauma fluids (e.g. blood)
- **ALWAYS** protect eyes, skin and clothing against accidental exposure
- After use, **ALWAYS** release pressure and clean the tank
- **ALWAYS** release tank pressure before servicing
- **DO NOT** modify the tank or any assembly component
- **DO NOT** store liquids in the tank
- **NEVER** transport or ship in a pressurized and/or full state
- **NEVER** leave a pressurized tank unattended
- **NEVER** fill the tank with more than 6 liters (1.6 gallons) of fluid
- **NEVER** exceed 35 strokes while pressurizing the tank

Attaching the Overflow Bottle to the Trauma Fill Tank Assembly

The overflow bottle is used to collect overflow when the METIman on-board tank is filled.

To attach the Overflow Bottle to the Trauma Fill Tank:

1. Connect the clear trauma fill tank hose to the bottle lid fitting

Connect the clear hose to the bottle lid fitting

Connecting the Trauma Fill Tank Umbilical to the Overflow Bottle

2. Clip the bottle to the tank using the attached carabiner mechanism

The carabiner

The Carabiner

Operating the Trauma Fill Tank

Be careful to complete the following steps correctly to ensure proper use and maintenance of the METIman and its peripherals.

Step 1: Pour the Fluid into the Trauma Fill Tank

Pour the desired amount of fluid into the Trauma Fill Tank, being careful to NOT to exceed 6 liters (1.6 gallons) of fluid.

Note: The right thigh tank holds 1.5 liters and is used for blood.

Three (3) liters of simulated blood provides enough fluid to fill the right thigh reservoir twice. The amount of blood used in a training session varies with the patient, the wounds simulated and the learner's experience.

Step 2: Connect the Trauma Fill Tank Connector to the Simulator

    a. Locate the tan **FILL** port and white **VENT** port

    b. Connect the **FILL** (with the tan label) and **VENT** (with the white label) hoses of the Trauma Fill Tank to the corresponding ports on the simulator

      Note: Both connections must be made for correct operation.

Step 3: Pressurize the Trauma Fill Tank and Fill the On-Board Blood Reservoir

An integrated hand pump is used to create the pressure for the Trauma Fill Tank.

> **WARNING**: *To prevent ejected pump assembly and/or solution from striking and injuring you, NEVER stand with your face or body directly over the top of the tank when pumping or loosening the pump.*

To operate the pump and fill the reservoir:

    a. Unlock the pump handle by turning counter-clockwise. Be careful not to loosen the pump from the tank

    b. Stroke the pump handle up and down from 25 to 35 times to transport 2 liters of simulated blood to the on-board blood reservoir. NEVER exceed 35 strokes while pressurizing the tank.

    c. Lock the pump handle back into the pump assembly by turning clockwise

    d. Watch the Overflow Bottle located on the tank assembly. When liquid begins to appear in this bottle, the on-board blood reservoir is full. Filling the on-board blood reservoir takes approximately 3 to 5 minutes.

Step 4: Release Pressure from the Trauma Fill Tank

Immediately release pressure from the tank by turning and holding the yellow pressure relief knob clockwise until all air pressure is gone.

If pressure will not release using the relief knob:

a. Place a rag over the top of the tank and pump handle

b. While firmly pushing down on the pump handle, slowly turn the handle counter-clockwise

NEVER leave a pressurized tank unattended.

Step 5: Disconnect the Trauma Fill Tank Umbilical from the Simulator

Disconnect the Trauma Fill Tank Umbilical from the simulator and store the assembly out of the way for later use.

After use, ALWAYS release pressure and clean the tank.

Preparing for Storage

After filling and using the Trauma Fill Tank and the simulator's blood reservoir, both must be cleaned before storage.

Step 1: Clean the Simulator and Fluid System

When the simulation is completed and the Trauma Fill Tank has been disconnected, remove the fluids and clean the simulator.

Step 2: Clean the Trauma Fill Tank

Before storing the Trauma Fill Tank, make sure the equipment is clean.

Step 3: Store the Trauma Fill Tank

After cleaning, the Trauma Fill Tank assembly should be stored securely for future use.

a. Allow the interior of the tank to dry by loosening the pump assembly. Do NOT leave the pump assembly out of bottle, however, because dust contaminates the system.

b. Loosely wrap the Trauma Tank Umbilical around the neck of the tank to protect it

c. Store all components in a clean, dry area

Optional: Connecting a TouchPro Computer to the Wireless Network

The CAE TouchPro computer is pre-configured for use with METIman. If you wish to supply your own TouchPro computer, use the following instructions to connect the computer to the METIman network.

Up to two additional computers may be used to run the TouchPro software. The additional computers must meet the TouchPro Software Specifications mapped out in

Step 5: Access the Software from the TouchPro Computer

a. On the TouchPro computer, launch the web browser (e.g., Safari®)

b. Enter the IP address obtained in **Step 2** into the browser's address field

The Müse Start Screen

OPTIONAL: From your web browser, a bookmark can be created on the TouchPro computer for ease of access to the Müse or TouchPro software. Please consult your web browser's help menu for aid in creating a bookmark.

IMPORTANT: The Instructor Workstation MUST remain on and connected to the METIman network for the TouchPro computer to be able to operate.

USING MÜSE

The Müse software is a browser-based application that can communicate directly with the simulator. With the software, users can run SCEs, create scenarios and SCEs, import and export educational content and perform administrative functions.

Note: *For optimal Müse performance, no other software programs should be open while Müse is running.*

IMPORTANT: *Only one Müse application window or tab and one TouchPro window or tab can be used per Instructor Workstation at a time.*

IMPORTANT: *Do NOT use any of the browser's navigational tools (i.e., back and forward buttons) while operating Müse.*

Starting Müse

Once the simulator is powered on and the Instructor Workstation is connected to the simulator network, the Müse software can be launched.

To launch the software:

1. Using the Laptop or Tablet Instructor Workstation, launch the web browser
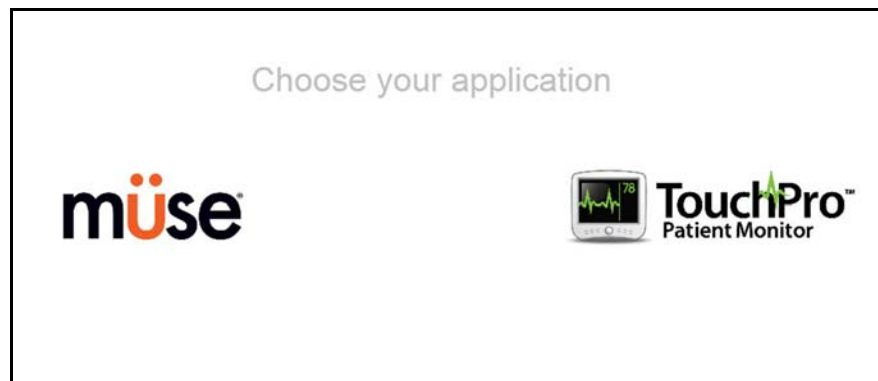
The Müse Start Screen

2. Select **Müse**

The Müse Login Screen

The icons in the bottom left corner of the screen provide access to additional information about the software:

Clicking the **Info** icon to access the Info menu. From the Info menu, users can select from the following options:

- Select **About** to access information about the Müse software version, the type of simulator and the serial number

- Select **User Guide** to download the user guide (English version). To access the User Guide in other languages, please visit www.caehealthcare.com and click the **Support** link

- Select **Support** for CAE Support contact information

Click the globe-shaped **Language** icon in the bottom left corner to change the language of the Müse software.

3. On the Login screen, enter the **Username** and **Password** in the appropriate fields and click **Login** to access Müse

The default **Username** is *admin* and the default **Password** is *admin*.
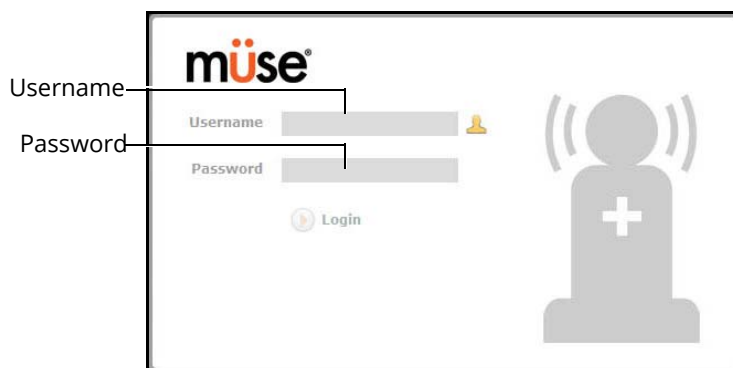
The Müse Login Fields

The Home Page View

From the Home page, users can run, create, edit, search for and print SCEs.

The Home page can be accessed by clicking the **Home** button in the upper right corner of the Müse software or, on any screen without a **Home** button, by clicking the **Return** button in the upper left or right corner of the screen.

The **Account Profile** button

The **System Administration** button

The **History** button

The **Home** button

The SCE Summary panel

The SCE Selection panel

The **Logout** button
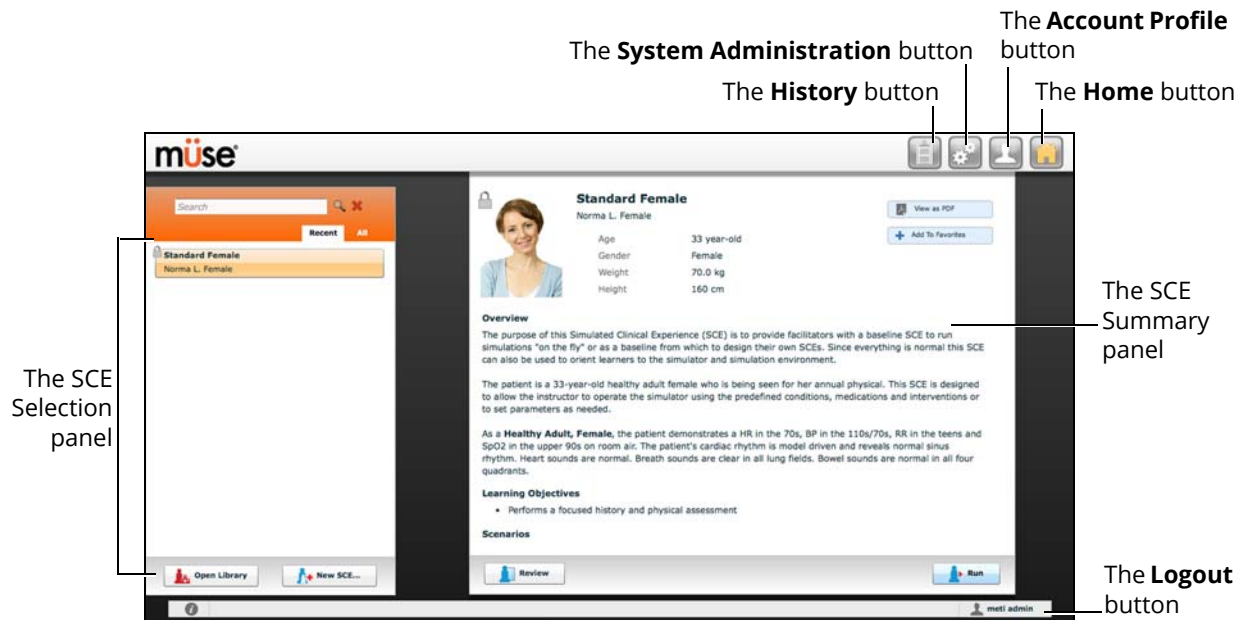
The Home Page

The SCE Selection Panel

SCEs are process tools that enable the facilitator to 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 comprised of a patient and up to four scenarios.

Available SCEs appear in the SCE Selection panel on the Home page.
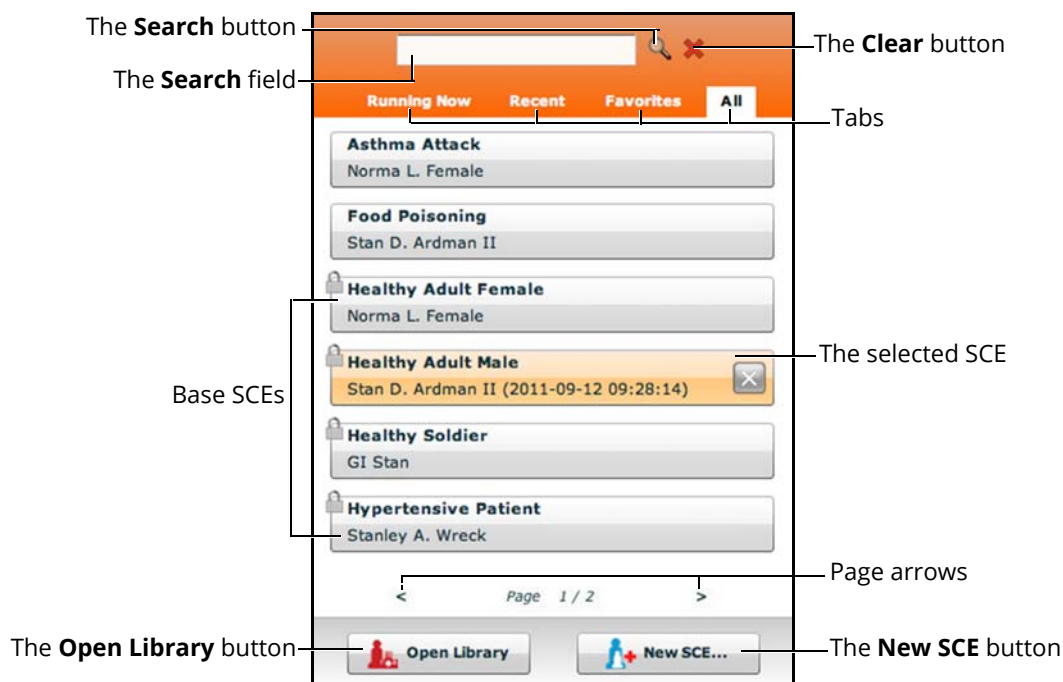
The SCE Selection Panel

The SCE Selection panel has four tabs that access SCEs: Running Now, Recent, Favorites and All.

- **Running Now** tab: Lists the SCE that is currently running and is only available when an SCE is running. **Note:** Only one SCE is allowed to run at a time.

- **Recent** tab: Lists all the recently run or edited SCEs.

- **Favorites** tab: Lists all SCEs that have been selected as favorites and is only displayed after favorites have been selected. To add a favorite SCE to your profile, click the **Add to Favorites** button at the top of any SCE on the Home page. Managing favorites is achieved in the Account Profile portion of the software.

- **All** tab: Lists all SCEs, including user-created SCEs and all SCEs from available learning modules.

The **Lock** icon indicates a locked SCE. Locked SCEs are installed by CAE and cannot be edited or deleted.

A Locked SCE
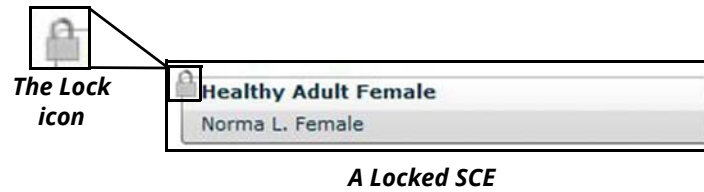
To search for an installed SCE, enter part of the name of an SCE in the **Search** field and click the **Search** button.

Click the page arrows to view additional pages of installed SCEs.

Click any SCE to select it. Once an SCE is selected, it appears in the SCE Summary panel.

To run an SCE, click **Run** in the SCE Summary panel to execute the SCE.

To open the SCE Library, click the **Open Library** button.

To create a new SCE, click the **New SCE** button.

The SCE Library

The SCE Library lists all SCEs available on your workstation. Access SCEs from your library by clicking the **Open Library** button at the bottom of the SCE Selection panel. The SCE Library appears.

The **Learning Modules** icon

The **Learning Modules** menu

The **SCEs** icon

The **Close Library** button

The SCE Library
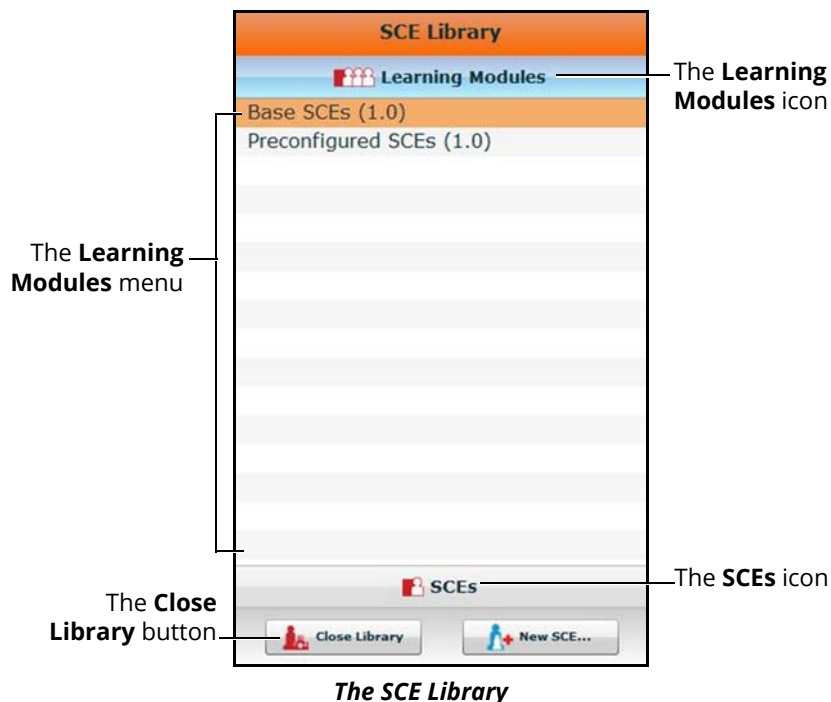
The Learning Modules menu is open by default. The Learning Modules menu lists Base SCEs, Preconfigured SCEs, and all installed learning modules. Click the desired learning module name to access its SCEs, or click Base SCEs or Preconfigured SCEs. The selected SCEs appear.

Clicking the **SCEs** icon reveals the SCEs menu, which lists all user-created SCEs.

Clicking the **Learning Modules** icon again reveals the Learning Modules menu.

To open an SCE, click the name of the SCE.

Click **Close Library** to exit the SCE Library.

Base SCEs

Base SCEs are fundamental SCEs with no scenarios and no progression of events. Each base SCE is designed to provide facilitators with a baseline to run simulations "on the fly" or as a physiological baseline from which to design their own SCEs.

To access a base SCE from the SCE Library, choose **Learning Modules**, then click **Base SCEs**. The base SCEs are displayed and available for selection.

There are six base SCEs included with HPS with Müse:

> Healthy Adult Male
>
> Healthy Adult Female
>
> Healthy Soldier
>
> Hypertensive Patient
>
> Chronic Obstructive Pulmonary Disease (COPD) Patient
>
> Pregnant Female

Preconfigured SCEs

Preconfigured SCEs are training tools with scenarios and multiple states. They are intended to be used for learner education and training.

To access a preconfigured SCE from the SCE Library, choose **Learning Modules**, then click the name of the SCE category. The SCEs in the chosen category are displayed and available for selection.

The SCE Summary Panel

The SCE Summary Panel provides information about the selected SCE.

The **View as PDF** button

The **Add to Favorites** button

The SCE Content Summary

The **Review** button

The **Run** button

The SCE Summary Panel

The **View as PDF** button can be used to generate a printable PDF of the selected SCE.

The **Add to Favorites** button adds the SCE to your Favorites list.

Click the **Review** button to review all information about an SCE; and edit any unlocked SCE.

Select the **Run** button to run the SCE.

Printing SCEs

To print an SCE:

1. From the Home page, select the SCE to print

The **View as PDF** button
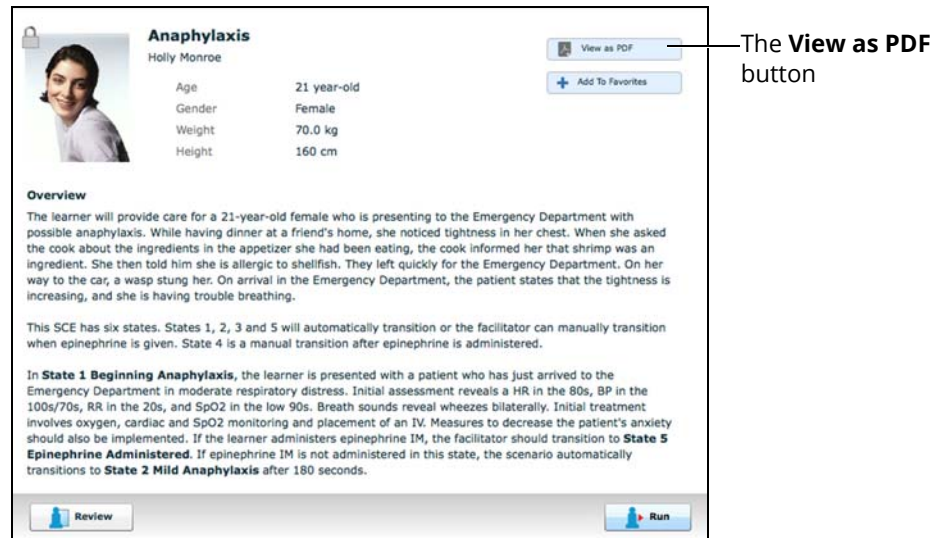
The SCE Summary Panel

2. From the SCE summary panel, click the **View as PDF** button

3. Save the PDF to an external storage device to print from another computer.

   Note: To print from the Instructor Workstation, consult your network administrator for assistance connecting to a printer.

4. When finished saving or printing the PDF, close the browser window containing the PDF to return to Müse

Running an SCE

To run an SCE, from the Home screen, select an SCE and click the **Run** button. The Run screen can also be accessed from the Scenario Designer or SCE Editor by clicking the **Run** button near the top of the screen.

The Run Button
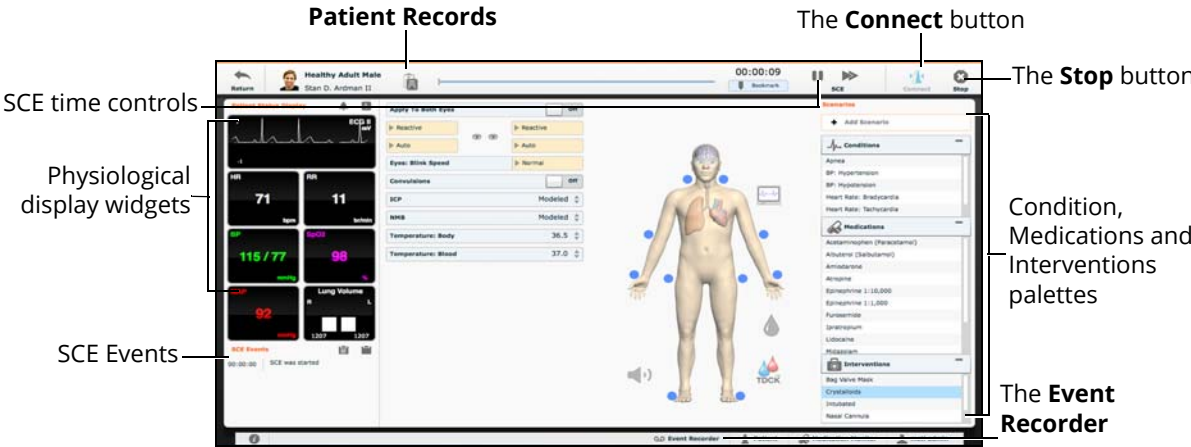
The Run Screen

From the Run screen, users can manage the SCE, perform interventions, view physiological status and events, save events as states, save the Patient and associate records with the Patient.

Monitor Signals

Lets the user control which vital sign signals are displayed on the patient monitor; including TouchPro and commercial monitors connected via VitalsBridge.

The Monitor Signals Icon
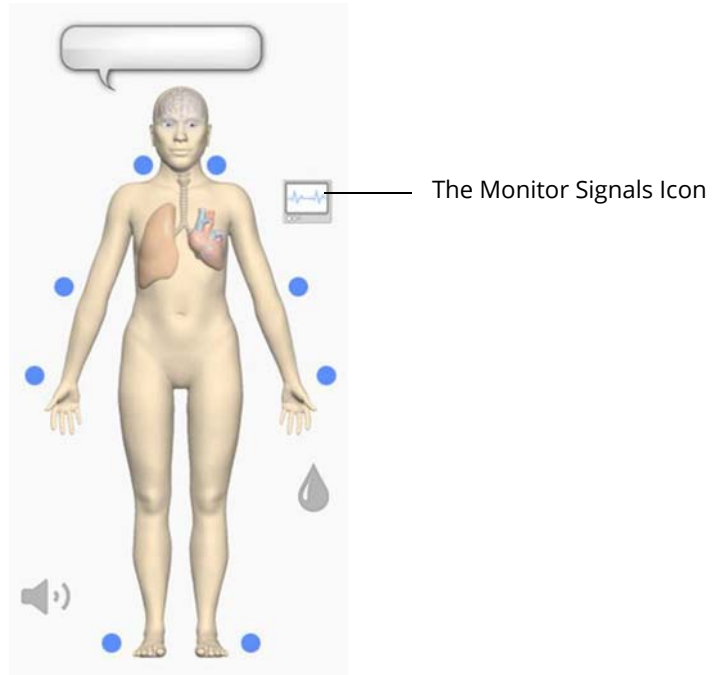
Monitor Signals Icon

A panel opens displaying a dedicated group of controls.

Cold Fluid Inject	▲
Arterial Catheter	▶ Peripheral Artery
Central Venous Catheter	▶ Right Atrium
PA Catheter	▶ Pulmonary Art...
PA Balloon	Deflated
ECG Leads	On
Pulse Oximeter	On
Capnograph	On
Intra-Cranial Catheter	On
Body Temperature Probe	On
Blood Temperature Probe	On
NIBP Cuff	On

Monitor Signals Panel

The listed probes impact which vital sign signals are displayed on the patient monitor; including TouchPro and commercial monitors connected via VitalsBridge. By default they are all on. Turning probes off here will impact some of the graphs as follows:

- ECG Leads OFF:
    - The ECG waveform is not displayed
- Pulse Oximeter OFF:
    - The PLETH waveform is not displayed
- Capnograph turned OFF:
    - The CO2 waveform is not displayed

The listed probes also impact the numerical values as follows:

- ECG Lead OFF and Pulse Oximeter OFF:
    - The HR (Heart rate) is not displayed
- Pulse Oximeter OFF:
    - SpO2 is not displayed
- Capnograph OFF:
    - EtCO2 not displayed
- Pulse Oximeter OFF and Capnograph OFF:
    - RR (Respiratory rate) not displayed
- Blood Temperature Probe OFF:
    - TBlood and TRectal not displayed
- Body Temperature Probe OFF:
    - TAxilla and TBody not displayed

Note: In simulators that include an emulated SpO2 probe which connects to the simulator's side and is placed on the finger, the detected on/off status of the emulated probe will take precedence over the on/off status indicated in the monitor signals menu.

Setting the catheter placement to Atmosphere causes a flat line to be displayed even when an override is used.

Arterial Catheter	▶ Peripheral Artery	None
Central Venous Catheter	▶ Right Atrium	Atmosphere
PA Catheter	▶ Pulmonary Art...	Peripheral Artery
		Left Ventricle
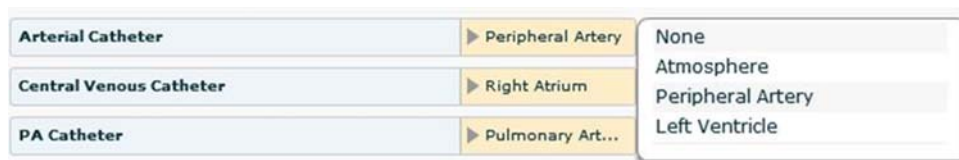
Arterial Catheter Placement
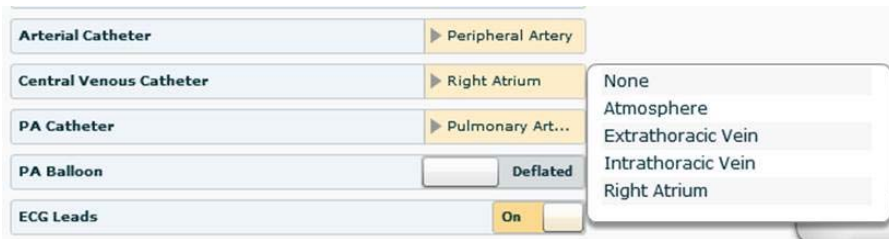
Central Venous Placement

PA Catheter Placement

If the catheter placement is none, no graph is displayed vs a flat line when Atmosphere is selected. The associated widget is displayed and no alarm is generated.
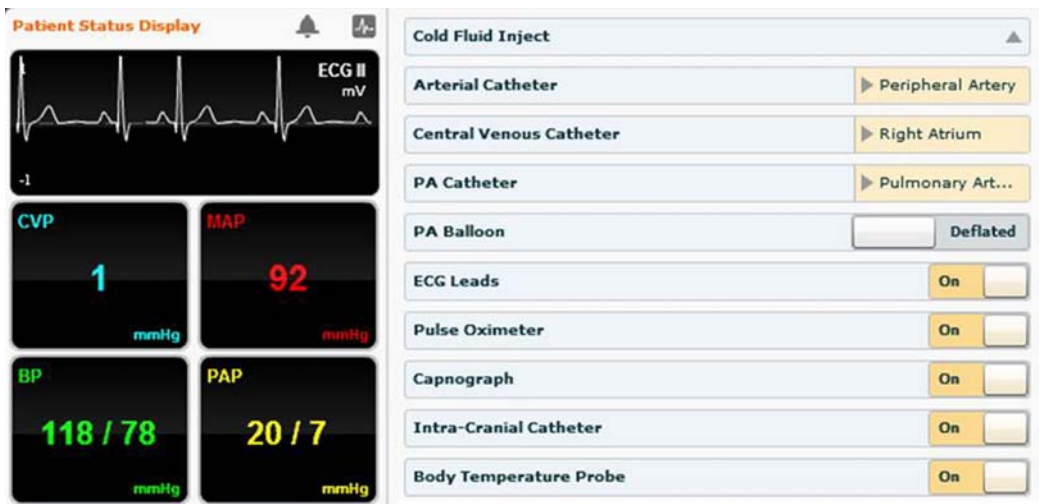
Catheters in Proper Locations

Catheters set at Atmosphere

Catheters set at None

The Event Logs

During an SCE, all software operations sensed by the simulator or entered manually (e.g., virtual defibrillation, setting a physiological parameter value) are recorded by an event entry that appears on the screen. The event entry notes what occurred and the time it happened.

The Event Logs

Displaying Patient Records

Patient records can be uploaded to Müse and displayed in the TouchPro software while an SCE is running.

To display an uploaded patient record:

1. From the Müse Run screen, click the **Patient Records** button

The Patient Records Button

The Patient Records list appears, displaying all available patient records.

Patient records

The **Start Displaying** button
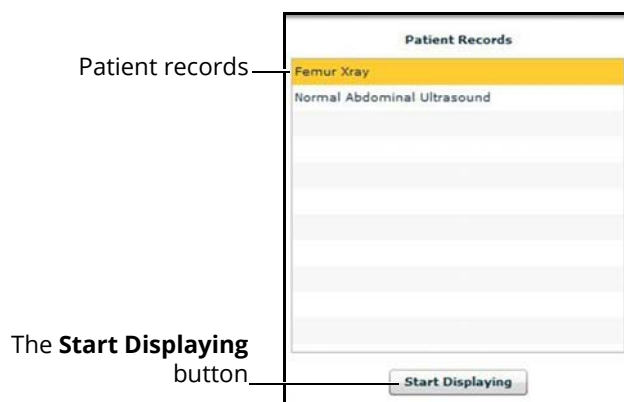
The Patient Records List

2. Select a patient record from the list

3. Click **Start Displaying**

The patient record is shown in a new TouchPro web browser window.

IMPORTANT: *Ensure pop-up blocking is turned OFF in the web browser of the Instructor Workstation and any TouchPro workstations. Consult the web browser's help menu for assistance.*

Note: The web browser window containing the patient record may be minimized initially. If the window is not readily visible, click the web browser icon on the Dock (Macintosh Instructor Workstation) or Taskbar (Windows Instructor Workstation) to locate the new window.

The **Patient Records** button turns red, indicating that a patient record is being displayed.

The Patient Records Button

The **Start Displaying** button at the bottom of the Patient Records list changes to a red **Stop Displaying** button.

Patient records

The **Stop Displaying** button
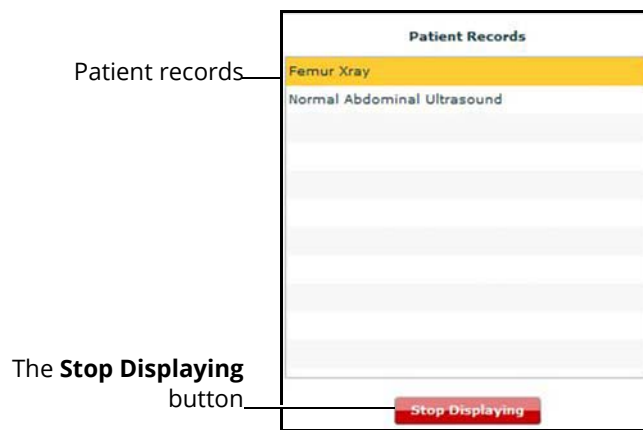
The Patient Records List

To stop displaying a patient record, click **Stop Displaying** at the bottom of the Patient Records list.

To close the Patient Records list, click the **Patient Records** button. The list closes. If a patient record is being displayed, the **Patient Records** button remains red until the list is re-opened and **Stop Displaying** is chosen.

Note: Only one patient record can be displayed at a time.

Adding a Scenario to a Running SCE

SCEs incorporate scenarios that contain pre-programmed physiology and events. Scenarios can be added to SCEs to enhance patient physiology.

To add a scenario to an SCE that is running:

1. Click the **Add Scenario** button on the Run screen

The Add Scenario Button

The **Add** button — The **Search** field
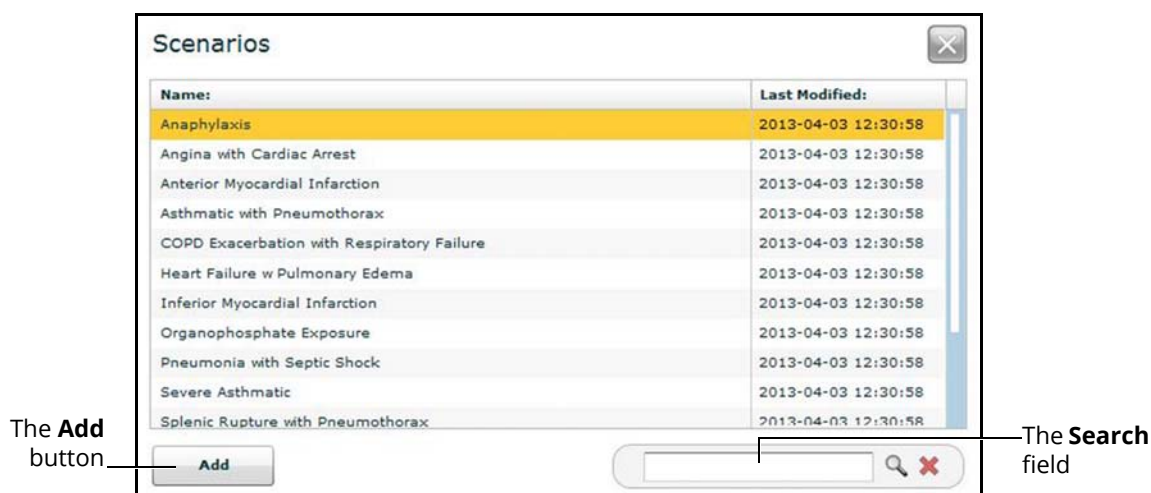
The Choose Scenario Dialog Box

2. Select a scenario from the Choose Scenario Dialog Box

3. Click **Add**

    The scenario is added to the SCE and appears under the **Scenarios** heading on the Run screen.
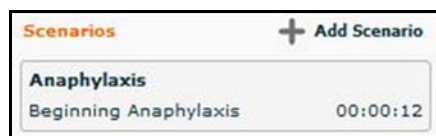
An Added Scenario

Changing Physiology

The patient physiology can be adjusted while an SCE is running in two ways: by using one of the physiological views on the Run screen to modify parameters or by using the Conditions, Interventions and Medications palettes.

Using the Physiological Views

From the Run screen, users can select from six different views representative of various body systems and features:

From the Run screen, users can select from different views representative of various body systems and features:

> Neurological
>
> Respiratory
>
> Cardiovascular
>
> Fluids
>
> TDCK (iStan, HPS, ECS, PediaSIM and BabySIM only)
>
> Sounds

To access each view, click the appropriate organ, icon or button.

- For Neurological, click the brain
- For Respiratory, click the lung
- For Cardiovascular, click the heart
- For Fluids, Click the **Fluids** icon
- For TDCK, click the **TDCK** icon (iStan, HPS, ECS, PediaSIM and BabySIM only)
- For Sounds, click the **Sound** icon

From each view, various parameters can be viewed and adjusted.
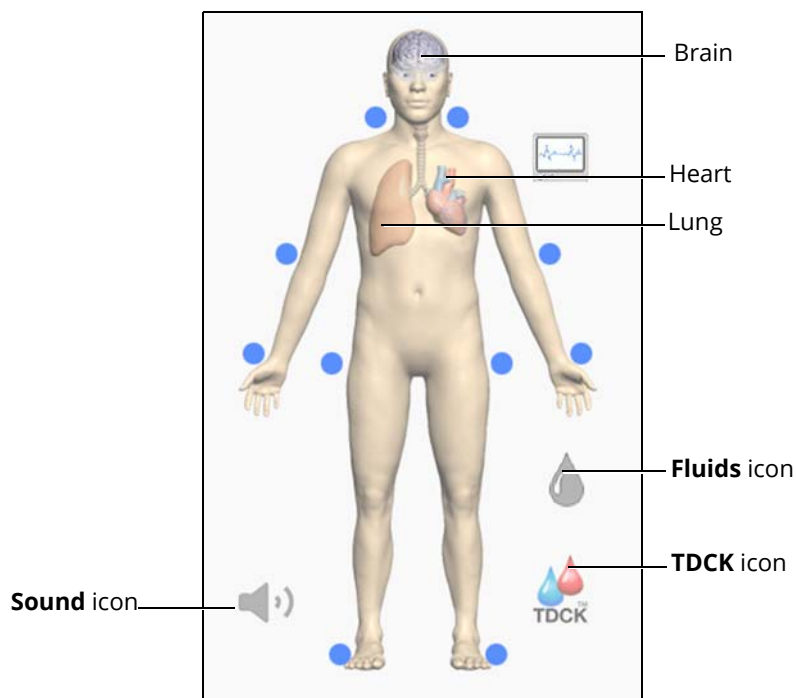
The Physiological Views

To change a patient's physiology using the physiological views:

1. Click the appropriate organ, icon or button from the homunculus to select the desired physiological view
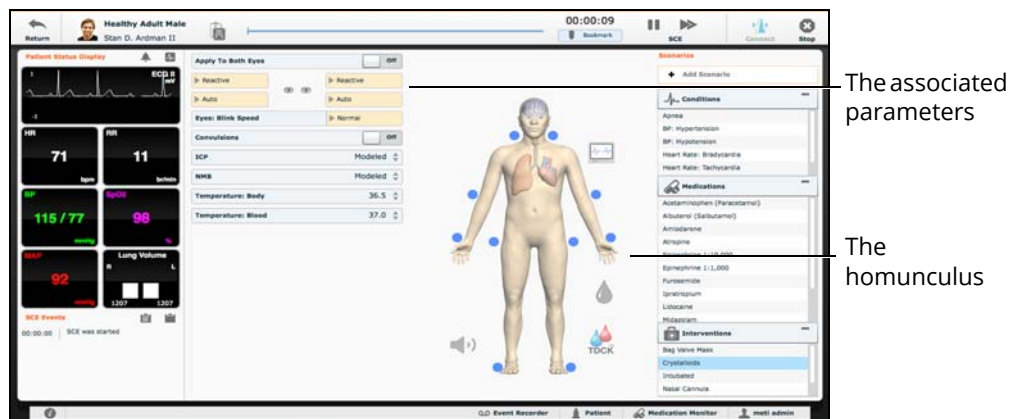
The Run Screen

The associated parameters appear to the left of the homunculus.

2. Locate the desired parameter

    Note: Some simulators have a **Basic/Additional** switch on the Respiratory and Cardiovascular views. Basic parameters are shown by default. The **Basic/Additional** switch can be toggled to show more parameters.

3. Select the parameter and set the new value

Parameters have varying controls, such as sliders, switches and menus. In the image below, the Heart Rate parameter is shown. Within the Heart Rate parameter, there are switches that toggle between **Modeled** and **Override** and **Seconds** and **Minutes**, a slider that sets the beats per minute and an available field where the beats per minute value can be keyed in.
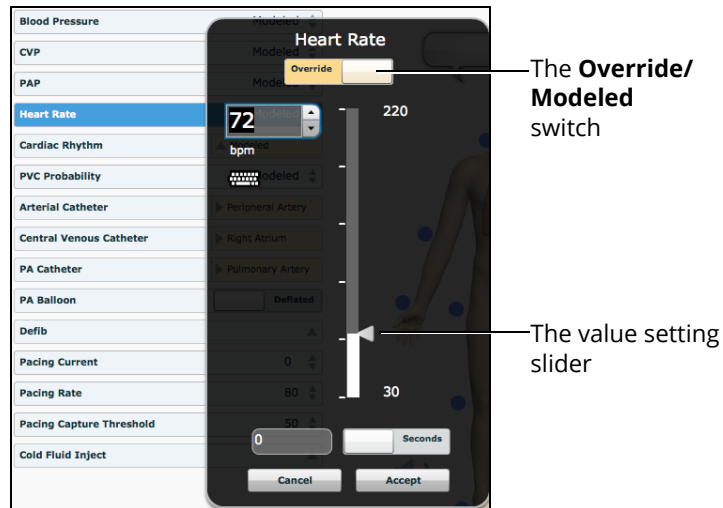
The Heart Rate Parameter

Once the parameter has been set, it is reflected in the patient's physiology.

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

Numeric parameters set either a measured value (e.g., 20 mL), a multiplied value called a factor (e.g., Heart Rate Factor 2.0 is two times the baseline Heart Rate) or a coefficient that affects a physiological value in a non-linear way (e.g., FHR Variability Coefficient).

Numeric parameters are changed by clicking in the relevant field and entering a new value in place of the existing one or using a slider to move through the range of parameter values until the desired numeric value is established.

Once a measured value is set, that value overrides the physiologically modeled parameter value. To return to a physiologically modeled value, switch the slider in the parameter dialog from **Override** to **Modeled**.

Discrete Parameters

Discrete parameters enable users to select one of two or more options.

Discrete parameters are changed by choosing the appropriate option using a drop-down menu or toggle switch.

In the image below, the **Bronchial Occlusion** parameter is shown. The **Bronchial Occlusion** parameter is set using a discrete parameter switch that toggles between **Off** and **On**.

The toggle switch

| Off | Bronchial Occlusion | Off |

The Bronchial Occlusion Parameter

Once the parameter has been set, it is reflected in the patient's physiology.
Some parameters have two toggle switches or buttons, one for the left side of the manikin and one for the right.

In the image below, the **Reactive Pupils** parameter is shown.

Apply To Both Eyes — Off

The left parameters — Reactive / Auto   Reactive / Auto — The right parameters

The Reactive Pupils and Apply to Both Eyes Parameters

When the **Apply to Both Eyes** parameter is set to **On**, any change made to the left or right side is also automatically applied to the other side.

Note: Not all changes to parameters affect the patient's physiology, but all are logged.

Using the Conditions, Medications and Interventions Palettes

The Conditions, Medications and Interventions palettes on the Run screen enable the application of conditions, medications and interventions during simulation. Once applied, conditions are reflected in the patient's physiology and logged. All medications and interventions are also logged, and most affect the patient's physiology.

TIP: Click on the palette collapse/expand button to collapse or expand the palette.

Conditions — The collapse/expand button

The Palette Heading

Using the Conditions Palette

Conditions are pre-programmed pathophysiological states that use one or more physiological parameters and are designed to enable you to create physiological changes on the fly.

There are two ways to apply conditions using the Conditions palette: using a Quick Link or using the complete Conditions menu. Quick Links are pre configured conditions that are made accessible in the Conditions palette for quick application. Quick Links can also be created for the Medications and Interventions palettes.

To set parameters using the Quick Links in the Conditions palette, click one of the Quick Link conditions. A popup menu will show the available conditions; and hovering over the condition will show the parameters. Click a specific condition to apply it and affect the patient's physiology.

The Medications Palette
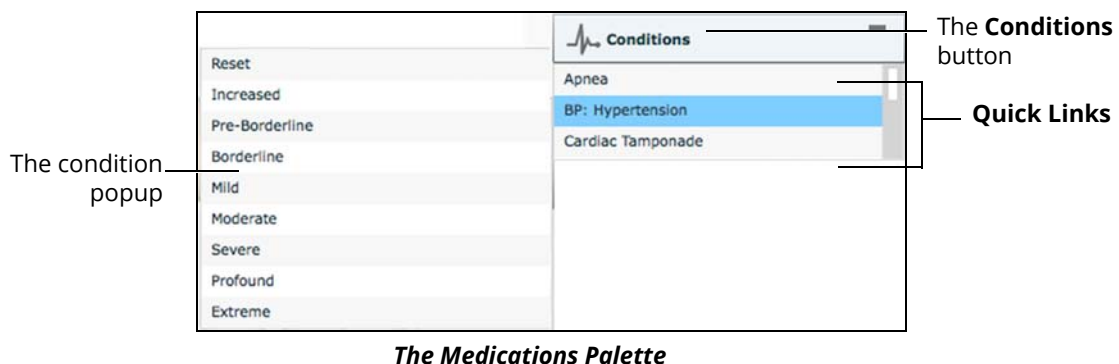
Note: Quick Links can only be added while creating or editing an SCE.

To apply a condition that is not set up as a Quick Link in the **Conditions** palette:

1. Click the **Conditions** button

    Conditions are organized by system, or all available conditions are listed under **ALL CONDITIONS**.

The Conditions Menu
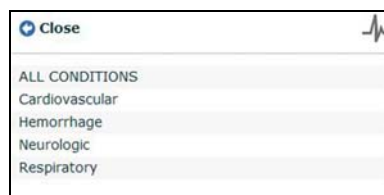
2. Navigate the menus to find the desired condition

    Once the desired condition has been located, click the condition's name from the list.

    The condition is applied and affects the patient's physiology.

Using the Medications Palette

There are two ways to administer medications using the **Medications** palette: using a Quick Link or using the **Medications** menu. Quick Links are preconfigured medications that are made accessible in the **Medications** palette for quick application. Quick Links can also be created for the **Conditions** and **Interventions** palettes.

To set parameters using the Quick Links in the **Medications** palette, click one of the Quick Link medications. A popup menu will show the available doses. Click a specific dose to apply it and affect the patient's physiology.
The option for custom doses will also be in the popup menu. Click the route of administration to get the Custom Dose Administration menu.

Note: Not all medications affect the patient's physiology, but all are logged.
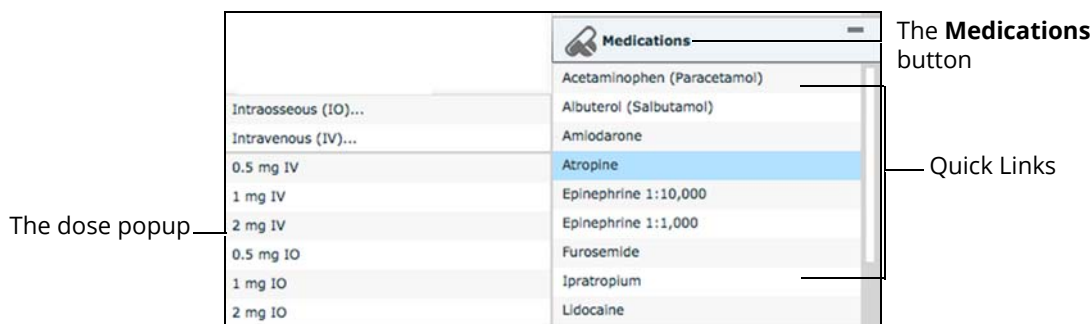
The Medications Palette

Note: Quick Links can only be added while creating or editing an SCE.

Or, to apply a medication that is not set up as a Quick Link in the **Medications** palette:

1. Click the **Medications** button. Medications are organized by type, and all available medications are listed under **ALL MEDICATIONS**
2. Navigate through the menus to locate the desired medication
3. Once the medication has been located, click the medication's name from the list
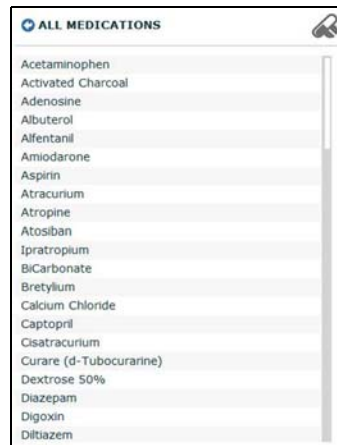
The All Medications Menu

The Medication Dose menu appears, displaying the pre-defined dose and custom dose routes for the chosen medication.
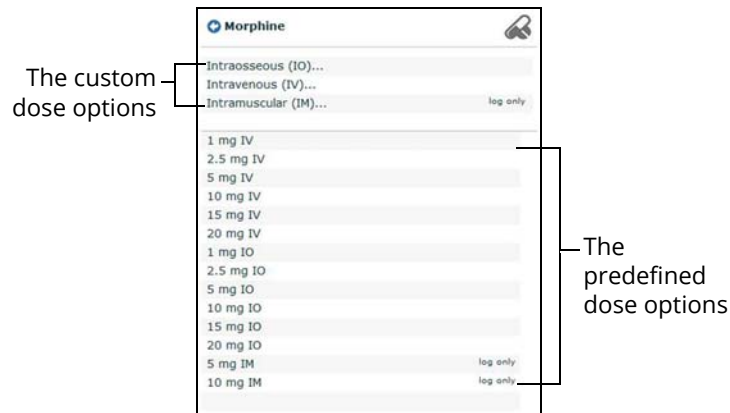
The Medication Dose Menu

4. Select a dose option. This can be done one of two ways:

a. Choose a pre-defined dose

The Medication Dose Menu

The dose is applied and appears in the patient's physiology. The medication selected also appears in the Medication Monitor.

b. Choose a route of administration to administer a custom dose
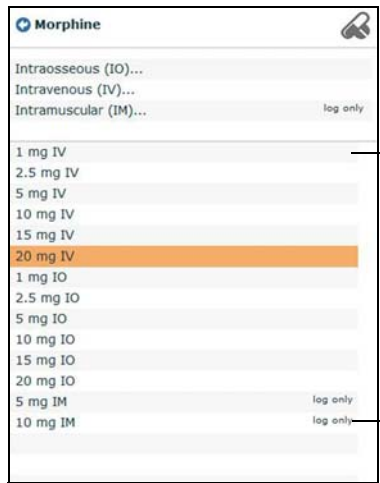
The custom dose options

The Medication Dose Menu

The **Administer** button
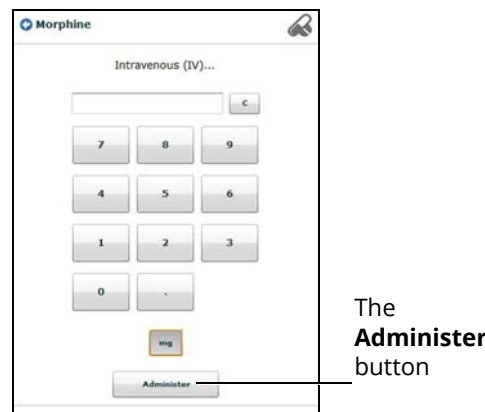
The Custom Dose Administration Menu

5. Enter the desired dose and click the **Administer** button

The dose is applied and appears in the patient's physiology. The medication selected also appears in the Medication Monitor.

Note: Not all medications affect the patient's physiology, but all are logged.

Using the Interventions Palette

There are two ways to perform and/or administer interventions using the Interventions palette: using a Quick Link or using the complete **Interventions** menu. Quick Links are preconfigured interventions that are made accessible in the **Interventions** palette for quick application. Quick Links can also be created for the **Conditions** and **Medications** palettes.

To apply an intervention using the Quick Links in the **Intervention** palette, click an Intervention Quick Link.

Note: Not all interventions affect the patient's physiology, but all are logged.

The Interventions Palette

Once an Intervention is selected, a menu appears with available options for the selected Intervention. Click the desired option to select it. The intervention is applied and appears in the patient's physiology.
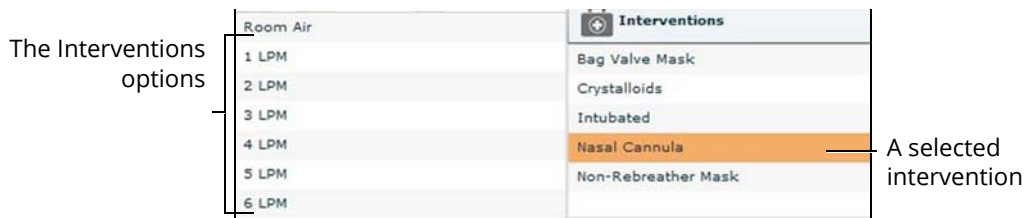
The Selected Intervention Options

Note: Quick Links can only be added while creating or editing the SCE.

To apply an intervention that has not been set up as a Quick Link in the **Interventions** palette:

1. Click the **Interventions** button
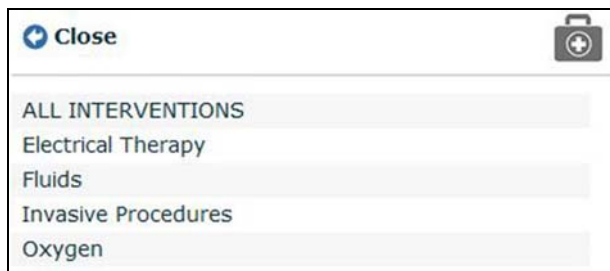
The Interventions Menu

Interventions are organized by type, or all available interventions are listed under **ALL INTERVENTIONS**.

2. Navigate through the menus to find the desired intervention

3. Once the desired intervention has been located, click the intervention's name from the list

The Intervention Options Menu

4. Click the desired option

The intervention is applied and appears in the patient's physiology.

Transitioning Scenario States from the Run Screen

To move between scenario states from the Run screen:

1. Click the desired scenario

A Scenario
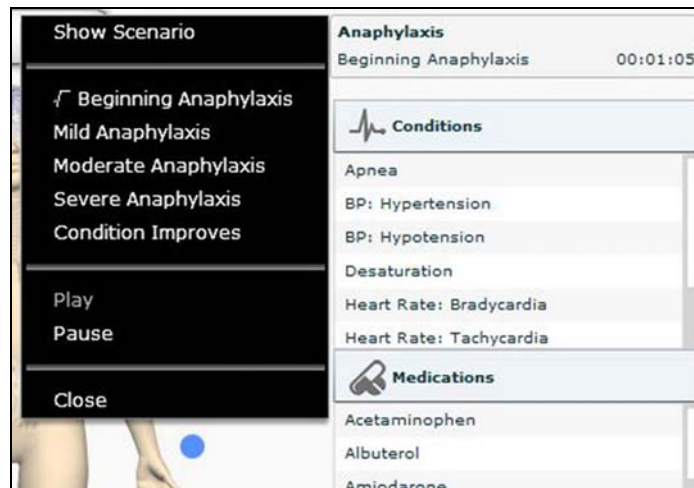
The Scenario Management Pop-Up Menu

2. Select the desired state. The scenario proceeds to the selected state

The scenario can also be paused or continued by selecting the **Pause** and **Play** options from the Scenario Management Pop-Up menu.

Transitioning Scenario States from the Scenario Screen

To move between scenario states from the Scenario Screen:

1. From the Run screen, click the desired loaded scenario

The **Show Scenario** option
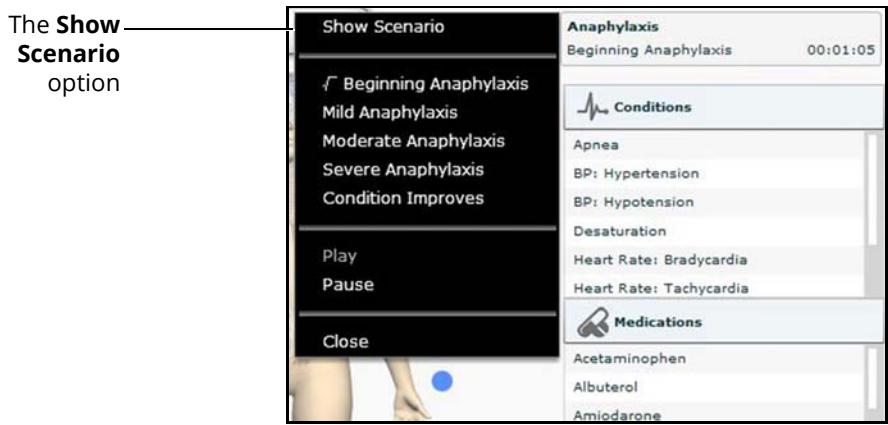
The Scenario Management Pop-Up Menu

2. From the menu, select **Show Scenario**

The **Jump to State** button

Selected state

The **Close Window** Button

States

The Scenario Screen

At the top of this screen, the Scenario Time and State Time are visible. Additionally, users can pause and continue playing the scenario by clicking the Scenario **Pause** and **Play** button on the top of the screen.

3. Click the **Jump to State** button

The Jump to State menu appears, displaying the available states.
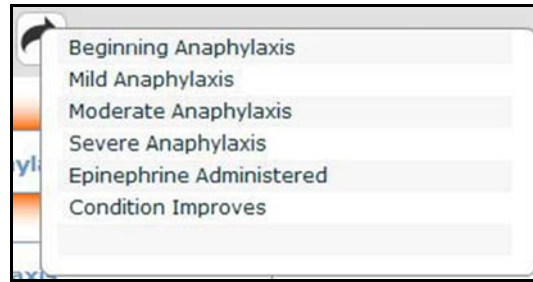
The Jump to State Menu

4. Select the desired state

   The scenario transitions to the selected state and the state is highlighted on the Scenario screen.

   Note: Double-click on the states to expand to the full view.

5. Click the **Close Window** button to return to the Run screen

SCE Time Controls

The SCE time controls are located at the top of the Run screen.
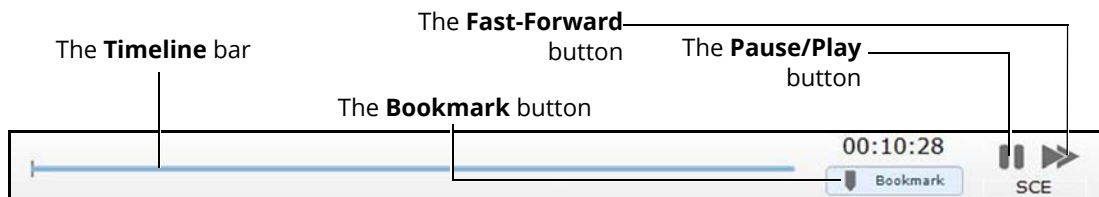
The SCE Time Controls

- The **Timeline** bar shows the amount of time that has elapsed and bookmarks that have been created

- The **Bookmark** button creates a bookmark at the current point in the SCE. The bookmark can be used later to reset the patient's physiology to what it was when the bookmark was created.

- Clicking the **Fast-Forward** button once accelerates the SCE time at a 4:1 ratio. Clicking the **Fast-Forward** button a second time accelerates the SCE time at an 8:1 ratio.

- The **Pause/Play** button pauses the SCE time 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 Bookmarks

To create a bookmark, click the **Bookmark** button. A bookmark appears on the **Timeline** bar.

A bookmark   **The Timeline bar**   The **Bookmark** button
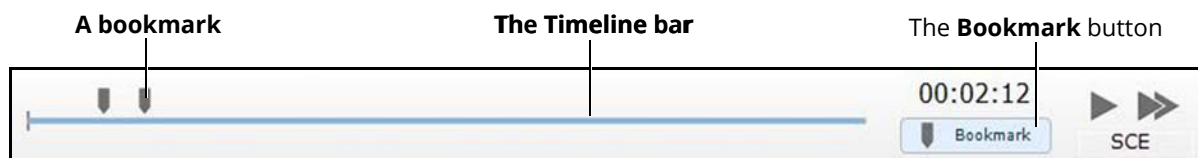
The SCE Time Controls

To return to a bookmarked time in the SCE:

1. Click the bookmark on the timeline

The **Return** button
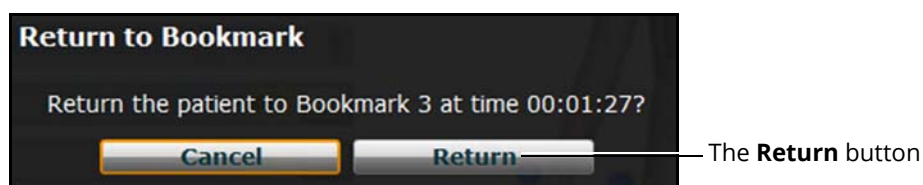
The Return to Bookmark Message

2. Click **Return**

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

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

The CPR Monitor

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

To use the CPR monitor, click the **CPR Monitor** button at the bottom of the Run screen.
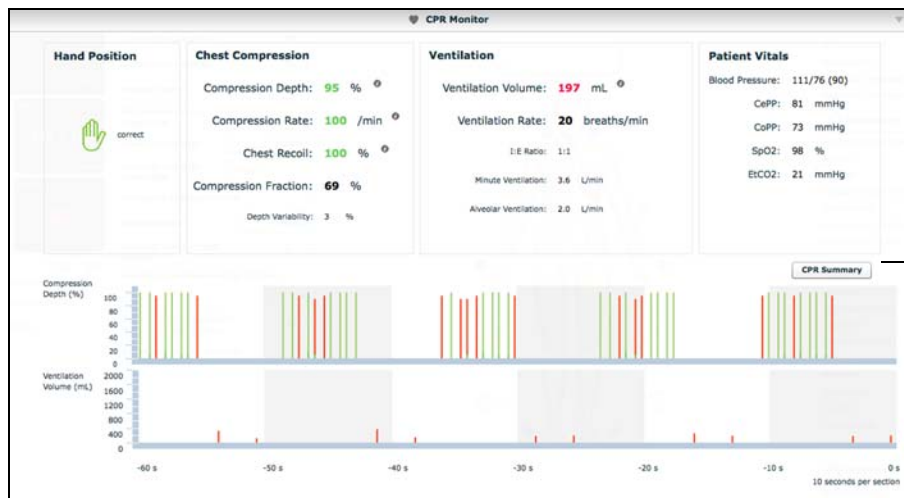
The CPR Monitor Button

The CPR Monitor - Live Data View

Click the **CPR Summary** button to display the summary view.
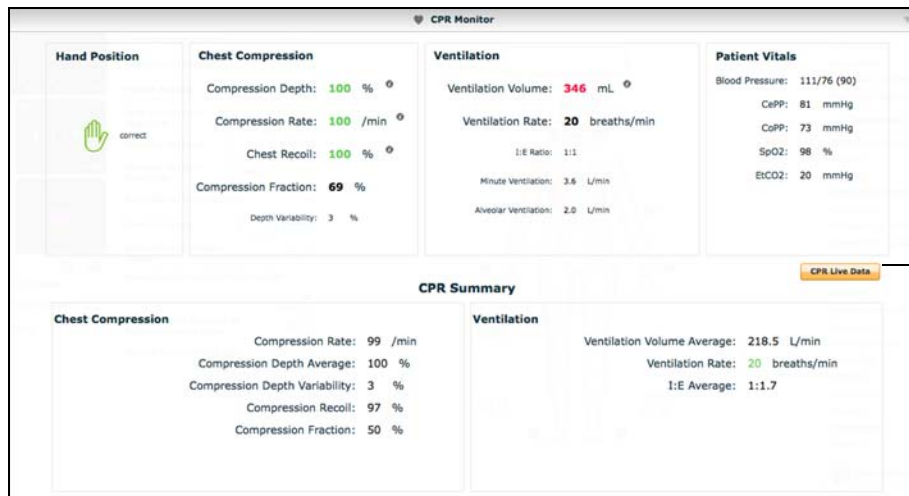
The CPR Monitor - Summary View

Click the **CPR 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 Logs.

To close the CPR Monitor, click the **Close** button.

Using the Event Recorder to Save States

The Event Recorder can be used to save conditions, interventions and parameter changes as states.

To save a state using the Event Recorder:

1. Apply the desired conditions, interventions and parameters
2. Click the **Event Recorder** button at the bottom of the Müse screen

The Event Recorder Button

The Event Recorder displays all events that have occurred since the start of the SCE.

Events

The **Edit** button

The **Save State** button   The **Clear** button
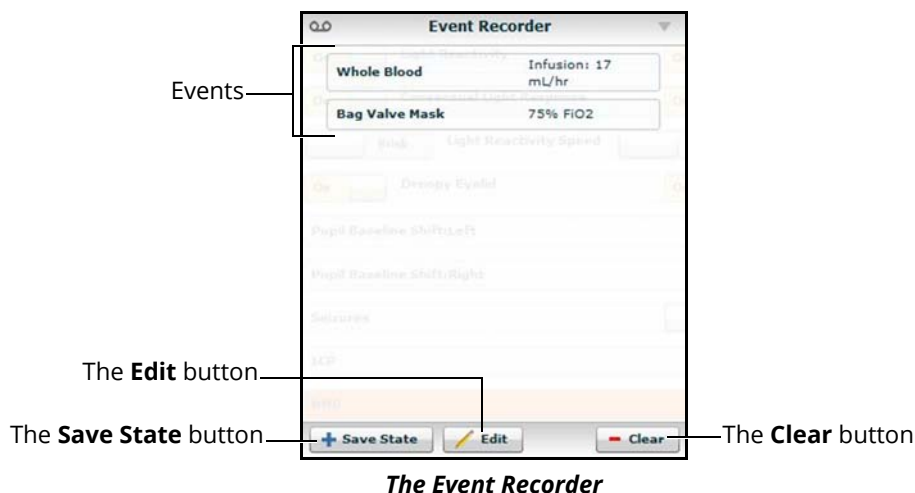
The Event Recorder

> WARNING: *The **Clear** button deletes all recorded events. This action cannot be undone.*

3. Review the list of events
    If you wish to remove any events from the state to be saved:
    a. Click **Edit**

A **Delete** button appears next to each recorded event

Events —

Delete buttons

The **Done** button —

The **Save State** button —
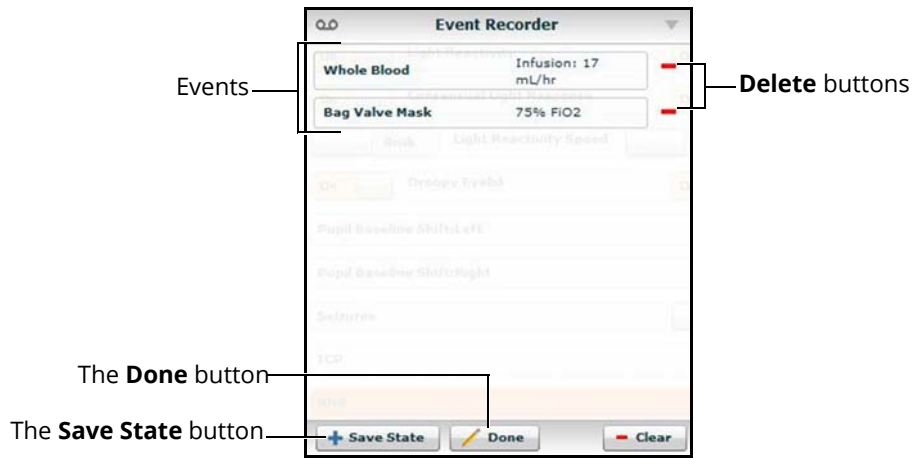
The Event Recorder

b. Click the Delete button next to each event to be removed

c. Click Done

4. Click Save State

The **Save** button
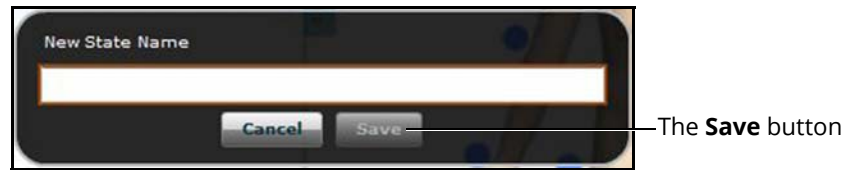
The New State Name Window

5. Enter a state name

6. Click **Save**

Creating a New Patient

When an additional patient with specific physiological characteristics is needed for repeated use, a new patient can be created from the Run screen.

To create a new Patient:

1. From the Home page, run an SCE that has a Patient with the same gender as the Patient to be created
2. From the Run screen, apply the desired conditions and set the necessary parameters
3. Once complete, click the **Patient** button at the bottom of the Run screen

**The Patient Button**

The Patient pop-up menu appears.
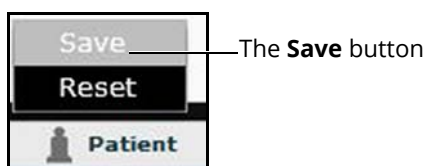
**The Patient Pop-Up Menu**

4. Click **Save**
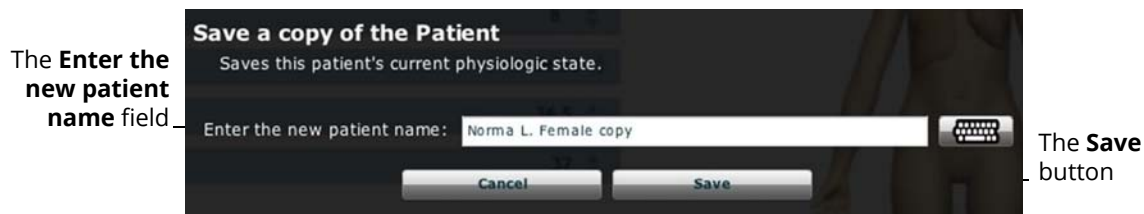
**The Save a Copy of the Patient Dialog Box**

5. Enter a name for the new Patient in the **Enter the new patient name** field
6. Click **Save**

   The new Patient is saved and available for selection from the Base Patients Library when creating a new SCE.

Note: Overwriting a patient will only impact the running SCE, not the base patient library or any other SCE created with the same base patient.
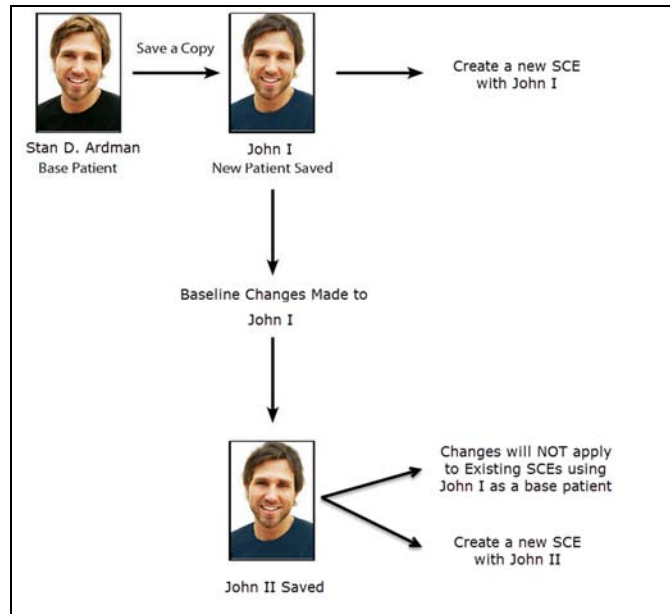
The New Patient Diagram

Resetting a Patient

Resetting a Patient brings the Patient back to its original physiological state before any scenarios were applied or modifications were made. Any running scenarios are paused. However, the SCE time is unaffected. Additionally, the reset appears in the Event Logs.

To reset a Patient:

1. While running an SCE, click **Patient** at the bottom of the Run screen

The Patient Button

The **Reset** button
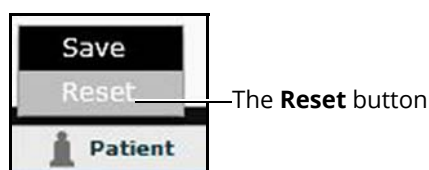
The Patient Pop-Up Menu

2. Click **Reset**

   The Reset the Patient dialog box appears, stating that the patient's physiology will be reset to its state at load time and all running scenarios will be paused.

The **Reset** button
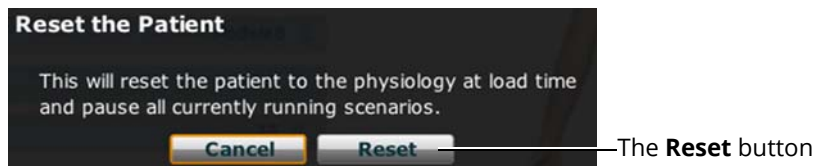
The Reset the Patient Dialog Box

3. Click **Reset**

   The patient returns to its original physiological state as at the start of the SCE. The patient reset is indicated with a red marker on the SCE timeline bar.

4. To resume any paused scenarios, click the loaded scenario on the left side of the screen

5. From the Scenario Management pop-up menu, select **Play**

The Medication Monitor

The Medication Monitor tracks the infusion of medication administered for medications that affect patient physiology. To activate the Medication Monitor, from the Run screen, click the **Medication Monitor** button in the bottom, right portion of the screen.

The Medication Monitor Button

The Medication Monitor appears as a movable box on the Run screen.

The Medication Monitor

The normalized effector site concentration is shown next to each medication listing.

The **Reset** button is used to clear a medication from the physiological model and the Medication Monitor.

To close the Medication Monitor, press the **Close** button in the upper right corner of the medication Monitor window.

Resetting a Medication

To reset a medication from the Medication Monitor, click the **Reset** button on the Medication Monitor.

The Reset Medication dialog box appears, asking you to confirm that you wish to reset the medication.
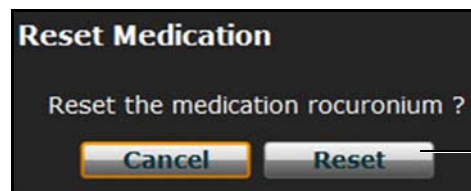
The Reset Medication Dialog Box

The medication is cleared from the model and from the Medication Monitor.

With continuous infusions, the amount infused goes back to zero, but the infusion continues. To stop the infusion, you must select the medication from the medication library and set the infusion rate to zero.

Returning to the Home Page

To exit the SCE and return to the Home page, click the **Return** button in the upper-left of the run screen.

The Return Button

The SCE continues running and the Home page appears.

To return to the SCE from the Home page, click the **Continue** button in the SCE summary panel of the running SCE.

The **Continue** button

The SCE Summary Panel

Stopping the SCE

Running SCEs can be stopped from the Run screen or the Home page.

To stop an SCE from the Run screen:

1. Click **Stop** in the upper right corner of the screen

The Stop Button
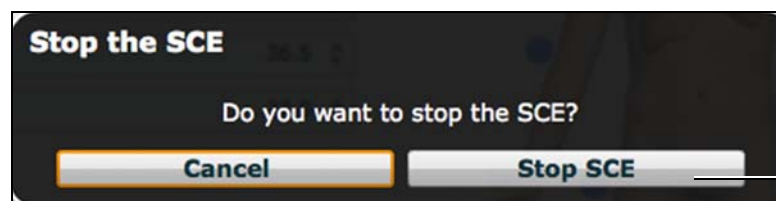
The **Stop SCE** button

The Stop The SCE Dialog Box

2. Click **Stop SCE**
   The SCE stops running and the Müse Home page is shown.

To stop an SCE from the Home page:

1. Click the **Stop** button in the bottom left corner of the SCE Summary Panel

The Stop Button
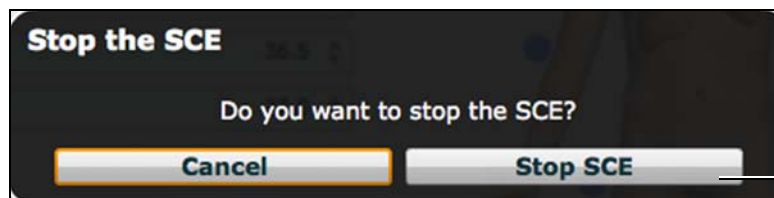
The **Stop SCE** button

The Stop The SCE Dialog Box

2. Click **Stop SCE**

IMPORTANT: *Always stop all running SCEs before logging out of Müse.*

Developing SCEs

Creating and editing SCEs are similar processes. Once an SCE is created, the steps for modifying the SCE are the same as those for editing a previously-created SCE. The processes of creating and editing SCEs each begin with a unique button on the Home screen.

Use the **New SCE** button to create a new SCE.

The New SCE Button

The minimal requirements for creating a new SCE include selecting a Patient, naming the SCE and saving the SCE. Once the new SCE is created, you can continue with the SCE development or edit it later.

Use the **Review** button to edit an existing SCE.

The Review Button

Creating a New SCE

Creating an SCE requires naming the SCE and selecting a Base Patient.

To create a new SCE:

1. From the Home screen, click **New SCE**

The New SCE Button

The **Create** button

The Patients Palette

2. Click on a patient to select that patient from the palette and click **Create**

The **Save** button

The **SCE Name** field

The SCE Editor

3. Enter the name for the SCE

   Note: The name of the SCE may NOT exceed 80 characters. Additionally, SCE file names CANNOT contain any special characters, such as (' / \ : * ? < > % | ") .

4. Click **Save**

   Once the SCE is saved, it is stored and can be edited and reviewed at any time, including creating a Patient Profile and content, determining settings and programming scenarios.

The SCE Editor

The SCE Editor can be used to review preconfigured SCEs and to create or edit custom SCEs.

To access the SCE Editor, click the **Review** button in the SCE Summary Panel or create a new SCE.
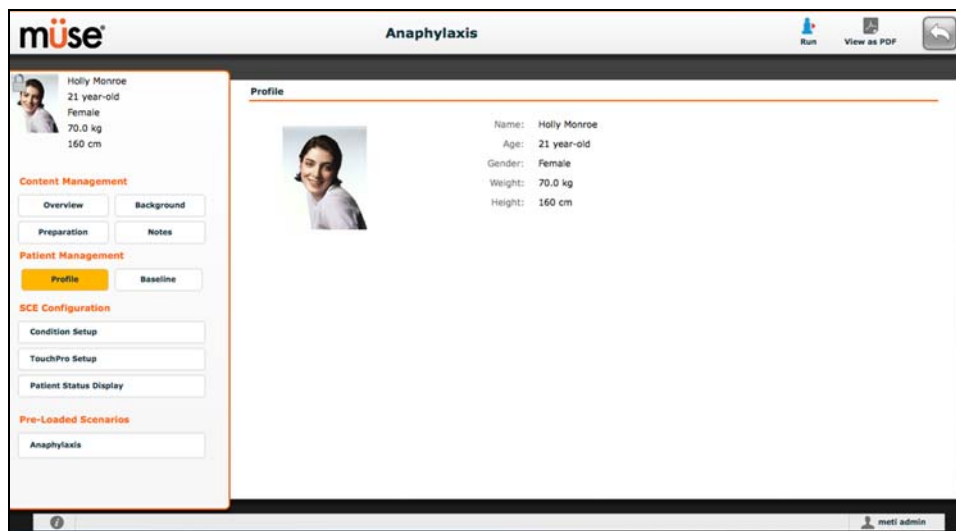
The SCE Editor

The buttons in the upper right corner of the SCE Editor provide options for running the SCE, generating a printable PDF, or returning to the Home page.

The **Content Management**, **Patient Management**, **SCE Configuration** and **Preloaded Scenarios** links in the left panel are used to review the SCE content and configuration, and to view scenarios applied to the SCE.

Editing a Patient's Profile

To edit the Patient Profile:

1. From the SCE Editor, in the **Profile** section, click **Edit**

The **Edit** button

The SCE Editor Screen

The **Change Picture** button

The **Save** button
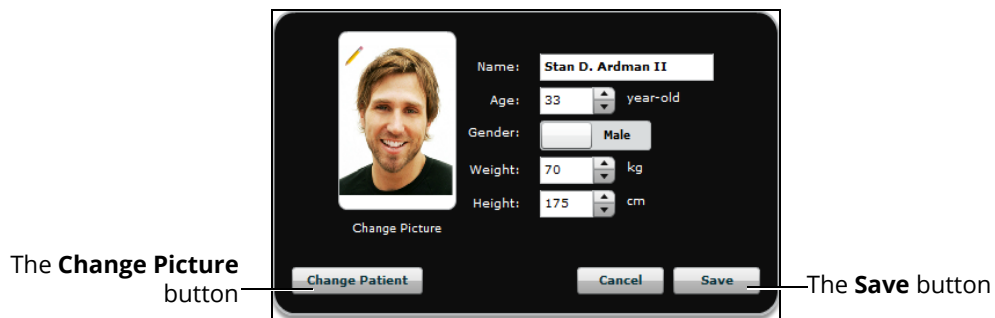
The Profile Editor

2. Set the Patient's name, age, gender, weight, and height by filling in the appropriate fields

3. Click the **Change Picture** button to change the patient's picture (optional)

4. Click **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 physiology at the beginning of an SCE. To set the Patient's Baseline:

1. From the SCE Editor, click **Baseline**

The **Baseline** button

The SCE Editor Screen
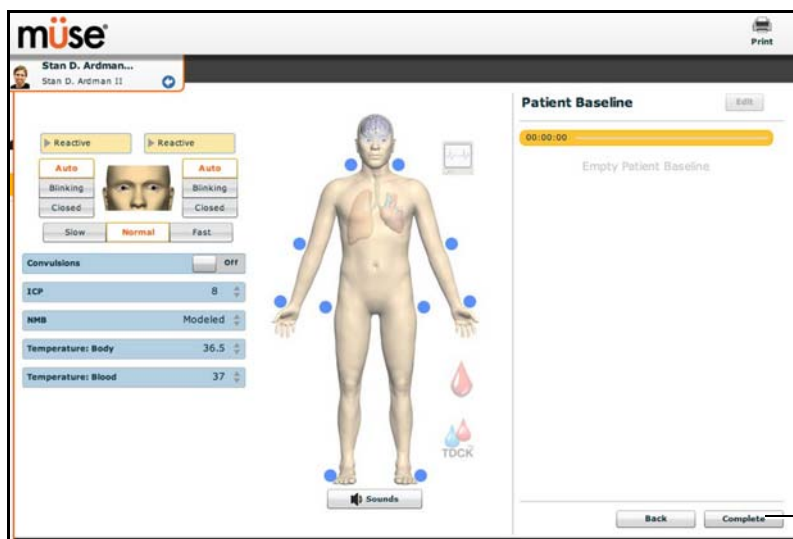
The **Complete** button

The Patient Baseline Screen

2. Set the Patient's baseline physiology by modifying the desired parameters
3. Click **Complete**

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

Content Management

SCE Content is entered from the SCE Editor using the **Overview**, **Background**, **Preparation** and **Notes** buttons under the **Content Management** heading.

The Content Management Buttons

Each button accesses a screen that allows users to enter information for the chosen section (Overview, Background, Preparation or Notes). Click the **Edit** button of each section on the SCE Editor to access a rich-text editor that enables data entry.

IMPORTANT: *Text can be copied and pasted into the fields from TextEdit or Notepad only.*
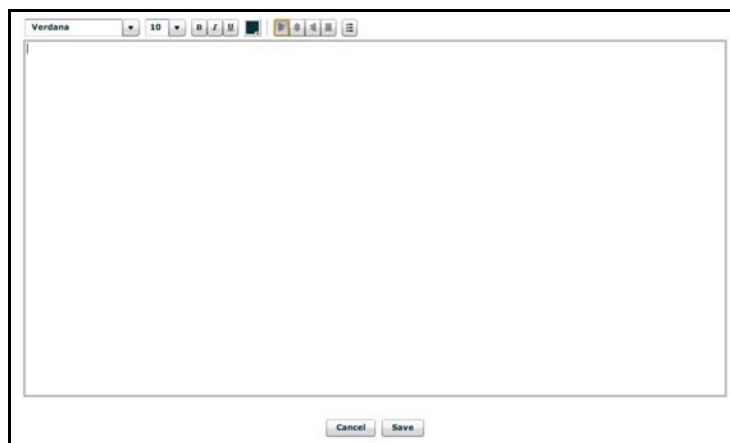
The Rich-Text Editor

Click **Save** when all data for the field has been entered.

SCE Configuration

Setting up the Conditions, the TouchPro software and the Patient Status Display is achieved by clicking the buttons under the **SCE Configuration** heading in the SCE Editor.

The SCE Configuration Buttons

Condition Setup Screen and Creating Quick Links

Click **Condition Setup** to access the Condition Setup screen. From the Condition Setup screen, conditions, medications and interventions can be preconfigured for the SCE creating Quick Links.

On the Condition Setup screen, **Conditions**, **Medications** and **Interventions** buttons are available. To navigate through available conditions and interventions, click the **Conditions, Medications** and **Interventions** buttons.
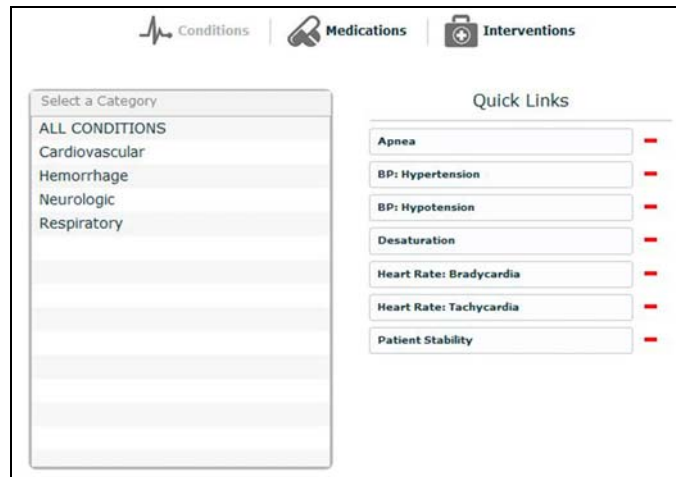
The Condition Setup Screen
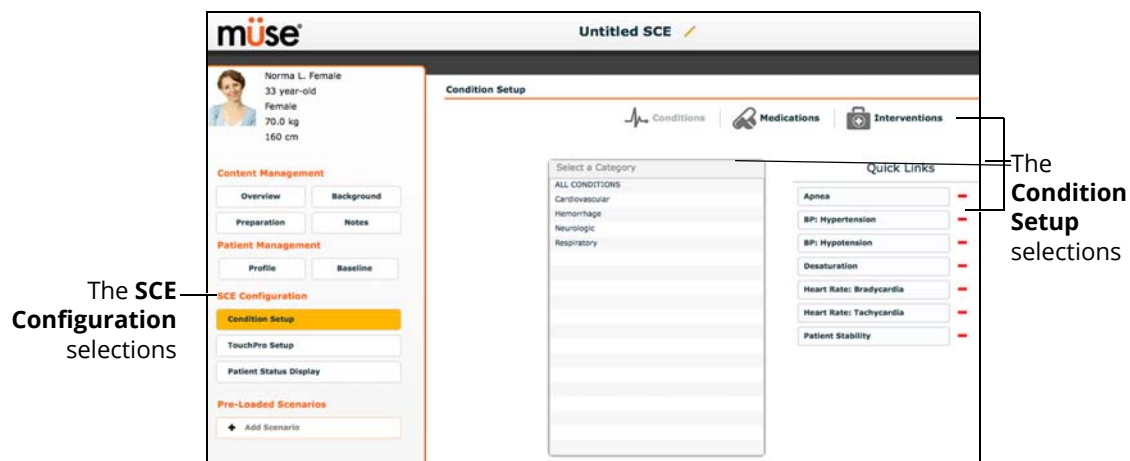
The Conditions Setup Panel

To create a Quick Link, drag and drop the desired choice from the Conditions, Medications or Interventions palette to the list of Quick Links.

Click the minus sign to remove a Quick Link from the SCE.

Modifying the TouchPro Setup

Use the **TouchPro Setup** link to access the TouchPro Setup panel.

From the TouchPro Setup panel, TouchPro layouts can be enabled or disabled for the selected SCE.

When a layout is enabled, it is available to be used in the TouchPro software with the selected SCE. When a layout is disabled, it is unavailable to be used in the TouchPro software with this SCE.

Click an **On/Off** switch next to a layout to enable or disable it.
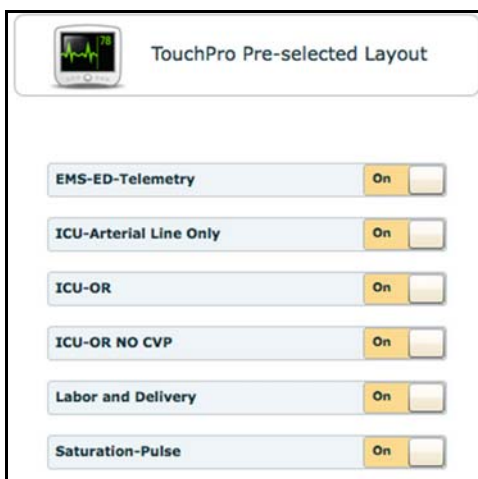
The TouchPro Setup Panel

Patient Status Display

To configure the Patient Status Display displayed on the Run screen, click **Patient Status Display** under the SCE Configuration heading on the SCE Editor.

The Patient Status Display screen appears.
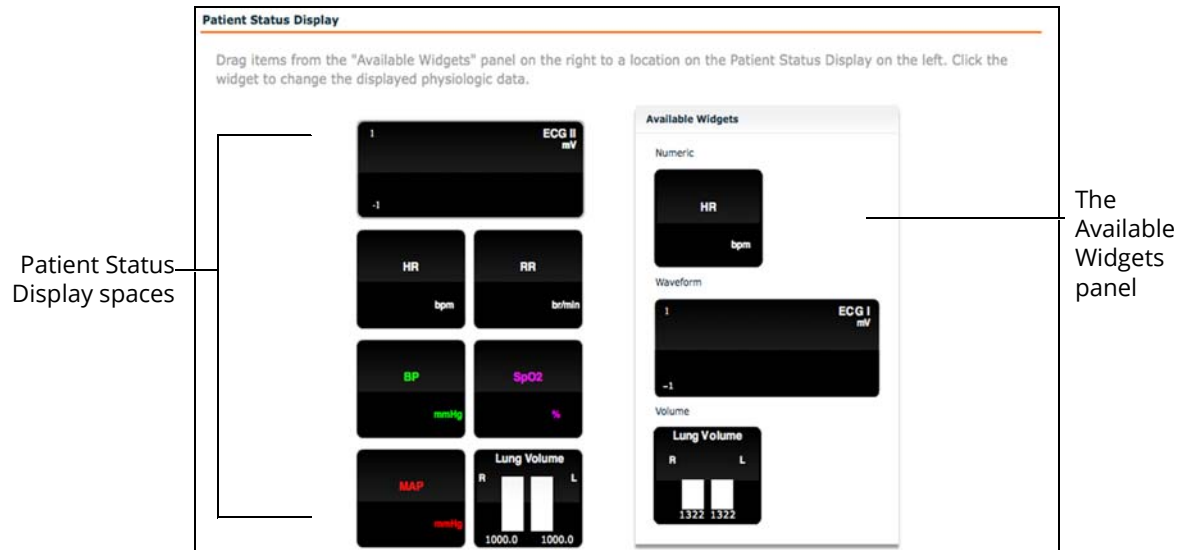
The Patient Status Display Screen

To modify the Patient Status Display, drag and drop the desired waveform, numeric or volume widgets from the Available Widgets panel to an available Patient Status Display space.

Note: Waveforms occupy two spaces.

Once the desired widget is placed, click the widget to change the physiologic parameter displayed.

Adding a Scenario from the SCE Editor

SCEs incorporate scenarios that contain preprogrammed physiology. Scenarios can be added to SCEs to enhance patient physiology. When a scenario is added to an SCE from the SCE Editor, the scenario becomes associated with the SCE and begins automatically when the SCE is run.

To add a scenario to an SCE from the SCE Editor:

1. From the Review screen, click the **Add Scenario** button under the Preloaded Scenarios heading
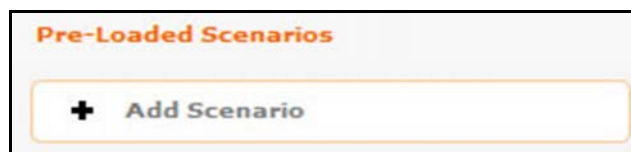
The Add Scenario Button
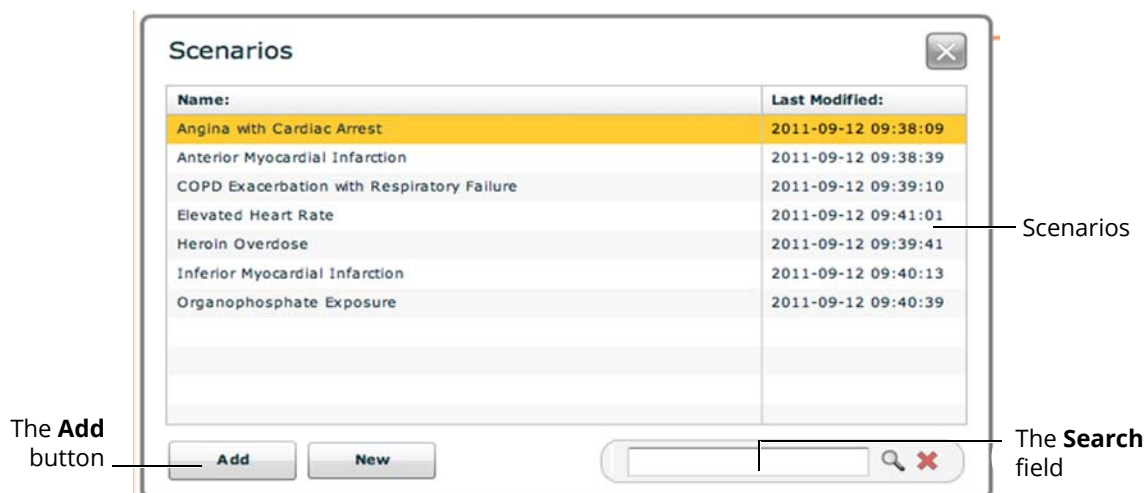
The Choose Scenario Dialog Box

2. Select a saved scenario from the Choose Scenario Dialog Box

    The **Search** field can be used to search for a scenario to select.

3. Click **Add**

    The scenario is added to the SCE and is listed on the SCE Editor beneath the Pre-Loaded Scenarios heading.

Developing Scenarios

The Scenario Designer allows users to create and edit scenarios.

Creating a New Scenario

To create a new scenario:

1. From the SCE Editor, under the Pre-Loaded Scenarios heading, click the **Add Scenario** button

The **Add Scenario** button

The Pre-Loaded Scenarios Heading

The **New** button
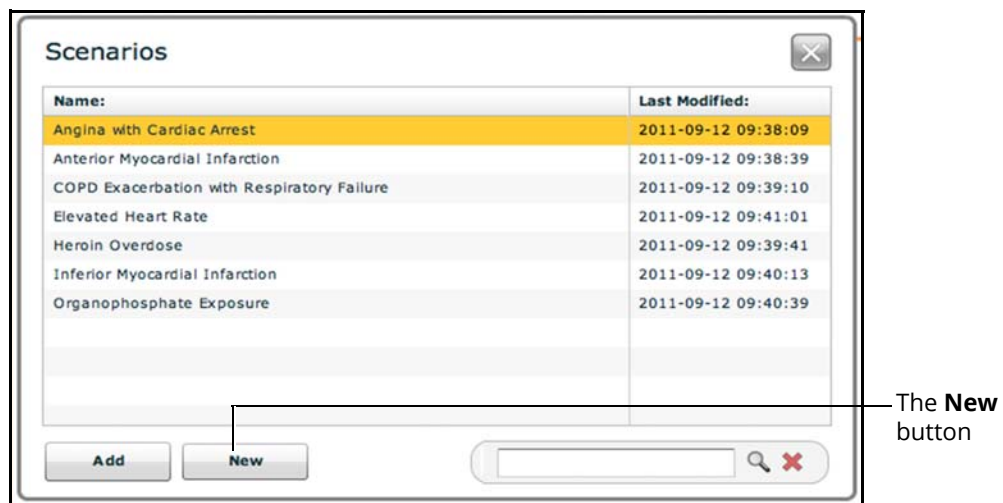
The Choose Scenario Dialog Box

2. Click **New**

From the Scenario Designer, scenario states can be added, modified, and deleted.

The **Scenario** button

The **View** buttons

The **New State** button

Canvas
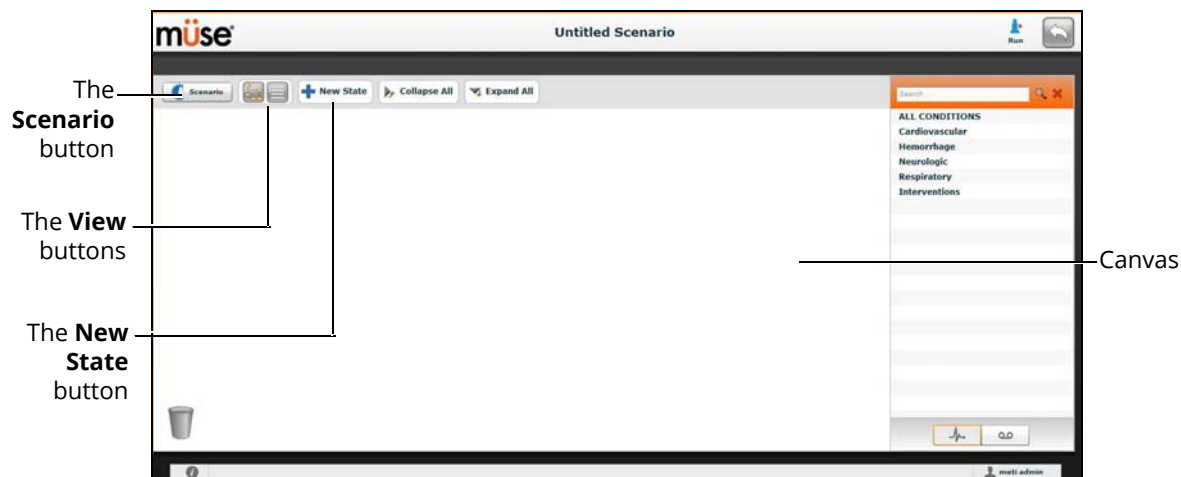
The Scenario Designer

- The **Scenario** button is used to manage states and save the scenario
- The **View** buttons toggle between Scenario Designer views
- The **New State** button is used to add new states

Once created, states are displayed on the Scenario Designer canvas.

Editing a Scenario

To edit a scenario:

1. From the SCE Editor, under the Pre-Loaded Scenarios heading, click the **Add Scenario** button

The **Add Scenario** button

The Pre-Loaded Scenarios Heading

Scenarios

The **Add** button

The **Search** field
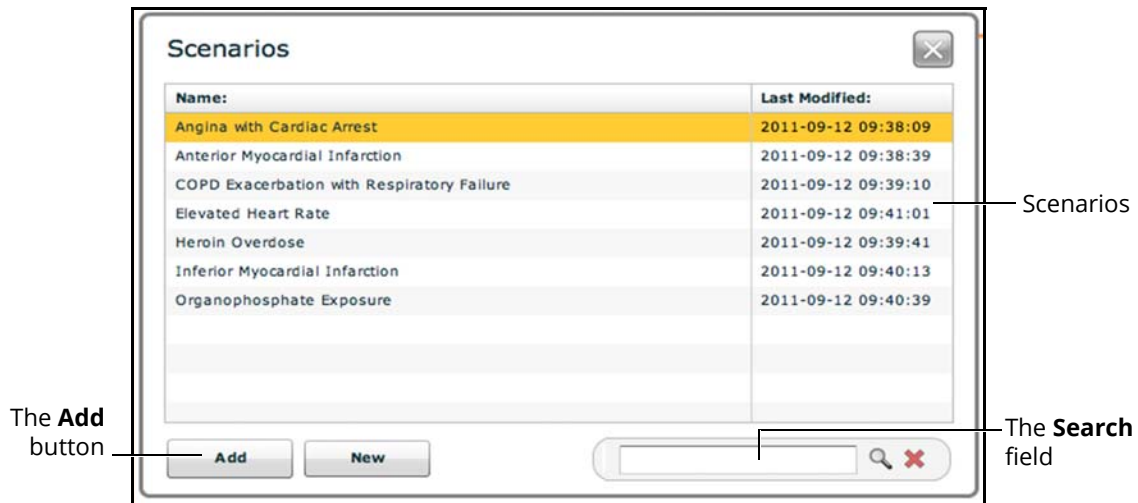
The Choose Scenario Dialog Box

2. Select a saved scenario from the Choose Scenario Dialog Box
3. Click **Add**

    The scenario is added to the SCE and is listed on the SCE Editor under the Pre-Loaded Scenarios heading.

4. Click the scenario's name under the Pre-Loaded Scenarios heading

The Scenario Designer appears, displaying the selected scenario.
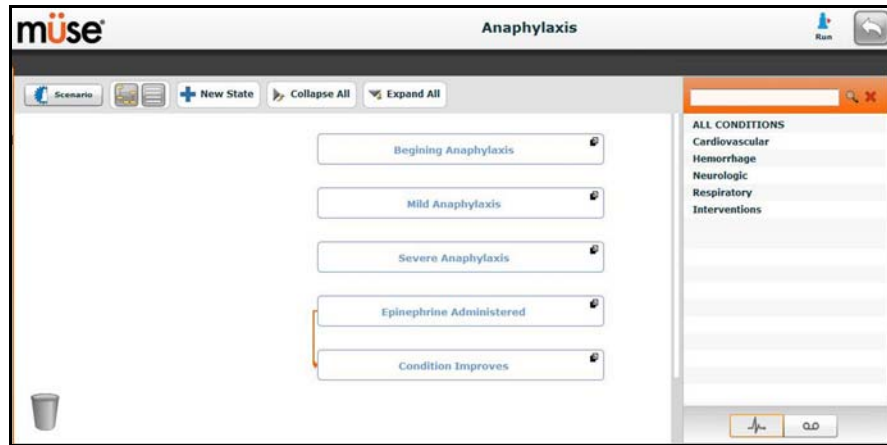
The Scenario Designer

Scenario Designer Views

The Scenario Designer has two views: the Graphical view and the List view. The Graphical view allows users to map out scenario states. The List view places the states and transitions into a linear format.

The **Graphical View** button · The **List View** button

The Scenario Designer View Buttons

Click the **Graphical view** button to utilize the Graphical View.

An expanded state · The **Collapse State** button
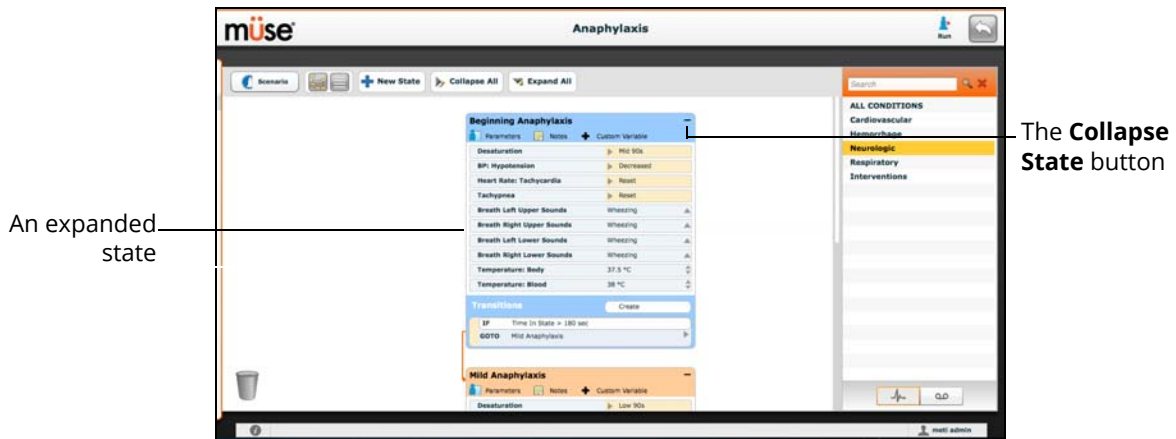
The Graphical View

From the Graphical View, double-click on any state to expand it and view all its components. Click the **Collapse State** button to collapse an expanded state.

Click the **List view** button to utilize the List view.

The **Expand/Collapse** arrow · An expanded state
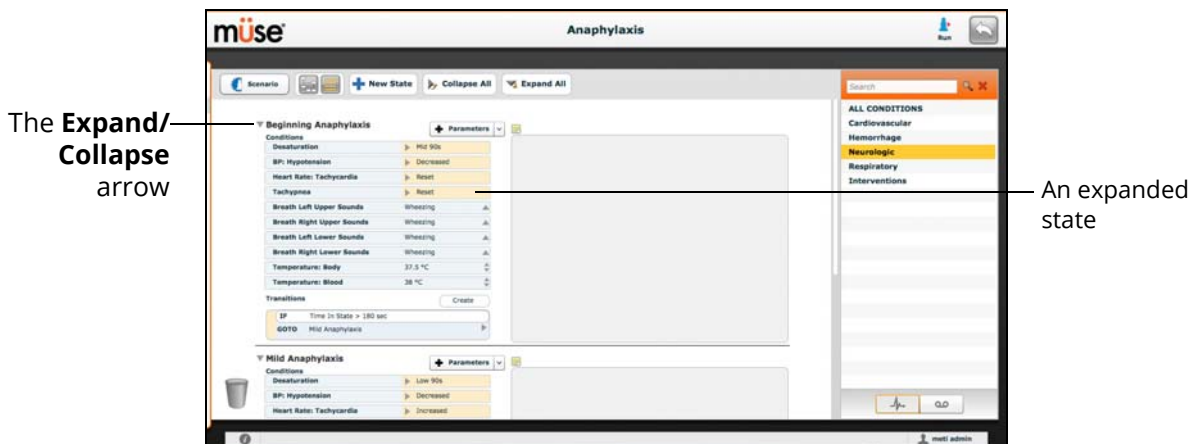
The List View

From the List View, click the **Expand/Contract** arrow to the left of any state to expand it and view all its components. Click the arrow again to collapse the state.

Adding Scenario States

When beginning to create a new scenario, the canvas is blank. Scenario states can be created by dragging and dropping conditions from their respective menus on the right side of the Scenario Designer to the canvas.

Drag and drop a condition onto the canvas to create a state
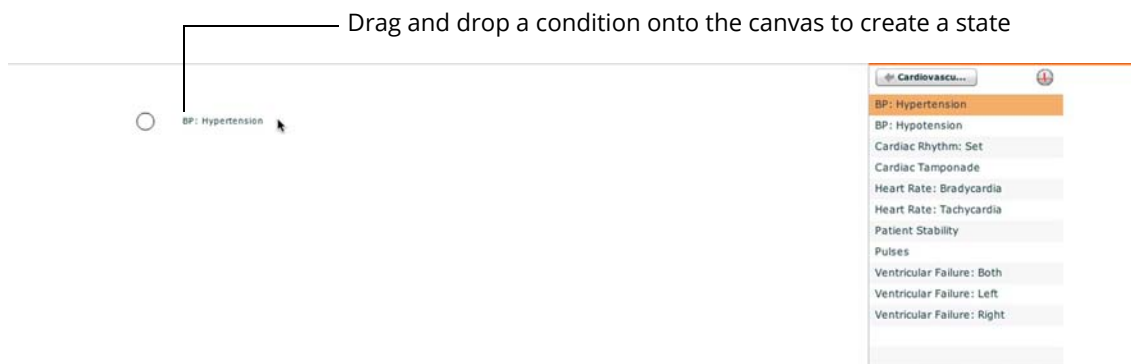
The Scenario Designer Canvas

Or, a new, empty state can be added using the **New State** button.

To add a new state using the **New State** button:

1. Click the **New State** button on the upper left side of the Scenario Designer

The New State Button

A New State

2. From the Graphical View, double-click the new state, or from the Line Item View, click the **Expand/Collapse** arrow to the left of the state to expand it
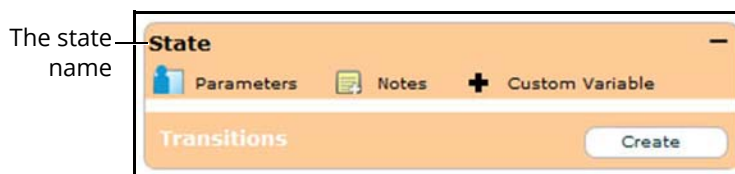
The state name

The Expanded State

3. Double-click the state name

    By default, new states are named "State."

The **State Name** field

The **Save** button
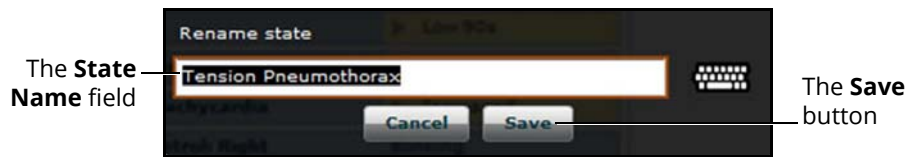
The Rename State Window

4. Enter a new state name

   Note: When naming a Scenario State, the state name may NOT exceed 127 characters Additionally, scenario file and state names CANNOT contain any special characters, such as (' / \ : * ? < > % | ").

5. Click **Save**

Modifying Scenario States

Once a scenario state has been placed on the canvas, it can be modified. Additional parameters, transitions and notes can be added. Each state can contain multiple parameters and transitions. Double-click the state name to rename it.

The **Collapse State** button

The parameter adjustment arrows
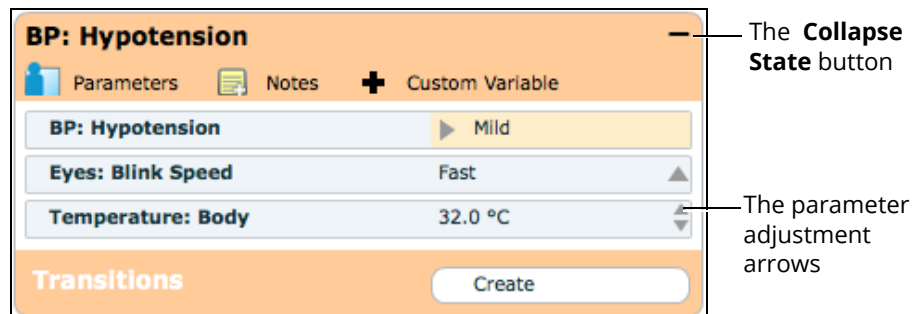
A State

Click the **Collapse State** button to minimize the state.

Double-click the collapsed state to expand it.

Adding Conditions, Interventions and Parameters

Conditions can be added to states by dragging and dropping them from the **Conditions** menu to the desired state.

Adding a condition to a state ⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯ The **Conditions** menu
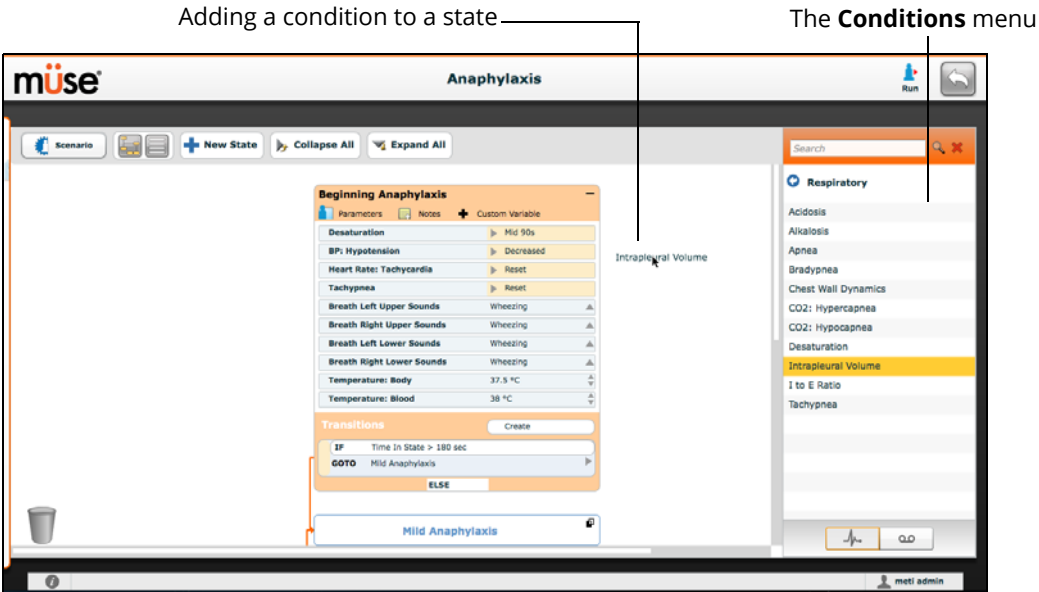
The Scenario Designer

To add parameters to a state, click the **Parameters** button within the state.
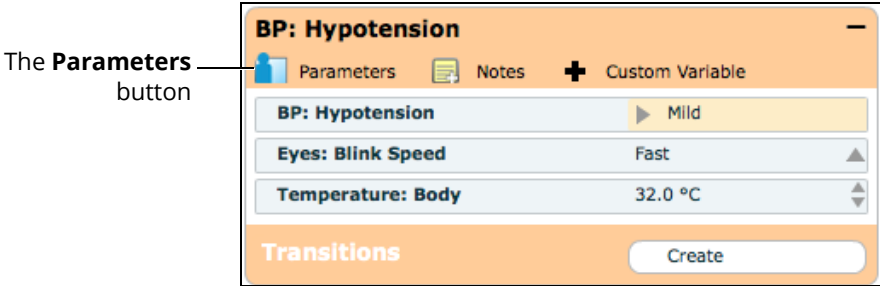
A State

The State Parameters screen appears.

The State Parameters panel

The **Complete** button
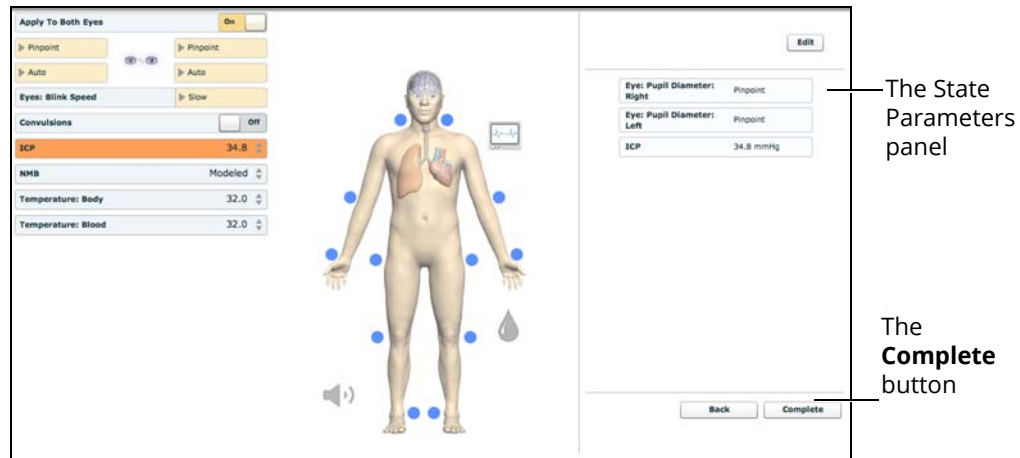
The State Parameters Screen

Click the various organs to change the views, and then select the desired parameter. Once a parameter has been selected, it appears in the State Parameters panel on the right side of the screen.

Add as many parameters as needed. Added parameters appear consecutively within the state. Drag and drop to reorder as needed. Click **Complete** to save and exit the State Parameters screen, or click **Back** to exit without saving.

Note: If the physiology of any of the parameters conflicts, the Müse software reflects the physiology of the last parameter entered.

Adding Transitions

To add a transition, the scenario must have both an original state and a state that results from the transition.

To add a transition:

1. Click the **Create** button in the original state
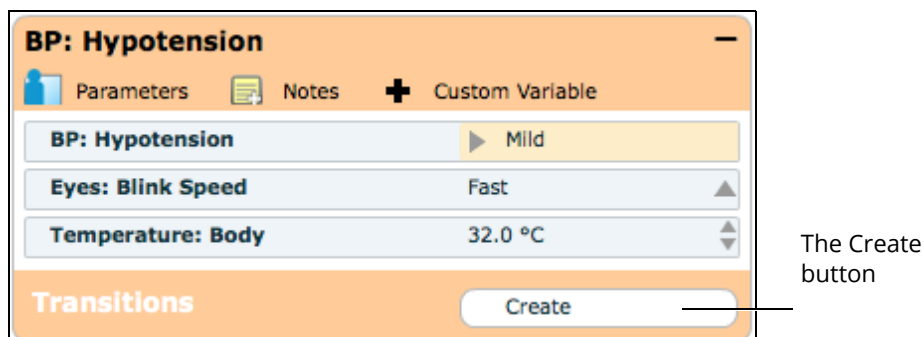
A State

The Transitions Menu appears, listing all available transition variable types.
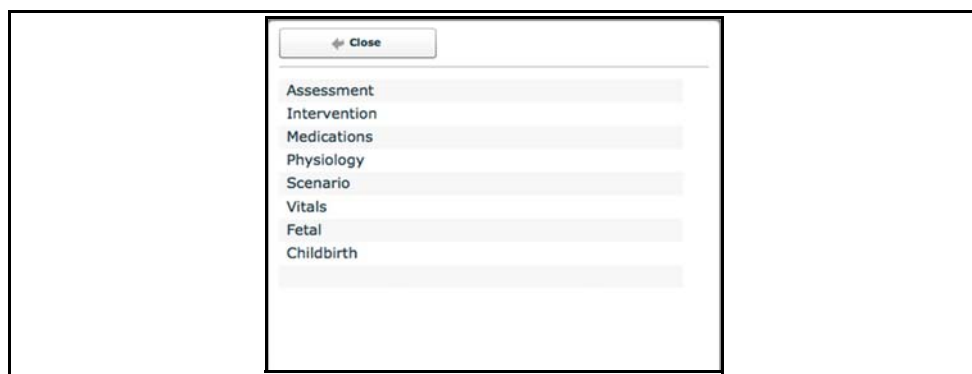
The Transitions Menu

2. Select the desired variable type. For example, if a transition based on the administration of medication is desired, select **Medications** and then select the desired medication from the list.

Once a medication is selected, The Medication Transition menu appears, asking for the comparison type and transition value.
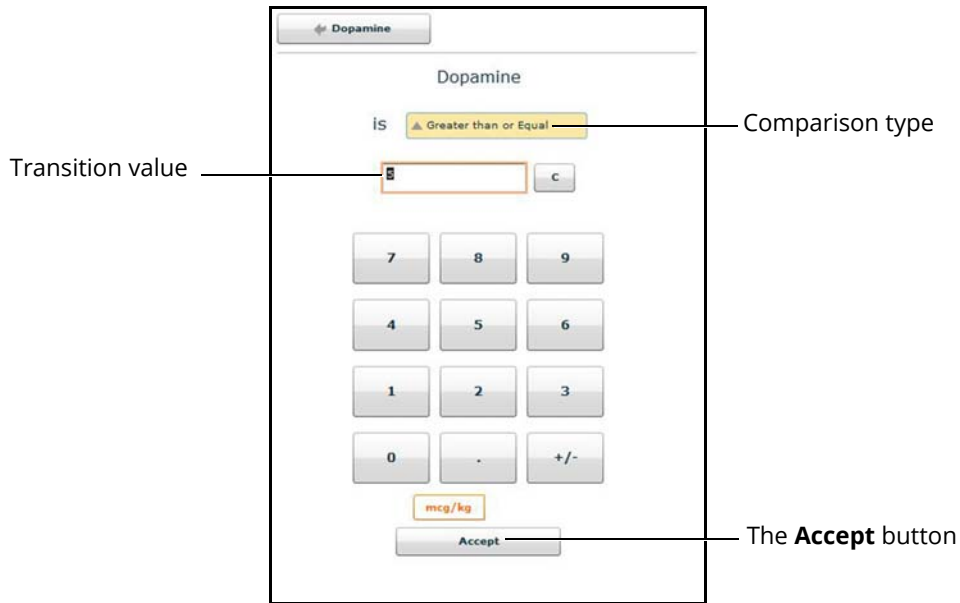
The Medication Transition Menu

Follow the same steps to make selections from similar menus for the **Assessment**, **Intervention**, **Physiology**, **Scenario, Vitals** variable types.

3. Once the variable values (e.g., comparison type and transition value) have been selected, click **Accept**

The selected transition variable is listed beneath the original state on the Scenario Designer.

4. From the Scenario Designer, click the **GOTO** arrow beneath the new transition variable
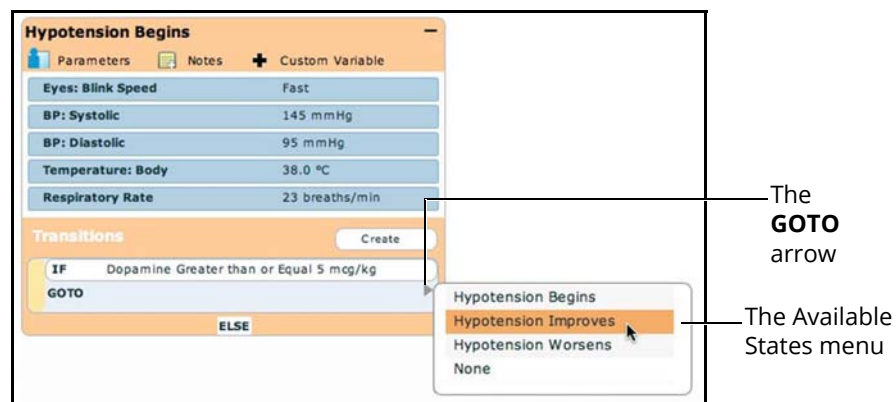
The Scenario Designer

5. Select a state from the menu

An orange connector line appears, indicating that the states are now linked by a transition.
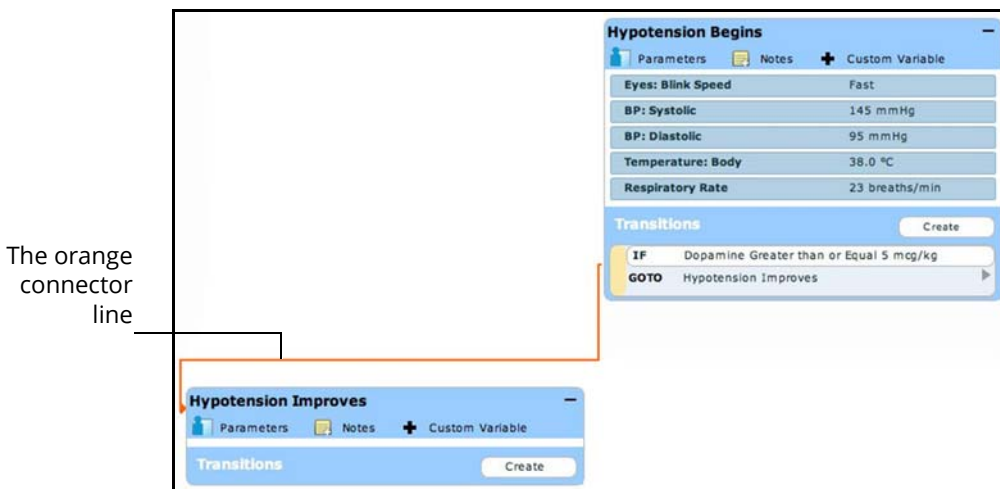
The Scenario Designer

ELSE Transitions

An ELSE transition is used to transition to a state automatically when none of the other programmed transitions occur.

Before specifying an ELSE transition from a state, the state must first contain at least one other transition.

To add an ELSE transition, click **ELSE** in the original state. The ELSE menu appears, listing all the available states.
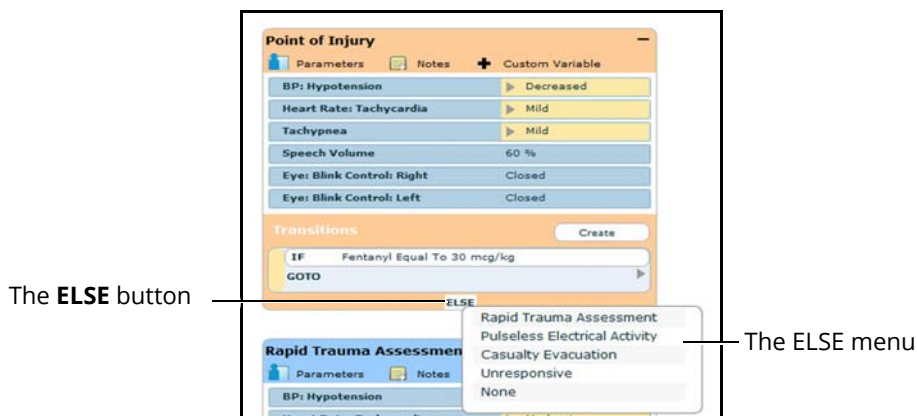
The Scenario Designer

Select the desired state. A black connector line appears, indicating that the states are now linked by an ELSE transition.

Black connector line
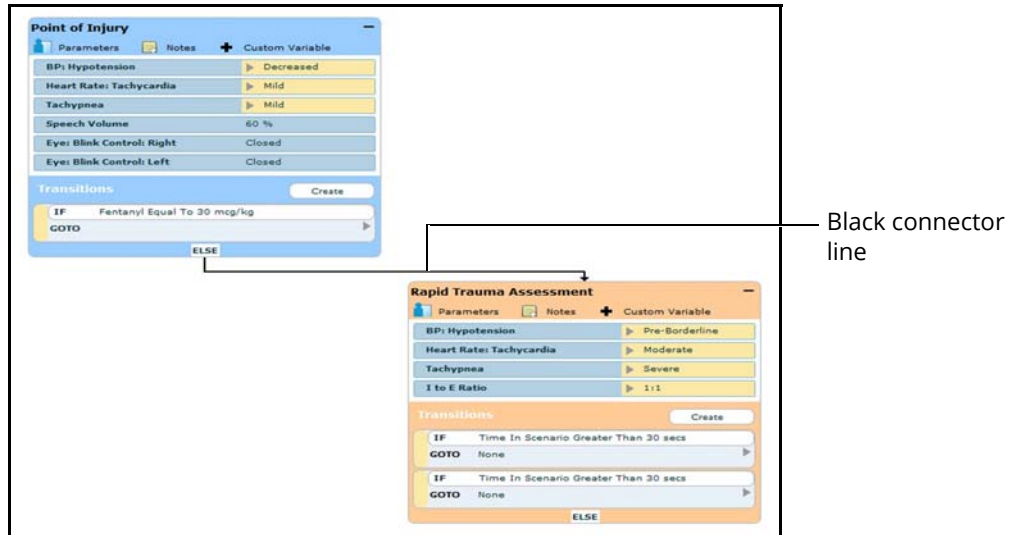
The Scenario Designer

Deleting Scenario States

To delete a state, drag and drop the state into the Trash.
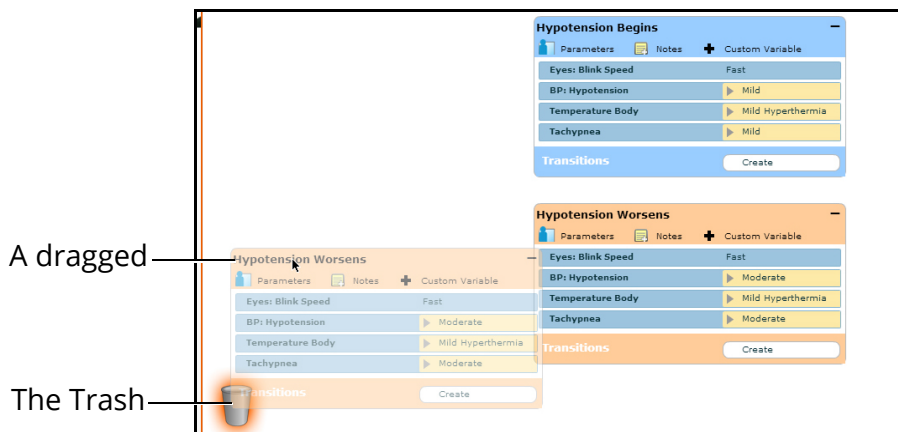
A dragged

The Trash

The Scenario Designer

States can be dragged and dropped to the Trash from the Graphical view or the Line Item view.

Deleted states remain in the Trash until you log out of the software or the Trash is cleared.

Deleting Parameters and Transitions

To delete a parameter or transition, from an active state, drag and drop the desired parameter or transition into the Trash.

To drag a parameter, click anywhere within the parameter. To drag a transition, click the yellow selection bar to the left of the transition.
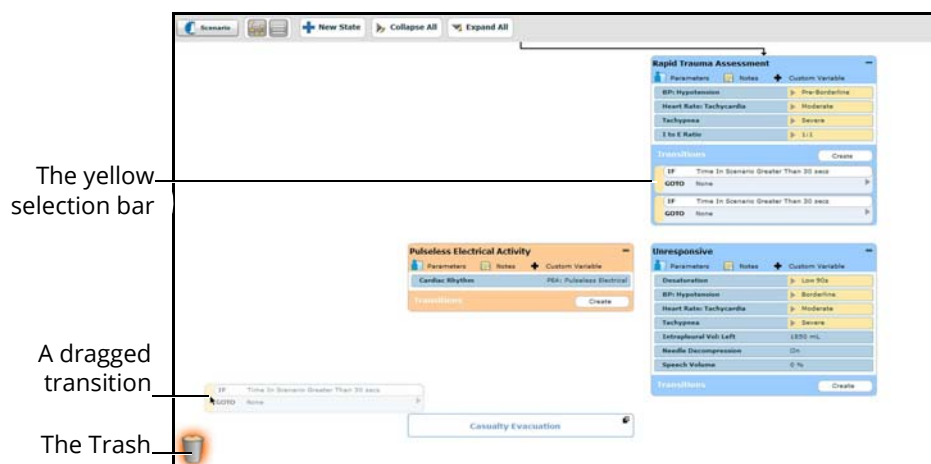
The Scenario Designer

Parameters and transitions can be dragged and dropped to the Trash from the Graphical view or the Line Item view.

Deleted parameters and transitions remain in the Trash until you log out of the software or the Trash is emptied.

Saving the Scenario

At any time during scenario creation or modification, the scenario can be saved.

To save a scenario:

1. Click the **Scenario** button in the upper left of the Scenario Designer

The Scenario Drop-Down Menu

2. To save the most recent version of a modified scenario, click **Save**

   To save a modified scenario as a new scenario, leaving the original scenario intact:

   a. Click **Save As**

The **Enter Scenario name** field ────── The **Save** button

The Save Scenario Dialog Box

   b. Enter the name for the scenario in the **Enter scenario name** field

   c. Click **Save**

Note: When naming a scenario, the scenario name CANNOT exceed 127 characters. Additionally, scenario file names CANNOT contain any special characters, such as (' / \ : * ? < > % ! | ").

Saving States to the State Library

Users can save states to the State Library for later use.

To access the State Library, click the **States** button in the bottom right corner of the Scenario Designer.

 ——The **States** button

The States Button

The State Library appears, listing all saved states.

The State Library

To save a state, drag and drop the state into the States Library.
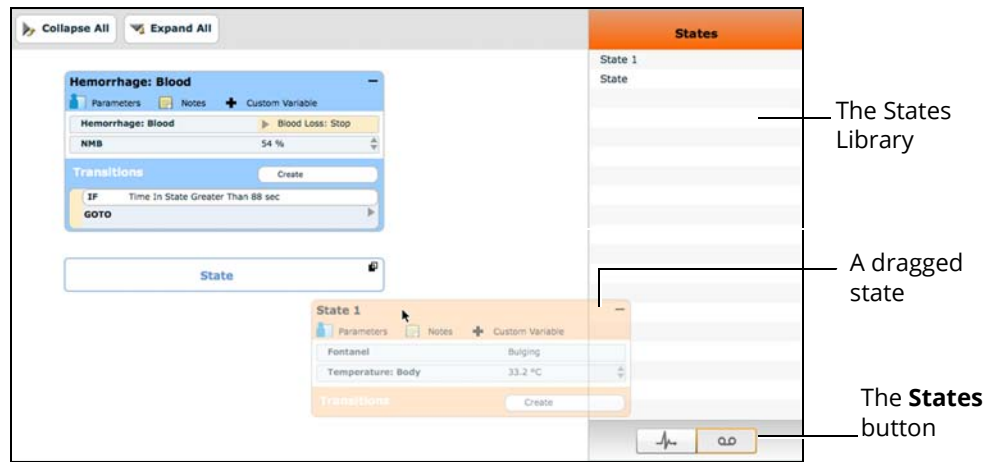
The Scenario Designer

The state is stored in the library.

To exit the State Library, click **Conditions**.

The Conditions Button

Emptying the Trash

To empty the Trash, click the **Trash** icon in the lower left corner of the Scenario Designer.
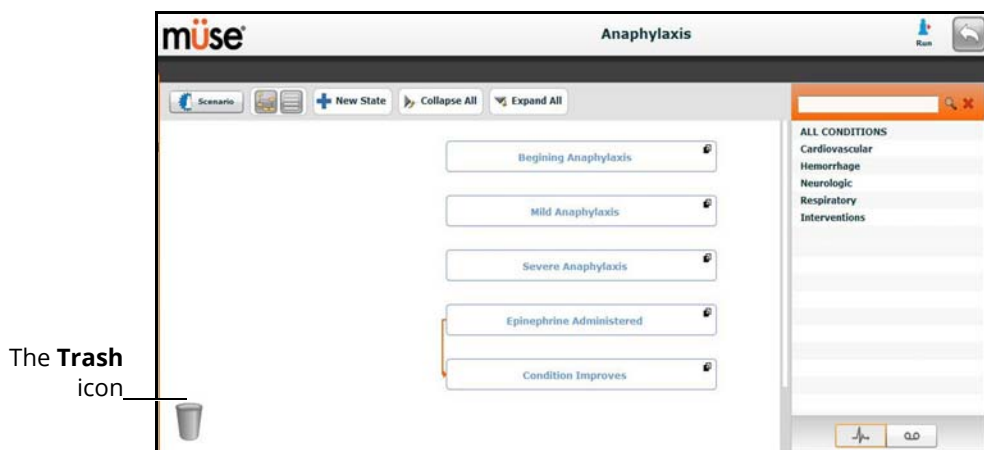
The **Trash** icon

The Scenario Designer

The Trash List appears.

The **Empty Trash** button

The Trash List

Click **Empty Trash** to empty the Trash. If you do not wish to delete the items listed, they can be dragged back into the scenario, at which time they are removed from the Trash.

Logging out of the software automatically empties the Trash.

IMPORTANT: *Items emptied from the Trash cannot be retrieved.*

ADMINISTRATIVE TOOLS

The Müse software has administrative tools that allow users to manage logs, stored content, users and system settings. The administrative tools are accessed via the Administrative Tools buttons, located on the Home page.

The **History** button ——————

The System —————— Administration button

The **Account Profile** button

The Administrative Tools Buttons

Click the **History** button to view and manage simulation session logs.

Click the **System Administration** button to manage stored content, user accounts, groups and system settings.

Click the **Account Profile** button to manage and determine preferences for the active account.

History

From the History screen, users can view and export simulation session logs. Each simulation session is listed with the Start Time, the title of the SCE and the Patient's name. In addition, the SCE Events, Physiological Data, CTG data, Traction data, and CPR data are available for review or export.

Start Time	SCE	Patient	SCE Events	Physiological Data	CPR Data	Clear All Logs
2016-02-04 14:26:56	Healthy Adult Male	Stan D. Ardman II	🔍	🔍	🔍	✖
2016-01-28 17:04:32	Healthy Adult Male	Stan D. Ardman II	🔍	🔍	🔍	✖

The History Screen

By clicking the **Simulation Events** link of a Simulation Session, users can view the entire log of the simulation and all the events that occurred during the SCE.

When the **Physiological Data** link of a Simulation Session is clicked, users can view all the physiological data that occurred during the SCE.

On the Simulation Events and Physiological Data screens, there is an **Export** button that, when clicked, exports the data to a CSV file that can be stored on an external device.

System Administration

From the System Administration screen, users can control and access Content Management, User Accounts, Groups, and System Settings.

To access the System Administration screen, click the **System Administration** button from the Home page.

The System Administration Button

The System Administration screen is displayed.
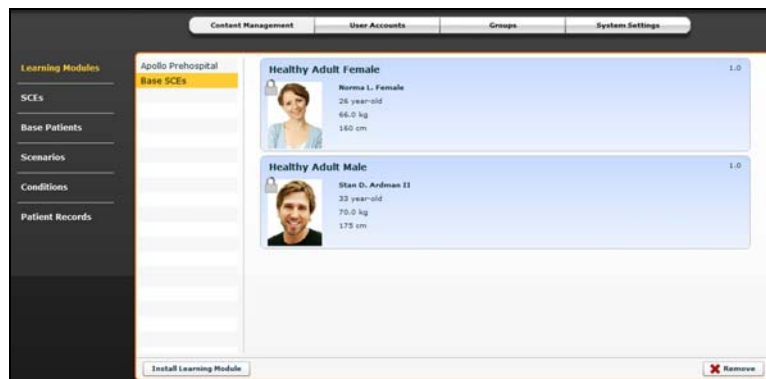
The System Administration Screen

Content Management

To access the Content Management options, from the System Administration screen, click **Content Management**.

From the Content Management options, users can manage learning modules, SCEs, Base Patients, Scenarios, Conditions, Patient Records, and Vocalization List.
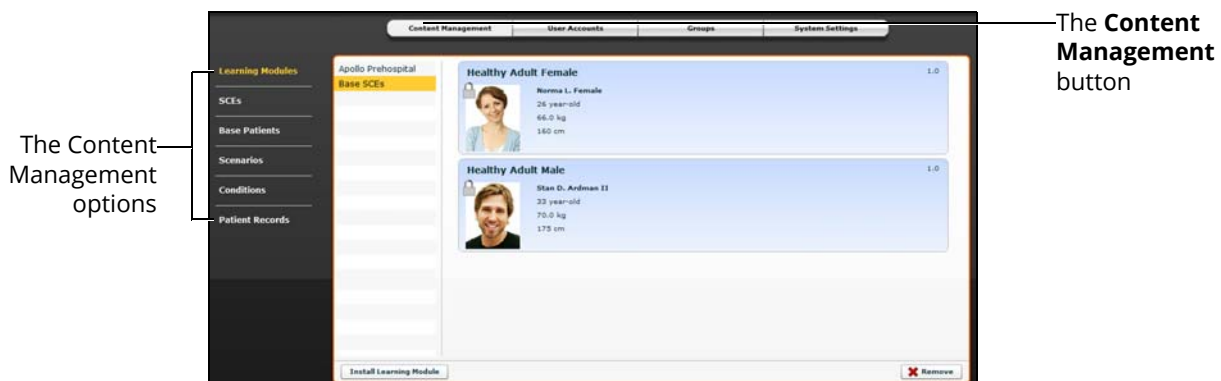
The Content
Management
options ——

—The **Content Management** button

The System Administration Screen

Learning Modules

From the Learning Modules panel, learning modules can be installed or deleted.

When the Content Management button is selected, the Learning Modules panel appears by default. If another panel has been selected, return to the Learning Modules panel by clicking the **Learning Modules** link.

The **Learning Modules** link

The Learning Modules panel

The **Install Learning Module** button

The **Remove** button

The Learning Modules Panel

To install a learning module:

1. Click **Install Learning Module**

2. Locate the correct learning module file on the external storage device or the hard drive location where the SCE file is saved. The file extension is *mlm*.

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

4. Refresh the screen by clicking the **Home** button in the Müse software and then return to the Learning Modules panel

To delete a learning module from Müse:

1. Select a learning module from the Learning Modules panel

2. Click the **Remove** button
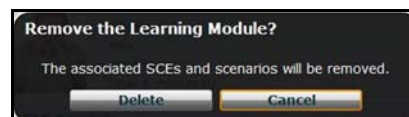
The Remove Learning Module Warning

3. Click **Delete**.

   NOTE: Preconfigured learning modules cannot be deleted. If a user attempts to delete them, a failure message appears.

SCEs

From the Content Management options, click **SCEs** to access the SCEs panel.

The SCEs panel appears.

The SCEs Panel

The **SCEs** link

The **Import SCEs** button
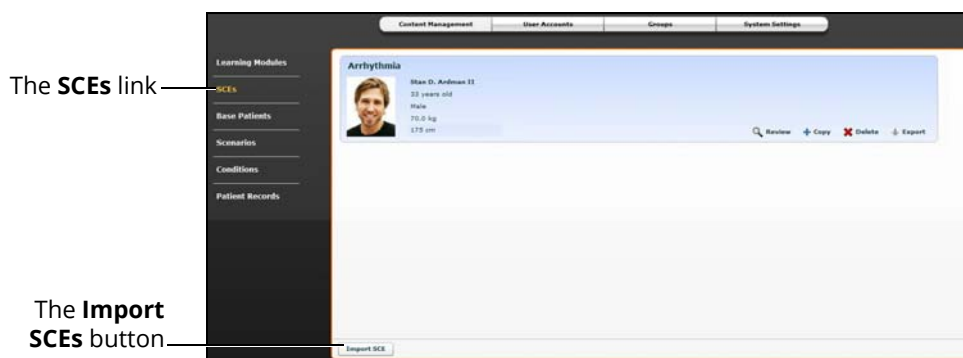
All user-created SCEs are listed in the SCEs panel.

On the SCEs panel, users can review, copy, delete, import and export the SCEs they have created.

Note: SCEs purchased from CAE CANNOT be exported.

Click **Import SCE** to import an SCE from an external device or the hard drive location where the SCE file is saved. Click **Export** to export an SCE to an external device. The SCE file extension is *sce*.

Base Patients

From the Content Management options, click **Base Patients** to access the Base Patients panel.

The **Base Patients** link

The **Import Patient** button
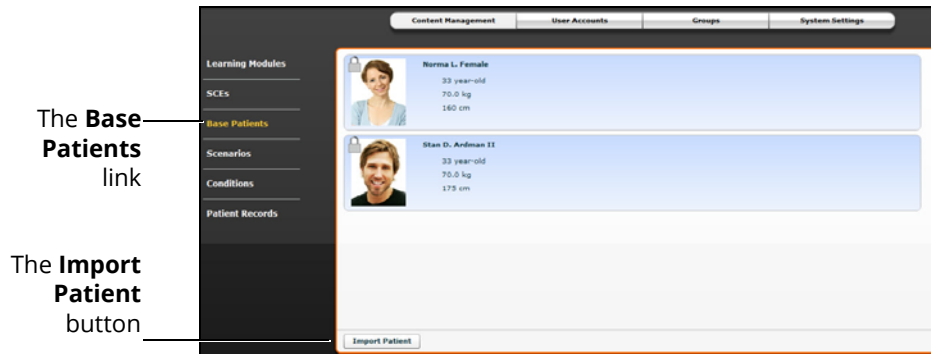
The Base Patients Panel

All Patients are listed in the Base Patients panel.

From the Base Patients panel, users can rename, review, delete and export Patients they have created by clicking the respective buttons next to each Patient.

- Click **Import Patient** to import a Patient file from an external device or the hard drive location where the SCE file is saved

- Use the **Rename** button next to a patient to give the patient a different name or the **Delete** button to delete the patient

- The **Export** button next to each patient can be used to export the Patient file to an external device. The Patient file extension is **pat**.

Note: Preconfigured CAE Base Patients have a lock symbol in the upper-left corner of the picture and CANNOT be renamed, deleted, or exported.

Scenarios

From the Content Management options, click **Scenarios** to access the Scenarios panel.

The **Scenarios** link

The **Import Scenario** button

The **Create New Scenario** button

The Scenarios Panel

From the Scenarios panel, users can rename, review, delete, import and export scenarios they have created by clicking the respective buttons within each scenario. Locked scenarios can only be reviewed.

Users can also create new scenarios from the Scenarios screen by clicking the **Create New Scenario** button.

Click **Import** to import a scenario file from an external device or the hard drive location where the SCE file is saved. Click **Export** to export a scenario file to an external device. The scenario file extension is *mss*.

Note: Locked CAE scenarios CANNOT be exported.

Conditions

From the Content Management options, click **Conditions** to access the Conditions Editor.

The Conditions Editor appears.

The **Conditions** link

The **Rename**

The **Delete** button

The **Add** button

The **Edit Parameters** button

The Conditions Editor
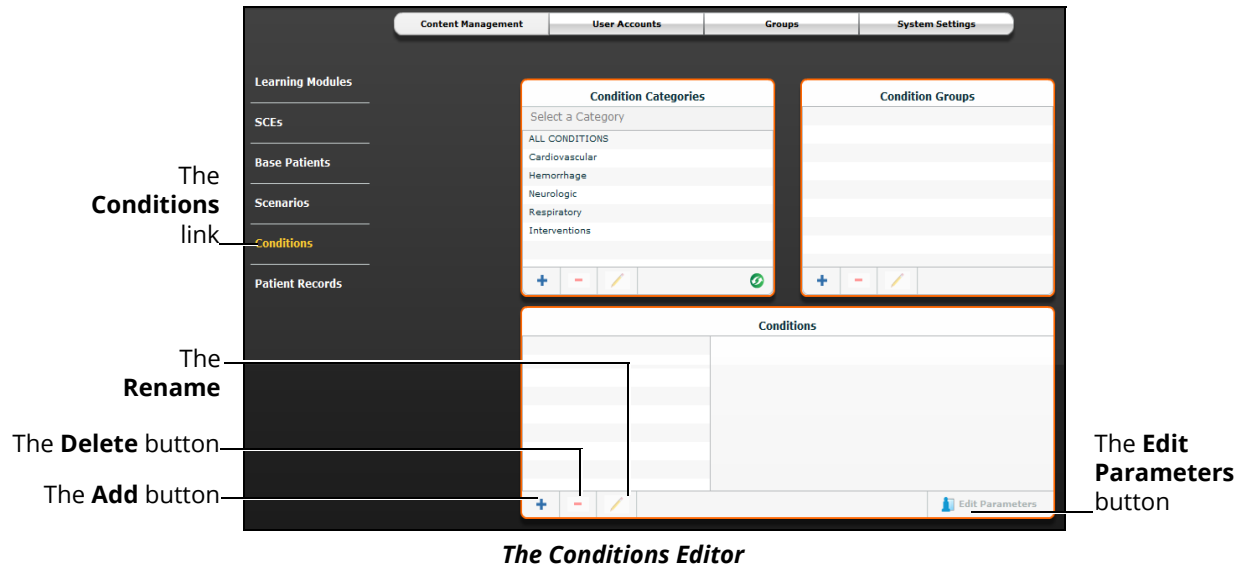
All conditions can be viewed in the Conditions panel by selecting their associated categories and groups from the Condition Categories and Condition groups panels.

From the Conditions Editor, users can create new Conditions to be used in SCEs. To create a new condition:

1. From the Condition Categories panel, select a category
   Note: Conditions CANNOT be added to the **Interventions** category.
2. From the Condition Group panel, select a group
3. In the Conditions panel, click the **Add** button
4. Enter a name for the condition in the New Condition Name dialog box
5. Click **Save**
6. From the Conditions panel, select the new Condition
7. Click the **Edit Parameters** button
8. From the Parameters screen, select the desired Condition parameters
9. Click **Complete**

   The condition is saved with the selected parameters.

New condition categories and groups can also be added by clicking the **Add** button in the Condition Categories and Condition Groups panels.

Use the **Delete** and **Rename** buttons in each panel to delete or rename a Condition, group or category.

Note: CAE conditions, groups and categories cannot be deleted or renamed.

Patient Records

Patient records can be uploaded to Müse for display in the TouchPro software. Once uploaded, a patient record is available for use with any SCE.

Patient Records are managed from the Patient Records panel on the **Content Management** tab of the System Administration screen.

The Patient Records Panel
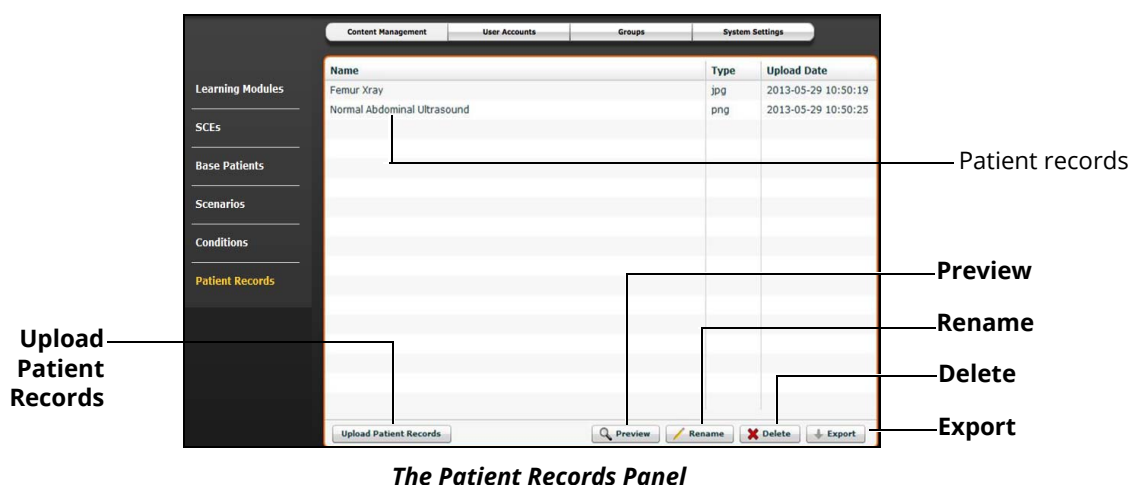
The following patient record file types can be uploaded to Müse:

- JPG or JPEG images
- GIF images
- PNG images
- XPS images
- PDF documents
- MPEG videos
- MOV videos
- MP3 audio files

A single patient record file cannot exceed 20MB.

To upload a patient record:

1. From Patient Records panel, click **Upload Patient Records**
2. Select the desired file and click **Open** or **OK**

Müse can store up to 100GB of patient record files. To ensure adequate space, please delete patient records when they are no longer needed.

To delete a patient record:

1. From the Patient Records panel, select the patient record to delete
2. Click **Delete**

User Accounts

o access the User Accounts panel, from the System Administration screen, click the **User Accounts** button. The User Accounts panel appears.

From the User Accounts panel, users can create, edit and delete users.

The **User Accounts** button

The user list

The **Delete** button

The user fields

The **Edit** button

The **New** button
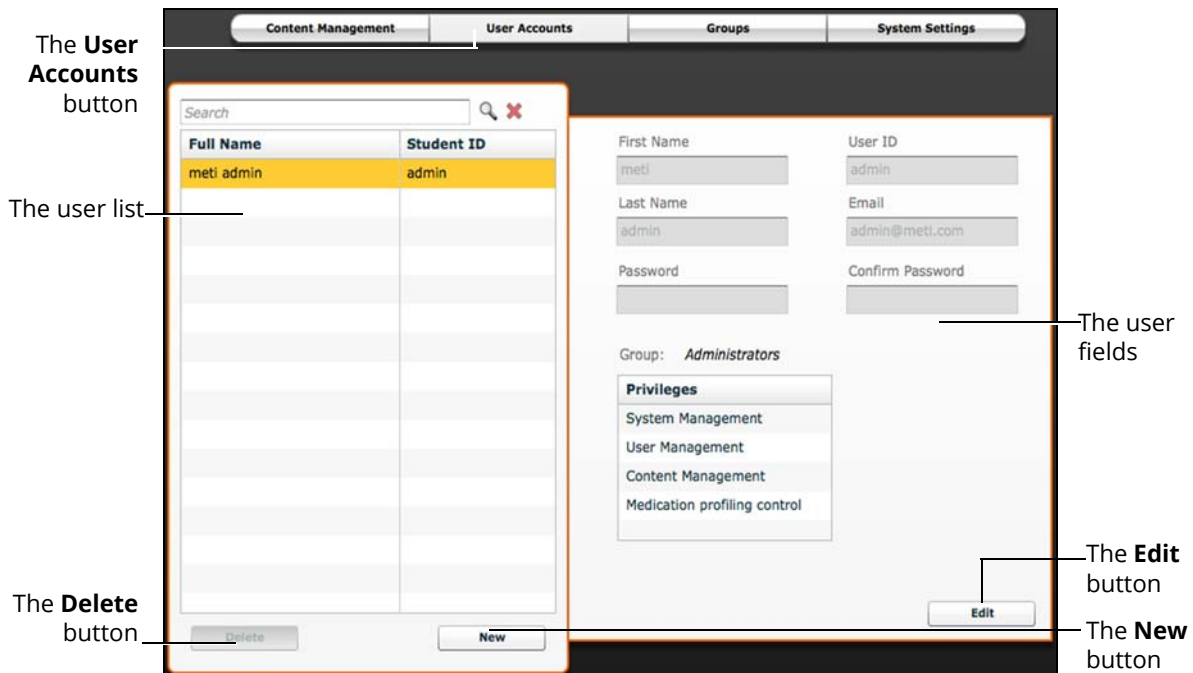
The User Accounts Panel

Note: User Accounts functions are available only to users with the User Management or System Management privilege.

Creating a User

To create a new user:

1. From the User Accounts panel, click **New**

2. In the New Account Creation panel, enter the user's personal data and choose a password

3. Assign the user to a group by selecting a group from the **Group** menu

   Note: A user can only be assigned to one group.

4. Click **Create**

Editing a User

To edit a user's information or privileges:

1. On the User Accounts panel, select the user to edit

2. Click **Edit**

3. Make the desired changes

4. Click **Save**

Deleting a User

To permanently delete a user, from the User Accounts panel, select a user and click **Delete**. When the User Deletion Warning box appears, click **Yes**.

The user account and the data associated with it are deleted. However, the administrative user deleting the account becomes the owner of any SCEs, scenarios or patients created by the user being deleted (i.e., the SCEs, scenarios and patients created by the deleted user are moved to the deleting user's account).

Groups

Users are assigned to groups to define access privileges. To access the Groups panel, from the System Administration screen, click **Groups**.

The Groups panel appears.
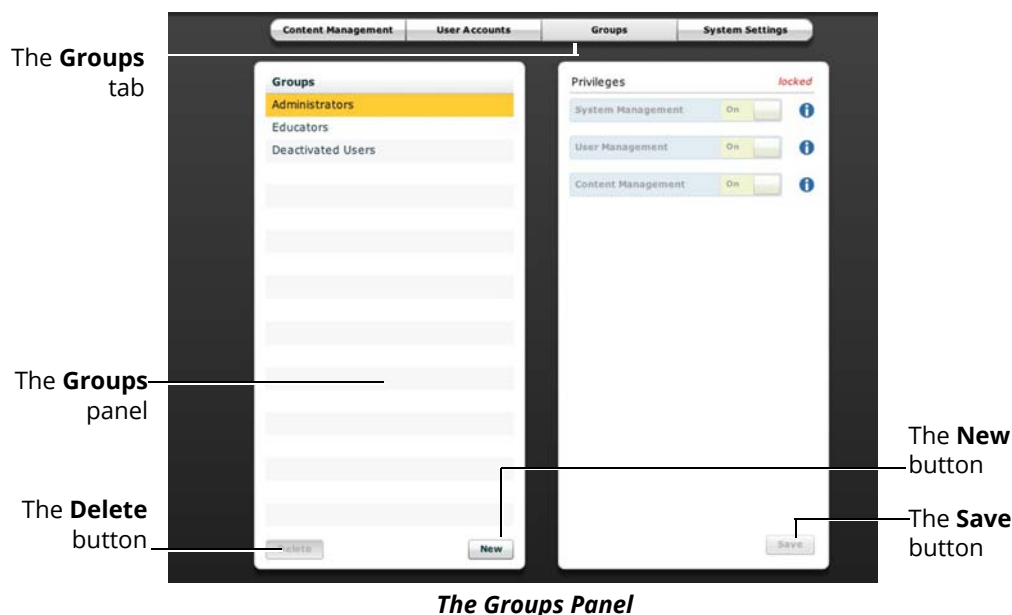
The Groups Panel

Note: Groups functions are available only to users with the User Management or System Management privilege.

From the Groups panel, users can create new groups, delete groups and assign privileges to groups.

In the Groups panel, three groups appear by default:

- Administrators
- Educators
- Deactivated Users

Each default group has privileges assigned.

Privilege System

The Müse software has three different privileges:

- System Management
- User Management
- Content Management

User Management and Content Management can be assigned independently or combined. The System Management privilege contains all privileges.

System Management

Users with the System Management privilege have access to all features of the Müse software, including the benefits of the User Management and Content Management privileges, listed below. Users with the System Management privilege can also view system settings, backup and restore data and apply software updates.

User Management

Users with the User Management privilege can manage all users and groups.

Content Management

Users with the Content Management privilege can create and manage all SCEs.

Creating a new Group

To create a new Group:

1. From the Groups panel, click **New**
2. Enter the name of the Group in the **Group Name** field
3. Click **Create Group**

   The group appears in the Groups panel. Privileges can now be selected.
4. Select the privilege(s) to be assigned to the Group
5. Click **Save**

Deleting a Group

Groups can be deleted when they are no longer needed. Once a Group is deleted, all users who were affiliated with the Group are moved to the Deactivated Users Group.

To permanently delete a Group, select the group to be deleted from the Groups panel and click **Delete**. When the Group Deletion warning box appears, click **Yes**.

Providing Access to Content Only

To provide users with the ability to create and manage SCEs, but NOT the ability to manage users or groups:

1. Create a new group called Content Only

2. Assign the group the Content Management privilege. Do NOT assign any other privileges to the group

3. On the **User Accounts** tab, create or edit the desired users, placing each user in the Content Only group

System Settings

From the System Settings panel, users can manage the System Configuration, Data Management, System Updates, Product Licensing, Language, Units, Updates, Simulator Usage Log, Error Log, CPR, and Performance Metrics of the Müse software.

To access the System Settings panel, from the System Administration screen, click **System Settings**.

The System Settings panel appears.
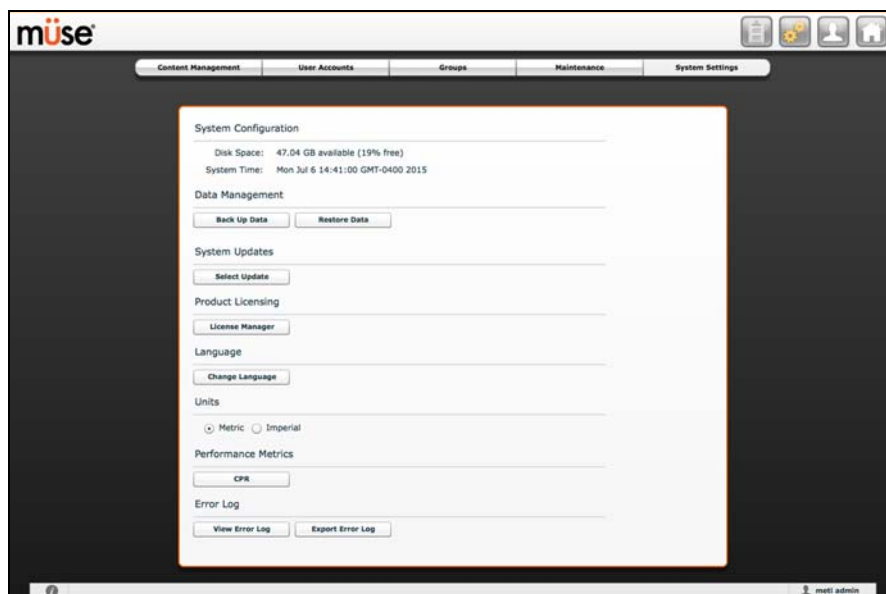
The System Settings Panel

TIP: *Height and weight can be set to display in Metric or Imperial units.*
Note: System Settings functions are available only to users with the System Management privilege.

System Configuration

Under System Configuration, Disk Space and System Time are displayed.

Data Management

The Data Management feature allows users to back up data to an external device. Users can also restore the backup data.

Backing Up Data

Users should back up data frequently to protect and store content and user data.

To back up data:

1. On the System Settings panel, click the **Back Up Data** button

The Back Up Data Button

2. Select a location to save the backed-up data

3. Click **Save**

IMPORTANT: *Always back up important content and data. A weekly backup should be done to protect content and user information.*

IMPORTANT: *Data backup performed from Müse for HPS does not back up data associated with Müse for PediaSIM HPS.*

Restoring Data

IMPORTANT: *Restoring data ERASES all current data and replaces it with the backed-up data.*

Users can restore data when the backed-up data needs to be replaced on the software. Restoring data only restores the last backup and does NOT merge the backup data with the current data.

To restore backup data:

1. On the System Settings panel, click **Restore Data**

The Restore Data Button

The System Restore warning box appears stating that restoring data erases all current data and asks if you want to continue.
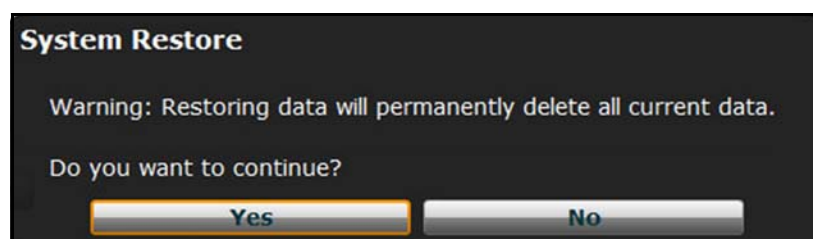
The System Restore Warning Box

IMPORTANT: *Restoring data ERASES all current data and replaces it with the backed-up data.*

IMPORTANT: *Restoring Müse for HPS data does not restore Müse for PediaSIM HPS data.*

2. Click **Yes**
3. Locate the appropriate .bak backup file to restore
4. Click Select. The data is restored
   Note: The computer may require a restart.

Product Licensing

To view product licensing information for your simulator or to enter a license key to activate your software, click **License Manager**.

Language

To change the language of the Müse software:

1. From the System Settings panel, under the Localization heading, Click **Change Language**
2. Select a language from the dialog box
3. Click **Accept**
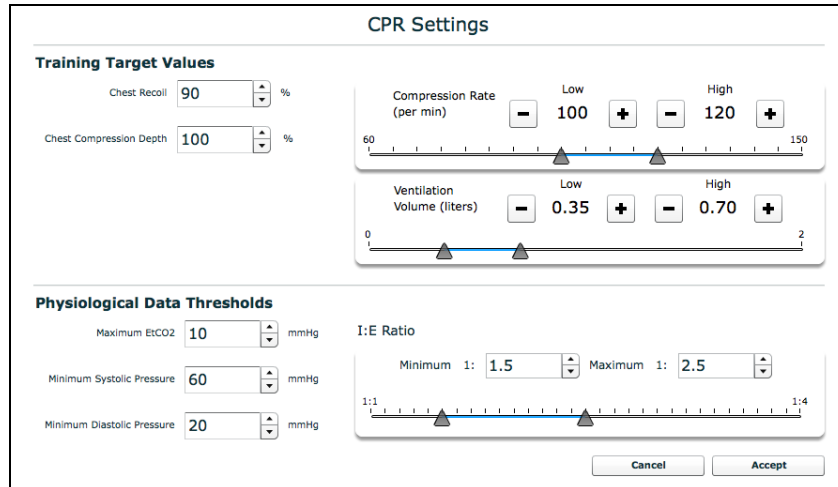
Note: Only the English version of the User Guide is available via the software, regardless of the Müse language selection.

Performance Metrics

Acceptable limits for key CPR parameters can be set from the System Settings panel.

To set CPR thresholds:

1. From the System Settings panel, under the Performance Metrics heading, click **CPR**

The CPR Settings Window

2. Adjust the settings as desired
3. Click **OK**

Error Log

The Error Log is available for technicians and is used when diagnosing the Müse software.

   IMPORTANT: *Do not clear the Error Log.*

Account Profile

From the Account Profile screen, users can view, update and reset personal profile information. Users can also view and add favorite SCEs from this screen.

Click the **Account Profile** button to access the Account Profile features.
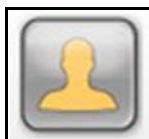
The Account Profile Button
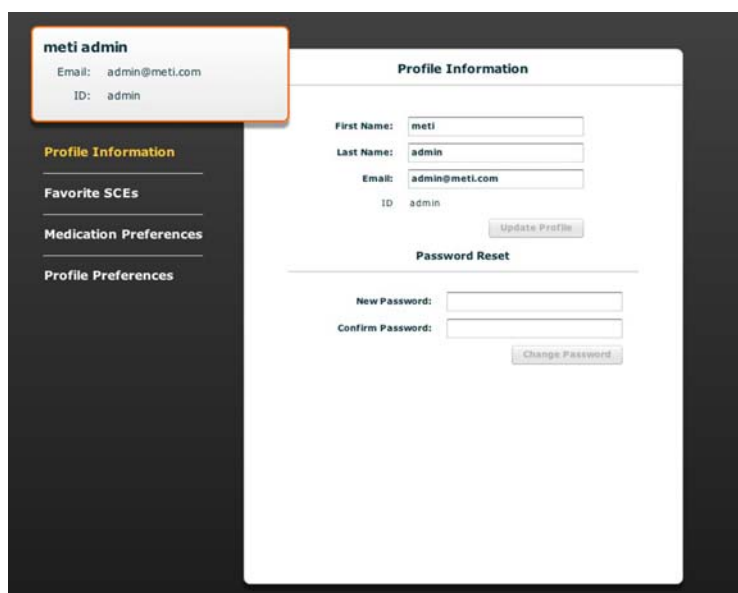
The Account Profile Screen

Profile Information

From the Account Profile screen, the Profile Information panel appears by default. If another panel has been selected, click **Profile Information** to return to the Profile Information panel.

From the Profile Information panel, users can change their profile information and reset their passwords.

The **Profile Information** link

The Profile Information panel
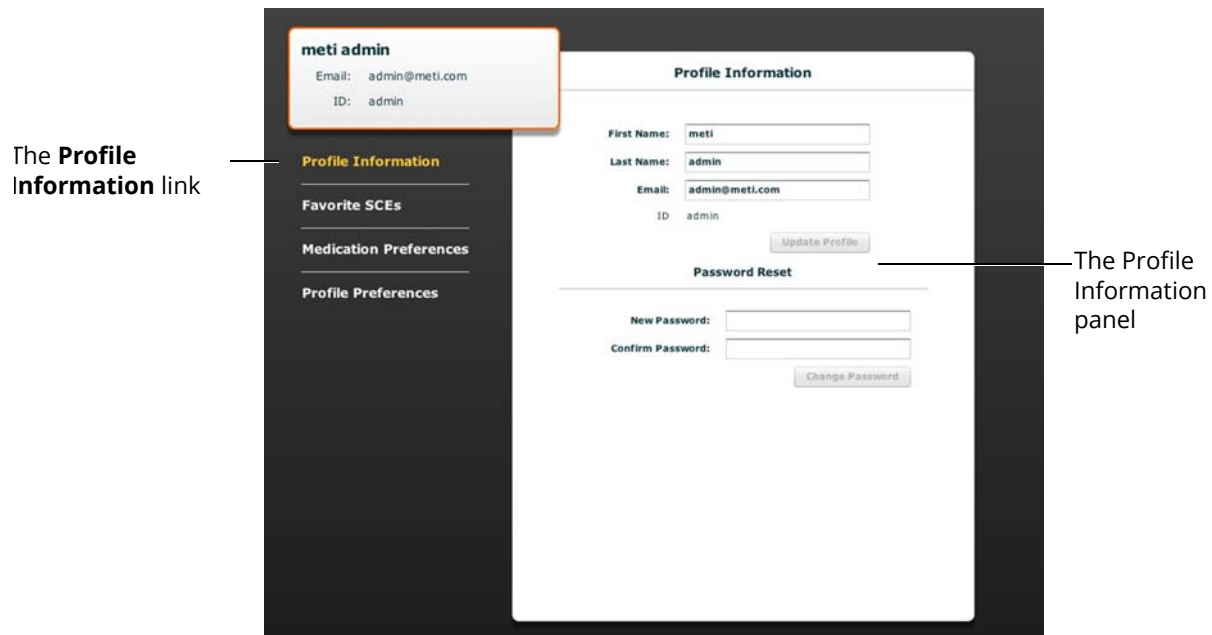
The Account Profile Screen

To change profile information, enter the new information in the appropriate fields and click **Update Profile** when finished.

To reset a password, enter the new password in the **New Password** field and re-enter the new password in the **Confirm Password** field. Click **Change Password** when finished.

IMPORTANT: *If you change your username or password, you MUST use the new username and/or password upon your next login. You cannot access the system with the old username or password once it has been changed.*

Favorite SCEs

To access the Favorite SCEs panel, click **Favorite SCEs** from the Account Profile screen. All of the logged-in user's favorite SCEs appear in the Favorite SCEs panel.

The **Favorite SCEs** link

The Favorite SCEs panel

The **Add Favorites** button
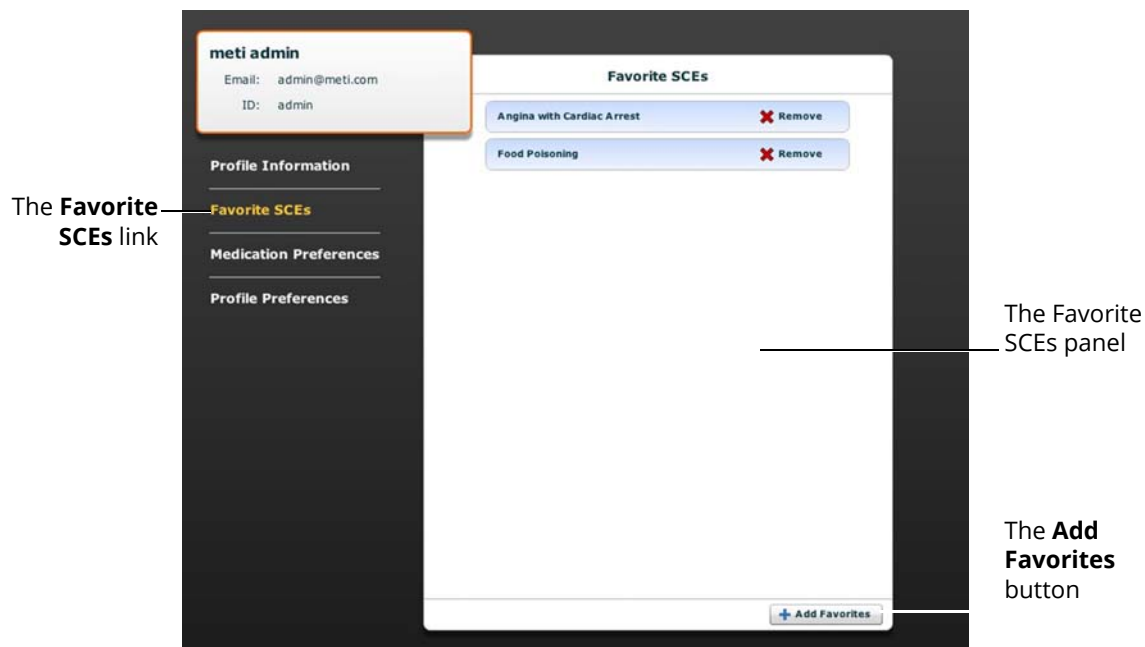
The Account Profile Screen

To add SCEs to the Favorite SCEs panel, click **Add Favorites**. The SCE Library appears. Select the desired SCE and it automatically appears in the Favorite SCEs panel.

To remove a SCE from the Favorite SCEs panel, click the **Remove** button next to the name of the SCE.

Medication Preferences

From the Medication Preferences panel, users can import customized medication response files created in the Pharmacology Editor software.

To access Medication Preferences, click **Medication Preferences** on the Account Profile screen.

The Medication Preferences panel appears.

The **Medication Preferences** link

The Medication Preferences panel

The **Set**, **Remove**, and **Export** buttons
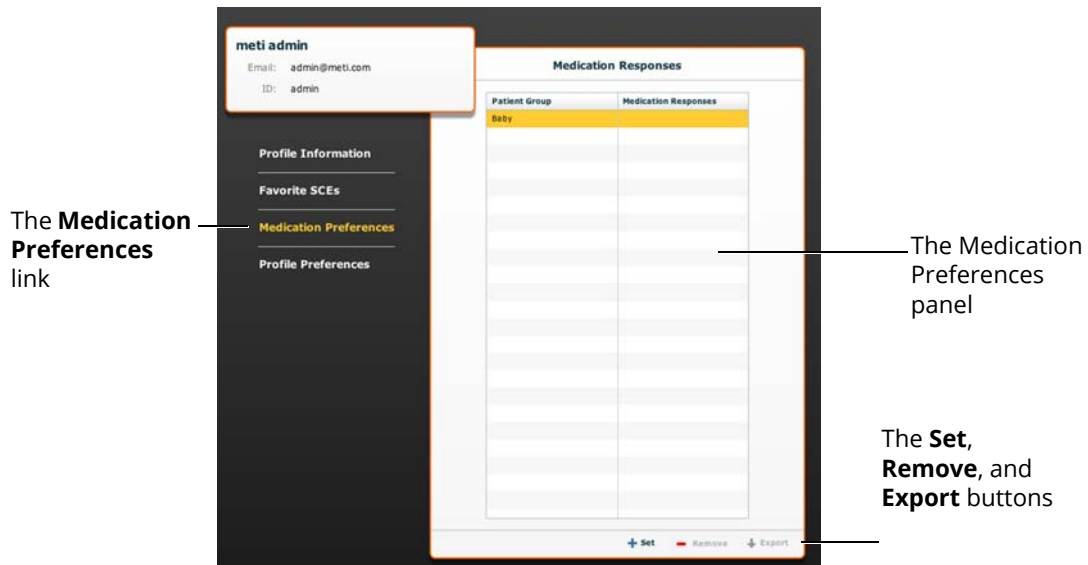
The Account Profile Screen

To import medication response files, click the **Set** button. The **Select File** dialog box appears. Select the medication response file to be added and click **Open** or **OK**.

Medication response files can also be removed or exported.

Profile Preferences

From the Profile Preferences panel, users can change the font size used in the software.

To access Profile Preferences, click **Profile Preferences** on the Account Profile screen.
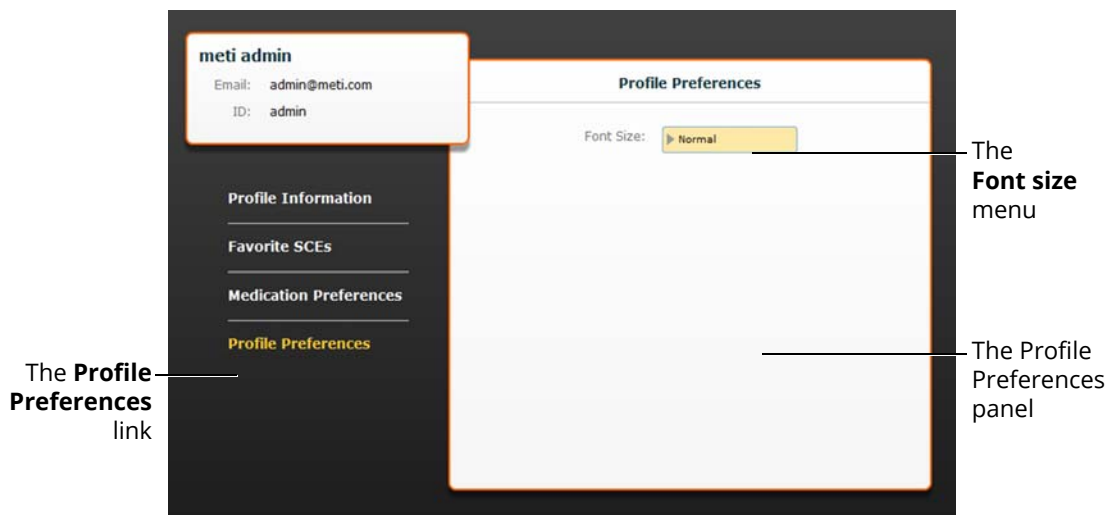
The Account Profile Screen

To change the font size, click on the **Font size** selection. From the **Font size** drop-down menu, select **Normal**, **Small** or **Large**.

USING THE TOUCHPRO PATIENT MONITOR

In this section, you will learn how to use the TouchPro software, which enables users to view the patient's physiology, expressed in waveforms and numeric values.

The TouchPro Patient Monitor software enables users to view patient physiology.

The software can be used from the Instructor Workstation or on another computer provided the computer has joined the simulator's wireless network.

IMPORTANT: *Only two TouchPro software screens can be open at a time.*

Scan or click the QR code to access the Using TouchPro video tutorial on caehealthcare.com.

Accessing the TouchPro Patient Monitor Software

Like the Müse software, the TouchPro Patient Monitor software is compatible with computers that have touch-screen capabilities.

To run the TouchPro Patient Monitor software, the Instructor Workstation must be connected to the simulator's network.

IMPORTANT: *An SCE must be running on the Müse software for any physiological data to be displayed on the TouchPro Patient Monitor software. The TouchPro Patient Monitor software can only show one Patient at a time.*

To launch TouchPro Patient Monitor from the Instructor Workstation:

1. With the Müse software running, open a new tab in the web browser and go to the **Home** page of the web browser
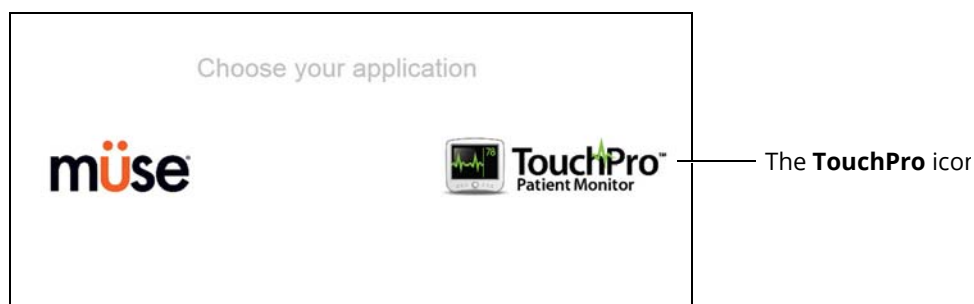
The **TouchPro** icon

The Müse Start Screen

2. Select the **TouchPro Patient Monitor** icon

    When TouchPro Patient Monitor software launches, the simulated patient monitor appears.

The TouchPro Display

Note: The capnogram waveform is not displayed on the TouchPro Patient Monitor software from the Instructor Workstation. Capnogram information can be found on the clinical patient monitor if one is connected to the simulator.

Modifying the TouchPro Patient Monitor Display

The layout of the waveforms and numeric data shown on the software can be customized. The software can show up to six waveforms plus an additional four numeric readouts.

Selecting a Preconfigured Layout

There are five preconfigured CAE Layouts:

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

To select a preconfigured layout:

1. Click the **Settings** button in the bottom right corner of the display

The Settings Button

The **Close Settings** button
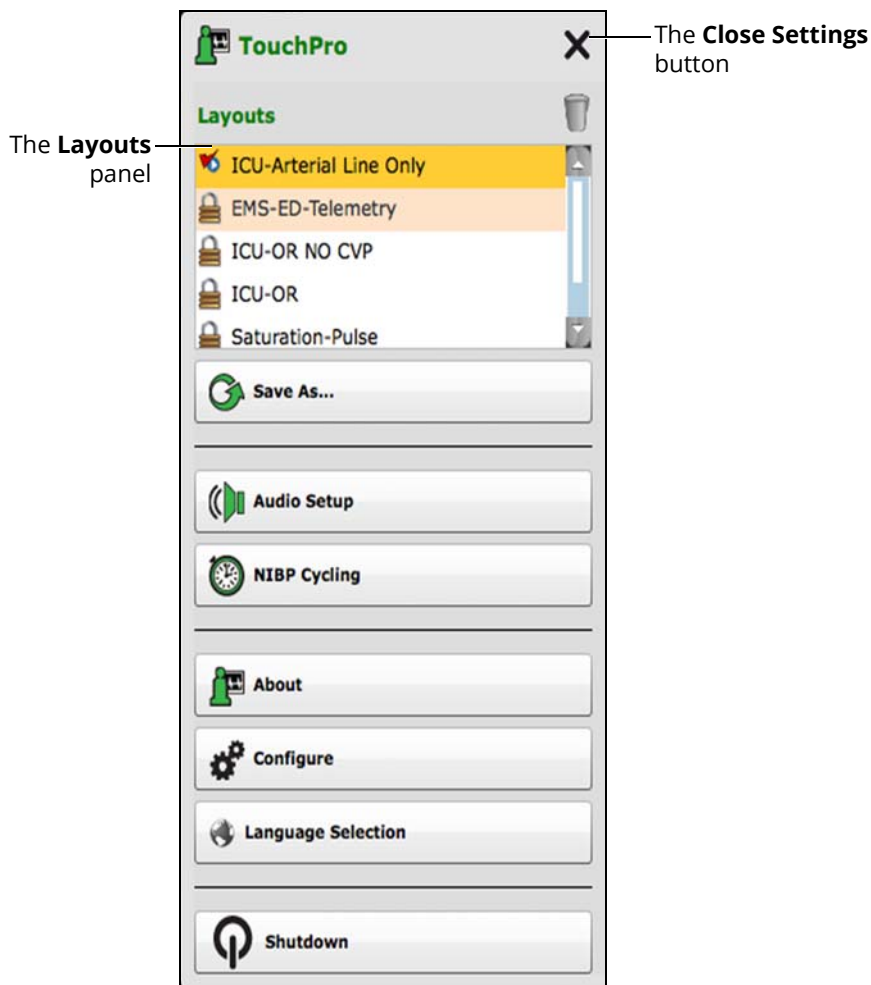
The **Layouts** panel

The TouchPro Settings Menu

2. Select a layout from the Layouts panel
3. Click the **Close Settings** button

Note: Preconfigured layouts must be enabled in the Müse TouchPro Setup for the currently running SCE to be accessible in the Layouts panel.

Changing a Waveform or Numeric Display

Waveforms and numeric displays can be changed to suit the user's needs.

To change a waveform or numeric display:

1. Click the waveform or numeric to be changed
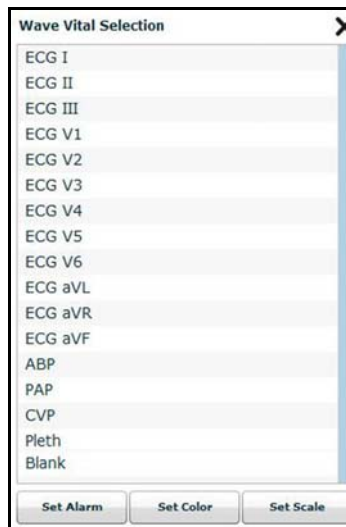
The Wave Vital Selection Menu

2. Select the desired waveform or numeric

3. use the **Wave Vital Selection** menu to set the alarm, color and scale can be set for the waveform using the **Set Alarm**, **Set Color** and **Set Scale** buttons

4. Use the **Numeric Vital Selection** menu to set the color and alarm for the numeric using the **Set Color** and **Set Alarm** buttons

Adding a Waveform

The TouchPro software supports up to six waveforms.

To add a waveform:

1. Click the **Settings** button in the bottom right corner of the TouchPro display

The Settings Button

An empty waveform field

The **Add Waveform** and **Remove Waveform** buttons

The TouchPro Display

2. Click the **Add Waveform** (**+**) button in the location above where you want the empty waveform to appear

3. Click the empty waveform field
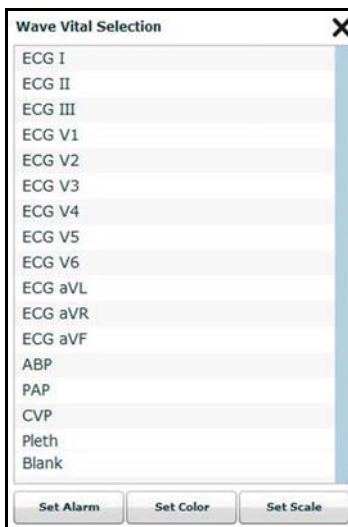
The Wave Vital Selection Menu

4. Select the desired waveform from the Wave Vital Selection menu

Adding a Numeric Display

The TouchPro software contains four numeric display fields. All four numeric display fields are located on one row beneath the waveform displays.

When fewer than four numeric readouts are being displayed, the remaining fields are blank.

To add or change a numeric display field:

1. Click an existing or a blank numeric display field

A blank numeric field

The TouchPro Display

The Numeric Vital Selection Menu

2. Select the desired numeric (scroll for all listings)

Moving a Waveform or Numeric Display

Waveforms and numerics can be moved on the screen to suit the user's needs.

To move a waveform or numeric, click the desired waveform or numeric and drag and drop the display to a desired location.

A dragged waveform
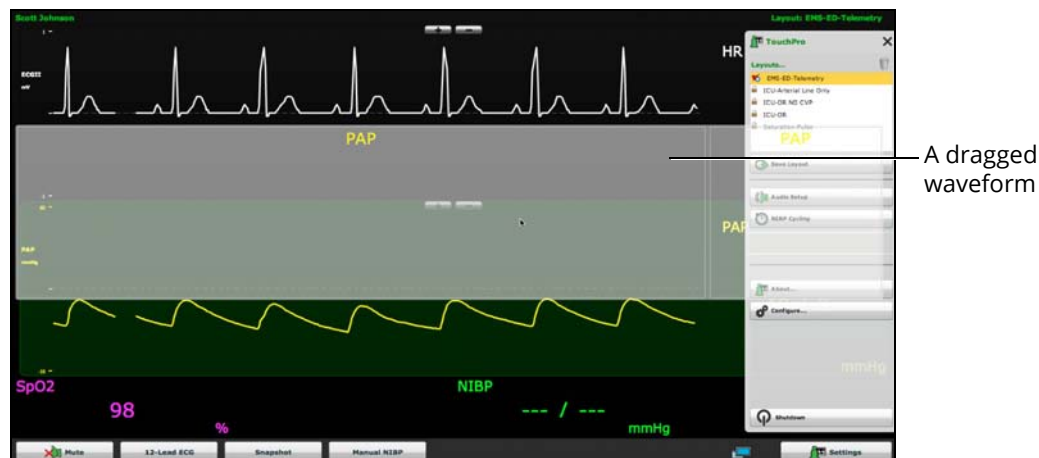
The TouchPro Display

Saving a Layout

Once a layout has been configured, it can be saved and reused.

To save a layout:

1. Ensure the desired waveforms and numerics are in place
2. Click **Settings**
3. Click **Save As**
4. In the Save Layout window, in the **Layout Name** field, enter a name for the layout

The **Layout Name** field
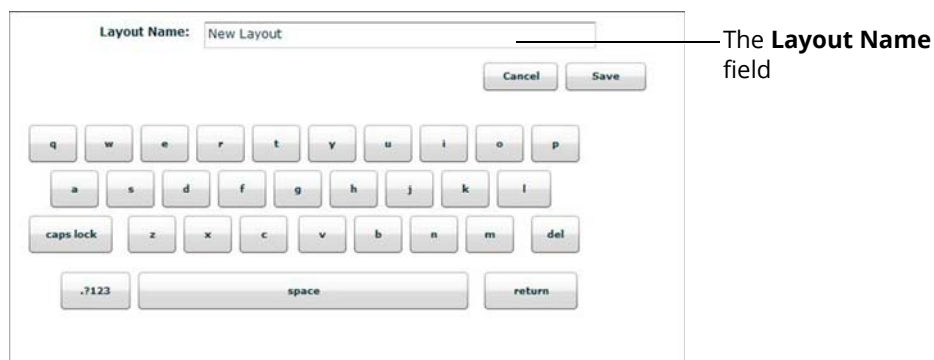
The Save Layout Window

5. Click **Save**
6. Click the **Close** button to exit the Settings menu

Saved layouts can be deleted from the Settings menu by dragging and dropping them in the Trash.

Note: When a layout is saved, it is available for use only with the current SCE. To enable the layout for use with any other SCE, enable the layout from the TouchPro Setup panel for the desired SCE.

Sounds

All sounds can be silenced by clicking the **Mute** button in the bottom left corner of the TouchPro display.
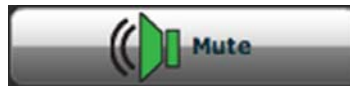
The Mute Button

To set up the audio for the TouchPro:

1. Click the **Settings** button in the bottom right corner of the TouchPro display

The Settings Button

2. From the Settings menu, click **Audio Setup**
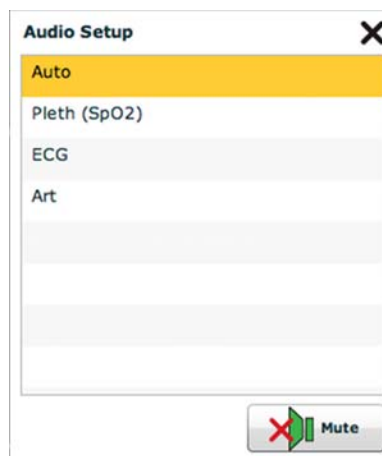
The Audio Setup Window

3. From the Audio Setup window, select a waveform to set it as the pulse sound

   Once a waveform is selected, the Audio Setup window automatically closes.

4. Click the **Mute** button from the Audio Setup window to mute all alarms. Click the **Mute** button again to return the alarms to their original state.

12-Lead ECG

To view a 12-lead ECG report, click the **12-Lead ECG** button at the bottom of the TouchPro screen.

The 12-Lead ECG Button

The **Close** button
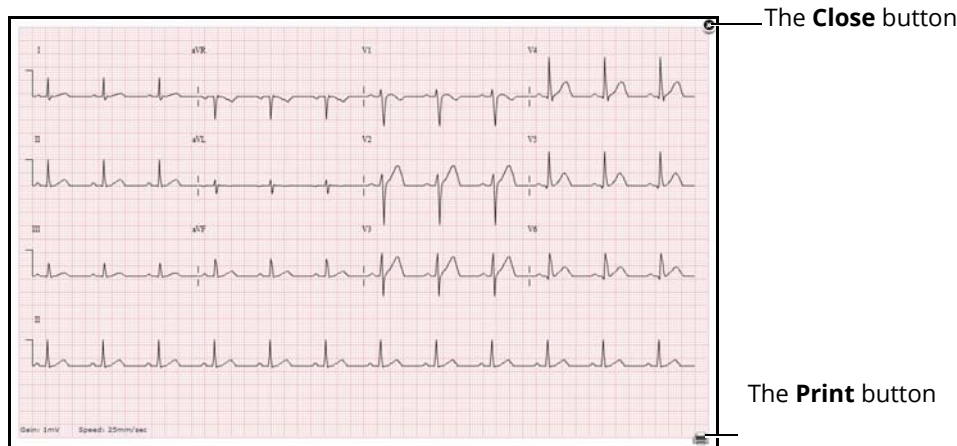
The **Print** button

A 12-Lead ECG Report

The report can be printed or saved by clicking the **Print** button in the bottom right corner of the 12-lead ECG report.

To close the report, click the **Close** button.

IMPORTANT: *Prior to saving the report as a PDF or printing to a network printer, the print presets must be adjusted. The page orientation must be set to Landscape and the margins must be set to .25 inches on all sides. These settings vary in location depending on the operating system (i.e., Macintosh or Windows).*

To save the report to a PDF file on a Macintosh Instructor Workstation:
1. From the 12-lead ECG report screen, click the **Print** button located in the bottom right corner of the 12-lead ECG report

The **Print** button

The 12-Lead Report Title Window

2. Enter a title for the 12-lead report
3. Click **Print**
4. On Page Setup Window, click **OK**

5. From the Print window, click the **PDF** drop-down menu in the lower left corner

6. From the drop-down menu, select the S**ave as PDF** option

7. In the Title field, enter the 12-lead report title

8. Click **Save**

   The report saves as a PDF on the Macintosh Instructor Workstation.

To save the report to a PDF file on a Windows Instructor Workstation:
1. From the 12-lead ECG report screen, click the **Print** button located in the bottom right corner of the 12-lead ECG report

2. From the drop-down menu, select Microsoft XPS Document Writer

To print a report:
1. From the 12-lead ECG report screen, click the **Print** button located in the bottom right corner of the 12-lead ECG report

— The **Print** button

The 12-Lead Report Title Window

2. Enter a title for the 12-lead report

3. From the Printer drop-down menu, select the appropriate network printer

   Note: A network printer must be configured in order to appear as an option.

4. From the Print window, click the **Print** button

Snapshot

A vital signs history window can be displayed using the **Snapshot** button.

To capture the vital signs history:

1. Click the **Snapshot** button on the bottom of the TouchPro display
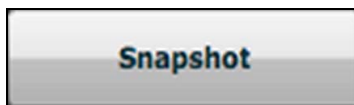
The Snapshot Button

The **Snapshot** window appears displaying that snapshot and live data.

The Capture Snapshot (refresh) button
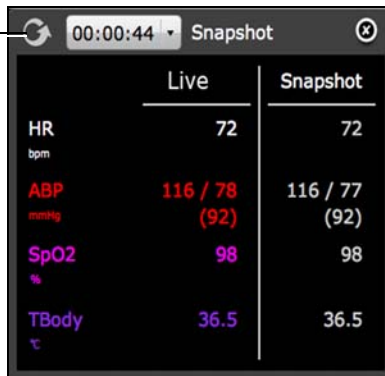
The Snapshot Window

2. To take another snapshot, click the Capture Snapshot (refresh) button

   IMPORTANT: *The Capture Snapshot (refresh) button is used to take all subsequent snapshots.*

   The time when the snapshot was taken is displayed in the simulation time dropdown.

3. Click the simulation time dropdown to display and select any snapshot time

The simulation time dropdown
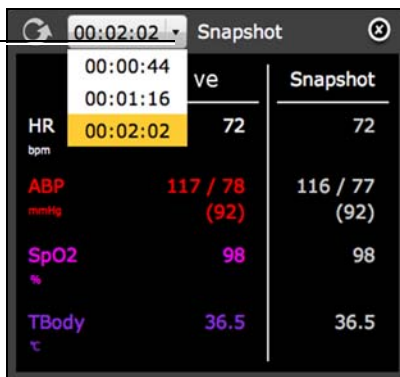
The Snapshot Window

4. Click the X to close the Snapshot window

NIBP Cycling and Manual NIBP

When non-invasive blood pressure (NIBP) is displayed, the patient's NIBP can be updated at specified intervals using NIBP Cycling, or the current NIBP can be displayed immediately using the **Manual NIBP** button.

NIBP Cycling can be used to set the patient's NIBP to be updated at regular intervals.

To set NIBP cycling:

1. Click the **Settings** button in the bottom right corner of the TouchPro display

The Settings Button

2. From the Settings menu, click **NIBP Cycling**
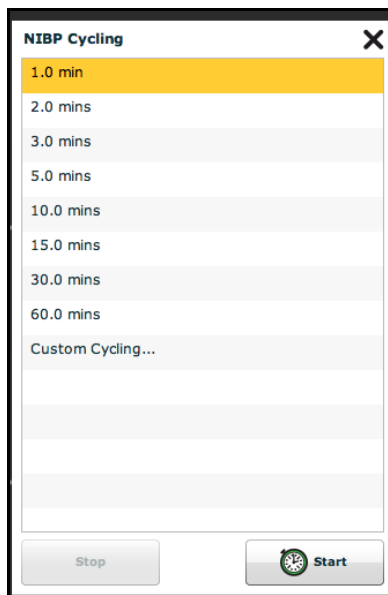
The NIBP Cycling Window

3. From the NIBP Cycling window, select the desired interval for the cycling
4. Click **Start**

Note: Custom cycling is also available.

Click the **Manual NIBP** button to display the patient's current NIBP.

The **Manual NIBP** button

The TouchPro Display

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

Configuring the TouchPro Software

The background color and alarm suspension time can be set from the TouchPro Configure panel.

To access the Configure panel:

1. Click the **Settings** button in the bottom, right corner of the TouchPro screen

The Settings Button

2. From the Settings menu, click the **Configure** button
3. From the Configure window, set the background color and alarm suspension time
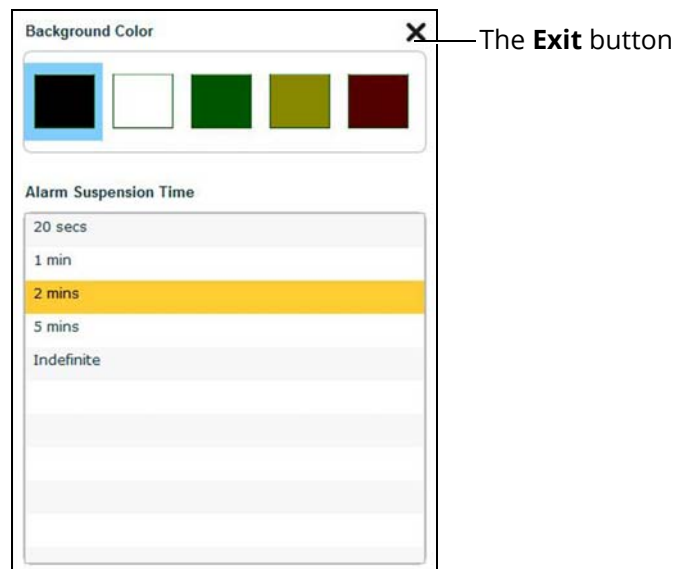
The **Exit** button

The Configure Window

4. Click the **Exit** button to exit the Configure window when finished

Changing the TouchPro Language

To change the language of the TouchPro software:

1. Click the **Settings** button in the bottom, right corner of the TouchPro screen

The Settings Button

2. From the Settings menu, click the **Language Selection** button
3. From the Language Selection window, select a language
4. Click **Accept**

Exiting the TouchPro Software

To exit TouchPro:

1. Click the **Settings** button from the bottom, right corner of the TouchPro screen

The Settings Button

2. From the Settings menu, click **Shutdown**
3. Click **Shutdown**

USING VIVO

Vivo is the facilitator-driven software that puts you in full control of your simulations. This information will help you get started using the Vivo tablet with the simulator.

IMPORTANT: *Before running Vivo, make sure that no application of Müse is open for the simulator using Vivo.*

Only one application of either Vivo or Müse can be open at any given time across all platforms, laptop or tablet. For example: If Vivo is open, then Müse needs to be closed.
Be sure to close and exit Vivo when not in use.

Note: A mouse-click on a laptop replaces the "tap" or "swipe" used on tablets.

Remember to make sure the tablet is fully charged prior to each use.

Laptop Setup

Vivo can be run from a laptop using the Google© Chrome browser (Chrome). Chrome is the only supported browser to run Vivo.

To configure Chrome for Vivo:

1. Ensure Chrome is installed on your laptop

   Note: It may be necessary to download the Chrome browser from the Google website.
2. Ensure the simulator is powered on and your laptop WiFi is connected to the simulator
3. Open Chrome

   Note: To access Vivo through Chrome, you need the 2 or 3-digit IP number from your simulator network.
   You can find the IP number on the *Simulator Data Sheet* listing:
   SBC Network Setup - IP Address or by going to the Network/WiFi settings on the laptop and viewing the **IPv4** address.

IPv4 Address: 192.168.xx.5
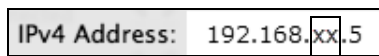
The 2 or 3-digit IP number

4. After obtaining the IP number, enter the web address **http://192.168.XX.5/vivo** into Chrome's address bar, replacing the **XX** with your IP number

   For example, if your IP number is 19, type *http://192.168.19.5/vivo*.

   After you enter the correct address, Vivo will launch.
5. Select the simulator
6. Select Run an SCE, then run on the fly SCE and **Begin Simulation**

   If Vivo is installed correctly, the simulator will start breathing and the manikin will respond to the Vivo tablet.

Tablet Setup

1. Power on the simulator first, and wait at least 3 minutes while the simulator establishes a wireless network. The power light will turn solid when ready.

   TIP: *It is recommended to wait 2 minutes after the manikin power light is solid, before starting the tablet.*

2. Power on the Vivo tablet. The power button is located on the top-right side of the tablet.

Once the simulator and the tablet are both powered on, they automatically establish a WiFi connection.

TIP: *For the initial WiFi connection, it may be necessary to have the tablet very close to the simulator.*

For the initial (first-time) startup, or if the WiFi does not automatically connect, perform the following steps to establish a WiFi connection to the simulator:

1. Swipe down from the top of the tablet screen to access the menu heading

2. Tap or swipe down on the WiFi icon to access the menu

3. Tap the WiFi icon dropdown

Tap the simulator network (Example: or APNXXXXis the serial number for the unit).

4. If necessary, enter the password *metiadmin*, then tap **Connect**

5. Tap the tablet square ▣ to minimize the windows. It may be necessary to first swipe up from the bottom of the tablet screen to show the tablet square ▣ .

6. Swipe the window right or left (off the screen) to close

The WiFi icon will show it as connected (an exclamation point may show beside the icon, this is ok).

Tablet Tips

- A touch screen stylus may be helpful while using the tablet

- The tablet must have a WiFi connection to the simulator in order to run Vivo. To verify the Vivo tablet is connected to the simulator WiFi, swipe down from the top of the tablet screen to access the menu heading. Then, tap or swipe down on the WiFi icon to access the menu. The simulator should be shown under the WiFi icon.

The simulator connection
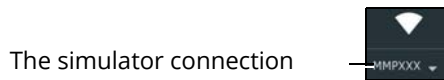
The WiFi Icon

- Depending on your location, it may be necessary to keep the tablet close to the simulator to maintain the WiFi connection

- Prior to running Vivo, it is recommended to lock the screen orientation in landscape view for optimal performance. To lock the screen in landscape view:

    ° Hold the tablet landscape and swipe down from the top of the screen to access the menu heading. Then, tap or swipe down on the menu heading to access the menu.

    ° Tap on the **Auto-rotate** icon to lock the landscape view
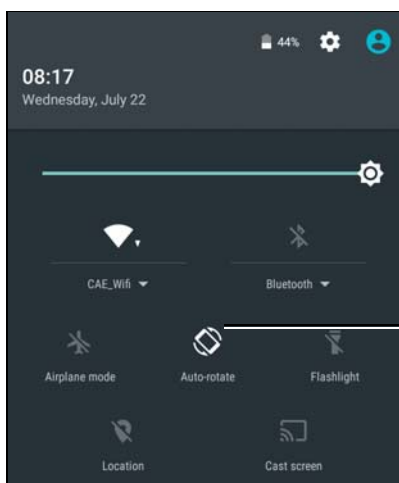
The **Auto-rotate** icon

The Menu

- If Vivo is closed accidentally, tap the tablet square ▣ to show any available running windows. If available, select the Vivo window.

- Various screens have a *back* button. Tap the *back* button to return to previous screen.

The Back Button

Opening Vivo - Running A Simulated Clinical Experience (SCE)

IMPORTANT: *Before running Vivo, make sure that no application of Müse is open for the simulator using Vivo.*
Only one application of either Vivo or Müse can be open at any given time across all platforms, laptop or tablet.

Verify the WiFi is connected to the manikin before launching Vivo (see *Tablet Tips* on previous page). If the WiFi is not connected, close and exit Vivo; then connect the WiFi before launching Vivo.

Tap the Vivo icon to launch Vivo (Vivo tablet only; for laptop use, launch the Chrome browser).

The Simulator Selection window may open before the Start screen. If so, tap to highlight the desired simulator, then tap Use Selected.
If the Simulator Selection window does not appear, then Vivo is automatically connected to the only available simulator and is ready to use.
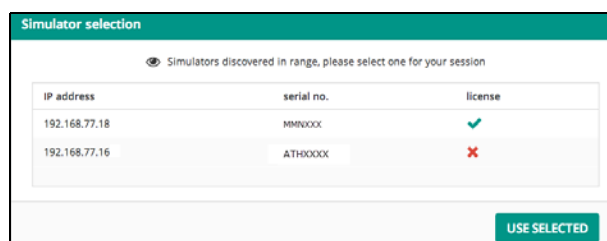
The Simulator Selection Window

Run an SCE

To run an SCE, from the Start screen, tap the Run (SCE) icon.
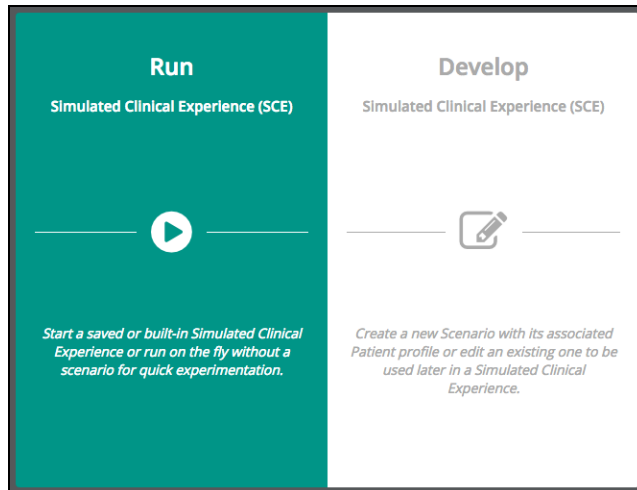
The Start Screen

The SCE selection window will open. Tap run on the fly; or tap on the SCE name dropdown to select an SCE and see it's description (scroll through the description to read its entirety).

The **SCE name** dropdown

The **SCE description**
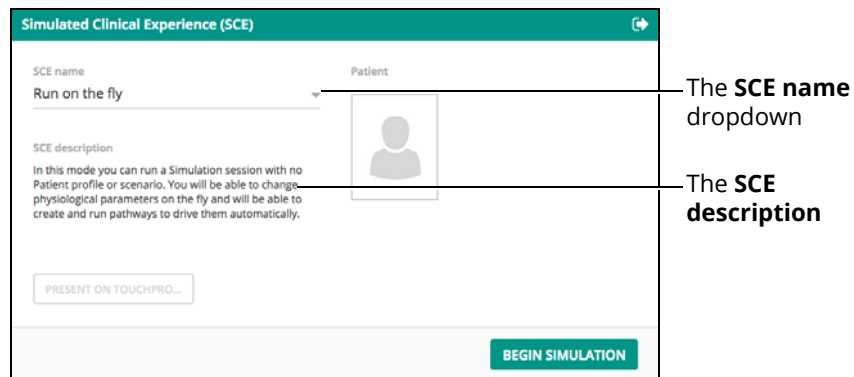
The SCE Selection Window

TIP: *Vivo comes with preconfigured SCEs for selecting and running simulations. Scroll through a description to read its entirety. The list of SCEs will include your saved SCEs and may vary depending on your software version.*

Tap **BEGIN SIMULATION.**
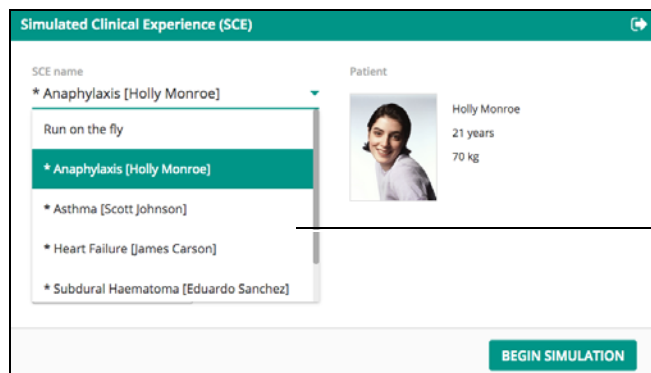
The SCE Selection Window

Vivo will open to the Run screen.

The Play/Next icon

The Run Screen

IMPORTANT: *For preconfigured and saved SCEs, Vivo starts with a base patient. You will need to tap on the Play/Next icon to begin the SCE. Refer to the Pathways section for more information.*

Develop an SCE

To develop an SCE, from the Start screen, tap the Develop (SCE) icon.
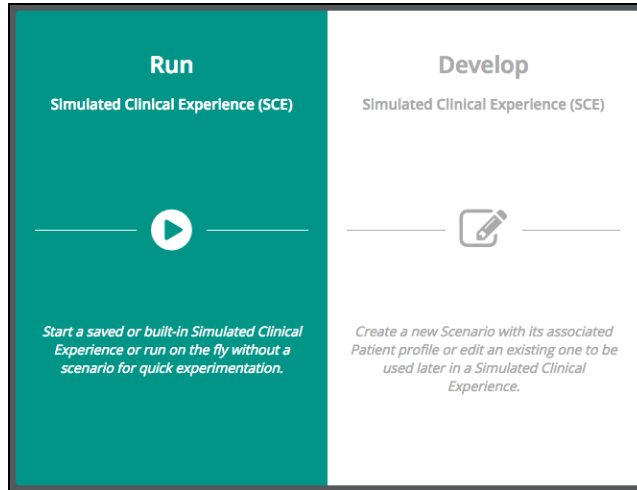
The Start Screen
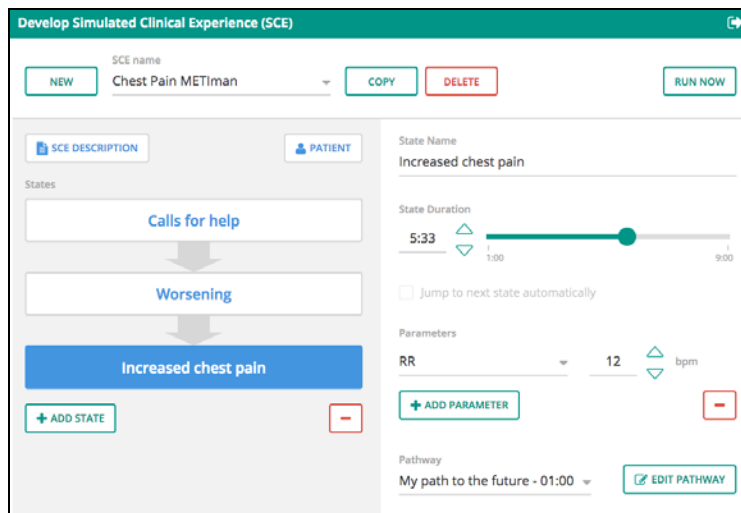
The Develop SCE Window

SCEs can be created, copied, adjusted, saved, deleted, and run as desired.

Using Vivo

The Run Screen

When an SCE is running, Vivo is facilitator-driven and fully adjustable. The top toolbar shows the play/pause/stop buttons, identifies what SCE is running, and shows the SCE clock.

The tile rows show the parameters and headers. Tile rows can be viewed or collapsed by tapping on the black header bar or on the dropdown of each row.

The bottom toolbar shows the Pathway(s) and countdown timer.
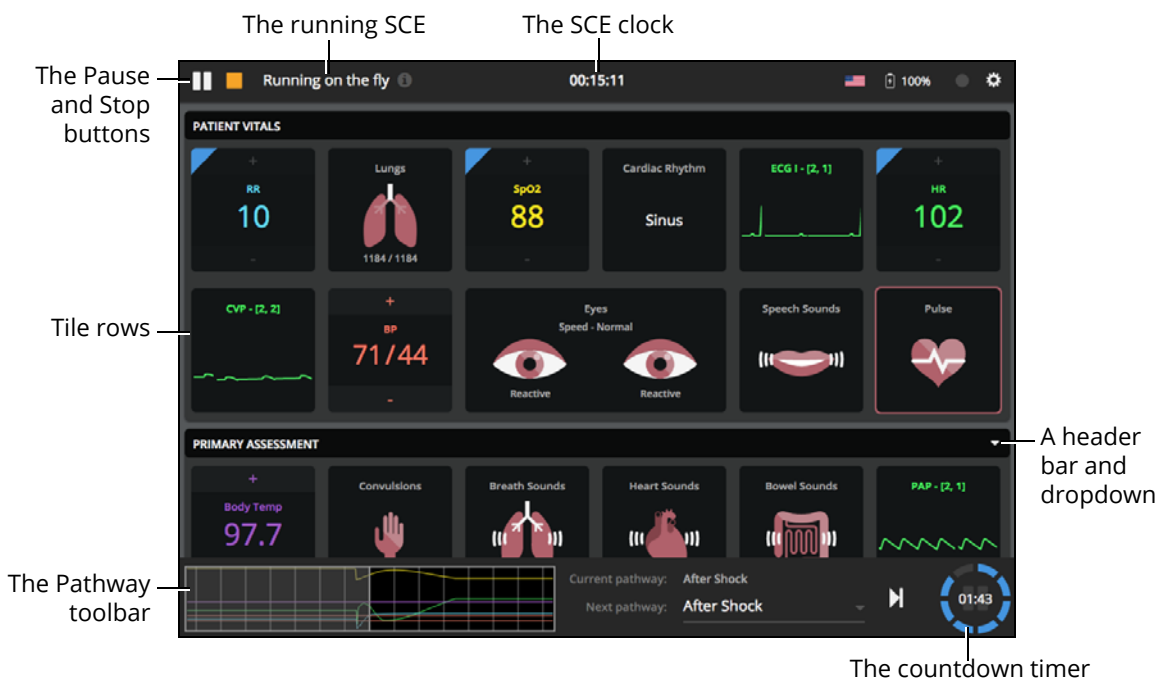
The Run Screen

TIP: *Vivo can also be used with a TouchPro™ Patient Monitor to display patient physiology.*

Tiles and Windows

Tap on a tile to adjust the parameters. The parameters window will open and can be applied as desired. Buttons, dropdowns, scroll lists, and slider bars are available based on each parameter.
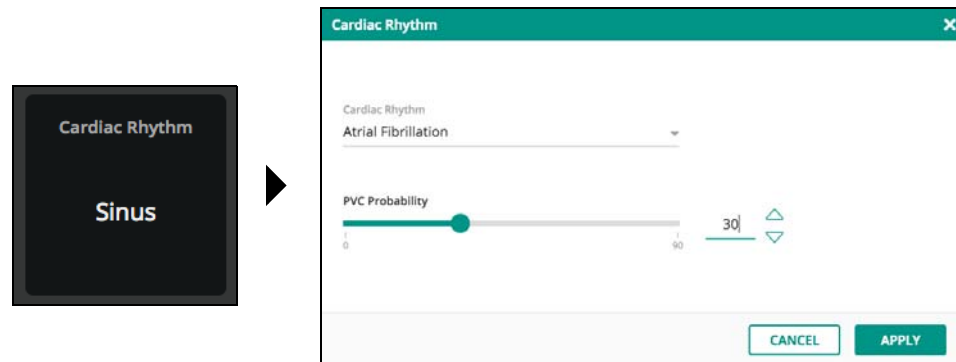
The Tile and Parameter Window

Examples

- For parameters with a **+** / **–** option, the parameter can be adjusted directly by tapping on the **+** or **–**

  A blue highlight in the corner of the parameter identifies that a change has been made to that parameter.
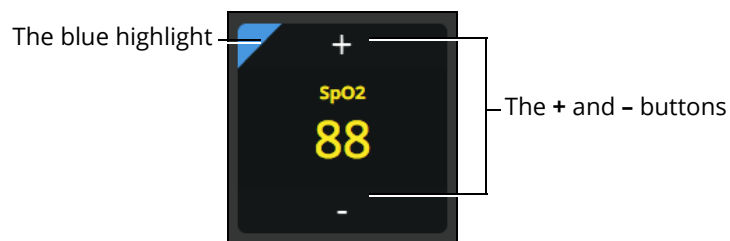
The Tile With + / – and Highlight

  Note: When making a change to a parameter with a waveform, such as CVP, the Vivo tablet tile will display the change, then remain fixed (non-animated) on the tile display.

- For parameters with a left and right option (lungs, eyes) the left and right parameters can be adjusted independently or together

For example, tap on either side or both sides of the Patient Vitals Lungs tile to highlight the selection.

 ——— The highlighted side

The Tile with One Side Highlighted

- Tiles with a notes icon allow for data capture. Tap the tile to open the data capture window
Refer to the *Right-Swipe and Left-Swipe* section for more information on the data capture window.
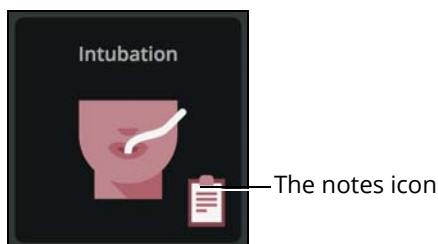
 ———The notes icon

The Tile With Notes Icon

- Tap on the Eyes tile to open the parameters windows and control the eyes independently or together
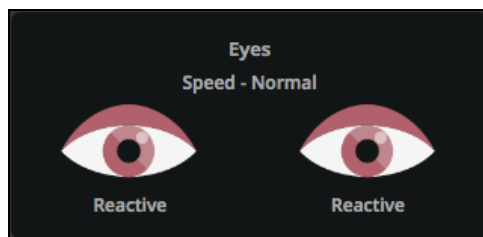
The Eyes Tile

Note: The blink speed can be adjusted, however the Vivo tablet tile does not display the eye blink animation.

- Tap on the CPR tile to open the parameters window

The CPR Tile

The CPR parameters window displays the results when chest compression or ventilation is performed.
Tap **Start/Stop Timer** to use the timer. Tap **Change User** to reset the timer.
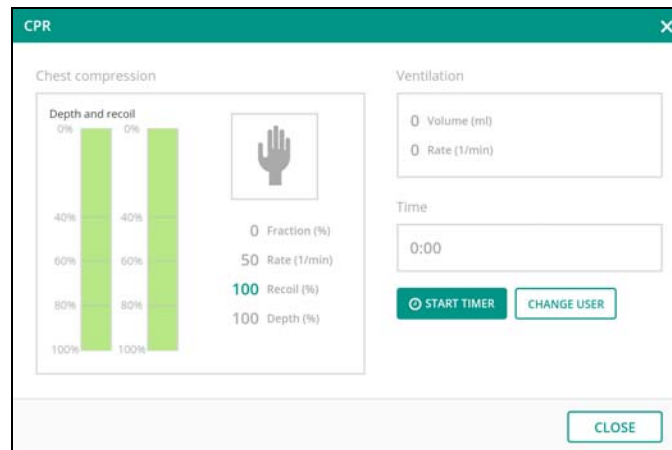
The CPR Parameter Window
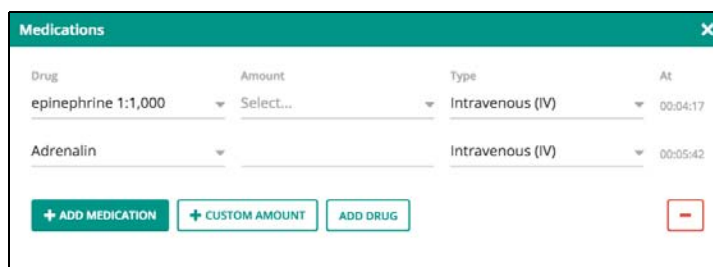
Right-Swipe and Left-Swipe

Swipe right on the Run screen to open the **Medications** window. Then, tap **ADD MEDICATION** to select the drug, amount, and type. Custom amounts are also available to enter.

Note: Adding medications only enters that medication into the log and does not affect the physiology.

Tap the red **–** and then the red **X** to remove a drug.
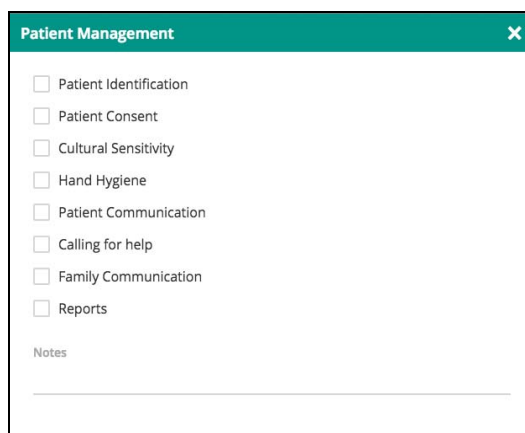
Tap the **X** or swipe the window left to close the window.

The Medications Window

Swipe left on the Run screen to open the data capture/checklist window. The data capture/checklist window allows for checkoffs and note taking.

The Data Capture Window

Depending on the previous action, swiping left opens the data capture/checklist window for the most recently accessed data.

For example:

- If no right-swipe has been made, then the **Patient Management** window will open with a left-swipe

- If **Medications** are accessed with a right-swipe, then the **Drugs** window will open with a left-swipe

- If the **Intubation** tile (with notes icon) is accessed, then the **Intubation** window will open with a left-swipe

Tap the **X** or swipe the window right to close the window.

Pathways

The pathway toolbar is located at the bottom of the Vivo screen. The pathway toolbar shows the pathway predictor, the Current pathway, the Next pathway queue, and the countdown timer.

The Current pathway · The countdown timer · The Pathway Predictor · The Next pathway queue · The Play/Next icon
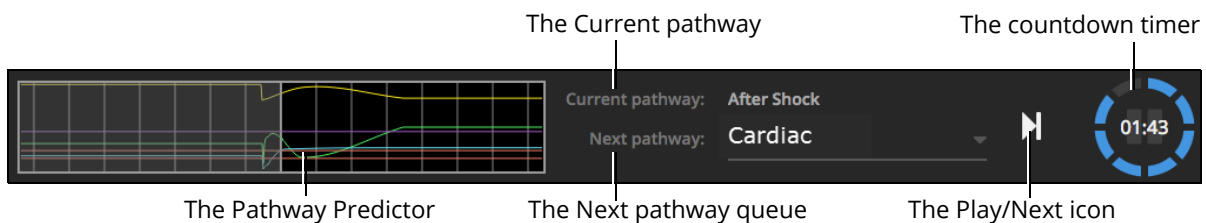
Note: Run on the fly SCEs will display "Current pathway" and "Next pathway".
Preconfigured and saved SCEs will display "Current state" and "Next state".

Preconfigured and saved SCEs

IMPORTANT: *Vivo starts with a base patient. Tap on the Play/Next icon to begin the SCE.*
*Then select a state in the **Next state** dropdown to queue up the next state. Tap on the Play/Next icon to play that next state.*

The countdown timer shows the time remaining to the next state. Tap the countdown timer to pause and resume.

Run on the fly SCEs

Run on the fly SCEs have the same pathway features, plus the ability to adjust the pathway predictor.

Tap the pathway predictor to access the **Pathway Editor**. Pathways can be created, copied, run, and fully customized.

When parameters are in (or added) to the pathway, those parameters can be adjusted by dragging any point on the parameter to any position.

TIP: *If more than one parameter is in the pathway, be sure to tap and select the desired parameter **tab** before adjusting the parameter.*
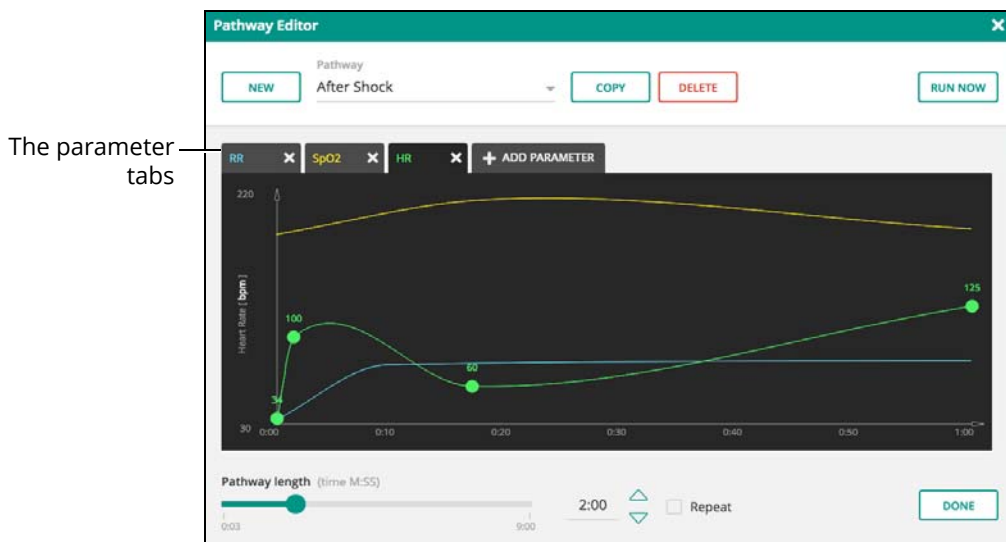
The parameter tabs

The Pathway Editor

Stopping An SCE

To stop an SCE, tap on the stop button. Then tap **OK** on the verification popup.
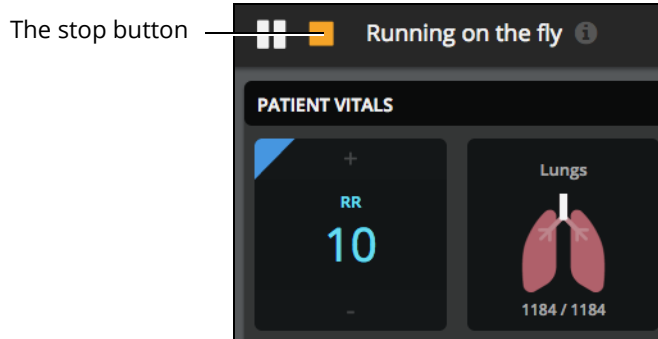
The stop button ⟶

The Stop Button

The **Session Debriefing** window will appear.
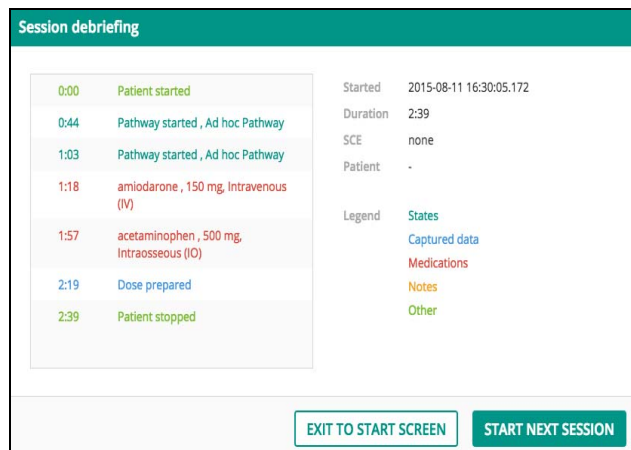
The Debriefing Window

When finished debriefing, select **Exit To Start Screen** or **Start Next Session**.

IMPORTANT: *Be sure to complete debriefing before exiting the debriefing window. Returning to debriefing window or accessing a debriefing log is not available.*

Exiting Vivo

IMPORTANT: *Stop the running SCE and return to the Start screen prior to exiting Vivo.*

To exit Vivo on the Vivo tablet, tap the tablet square ▣ to shrink the window. It may be necessary to first swipe up from the bottom of the tablet screen to show the tablet square ▣ .
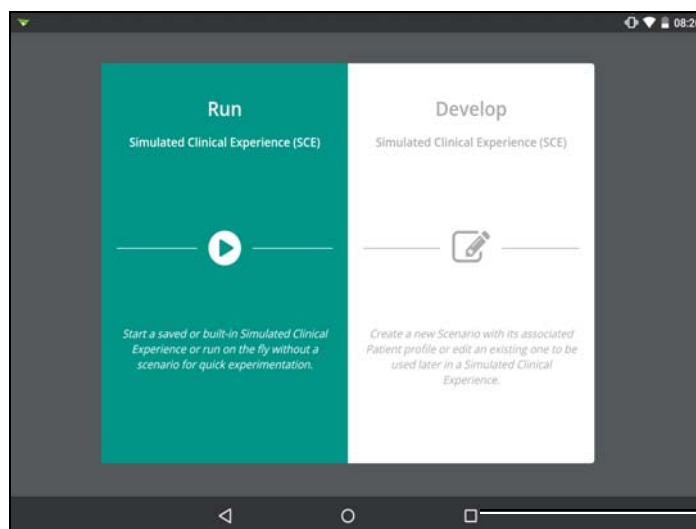
The tablet square

The Tablet

Swipe the Vivo window right or left (off the screen) to exit.
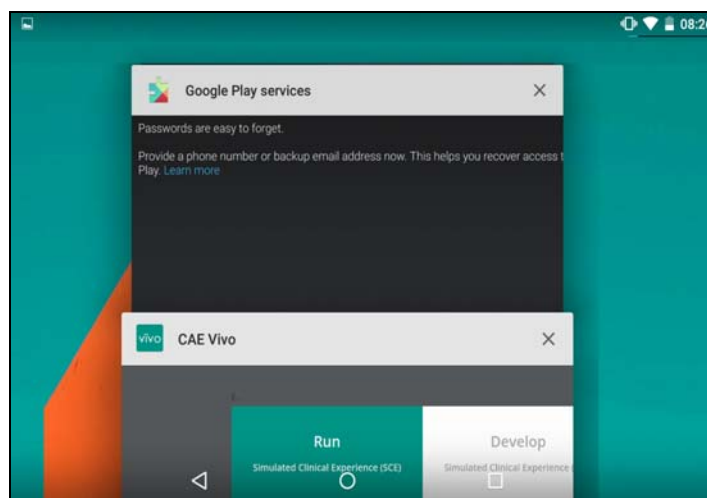
The Open Windows

To exit Vivo from the Chrome browser, close and exit the browser.

Clearing the Data Cache on the Vivo Tablet

For optimal performance, it may be necessary to occasionally clear the data cache on the Vivo tablet.

To clear the data cache and reset Vivo to the default state:

1. Ensure Vivo is exited and closed
2. On the tablet screen, open the **Settings** icon
3. Select **Apps** (under the **Device** tab)
4. Select Vivo
5. Tap **Clear Data**, then **OK** on the verification window
6. Tap the tablet square ▣ to shrink the window, then swipe the Settings window right or left (off the screen) to exit

TIP: *Clearing the Vivo data cache will not delete any user-created SCEs.*

USING APOLLO

Once Apollo has been set up (see the Setup section) and the software has been launched (see the Using the Software section), the simulator is ready for learner interventions. The features of Apollo are broken down by Neurological, Respiratory, Cardiovascular, Gastrointestinal and Genitourinary systems.
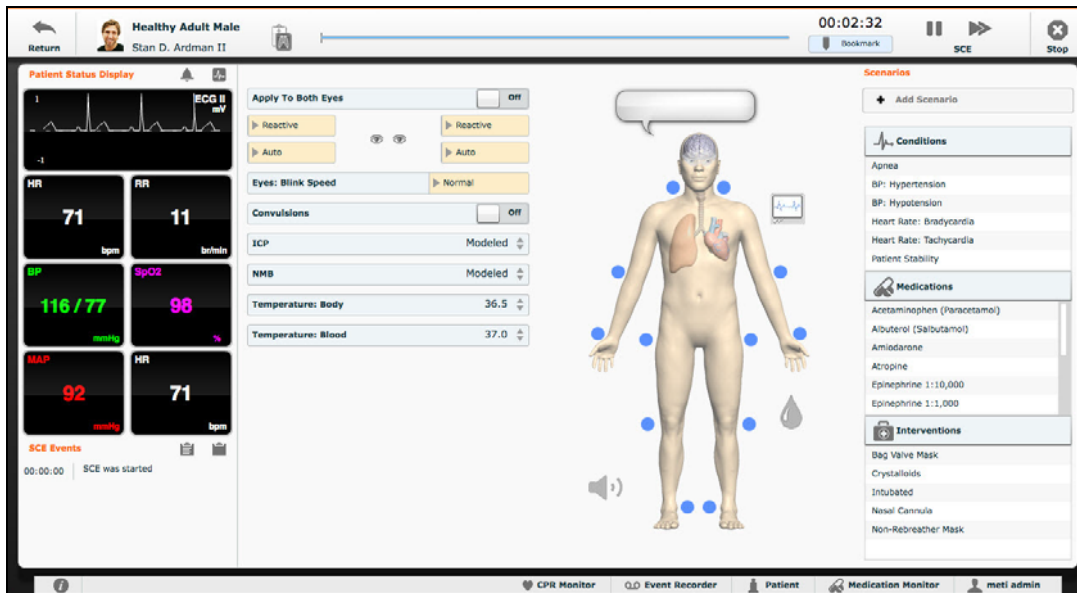
The Run Screen

Neurological

The clinical features that can be controlled from the Neurological Assessment view are Blinking Eyes, Reactive Pupils, Convulsions, Neuromuscular Block, Body and Blood Temperature and Speech.

To access the Neurological view, from the Run screen, click the brain on the human form.

Neurological parameters

Click the brain to access the Neurological view
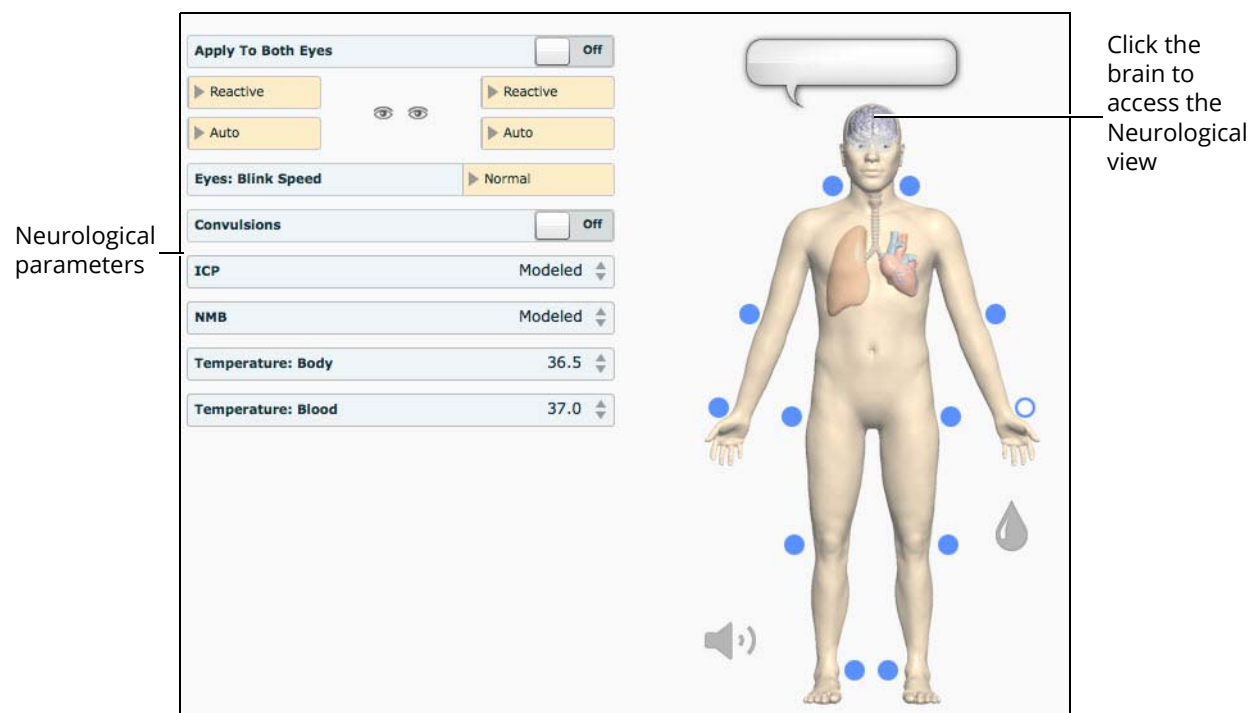
The Neurological View

Eyes

The pupil diameter, pupil reactivity, blinking and blink speed of the simulator's eyes can be controlled from the software.

Click the **Reactive** drop-down menus of each eye to determine reactivity: Reactive, Non-Reactive, Pinpoint or Blown.

Click **Auto** to have the eyes blink while the patient is conscious. Click **Closed** to close the eyes. Click **Blinking** to force the eyes to be open and blinking regardless of patient consciousness. These features can be controlled on both eyes.

Click **Slow**, **Normal** or **Fast** to control the blink speed.

Convulsions

Apollo simulates convulsions when the feature is activated on the software. To activate the Convulsions feature, click the **Convulsions** switch. The Convulsions feature is activated when **On** appears. To deactivate the convulsions feature, click the switch again. The feature is deactivated when **Off** appears.

Neuromuscular Blockade

To manually adjust the Neuromuscular Blockade (NMB: Set), click **NMB**. The **NMB** slider appears. Set the percentage by dragging the arrow up or down. Click **Accept** to exit and save the changes.

Body Temperature

To control a patient's body temperature, click **Temperature: Body**. The Body Temperature slider appears. Set the body temperature by dragging the arrow up or down.

Click **Accept** to exit and save the changes.

Blood Temperature

To manually control a patient's blood temperature, click **Temperature: Blood**. The Blood Temperature slider appears. Set the temperature by dragging the arrow up or down. Click **Accept** to exit and save the changes.

Head Secretions (Prehospital Only)

Secretions of the eyes, nose and mouth are manually controlled with a gravity feed.

Note: An IV bag is needed for each site in use.

To use the head secretion features:

1. Using a 60 mL syringe, prime the line of the desired secretion by injecting fluid into the **NOSE**, **MOUTH** or **EYES** port on Apollo's left shoulder until fluid emerges from the secretion sites

2. Set up the IV pole near the simulator

3. Fill an IV bag with the clinically appropriate fluid. Use distilled water only, with food coloring, if desired

4. Hang the IV bag on the IV pole

5. Ensure the roller clamp is closed and insert the IV spike into the IV bag

6. Connect to the simulator by attaching the end of the IV spike set tubing to the **NOSE**, **MOUTH** or **EYES** port on the simulator's left shoulder. Repeat for each site necessary.
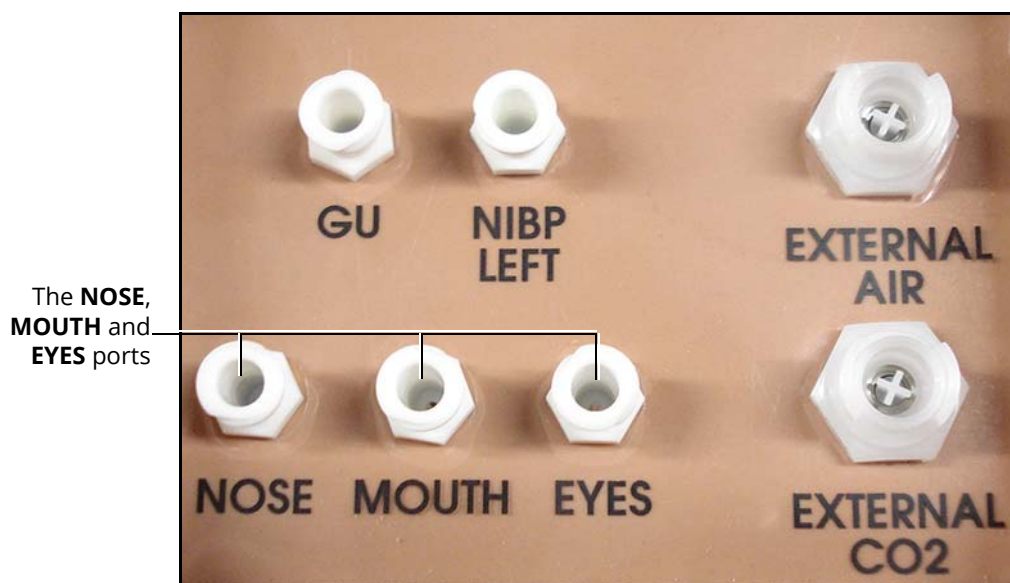
Apollo Prehospital's Left Shoulder

7. Open the clamp and allow fluid to flow into the simulator

8. Keep the IV bag attached. Adjust the flow rate manually using the roller clamp

Note: Cleanup is very important when using simulated fluids.

Respiratory
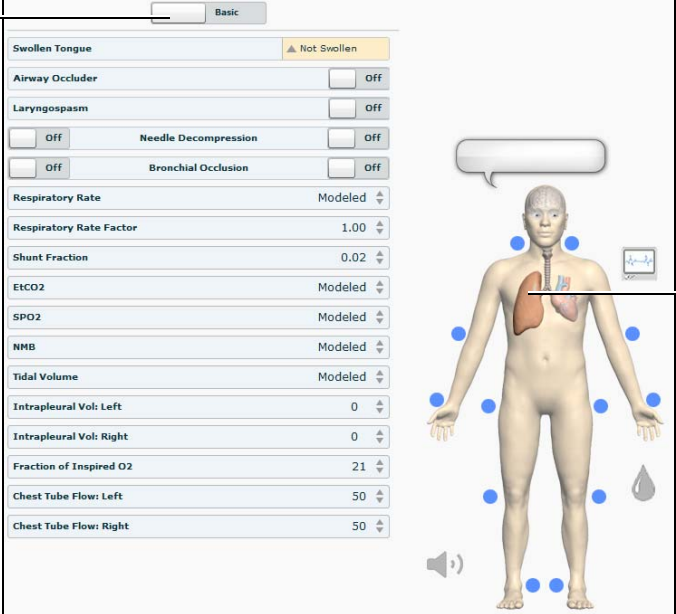
Apollo Prehospital's Respiratory system is comprised of the airway management, spontaneous breathing and ventilation features. On Apollo Nursing, various clinical signs such as breath sounds, chest excursion and airway patency can be physically demonstrated. A series of speakers inside each simulator can generate a range of breath and throat sounds used in diagnosing conditions.

To access the Respiratory parameters of Apollo, on the Run screen, click the lung on the human form. The respiratory parameters appear on the Run screen. To view additional parameters, click the Basic/Additional switch.

The **Basic/Additional** switch

Respiratory Parameters

Click the lung to access the Respiratory view

The Respiratory View

Airway

Various clinical signs such as breath sounds, chest excursion and airway patency can be physically demonstrated. A series of speakers inside the simulator can generate a range of breath and throat sounds used in diagnosing conditions.

Apollo Prehospital's anatomically realistic upper airway provides for the opportunity to intubate the patient as well as apply other airway interventions. In addition, the Apollo Prehospital airway was designed to be a difficult airway that teaches learners to use the best technique when encountering clinical situations with real patients. The airway is best visualized when using the Sellick maneuver, which is performed when a patient is undergoing the intubation procedure.

The Apollo Nursing airway has the ability to produce secretions to allow for suctioning.

Airway Features			
Anatomy, Physiology and Clinical Signs	**Clinical Interventions, Patient Monitoring and Scenarios**	**Software Control**	**Manual Control**
Realistic Upper Airway (Oropharynx, Nasopharynx and Larynx) (Prehospital only)	**Allows direct laryngoscopy, oral and nasal intubation and use of specialty airway devices. Detects right mainstem intubation. Endobronchial intubation results in unilateral chest excursion and breath sounds.**	**None required.**	**None required.**
Trachea, Left and Right Mainstem Bronchi (Prehospital only)	**Tracheal intubation results in bilateral chest excursion and breath sounds.**	**None required.**	**None required.**
Airway Management and Ventilation	**Alveolar and arterial gas concentrations appropriately reflect the efficacy of ventilation and oxygen administration.**	**Oxygen administration input by the instructor.** **VIEW: Respiratory**	**None required.**
Gastric Distention (Prehospital only)	**Esophageal intubation results in gastric distension and the absence of breath sounds, chest excursion and CO_2 output.**	**None required.**	**None required.**
Breakaway Teeth (Prehospital only)	**Upper front teeth can be dislodged if laryngoscopy is performed incorrectly.**	**None required.**	***See Breakaway Teeth***

Airway Features			
Anatomy, Physiology and Clinical Signs	**Clinical Interventions, Patient Monitoring and Scenarios**	**Software Control**	**Manual Control**
Tongue Edema (On/Off)	**Hinders, but does not prevent, intubation.**	**VIEW: Respiratory**	**None required.**
Posterior Pharynx Swelling (Prehospital only)	**Obstructs view of larynx to prevent intubation, but allows mask ventilation "can't intubate, can ventilate" scenario.**	**VIEW: Respiratory**	**None required.**
Laryngospasm (Prehospital only)	**Closes vocal cords and prevents intubation and ventilation. When used with posterior pharynx swelling, creates a "can't intubate, can't ventilate" scenario.**	**VIEW: Respiratory**	**None required.**
Cricothyroid Membrane	**Allows needle cricothyrotomy, transtracheal jet ventilation, retrograde wire techniques and cricothyrotomy.**	**None required.**	***See Cricothyrotomy.***

Swollen Tongue

The swollen tongue feature is activated on the Respiratory view by setting the **Swollen Tongue** switch to **Swollen**.

Posterior Pharynx Swelling (Prehospital Only)

Swelling of the posterior oropharynx (posterior airway occlusion) can be activated to obstruct the view of the larynx and prevent intubation, but allow mask ventilation of the patient's lungs, thereby creating a "cannot intubate, can ventilate" scenario.

Click the **Airway Occluder** switch to activate the feature.

Realistic Upper Airway (Prehospital Only)

The upper airway of Apollo Prehospital is designed to allow for intubation and laryngoscopy. Oral and nasal intubation can be performed using a variety of airway devices, including LMAs, endotracheal tubes, nasal-pharyngeal airways and oropharyngeal airways.

Intubation

The simulator detects and responds appropriately to right mainstem intubation, and an event is recorded in the Event Log.

Intubation incorrectly applied into the esophagus causes abdominal distension.

> **IMPORTANT** *Airways can be damaged by improper insertion of an airway adjunct (e.g. endotracheal tube). To protect the airway, lubricate the adjunct prior to insertion using the silicone spray provided.*
>
> *Use ONLY the provided SILICONE SPRAY to lubricate the adjunct. NEVER use a water-based lubricant because of resulting residue damage.*

Laryngospasm (Prehospital Only)

A laryngospasm actuator closes the patient's vocal cords and prevents both ventilation and intubation. Click the **Laryngospasm** switch to activate the feature.

Teeth with Breakaway Incisors (Prehospital Only)

Apollo Prehospital is equipped with Breakaway Teeth whose front incisors become dislodged with improper handling of a laryngoscope.

The teeth are tied to the upper denture with a lanyard, which prevents losing the teeth down the airway or misplacing them during storage.

Airway Secretions (Nursing Only)

Apollo Nursing allows for suctioning of fluids from the airway using a manual feed. Ensure all fluids have been removed from previous uses before each new use to prevent overfilling.

Tracheostomy Suction

To use the airway secretion feature, inject up to 40 mL of clinically appropriate colored fluid into the **AIRWAY FILL** port on Apollo Nursing's left shoulder.

The **Airway Fill** port

GASTRIC FILL   AIRWAY FILL   EXTERNAL AIR

GU   NIBP LEFT
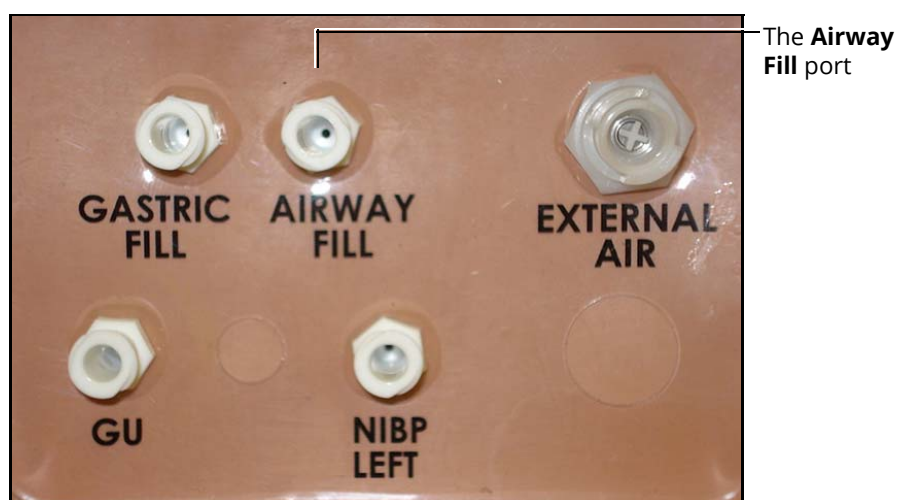
Apollo Nursing's Left Shoulder

The trachea is now ready to be suctioned. Using the proper clinical technique, insert the suction catheter until resistance is encountered at the bifurcation.

Withdraw and apply suction. Fluid can be suctioned over a distance of approximately 4 cm distal to the bifurcation.

Note: Use only distilled water with food coloring, if desired.

Note: Cleanup is very important when using simulated fluids.

Cricothyrotomy

Cricothyrotomy can be simulated on Apollo. Before performing a needle cricothyrotomy, the Cricothyrotomy plug must be removed, and a 2.25-inch (6-cm) length of red tape from the roll provided must be placed over the hole.

To replicate a needle cricothyrotomy:

1. Spray the silicone lubricant onto the airway adjunct prior to the simulation session. To prevent damage to the simulator, always spray silicone lubricant into the airway.
2. Locate the simulated cricothyroid membrane sealed with tape underneath the neck skin
3. Follow standard clinical techniques and palpate to find the cricothyroid space
4. Puncture the space through the neck skin of the patient simulator and into the tape "membrane." This puncture goes all the way through to the "trachea," simulating the clinical procedure.
5. Users must replace the tape that simulates the cricothyroid membrane after each cricothyrotomy

Note: Replacement components are available in the Inventory Kit.
Note: When ventilating through a surgical airway, the Laryngospasm feature must be deactivated, or the chest rise is not observed.
Note: When finished using the Cricothyrotomy feature, replace the Crichothyrotomy plug.

Replacing the Cricothyrotomy Tape

Remove the old, punctured tape completely from the cricoid feature and use alcohol to clean the glue residue from the surface. (An alcohol prep pad works well.) Allow to dry.

Cut an approximately 2.25-inch (6 cm) length of the double-sided tape from the roll provided.

Carefully remove the paper backing and lightly stretch the newly revealed adhesive side of the tape over the cricoid hole and down the far side of the cricoid feature. Use the non-stick paper backing to press the tape against the cricoid feature.

Cut a 2.5-inch to 3-inch (7 cm to 8 cm) length of red tape and apply it over the cricoid feature and the tape.

Resealing the Membrane After a Puncture

To reseal the cricoid feature, apply a small piece of red tape over the punctured area. This can be repeated a brief number of times, but when the number of layers impedes the cricothyrotomy, all existing tape must be removed and replaced with new tape.

Pulmonary

Apollo uses both physical and mathematical models to achieve an extremely accurate simulation of respiration. Apollo's chest rises and falls, mimicking inspiration and expiration. Apollo Prehospital's lungs also react realistically to intubation as well as to pathophysiologic states.

Pulmonary System			
Anatomy, Physiology and Clinical Signs	**Clinical Interventions, Patient Monitoring and Scenarios.**	**Software Control**	**Manual Control**
Spontaneous Breathing	**Normal tidal breathing and pathophysiological conditions such as atelectasis, pneumothorax, asthma and COPD.**	**None required, but adjustable** **VIEW: Respiratory**	**None required.**
Exhaled CO_2 **(Prehospital only)**	**Measure the presence or absence of CO_2 during positive pressure ventilation.**	**None required.**	**CO_2 canister is inserted**
Pneumothorax or Hemothorax	**Increase in intrapleural volume, leading to asymmetrical breathing.**	**None required, but adjustable** **VIEW: Respiratory** **CONTROL: Intrapleural Volume (Left or Right)**	**None required.**
Chest Excursion	**Synchronized with ventilation (spontaneous or positive pressure ventilation). Excursion depth proportional to tidal volume.**	**None required.**	**None required.**
Breath Sounds	**Normal and abnormal breath sounds are independently synchronized with ventilation of the right and left lungs. Breath sounds can be auscultated over anterior and posterior anatomic locations.**	**None required, but adjustable** **VIEW: Sounds**	**None required.**
Bronchial Occlusion	**Completely obstructs right and/ or left mainstem bronchi, simulating a lower airway obstruction (e.g. mucus plug). This yields an inability to ventilate the lungs and asymmetric chest excursion.**	**VIEW: Respiratory**	**None required.**

Pulmonary System			
Anatomy, Physiology and Clinical Signs	**Clinical Interventions, Patient Monitoring and Scenarios.**	**Software Control**	**Manual Control**
Pulse Oximetry	**Oxyhemoglobin saturation (SpO_2) automatically correlates with the oxygen concentration in the lungs and the intrapulmonary shunt fraction.**	**None required, but adjustable**	**SpO_2 probe is attached.**
Arterial Blood Gases	**PaO_2, $PaCO_2$ and pH are continuously calculated, and the Patient Status Display can be configured to show them.**	**None required, but adjustable**	**None required.**
Venous Blood Gases	**PvO_2 and $PvCO_2$ are continuously calculated, and the Patient Status Display can be configured to show them.**	**None required, but adjustable**	**None required.**
Needle Decompression *(Prehospital Only)*	**Decompression of a pneumothorax can be performed bilaterally by inserting a needle at the mid-clavicular line of the second intercostal space.**	**The instructor must adjust the amount of physiologic intrapleural air present.** **VIEW: Respiratory** **CONTROL: Needle Decompression, Intrapleural Vol: Left, Intrapleural Vol: Right**	***See Needle Decompression setup,.***

Needle Decompression (Prehospital Only)

Needle decompression can be performed bilaterally into a small hole located in the midclavicular line of the second intercostal space.

To enable the Needle Decompression feature, activate the switch for the appropriate side(s). From the Respiratory view, turn the desired **Needle Decompression** switch to **On**.

Needle Decompression Switch

Needle Decompression

When a needle is inserted in the second intercostal space, along the midclavicular line, air is released while intrapleural volume is present.

Needle Decompression and Chest Tube

When using the Apollo Prehospital system, the Needle Decompression and Chest Tube features can be enabled simultaneously. Intrapleural volume will decrease when both are in use.

Scan or click the QR code to access the Performing Needle Decompression video tutorial on caehealthcare.com.

Bronchial Occlusion

When bronchial occlusion is enabled, unilateral chest excursion is observed during spontaneous breathing or positive pressure ventilation. To stop airflow to the bronchi, creating a bronchial occlusion, the switch for the appropriate side(s) must be activated. From the Respiratory view, turn the desired **Bronchial Occlusion** switch to **On**.

Bronchial Occlusion Switch

Respiratory Rate

To adjust the respiratory rate manually, from the Respiratory view, click **Respiratory Rate**. The Respiratory Rate slider appears. Set the rate by dragging the arrow up or down. Click **Accept** to exit and save the changes. The switch is now orange, indicating a change has been made. To return to the programmed physiologic model, click the switch and turn the **Override** switch to **Modeled**.

Respiratory Rate Parameter

Pulse Oximetry

To adjust the SpO$_2$ percentage manually, from the Respiratory view, click **SpO$_2$**. The SpO$_2$ slider appears. Set the rate by dragging the arrow up or down. Click **Accept** to exit and save the changes. The switch is now orange, indicating a change has been made. To return to the programmed physiologic model, click the switch and turn the **Override** switch to **Modeled**.

SPO2 Parameter

Scan or click the QR code to access the Connecting the SpO$_2$ Probe to METIman video tutorial on caehealthcare.com.

CO_2 Exhalation (Prehospital Only)

Whether supplied via a portable canister or from an external source, the simulator exhales CO_2 during positive pressure ventilation.

Note: An optional regulator kit must be purchased to use CO2 from an external source.

To use the CO_2 Exhalation feature, connect the CO_2 canister to the CO_2 canister socket or connect the external source on the simulator's right shoulder, and Apollo Prehospital exhales CO_2 gas. There are approximately 15 minutes of CO_2 gas available once the canister is connected.

Positive Pressure Ventilation

When positive pressure ventilation is administered, the process is automatically detected by the simulator, and the physiologic model is sensitive to the volume administered.

Gastric Distention (Prehospital Only)

During esophageal intubation or overly aggressive bag valve mask ventilation, gastric distention occurs. Gastric distention is relieved by putting pressure on the abdomen.

Chest Tube: Apollo Prehospital

Apollo Prehospital has the ability to simulate chest tube drainage. The Chest Tube sites are located bilaterally in the fifth intercostal space.

Ensure all fluids have been removed from previous uses before each new use to prevent overfilling.

To simulate continuous chest tube drainage:

1. Insert the Apollo Priming Tube in the Chest Tube site
2. Set up the IV pole near the simulator
3. Fill an IV bag with the clinically appropriate fluid. Use distilled water only, with food coloring if desired
4. Hang the IV bag on the IV pole
5. Ensure the roller clamp is closed and insert the IV spike into the IV bag

6. Connect to the simulator by attaching the end of the IV spike set tubing to the corresponding **CHEST TUBE** port (**LEFT or RIGHT**) on the simulator's right shoulder

Apollo's Right Shoulder

7. Open the clamp and allow fluid to flow into the simulator until fluid is seen in the Apollo Priming Tube

8. Once fluid appears in the Apollo Priming Tube, remove the Apollo Priming Tube. The simulator is ready for chest tube insertion.

9. Keep the IV bag attached and adjust the flow rate manually using the roller clamp

The chest tube must be fully inserted for the fluid to flow.

Chest Tube Insertion

Note: Cleanup is very important when using simulated fluids.

When the Chest Tube feature is used on Apollo Prehospital, the simulator automatically detects the tube insertion and creates a log entry.

On Apollo Prehospital, if a small volume of fluid is needed to simulate proper chest tube insertion, the internal reservoir may be filled.

To insert a small amount of fluid into the Chest Tube reservoir:

1. Insert the Apollo Priming Tube in the Chest Tube site
2. Using a 60 mL syringe filled with clinically appropriate fluids, inject the contents into the **CHEST TUBE** port **(LEFT or RIGHT)** until fluid is seen in the Apollo Priming Tube. Use distilled water only, with food coloring, if desired.
3. Remove the Apollo Priming Tube
4. Inject the remaining contents of the syringe into the **CHEST TUBE** port
5. Remove the syringe

Chest Tube: Apollo Nursing

Apollo Nursing has the ability to simulate chest tube drainage. The Chest Tube sites are located bilaterally in the fifth intercostal space.

Ensure all fluids have been removed from previous uses before each new use to prevent overfilling.

To simulate continuous chest tube drainage:

1. Insert the Apollo Priming Tube in the Chest Tube site
2. Set up the IV pole near the simulator
3. Fill an IV bag with the clinically appropriate fluid. Use distilled water only, with food coloring if desired.
4. Hang the IV bag on the IV pole
5. Ensure the roller clamp is closed and insert the IV spike into the IV bag
6. Connect to the simulator by attaching the end of the IV spike set tubing to the corresponding **CHEST TUBE** port (**LEFT or RIGHT**) on the simulator's right shoulder

Apollo's Right Shoulder

7. Open the clamp and allow fluid to flow into the simulator until fluid is seen in the Apollo Priming Tube
8. Once fluid appears in the Apollo Priming Tube, remove the Apollo Priming Tube. The simulator is ready for chest tube insertion.
9. Keep the IV bag attached and adjust the flow rate manually using the roller clamp

The chest tube must be fully inserted for the fluid to flow.

Note: Cleanup is very important when using simulated fluids.

Cardiovascular

With Apollo's Cardiovascular system, users can replicate the clinical signs associated with cardiac activity, including palpable pulses, heart sounds and electrical activity.

Cardiovascular System			
Anatomy, Physiology and Clinical Signs	Clinical Interventions, Patient Monitoring and Scenarios.	Software Control	Manual Control
Heart Sounds	Normal and abnormal heart sounds are synchronized to the cardiac cycle and audible to a standard stethoscope. Heart sounds can be auscultated over the left and right upper sternal border, right lower sternal border and apex.	None required; specific sounds can be selected. VIEW: Cardiovascular	None required.
5-Lead ECG	ECG waveforms can be viewed on a standard monitor and/or on the TouchPro Patient monitor. Normal and abnormal cardiac rhythms are linked to patient physiology (e.g. blood pressure, cardiac output).	None required; specific rhythms can be selected.	ECG monitor may be utilized.
Myocardial Ischemia	Myocardial oxygen supply and demand automatically influence the cardiac rhythm, yielding response to hypoxemia.	None required, but adjustable.	None required.
Palpable Pulses	Carotid, brachial, radial, femoral, popliteal, posterior tibial and dorsalis pedis pulses can be palpated bilaterally and are synchronous with the cardiac cycle. A pulse deficit automatically occurs if the systolic arterial blood pressure falls below specified thresholds.	None required, but adjustable. VIEW: Available on all views on the Run screen	None required.
Non-Invasive Blood Pressure Measurement	Systemic blood pressure can be measured using the return-to-flow technique. Korotkoff sounds can also be auscultated.	None required.	Use of modified blood pressure cuff.

To access the Cardiovascular parameters of Apollo, on the Run screen, click the heart on the human form. The cardiovascular features appear on the Run screen. To view additional parameters, click the Basic/Additional switch.

The **Basic/Additional** switch

Cardiovascular parameters

Click the heart to access the Cardiovascular view

Pulses

The Cardiovascular View

Pulses: Apollo Prehospital

Apollo Prehospital has 14 pulse sites that are activated by touch.

- Carotid (2)
- Brachial (2)
- Radial (2)
- Femoral (2)
- Popliteal (2)
- Posterior Tibial (2)
- Dorsalis Pedis (2)

Note: The Dorsalis Pedis and Posterior Tibial pulses are controlled together. The left and right Carotid pulses are also controlled together.

Pulses are visible and can be controlled from any physiological view.

To disable a pulse:

1. Click the pulse location on the human form
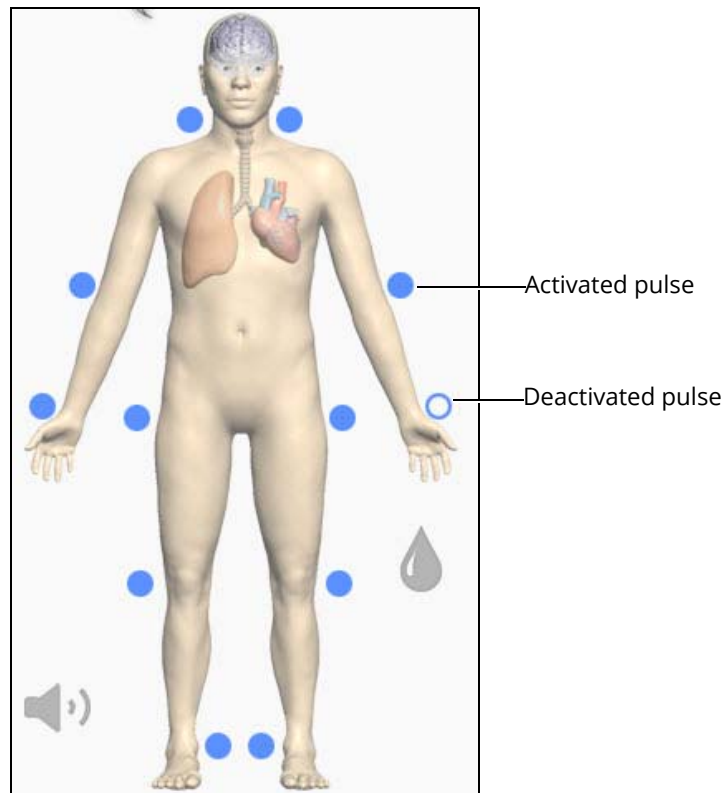
Pulses: Apollo Prehospital – Active and Inactive

2. Click the **Pulse Enable** switch to turn the pulse **Off**
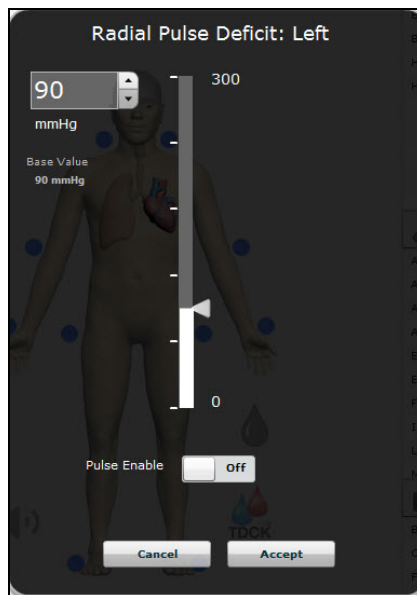
3. Click **Accept**

Pulses: Apollo Nursing

Apollo Nursing has 14 pulse sites that are activated by touch.

- Carotid (2)
- Brachial (2)
- Radial (2)
- Femoral (2)
- Popliteal (2)
- Posterior Tibial (2)
- Dorsalis Pedis (2)

Note: The left and right Carotid pulses are controlled together.

Pulses are controlled from the Cardiovascular view only. All pulses, unless altered by an SCE, are enabled by default.

To disable a pulse:

1. Click the pulse location on the human form
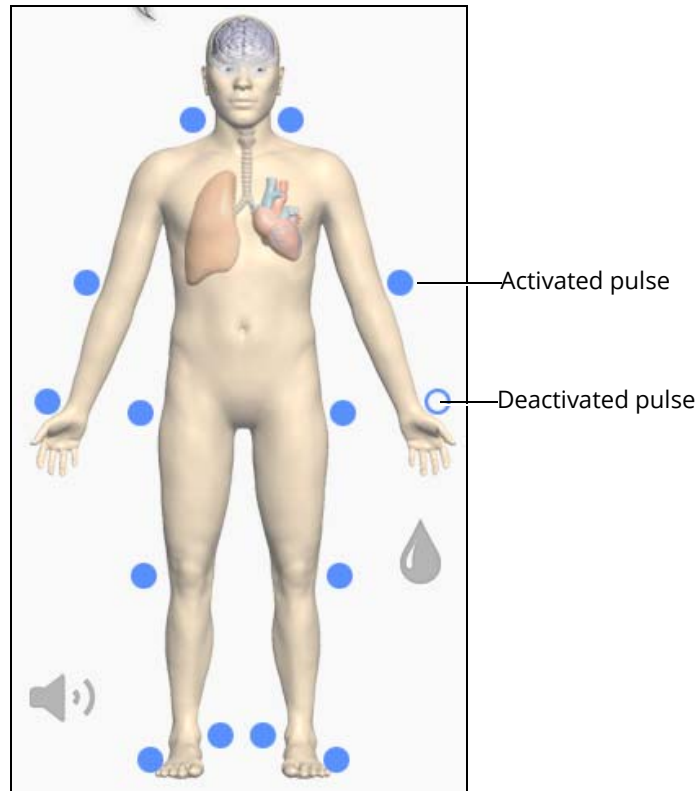
Pulses: Apollo Nursing – Active and Inactive

2. Click the **Pulse Enable** switch to turn the pulse **Off**
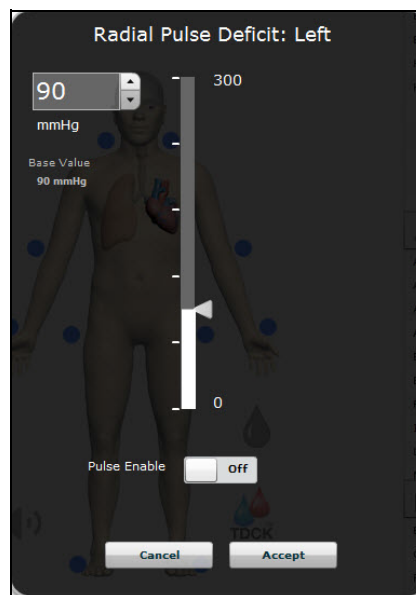
3. Click **Accept**

   The pulse can be re-enabled with the same steps.

Blood Pressure

Apollo supports non-invasive blood pressure measurements, and systolic and diastolic readings can be obtained and manipulated through the software.

Systolic and Diastolic Blood Pressure

To manually adjust the systolic and/or diastolic blood pressure:

1. From the Cardiovascular view, click the parameter of desired blood pressure
2. Set the pressure by dragging the arrow up or down
3. Click **Accept** to exit and save the changes. The switch is now orange, indicating a change has been made.
4. To return to the programmed physiologic model, click the switch and turn the **Override** switch to **Modeled**

Non-Invasive Blood Pressure Measurement

Blood pressure can be taken manually on either arm. Non-invasive blood pressure (NIBP) monitoring techniques can be used by attaching the standard cuff modified with a T-fitting and adapters.

To modify a standard blood pressure cuff:

1. Cut the blood pressure cuff tube approximately 9 cm from the cuff
2. Insert the barbed end tubing connectors into the cut ends of the blood pressure cuff tubes

3. Secure the tubing connectors with cable ties

An Attached Tubing Connector

4. Attach the blood pressure adapter to the connectors

An Attached Blood Pressure Cuff Adapter

To get a blood pressure reading, connect the extension from the T-fitting on the blood pressure cuff adapter to either of the NIBP ports on Apollo's left and right shoulders.
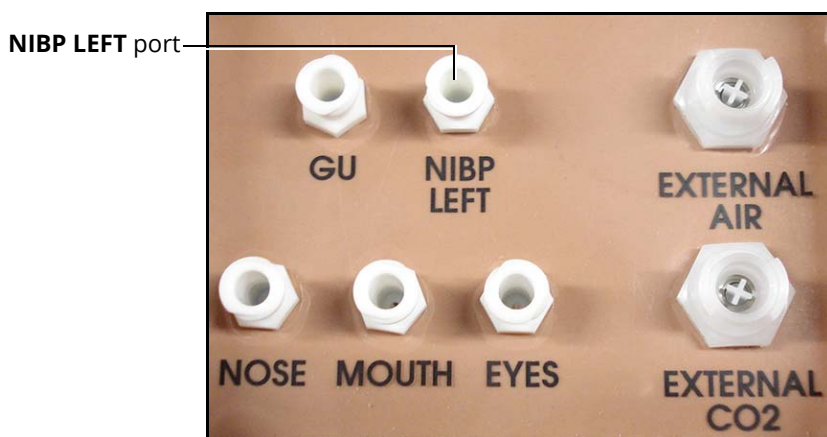
NIBP LEFT port

Apollo Prehospital's Left Shoulder

NIBP LEFT port

Apollo Nursing's Left Shoulder

NIBP RIGHT port
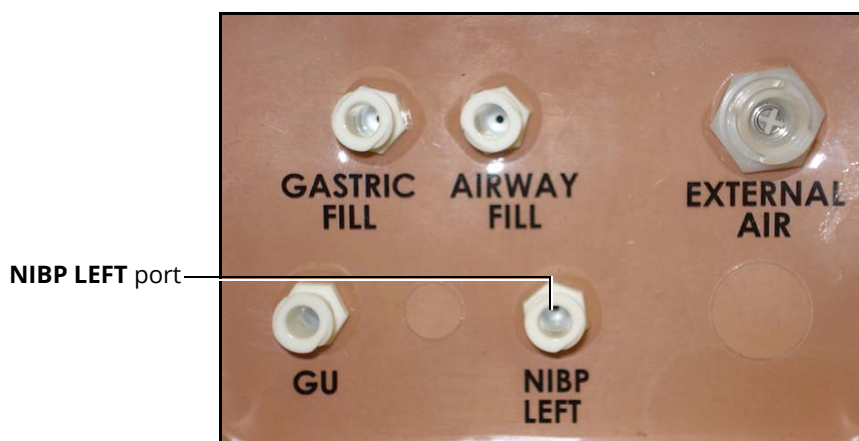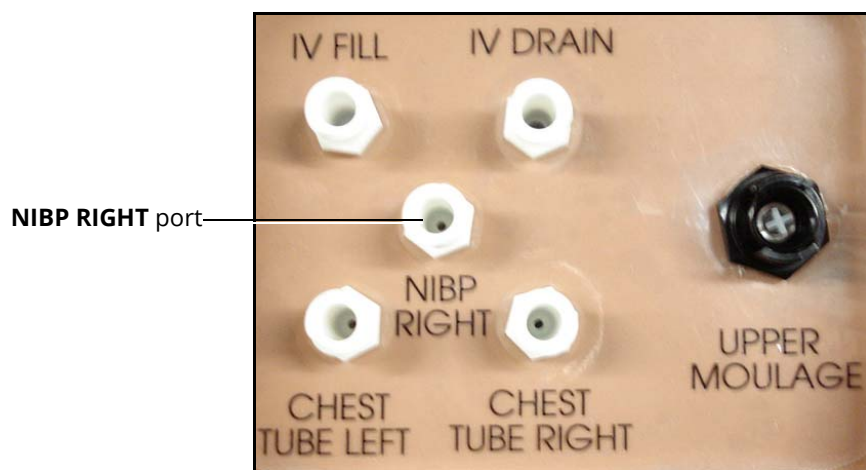
Apollo's Right Shoulder

Connect the T-fitting extension to the hose.

Take the non-invasive blood pressure reading using the return-to-flow technique.

Attached Blood Pressure Cuff

At appropriate cuff pressures, Korotkoff sounds are produced, and the radial pulse disappears.

Scan or click the QR code to access the Non-invasive Blood Pressure Measurements video tutorial on caehealthcare.com.

Heart Rate

To manually adjust the heart rate, from the Cardiovascular view, click **Heart Rate**. Set the rate by dragging the arrow up or down.

Click **Accept** to exit and save the changes. The switch is now orange, indicating a change has been made.

To return to the programmed physiologic model, click the switch and turn the **Override** switch to **Modeled**.

Five-Lead ECG

On Apollo, a 5-lead ECG is emitted from the appropriate positions for display on a standard monitor. A contact is available on Apollo's chest for each of the five cables.
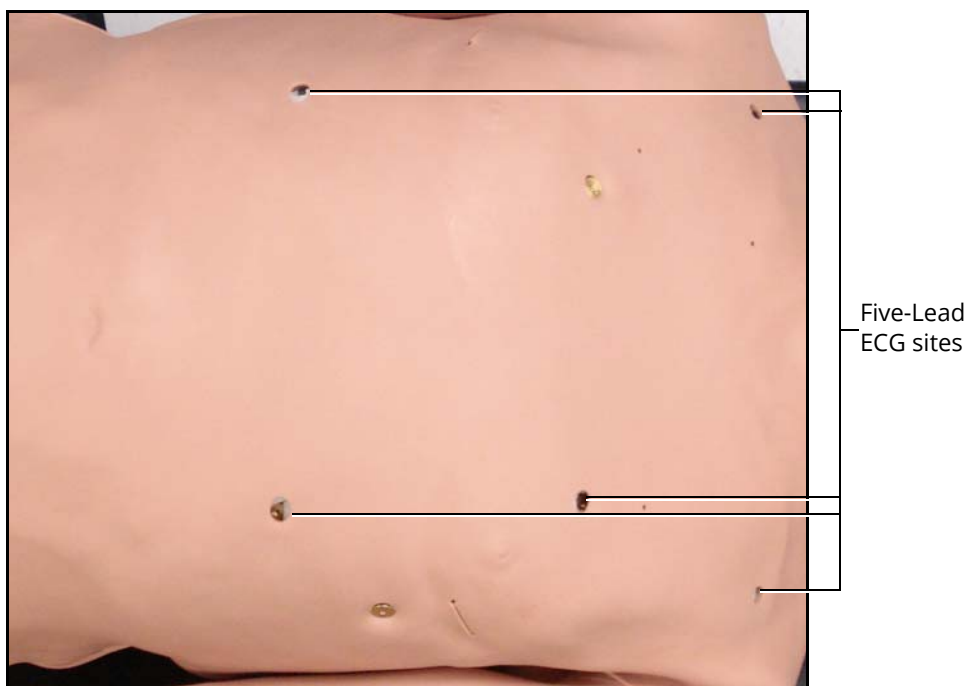
Five-Lead ECG sites

5-Lead ECG Sites

The simulator generates a normal sinus ECG, as well as a broad range of abnormalities such as myocardial ischemia, sinus tachycardia and bradycardia, ventricular fibrillation and asystole. The hemodynamic response to the arrhythmias is physiologically correct. Myocardial oxygen balance and cardiac ischemia automatically influence the cardiac rhythm resulting in a realistic and automatic response of the rhythm to hypoxemia. The degree of influence can be controlled or completely overridden by the instructor.

Cardiovascular Interventions/Therapy

Apollo can simulate chest compressions and three types of electrical therapy: defibrillation, cardioversion and pacing.

Realistic Cardiovascular Interventions			
Anatomy, Physiology and Clinical Signs	**Clinical Interventions, Patient Monitoring and Scenarios.**	**Software Control**	**Manual Control**
Chest Compression	**Effective chest compression results in artificial circulation, cardiac output, central and peripheral blood pressures, palpable pulses, and CO_2 return.**	**None required, but adjustable.**	**None required.**
Cardiac Monitoring	**The desired arrhythmia can be selected.**	**The response to clinical intervention must be controlled by the instructor.** **VIEW: Cardiovascular**	**None required.**
Defibrillation	**Apollo supports operation with a variety of manual and automatic external defibrillators.**	**Defibrillation can be simulated by the instructor under the Interventions palette** **VIEW: Cardiovascular**	_**See Defibrillation below for defibrillation disk locations and instructions.**_
Cardiac Pacing	**Transthoracic cardiac pacemaker can be used with Apollo. Pacing results in appropriate physiological changes in blood pressure and cardiac output.**	**None required.**	_**See Pacing below for cardiac pacing disk locations and instructions.**_

Chest Compressions

Apollo supports normal hand placement and standard compression techniques, and chest compressions can be performed. Apollo can detect the compressions, and the physiology responds accordingly.

Cardiovascular Features			
Anatomy, Physiology and Clinical Signs	**Description**	**Software Control**	**Manual Control**
Chest Compression	**Effective chest compression results in artificial circulation, cardiac output, central and peripheral blood pressures, palpable pulses, and CO$_2$ return. The Müse CPR Monitor displays key compression parameters in real time.**	**None required, but adjustable.** **VIEW: Cardiovascular** **PARAMETER(S): CPR Monitor**	**Apply chest compressions.**

Defibrillation and Cardioversion

Manual defibrillation and cardioversion can be performed on Apollo. Additionally, defibrillation and cardioversion are available virtually through the software.

Defibrillation sites
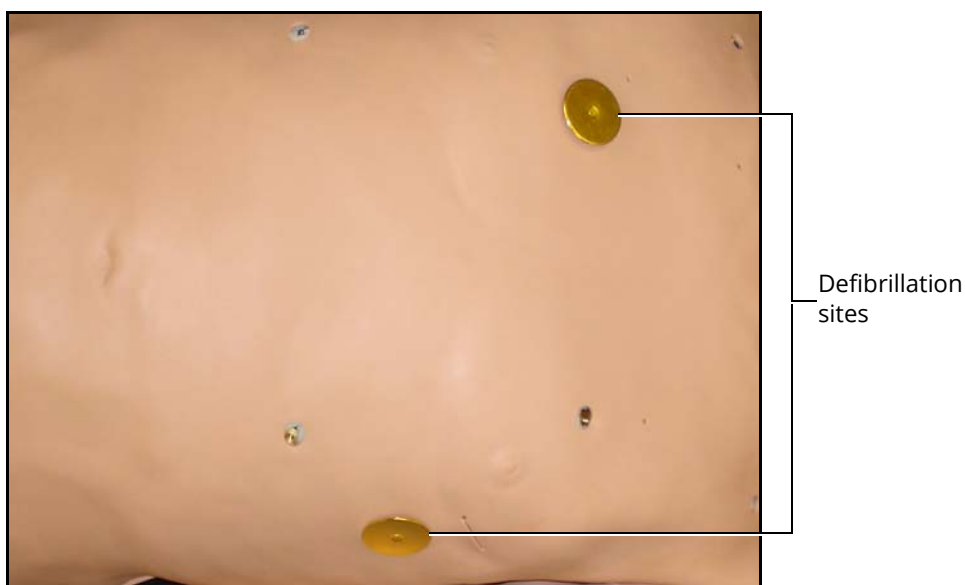
Defibrillation Sites

Apollo is designed to safely absorb the energy discharged from manual and automatic defibrillators. Standard defibrillation energy levels should be used for positive learning reinforcement and to avoid negative training transfer. However, please refer to the following cautions.

Use of a defibrillator for training purposes represents an operational hazard equivalent to use of a defibrillator on a real patient. Consequently, ALL SAFETY PRECAUTIONS for the use of defibrillators MUST BE FOLLOWED as if the simulator were a patient. Consult the specific defibrillator's user manual for further information.

The following cautions should be observed:

- Defibrillation should be performed on the defibrillation electrodes only. If defibrillation is performed over any ECG electrode, high voltage may be present on the remaining connectors during the shock. This may also damage ECG circuitry.

- To prevent overheating, do NOT provide more than three (3) defibrillator discharges (maximum 200 joules with a biphasic defibrillator) in a sequence. Do NOT exceed an average of two (2) defibrillator discharges per minute during the training session.

- Avoid a large number of consecutive discharges. For example, 20 or 25 discharges without any recovery interval may damage the system.

- Do NOT let the simulator come in contact with electrically conductive surfaces or objects during defibrillation. A flame-supporting atmosphere, for example, with a high content of oxygen, should be avoided during defibrillation.

- Keep the simulator's chest dry. Special attention should be taken when using the urinary system or the chest tube feature.

- To prevent pitting of the chest skin electrode, do NOT apply conductive gel or conductive defibrillation pads intended for patient use

- Do NOT use cables or connectors having visible damage

- Do NOT spill fluids over any component inside the simulator torso. This could damage the system and may also present a possible hazard for the operator.

- When using a manual defibrillator, the ECG can be monitored via the defibrillator paddles. Coarse ventricular fibrillation and high-rate ventricular tachycardia cardiac rhythms are automatically recognized as "shockable" rhythms.

- With each defibrillation, the Apollo automatically records the amount of energy discharged and the time defibrillation was performed. The simulated patient response to defibrillation is determined by the scenario script or instructor intervention. Thus, cardioversion is not automatically determined by the physiological models.

- The minimum electrical charge recognized by the circuitry within the simulator is 20 joules

- For paddle placement on the chest, the simulator has two anterior defibrillation disks, which can be unscrewed, leaving threaded connections, if required.

- Biphasic defibrillators can be used with either paddles or hands-free connectors

Pacing

Pacing can be achieved virtually by selecting the appropriate intervention in the Interventions palette. A standard transthoracic cardiac pacemaker can be connected to the simulator using the anterior contacts. The simulator automatically detects and responds to pacing signals (from 20 mA to 200 mA, in increments of 10).

Scan or click the QR code to access the Defibrillation, Cardioversion, and Pacing video tutorial on caehealthcare.com.

Subclavian Catheter (Nursing Only)

The Subclavian Catheter feature allows for cleaning and dressing practice. When using the Subclavian Catheter feature, users can infuse up to 50 mL of distilled water in the line.

Subclavian Catheter

Note: Cleanup is very important when using simulated fluids.

Intramuscular (IM) Injection

Apollo allows for the administration of a deltoid intramuscular (IM) injection. The injection site is located on Apollo's right shoulder.

Intramuscular Injection

Intraosseous (IO) Cannulation

Apollo also allows for the administration of humeral intraosseous (IO) cannulation. The designated IO site is located on Apollo's left shoulder. Use a 25mm needle only with IO cannulation.

No more than 1 mL of fluid should be flushed per cannulation. Ensure all liquid is removed from previous use. Excessive bulging may occur when the IO reservoir is full of fluid. If the site is full or bulging, use an inserted IO needle with a syringe to withdraw and discard 5 - 10 mL of excess fluid.

> **Note:** The IO site is designed to support 10 cannulations and does not support full infusion of fluids.
>
> Ensure the IO site is properly aligned in the shoulder, with the "top" indicator toward the manikin's head.

IMPORTANT: *Never stick or puncture the IO reservoir.*
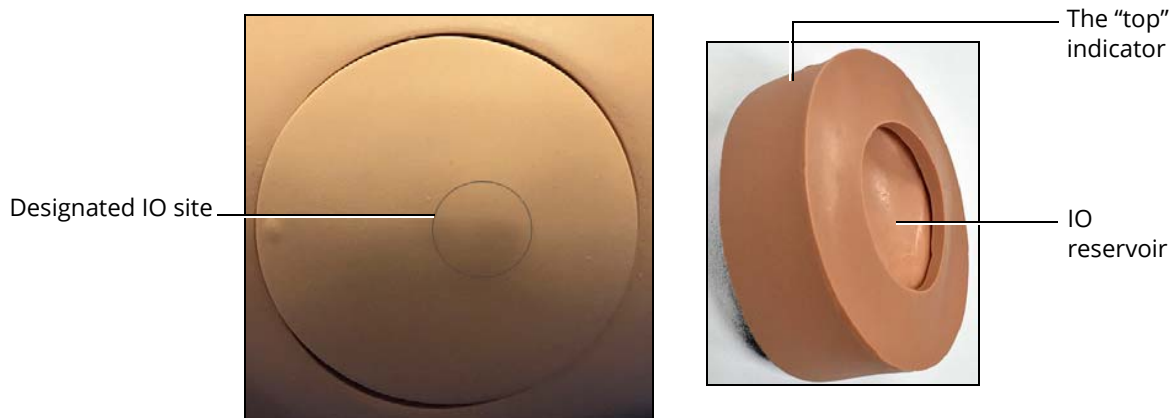
Intraosseous Cannulation Site

IV Cannulation

Veins for the IV Cannulation feature are located in the dorsum of the hands, forearms and antecubital region of the arms.

To simulate realistic flashback, the system must be primed prior to use. Ensure all fluids have been removed from previous uses before each new use to prevent overfilling.

IV Cannulation

To prime the IV access ports, connect a 60 mL syringe filled with distilled water (with clinically appropriate food coloring if desired) to the **IV FILL** port on Apollo's right shoulder and firmly inject all 60 mL. This primes the arms and charges the system for Flashback and Venipuncture support.

> **WARNING**: *If a flash does NOT occur, do NOT inject any fluid and remove the needle immediately. Repeat the priming directions and ensure you have injected the needle properly and into the simulated vein.*
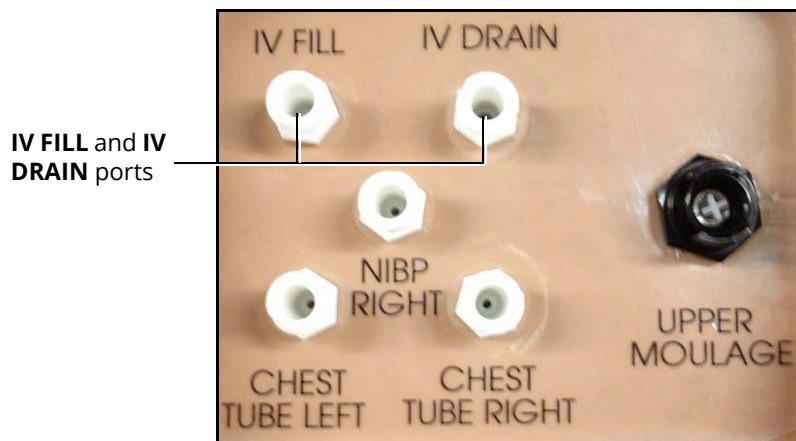
Apollo's Right Shoulder

Fluids and medications can be administered intravenously. Approximately 50 mL of fluid may be infused. To support infusion of larger volumes, connect an empty IV bag or other receptacle to the **IV DRAIN** port located on Apollo right shoulder.

Note: Cleanup is very important when using simulated fluids.

Fluids

Apollo is capable of bleeding simultaneously at two sites from an internal tank. Arterial and venous bleeding can be simulated.

Venous settings produce a continuous bleed at three user-adjustable flow rates.

Arterial settings produce a pulsing flow synchronized with the cardiac cycle at three user-adjustable flow rates.

The flow rate is determined by the selected bleeding vessel size and the blood pressure. In addition, the simulator features auto-sensing of hemorrhage control (e.g., tourniquet application or direct pressure).

Bleeding results in an automatic loss of blood from the physiologic models with subsequent changes in hemodynamics. Blood loss occurs at a rate dependent on wound size and Mean Arterial Pressure (MAP).

Setup must be completed before using the bleeding feature.

To enable bleeding, from the Run screen, click the Fluids icon. The Fluids view appears.
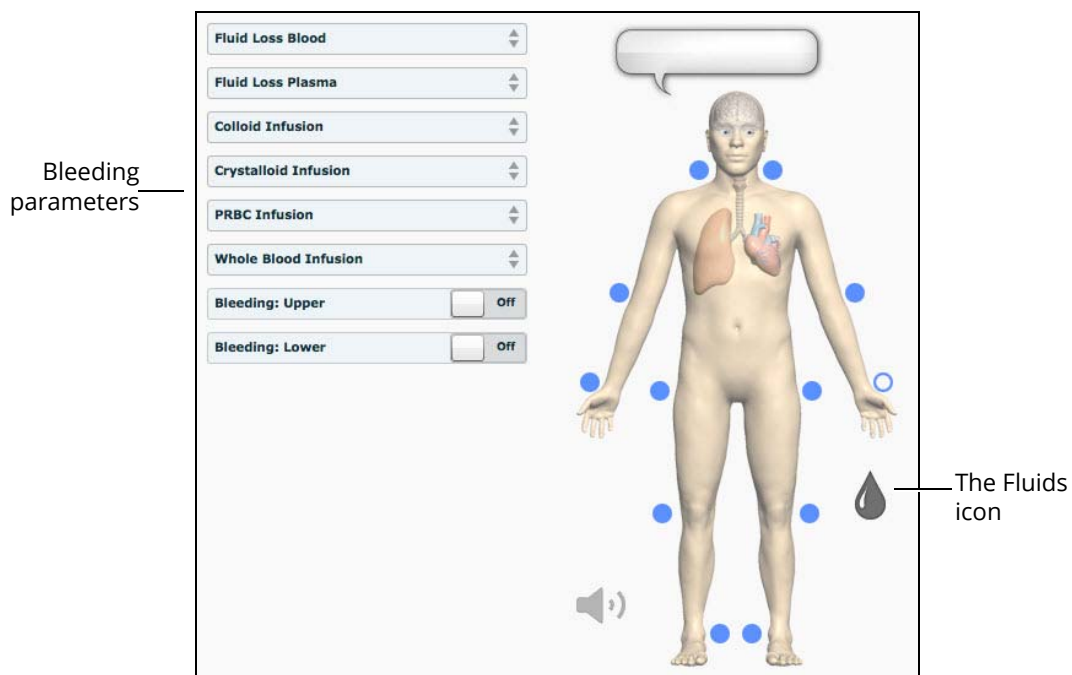
The Fluids View

Simulated blood MUST be removed from the simulator after each use. Failure to remove simulated blood from the simulator can void the warranty.

Hemorrhage Setup

The user determines the type and placement of the bleeding moulage for the lesson. An optional Moulage Kit can provide molded gunshot wounds, broken and protruding bones, amputations and an abdominal wound as well as theatrical components.

To decrease the likelihood of staining, apply a thin coat of petroleum to the area of bleeding.

To use one of the moulage wounds from the Moulage Kit:

1. Secure the wound over the simulator using the integrated straps

2. Connect the wound haptic to the one of the moulage ports located on Apollo's right shoulder (**UPPER MOULAGE**) or right hip (**LOWER MOULAGE**)
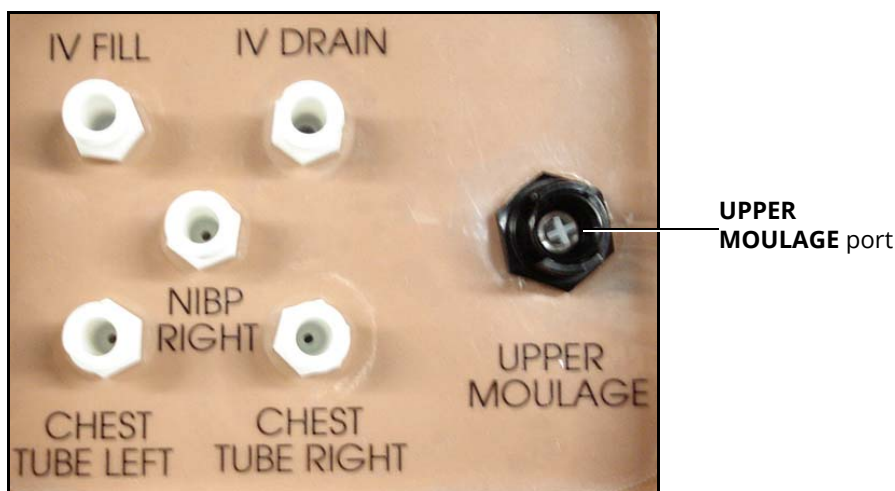
Apollo's Right Shoulder

Apollo's Right Hip

3. Enable **Bleeding: Upper** or **Bleeding: Lower** on the Fluids view of the Müse software, as desired

Hemorrhage Control

When bleeding is controlled (e.g., hemostat, tourniquet), the action is detected and logged, and the physiology responds accordingly.

Tourniquet Application

A tourniquet may be applied to stop the flow of blood.

The wound umbilical contains an 18-inch section of soft tubing that allows the use of a tourniquet to stop the flow of blood.

For added realism, the simulator should be dressed in clothing that can be torn to "conform" with the type of injury being demonstrated. Bleeding moulages and the wound umbilical should be concealed under the victim's clothing with only the wound showing.

Tourniquet Application

Fluid Loss Blood

To manually control a patient's blood loss, from the Fluids view, click the **Fluid Loss Blood** parameter. The Fluid Loss Blood slider appears. Set the amount of blood loss by dragging the arrow up or down. Click **Accept** to exit and save the changes.

Fluid Loss Plasma

To manually control a patient's plasma loss, from the Fluids view, click the **Fluid Loss Plasma** parameter. The Fluid Loss Plasma slider appears. Set the amount of Plasma loss by dragging the arrow up or down.

Click **Accept** to exit and save the changes.

Gastrointestinal

Apollo produces realistic bowel sounds. In addition, on Apollo Nursing, gastric lavage, gavage and suction can be administered.

Gastrointestinal Gavage, Lavage and Suction (Nursing Only)

Apollo Nursing has a gastric reservoir that allows for simulated gavage, lavage and gastric suction. Before each use, ensure the reservoir has been drained completely. The reservoir should be primed with 60 mL of fluid before performing gastric suction (see *Gastric Suction* for more information).

Gavage (Nursing Only)

To perform gastrointestinal gavage, ensure the reservoir is empty and infuse fluid according to procedure using a standard nasogastric tube.

Note: Cleanup is very important when using simulated fluids.

Note: Ice the nasogastric tube if extra rigidity is needed for insertion.

Lavage (Nursing Only)

To perform gastrointestinal lavage, ensure the reservoir is empty and infuse fluid normally using a standard nasogastric tube. Fluids can then be removed according to proper clinical procedure.

Gastric Lavage

Note: Ice the nasogastric tube if extra rigidity is needed for insertion. Cleanup is very important when using simulated fluids.

Gastric Suction (Nursing Only)

To perform gastric suction, the reservoir must be primed prior to use. To prime the gastrointestinal reservoir, attach a syringe with a luer-lock extension set (provided) and inject 60 mL of distilled water into the **GASTRIC FILL** port on the simulator's left shoulder.

The **GASTRIC FILL** port —
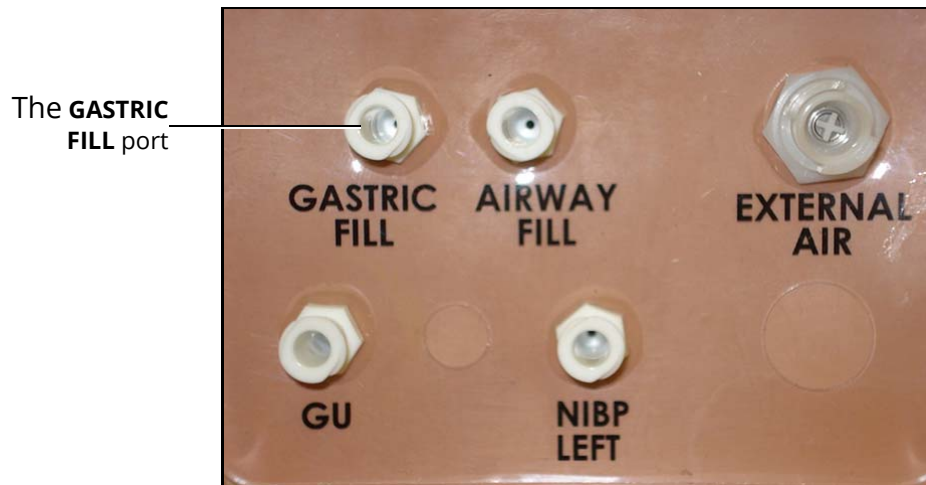
Apollo Nursing's Left Shoulder

Fluids can then be removed according to procedure using a standard nasogastric tube.

Note: Cleanup is very important when using simulated fluids.

Genitourinary System

Apollo may be configured with either male or female genitalia, either of which allows for the insertion of a urinary catheter. The genitourinary system also provides for the excretion of urine.

Urinary Catheterization

Catheterize the simulator using a standard urinary catheter lubricated with silicone spray.
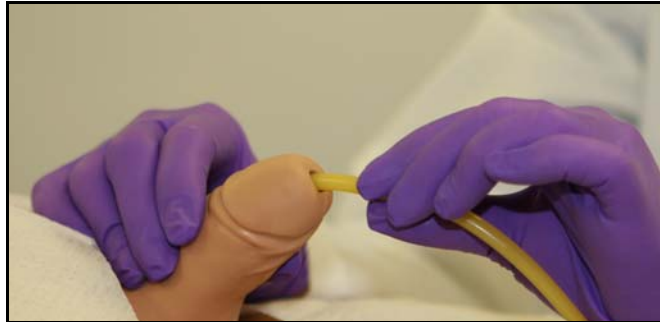
Urinary Catheterization

The bladder for the simulated urine is accessed directly via the urethra.

Simulating Urine Output

Apollo allows urinary catheterization and simulation of urinary output. Ensure all fluids have been removed from previous uses before each new use to prevent overfilling.

To simulate continuous urinary output:

1. Set up the IV pole near the simulator

2. Fill an IV bag with the clinically appropriate fluid. Use distilled water only, with food coloring if desired.

3. Hang the IV bag on the IV pole

4. Ensure the roller clamp is closed and insert the IV spike into the IV bag

5. Connect to the simulator by attaching the end of the IV spike set tubing to the **GU** port on the simulator's left shoulder

The **GU** port

Apollo Prehosptial's Left Shoulder

The **GU** port
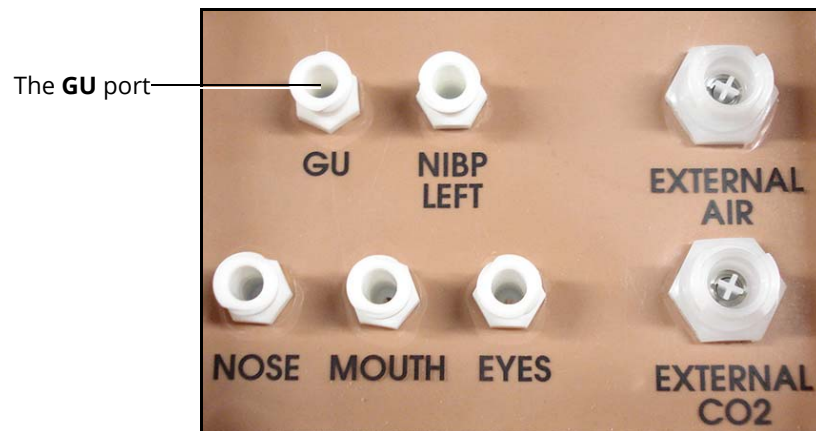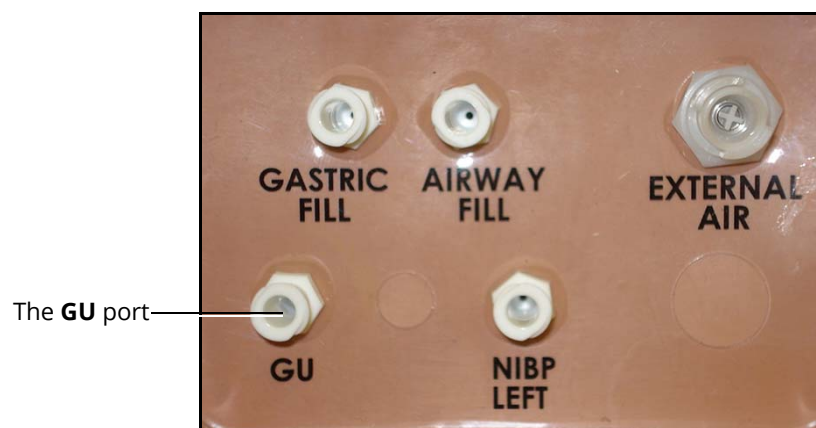
Apollo Nursing's Left Shoulder

6. Open the clamp and allow fluid to flow into the simulator. There is a reservoir inside the simulator that fills up with the fluid.

7. Keep the IV bag attached. Adjust the flow rate manually using the roller clamp.

8. Catheterize the simulator using a urinary catheter lubricated with silicone spray

Note: Cleanup is very important when using simulated fluids.

If a small volume of fluid is needed to simulate proper urinary catheterization in a field location, the internal reservoir may be filled. To fill the genitourinary reservoir, attach a syringe with a Luer-lock extension set (provided) and inject 60 mL of distilled water into the **GU** port on the simulator's left shoulder.

Scan or click the QR code to access the Using Apollo's Genitourinary System video tutorial on caehealthcare.com.

Changing the Simulator's Genitalia

Apollo comes with male and female genitalia.

To switch genitalia:

1. Pull apart the Velcro holding the genitalia
2. Loosen and remove the urethra connector. This connection may be tight when genitalia are removed the first time.
3. Remove the genitalia
4. Attach urethra tube to the urethra connector
5. Attach the desired genitalia using the Velcro

Sounds

A variety of simulated sounds are available to enhance realism. A patient must be running on the simulator for any sounds to be available.

Speech

Speech can be added to simulations using the Vocal Sounds and Speech Sounds features on the software or by using an external microphone.

Speech Sounds

Speech Sounds include a male or female voice that can utter pain rating indicators from 0 to 10, various phrases and a series of other utterances. Unlike Vocal Sounds, Speech Sounds only play once.

To play a Speech Sound, click the **Speech Sounds Controls** balloon and a list of Speech Sounds will appear. Select the desired sound. The sound plays, and the list disappears.

To replay the last sound, click the Play button in the Speech balloon.

Speech Sounds
"10, 9, 8, 7, 6..."
"0" through "10" - Pain Ratings
"Aching"
"Dull"
"I can't breathe"
"My belly hurts"
"My chest is tight"
"My leg hurts"
"No"
"Ouch"
"Ow, that hurts"
"Pressure"
"Sharp"
"Sometimes"
"Stabbing"
"Yes"
Grunt
Loud Cough
Scream
Short Loud Cough
Short Soft Cough
Soft Cough

The Speech Sounds menu

The Speech Sounds Menu

Select the desired sound. The sound plays, and the list disappears.

To replay the last sound, click the **Play** button in the **Speech** balloon.

Vocal Sounds

A variety of programmable vocal sounds are available. Vocal sounds are male or female based on the gender of the active patient.

Vocal Sounds
None
Crying
Gagging
Gasping
Groaning
Long loud cough
Long soft cough
Wheezing
Mumbling

To select a sound from the Vocal Sounds drop-down menu, click the **Sound** icon on the Run screen. The Sounds panel appears.
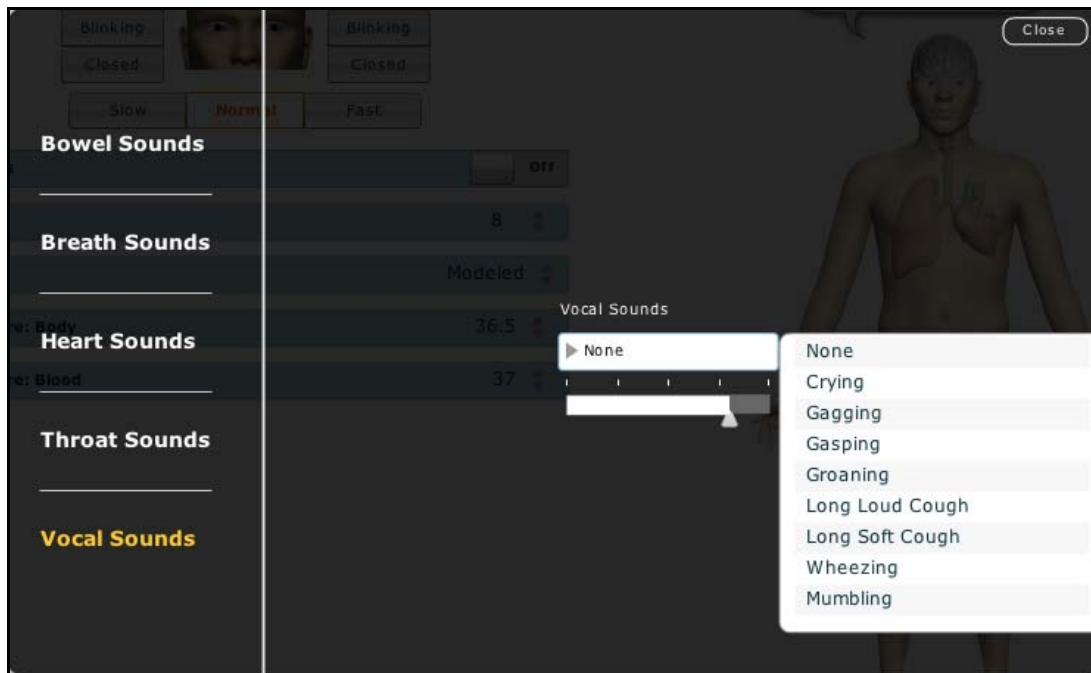
Vocal Sounds Menu

Click **Vocal Sounds** and select the type of sound desired from the Vocal Sounds drop-down menu. Vocal Sounds play continuously when selected and are emitted immediately when selected from the **Vocal Sounds** drop-down menu. To stop playing one of the vocal sounds, select **None** from the list.

Wireless Voice Capability

In addition to the pre-programmed speech, any response can be transmitted through the speakers using the wireless microphone.

Wireless Microphone

The microphone volume can be adjusted on the microphone itself using the volume control. See also, the *Wireless Voice Link* section for more information.

Throat Sounds

Stridor throat sounds can be enabled using the software. Throat sounds can be adjusted by clicking the **Sound** icon on the Run screen. When the Sounds panel appears, select Throat Sounds.
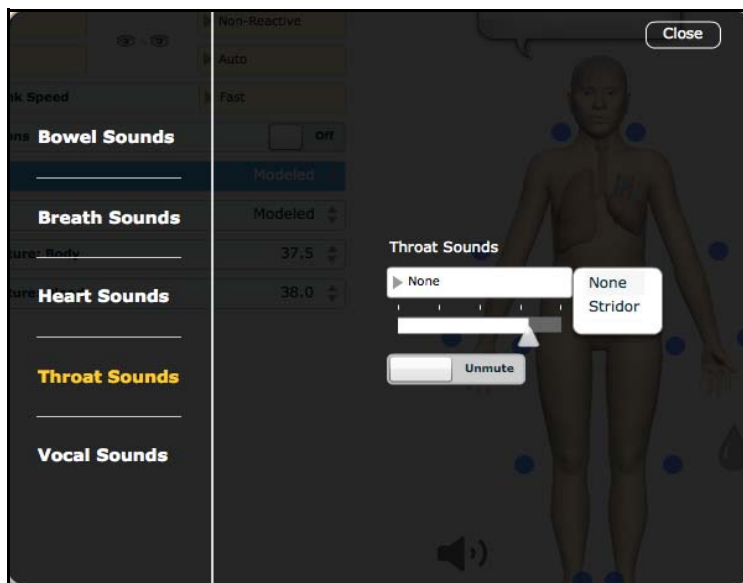
The Throat Sounds Menu

Click the **Throat Sounds** drop-down menu to change the type of sound. Click and drag the slider to adjust the volume. Use the Mute/Unmute button to turn the sounds on/off.

Breath Sounds

Breath sounds are independently synchronized with ventilation of the left and right lungs. Fourteen speakers, eight anterior and six posterior, provide breath sounds that can be auscultated. Each of the four quadrants of the torso can be set independently to produce a particular breath sound.

Breath Sounds
Normal
Crackles
Diminished
Gurgling
Pleura Rub
Rhonchi
Wheezing

Click any one of the Breath Sounds drop-down menus that each control one of four quadrants to change the type of sound. Click and drag the slider for each location to adjust the volume.

A patient must be running on a METIman simulator for any sounds to be available.

By default, **Normal** breath sounds are heard.

Breath sounds can be adjusted by clicking the **Sound** icon on the Run screen. When the Sounds panel appears, select **Breath Sounds**.
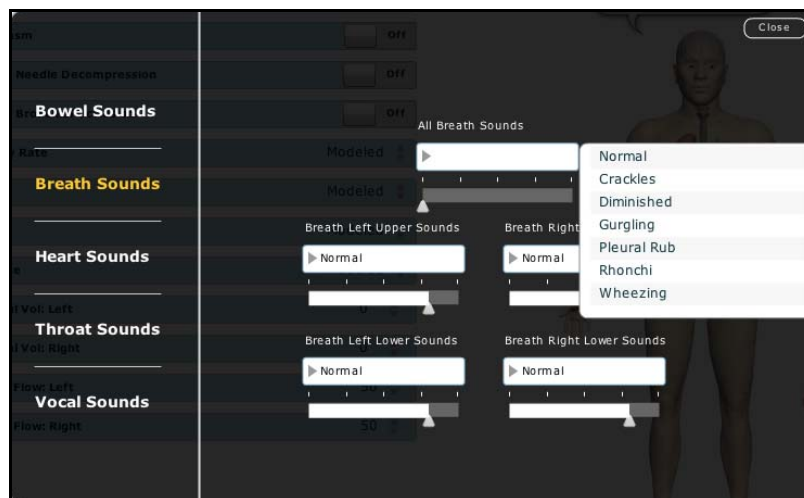
The Breath Sounds Menu

Heart Sounds

Heart sounds emanate from four speakers and are synchronized with the cardiac cycle. Heart sounds can be auscultated over the left and right sternal border, left lower sternal boarder and apex.

By default, heart sounds are set to the **Normal** sound. The following sounds are available:

Heart Sounds
Normal S1-S2
S3
S4
S3 and S4
Early Systolic Murmur
Mid Systolic Murmur
Late Systolic Murmur
Pan Systolic Murmur
Late Diastolic Murmur

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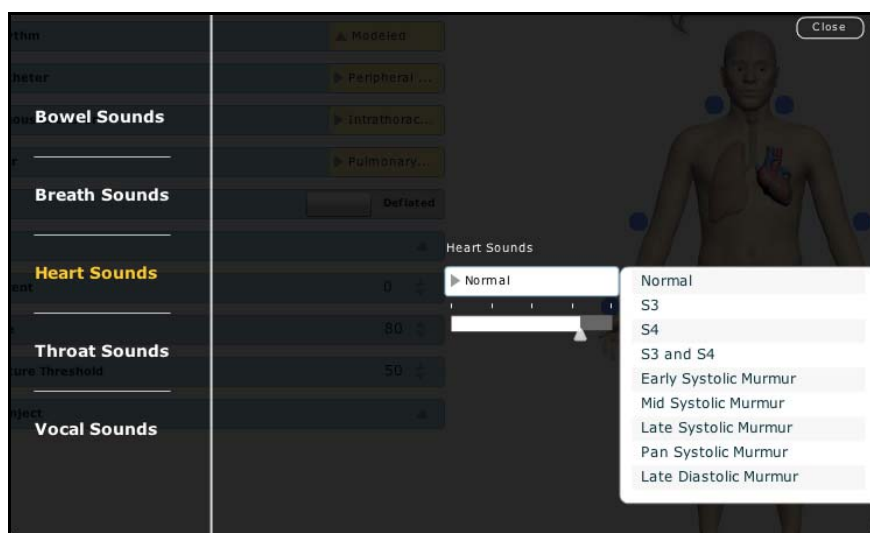
The Heart Sounds Menu

Click the **Heart Sounds** drop-down menu to change the type of sound. Click and drag the slider to adjust the volume.

Bowel Sounds

Learners can auscultate bowel sounds over each of four intestinal quadrants: the Upper Right, Upper Left, Lower Right and Lower Left. The sounds can be independently set in each anatomical region to **Normal**, **Hypoactive**, **Hyperactive** or **None** (bowel sounds are absent).
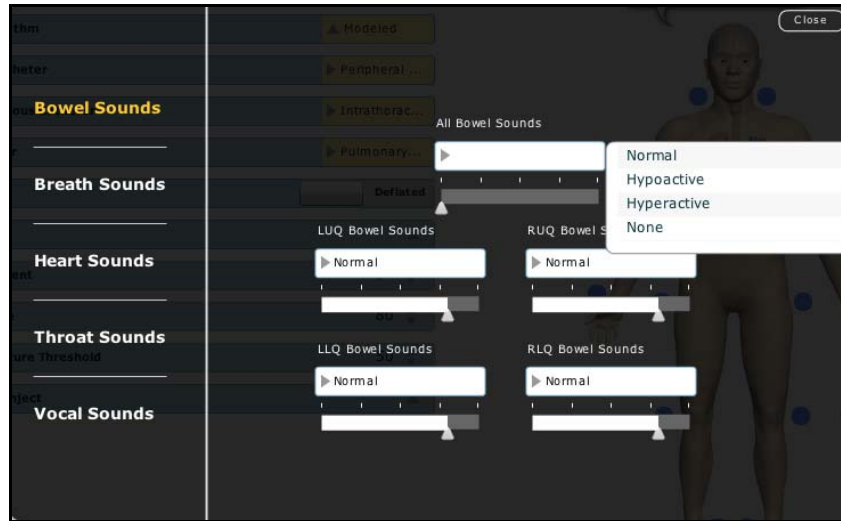
The Bowel Sounds Menu

Bowel sounds can be adjusted by clicking the **Sound** icon on the Run screen. When the Sounds panel appears, select **Bowel Sounds**.

Click any one of the **Bowel Sounds** drop-down menus that each control one of four quadrants to change the type of sound.

Click and drag the slider for each location to adjust the volume.

Normal bowel sounds are present by default.

CARE AND MAINTENANCE

Maintaining Apollo requires careful treatment of the electronic and mechanical components. Each time Apollo is assembled or disassembled, make sure all components are properly handled and either removed from or placed into storage correctly.

Apollo Warranty Programs

General Information

CAE patient simulator products come with a one-year Manufacturer's Warranty (excluding batteries and consumables). All warranties begin at date of shipment or CAE installation. You may upgrade your first year Warranty to an Enhanced Warranty and receive remedial and planned maintenance. To prevent equipment downtime and delays after your warranty expires, we encourage you to contract for extended maintenance services for all subsequent years.

Units Out of Agreement

For units no longer under warranty requiring repairs, the Time and Materials service plan will apply.

To place an out-of-warranty unit under a warranty contract, CAE reserves the right to have the patient simulator inspected by a CAE-approved technician at the customer's expense. If necessary, the unit would have to be repaired at the customer's expense prior to issuance of a warranty contract.

The repairs required, as the result of the examination, will be quoted on a time and material basis.

How to Contact Customer Service

CAE Customer Service Headquarters - United States and Latin America
Monday - Friday from 7:00 a.m. to 6:00 p.m. ET
Toll Free   +1 (866) 462-7920
24-hour Hotline   +1 (941) 342-5605
Fax   +1 (941) 342-5600
Email Address: customerservice@caehealthcare.com
Web URL: www.caehealthcare.com

CAE Customer Service - Canada
Monday - Friday from 8:00 a.m. to 5:00 p.m. ET
Toll Free   +1 (877) 223-6273
Email Address: can.service@caehealthcare.com

CAE Customer Service - Europe, Middle East and Africa (EMEA)
Monday - Friday from 8:00 a.m. to 5:00 p.m. CET
Phone   +49 (0) 6131 4950354
Fax   +49 (0) 6131 4950351
Email Address: international.service@caehealthcare.com

CAE Customer Service - UK and Ireland
Monday - Friday from 9:00 a.m. to 5:00 p.m. GMT
Phone   +44 (0)800-917-1851
Email Address: uk.service@caehealthcare.com

Principal hours of operation exclude holiday and non-business days.

Contract Period

Warranty contracts are not ordinarily offered for periods of less than one year. However, multiple-year warranty contracts may be arranged for up to an additional three years. Discounts are available for purchase of multiple-year contracts.

Limitations of Agreement

Your exclusive remedy for any defective patient simulator is limited to the repair or replacement of the defective patient simulator.

CAE may elect which remedy or combination of remedies to provide at its sole discretion. CAE shall have a reasonable time after determining that a defective material exists to repair or replace defective material. CAE's replacement material will be manufactured from new and/or serviceable parts. CAE's agreement applies to repaired or replaced materials for the balance of the applicable period of the original warranty or ninety days from the date of shipment of a repaired or replaced material, whichever is longer. CAE warrants its LABOR for 30 days or the balance at the applicable period of the original warranty, whichever is greater.

CAE shall not be liable under this warranty for incidental or consequential damages, or in the event of any unauthorized repairs or modifications have been made or attempted, or when the product, or any part thereof, has been damaged by accident, misuse or abuse. This warranty does not cover normal wear and tear, staining, discoloration or other cosmetic irregularities that do not impede or degrade product performance. Any damage or malfunction as a result of the installation of software or hardware, not authorized by CAE, will be repaired under the Time and Materials service plan (see Time and Materials section).

CAE's warranty does not cover products that have been received improperly packaged, altered or physically damaged. Products will be inspected upon receipt.

Some states in the USA do not allow the exclusion or limitations of incidental or consequential damages, so the limitations above may not apply to you. This warranty gives you specific legal rights and you may also have other rights, which vary from state to state.

Return Materials Authorization (RMA)

No product may be returned directly to CAE without first contacting CAE for an RMA number. If it is determined that the product may be defective, you will be given an RMA number and instructions for product return. An unauthorized return, e.g., one for which an RMA number has not been issued, will be returned at your expense. Authorized shipments are to be shipped prepaid to the address on the RMA. Your original box and packaging materials should be kept for storing or shipping your product. To request an RMA, please contact Customer Service.

System Software Upgrade Support

Customers with current warranty contracts are entitled to receive upgrades to applications software previously purchased. Installation of the system software is the user's responsibility.

The System Software Upgrades Support includes software upgrades for base software and purchased optional software modules.

This does not apply for major upgrades or technological enhancements.

Pricing Structure

Time and Materials

For those systems not under agreement, service will be provided as required on a Time and Material basis:

Description	In-House	On-Site
Technical Support	As quoted at time of repair	CAE's prevailing labor rate with a minimum of four hours labor
Material	As quoted at time of repair	As quoted at time of repair
Travel	N/A	Priced at CAE's fully burdened cost plus fee

Principal period of on-site support (customer's local time) is:

- Monday through Friday, 8:00 AM to 5:00 PM (customer's time zone)
- Holiday and non-business days excluded
- Support outside the principle period is billed at the premium rate (hourly rate x 1.5)

A minimum of 48 hours notice is required for scheduling an on-site support call. Urgent on-site support with less that 48 hours notice will be charged at the premium hourly rate.

On-site time is described as the time period commencing from arrival at customer site through departure from customer site.

Breakdown

After each use, Apollo should be properly disassembled and stored in a secure place. To ensure that Apollo remains in good working condition, follow the prescribed CAE breakdown procedures below. These procedures are estimated to take less than 30 minutes.

Breakdown Steps	
1	Stop A Running SCE
2	Clean the Simulator and the Fluid System
3	Shut Down the Software
4	Power off the Simulator

Step 1: Stop A Running SCE

Stop a running SCE using the **Stop** button in the upper right corner of the Müse software

Step 2: Clean the Simulator and Fluid System

Refer to the Maintenance Advice on the following pages for detailed instructions.

Step 3: Shut Down the Software

To shut down the Müse software:

    a. Stop any running SCEs

    b. Click the Account Name in the lower, right-hand corner of the screen. The Logout/ Shutdown dialog box appears.

    c. Click **Logout** to exit the software

To shut down Vivo, refer to the *Using Vivo* section of this guide.

To shut down the TouchPro software (optional):

    a. Click the **Settings** button from the bottom, right-hand corner of the TouchPro screen

    b. From the Settings menu, click **Shutdown**. A warning box appears asking if you want to exit

    c. Click **Shutdown**

Step 4: Power Off the Simulator

    d. Carefully pull back the skin on Apollo's left hip and hold the power button for two seconds. The light on the button will blink, indicating shutdown is in progress. Allow up to 30 seconds for complete shutdown. The light will turn off when shutdown is complete. If the simulator fails to shut down when these steps are performed correctly, press and hold the power button for five seconds to force the system to shut down.

    e. Carefully put the skin back into place for storage

Scan or click the QR code to access the Shutting Down Simulator video tutorial on caehealthcare.com.

Maintenance Advice

Simple care and maintenance helps to ensure that METIman stays in good working condition. Many problems are caused by inadequate or improper maintenance. Perform a thorough check of the various components each time the simulator is used. Failure to follow these guidelines can lead to damage not covered by warranty.

General Simulator Care

Avoid the use of writing instruments and sharp objects near the patient simulator to prevent unattractive markings on or tears in the skin.

Lubricate airway adjuncts, urinary catheters and chest tubes with silicone spray (NOT a water-based lubricant) prior to insertion.

A mild detergent and warm water will remove most marks and stains. Gently rub the soiled area with a soft cloth. Do NOT use solvents or abrasive pads.

Prior to using moulage of any kind, CAE suggests the application of a very light coating of petroleum jelly, followed by a light dusting of baby powder, to the simulator's skin. This application makes cleaning the skin easier.

If any of Apollo's fluid systems have been used, flush out the simulator as described in the following pages. Failure to flush the systems may cause damage to the simulator.

Storage

When in regular use, Apollo's breakdown procedure and general cleanup should be sufficient to prepare the simulator for storage.

In addition, be certain to follow these instructions:

- Storage temperature should not exceed 122° F (50° C) or fall below 41° F (5° C)
- If a soft-sided simulator case is being used, the simulator should lie flat
- The simulator should NEVER be stored or shipped with fluids in the system

Care of Electronic Equipment

Install any CAE software updates as soon as they become available.

Airway Inspection

Apollo is equipped with an anatomically accurate airway that supports the practice of difficult airway management techniques. In the process of performing these techniques improperly or aggressively, the upper airway can be damaged.

Because damage can occur, occasional visual inspection of the airway is recommended. Using the light of a laryngoscope blade or a flashlight, visually examine the airway. While tears in the upper airway resulting from intubation may be obvious, needle holes in the lower trachea resulting from techniques such as transtracheal jet ventilation may not be readily apparent.

If damage to the airway is found, small cuts or tears may be reparable with silicone adhesive. However, for permanent repair of damaged simulators, contact CAE Customer Service.

Replacing the Battery

After approximately four hours of use, the simulator's battery must be removed to be recharged or replaced with a charged battery.

WARNING : *When handling Apollo's batteries, be sure to adhere to all the cautions and warnings.*

To replace the battery:

1. Unzip the chest skin
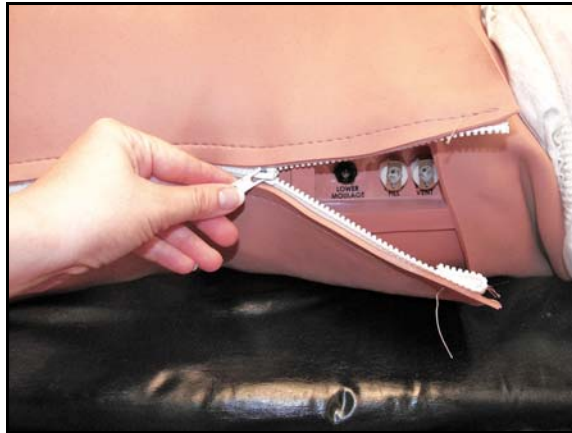
Unzipping the Chest Skin

2. Lift the abdominal insert

Lifting the Abdominal Insert

3. Remove the abdominal support
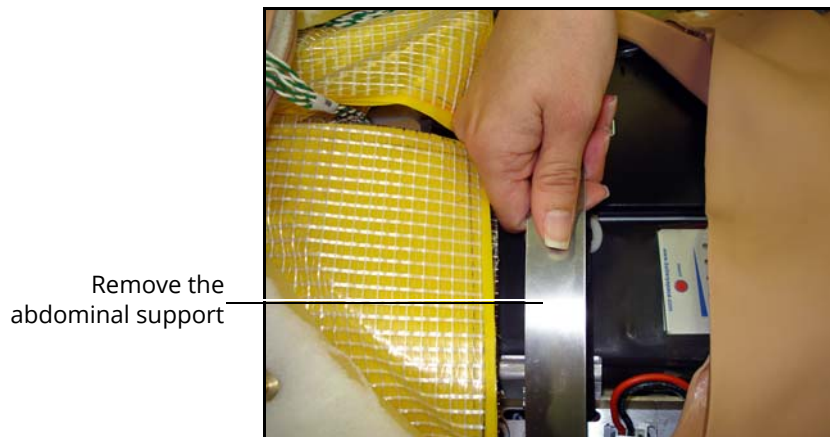
Remove the
abdominal support

Removing the Abdominal Support

4. Release the Velcro battery tie-down
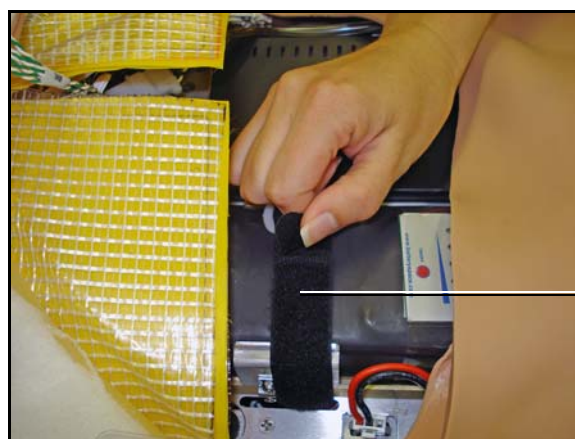
Release the Velcro
battery tie-down

Releasing the Battery Tie-Down

5. Disconnect the battery leads

Disconnect the
battery leads

Disconnecting the Battery Leads

6. Remove the uncharged battery

Remove the uncharged battery

Removing the Battery

7. Insert a charged battery and affix the battery tie-down

8. Connect the battery leads and replace the abdominal support, ensuring both ends are secure in the slits

9. Replace the abdominal insert and chest skin

Recharging the Battery

The battery should be recharged after approximately four hours of use.

To recharge the battery, disconnect and remove the battery from the simulator and connect to the external charger provided.

WARNING: *When handling Apollo's batteries, be sure to adhere to all the cautions and warnings.*

Recharging should take approximately four hours.

IMPORTANT: *Never recharge the battery while it is connected to Apollo.*

Draining Condensation from the Simulator

As part of a regular preventive maintenance schedule, condensation should be drained from the simulator.

Depending on environmental conditions, moisture may condense inside the compressed air lines and tanks within the simulator. It is recommended that this fluid be drained every 40 hours of operation. In outside, high-humidity conditions, the system should be drained more frequently.

To drain condensation:

1. Locate the Condensation Drain Hose included with the Inventory Kit

Condensation Drain Hose

2. Bring the hose and a small bucket to the simulator location
3. Locate the **EXTERNAL AIR** port on Apollo's left shoulder
4. With assistance, place Apollo into a supine position
5. Power on Apollo. Do NOT launch the Müse software.
6. Allow 60 seconds for the internal compressor to pressurize the system
7. Power down Apollo
8. With assistance, raise the left leg 45 degrees
9. Place the tubing end of the Condensation Drain Hose into the small bucket and then connect the fitting onto the simulator's drain connector. There will be a sudden release of pressure into the bucket. Any condensation within the system drains with this exhaust.
10. Disconnect the Condensation Drain Hose from the simulator

Clean the Simulator and On-Board Bleeding System

Note: A small bucket is recommended to collect wastewater during cleaning and flushing operations.

To clean and maintain the simulator and On-Board Bleeding system:

1. Remove and clean the wound haptics
2. Connect the beige-colored "fill" connector from the Trauma Fill Tank to the hip, but do not connect the white "vent" connection
3. Open the yellow Pressure Relief knob clockwise on the Trauma Fill Tank or loosen its Fill Lid so the tank is able to vent during this draining process
4. With the wound umbilicals in place, put the ends of both wound umbilicals into a wastewater bucket
5. From the Müse home screen, click the **System Administration** button in the top right of the screen
6. From the Maintenance screen, click **Flush System**. The fluid begins to drain
7. Verify both channels produce a high, steady flow
8. When fluid stops flowing from either wound umbilical, detach the Fill Tank from the simulator
9. When fluid stops flowing from the lower wound umbilical, detach from the simulator
10. When fluid stops flowing from the upper wound umbilical, detach from the simulator
11. Click **Done** on the Maintenance screen. The fluids are now drained.
12. Empty the wastewater bucket
13. Rinse out the Trauma Fill Tank and fill with approximately 1 liter of clean, distilled water
14. Pump this fluid into the simulator
15. Repeat Steps 3 through 7 and 9 through 15 until the fluid exiting the simulator runs clear
16. Empty the Fill Tank and dry the wound umbilicals with a towel before storage

    Note: It takes two to three minutes for this final flush.

    Once a month, it is advised to flush the system with a mix of 50% distilled water and 50% white vinegar to keep mineral and algae buildup to a minimum. Always perform the steps for Flushing the Simulator afterward to remove vinegar.

Cleaning the Trauma Fill Tank

To prolong the life of the Trauma Fill Tank assembly and the fluid reservoirs, wash and flush the tank and connections after each use with clean distilled water.

Note: A small bucket is recommended to collect wastewater during cleaning and flushing operations.

Do NOT store liquids in the Trauma Fill Tank. If simulated blood mixtures are stored in the tank, they may clog the system when they dry and possibly damage the seals, filter and other components.

1. Remove and rinse the Overflow Bottle
2. Remove and rinse the Pump Assembly
3. Rinse the tank to remove all traces of the simulated blood
4. Pour 480mL (16 oz) of distilled water into the tank and reinstall the Pump Assembly. The Overflow Bottle holds 16 ounces.
5. Place the Overflow Bottle lid with umbilical attached into the wastewater bucket
6. Attach the fill (blue-labeled) and vent (yellow-labeled) fittings together at the other end of the umbilical
7. Pump the tank 25 times while making sure the wastewater is going into the bucket
8. Allow the tank to empty completely (the remaining air pressure will purge the fluid from the lines
9. Reinstall the lid onto the Overflow Bottle and place the bottle back onto the tank assembly
10. Remove the Pump Assembly and pour any remaining fluid out of the tank. Then, reinstall the pump.
11. Disconnect the fill and vent fittings from each other and wrap the Trauma Tank Umbilical around the neck of the tank

Always depressurize the tank, remove trauma fluid and clean the tank before performing maintenance. The pump assembly may need periodic lubrication. Call CAE Customer Service for details if the pump loses the ability to create pressure, squeaks loudly or is difficult to move.

Scan or click the QR code to access the Cleaning the Trauma Fill Tank video tutorial on caehealthcare.com.

Cleaning the In-Line Filter

To clean the in-line filter:

1. Grasp both ends of the in-line filter and twist counterclockwise
2. Pull apart both ends of the filter to separate
3. Remove the blue filter cone from the encasement. Do NOT remove the black rubber seal
4. Using a 60 mL syringe with distilled water, push fluid from the outside of the blue filter cone to the inside, removing all debris
5. Repeat process until all debris is removed
6. Re-assemble the in-line filter, ensuring the black rubber seal is in place at the base of the blue filter cone

The In-Line Filter

Troubleshooting the Trauma Fill Tank

Before making any repairs, ALWAYS depressurize the tank, remove all trauma solution and clean the tank.

Problem	Cause	Solution
Tank can be pressurized, but only air comes out.	Siphon tube has detached from insert.	Remove hose from tank and reinsert siphon tube.
Pressure does not build up. No fluid is transported to simulator.	(1) Pump assembly not sealed tightly into tank or (2) Damaged pump cylinder gasket or o-ring or (3) Tank pressure relief valve is set to "open."	(1) Thoroughly clean pump cylinder gasket or o-ring and surrounding area and apply a light coating of silicone to pump gasket or o-ring. (2) Contact CAE for service. (3) Turn valve until it returns to a "sealed" position.
Simulator fill time is too long (more than 5 minutes).	(1) Not enough strokes applied to create pressure or (2) The in-line filter is dirty or (3) The umbilical is discon- nected at Overflow Bottle or (4) Too much fluid in fill tank.	(1) Pump 25 to 35 times for best performance. (2) Clean filter. (3) Reconnect the overflow fitting. (4) The Trauma Fill Tank works best with 1 gallon (3.6 liters) of fluid inside. If greater amounts of fluid are used, tank may require additional pumps as fluid is transported to simulator.

Empty and Flush the Chest Tube Reservoir

Removing fluids from the Chest Tube reservoir and the Chest Tube system requires the same steps.

To empty the Chest Tube reservoir or flush the Chest Tube system, have a chest tube and a basin to catch fluid in place. Use a syringe to slowly push air through the appropriate **CHEST TUBE** port until only air flows through the chest tube.

Flush the IV Lines

To flush the IV lines:

1. Connect an empty IV bag to the **IV DRAIN** port
2. Using a syringe, slowly push air into the **IV FILL** port. The fluid drains out of the **IV DRAIN** port.
3. Continue to push air until empty

Emptying the Genitourinary Reservoir

To empty the Genitourinary reservoir, have a catheter in place and a basin to catch fluid. Use a syringe to slowly push air through the **GU** port until only air flows through the catheter.

Empty the Head Secretions Lines (Prehospital Only)

To remove fluid from the Head Secretions lines, connect a syringe to the **NOSE** port and vacuum out fluid until empty. Repeat this process for the **MOUTH** and **EYES** ports.

Empty the Airway Secretions Reservoir (Nursing Only)

To empty the Airway Secretions reservoir, connect a 60mL syringe to the **AIRWAY FILL** port and vacuum out fluid until empty.

Flush the Subclavian Catheter (Nursing Only)

When flushing the Subclavian Catheter, the catheter must be in place.

To flush the Subclavian Catheter:

1. Connect an external drain to the **IV DRAIN** port and place a basin to catch fluid
2. Using a syringe, slowly push air into the **IV FILL** port. The fluid drains out of the **IV DRAIN** port.
3. Continue to push air until empty
4. Using the same syringe, push air through the Subclavian Catheter until empty

Handling CO_2 Canisters (Prehospital Only)

Careful handling is required in the use of CO_2 canisters. Please read and follow all appropriate cautions and warnings.

Remove the CO_2 Canister from the Regulator

The following instructions describe how to safely remove the CO_2 canister from the regulator assembly for replacement or shipping.

CAUTION: If unsure that CO_2 canister is empty, eye and hand protection must be worn to protect from release of freezing gas or liquid.

1. Remove the CO_2 regulator assembly from the simulator

2. While holding the regulator assembly firmly, slowly unscrew the CO_2 canister from the regulator. There is a small relief hole in the side of the regulator from which any remaining CO_2 will bleed. If this should happen, no harm will be done to system, but it is rather noisy and the rapid release of CO_2 gas can freeze the canister's surface and cause frostbite to unprotected skin.

3. Continue unscrewing the canister until it is free from the assembly

Important Canister Information

The 16 Gram CO_2 Canister with threaded neck is available at most sports equipment retailers - most often used for bicycle tire inflators. We recommend purchasing Leland brand canisters (P/N 82122Z), which are also available from CAE.

Punctured canisters are considered to be empty. No residue remains in the canister after use. The steel used is a low carbon type, which rusts if disposed in a landfill. If your community requires recycling, then place with normal household recycling.

CO_2 Canisters are considered by the U.S. Department of Transportation to be "Other Regulated Materials - Domestic" (ORM-D). Ground shipping containers must be clearly marked with this label. CO_2 Canisters are considered hazardous material when offered for air transportation, so different rules apply. Contact carrier for details and instructions.

Related Cautions & Warnings

CO_2 Canister

- Store the CO_2 canisters in a dry location between 32° and 104° F (0 to 40°C)
- Do not expose the CO_2 canister to heat above 140° F, as rupture may occur
- Never point the CO_2 canister towards your face or someone nearby
- Use only CAE specified CO_2 canisters

CO_2 Regulator Assembly

- Care must always be taken when using high-pressure equipment
- Do not disassemble or alter regulator
- Dry completely if the regulator becomes wet
- Discontinue use of this equipment if leakage or visible damage is evident

Use of Equipment

- Canister end becomes punctured when screwed into regulator base and therefore should not be removed until empty
- Unscrewing canister before it is empty will result in sudden release of all high-pressure gas with a possibility of liquid CO_2 spray. Unprotected skin could receive freezing burns.
- Wear protective gloves and eye protection when removing canister from regulator assembly
- Remove CO_2 canister from regulator assembly when shipping simulator

Scan or click the QR code to access the Using a CO_2 Canister video tutorial on caehealthcare.com.

RECOMMENDED CLINICAL SUPPLY SIZES

The following clinical supply sizes are recommended for use with Apollo. Other sizes may cause damage to the simulator and should not be used.

Table 1:

Recommended Tube, Needle and Airway Sizes	Apollo Prehospital	Apollo Nursing
Urinary Catheter	16 Fr	16 to 16 Fr
Nasogastric Tube (NGT)	14 Fr**	12 to 14 FR*
Gastric Lavage/Gavage	Not Supported	12 to 14 FR*
Airway Suctioning	Not Supported	12 to 14 FR*
ETT	7.0 to 7.5mm	Not Supported
LMA Unique	#4	Not Supported
King LTS-D LT-D	#4	Not Supported
Combitude	37 Fr	Not Supported
Oropharyngeal Airway	90 mm	90 mm
Nasopharyngeal Airway	30 Fr, 7.5 mm	30 Fr, 7.5 mm
Tracheostomy Tube	6 mm	6 mm
IV Cannula	18 to 22 gauge	18 to 22 gauge
Chest Tube	28 Fr	26 to 28 Fr
Needle Decompression	14 gauge, 6 cm	Not Supported

* With fluid return

** Insertion only

CONDITION GUIDELINES FOR PROGRAMMING APOLLO

This section is intended to help you select Müse 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 Müse software is physiologically driven. When using multiple conditions (e.g., 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		

MÜSE PARAMETER DESCRIPTIONS

The Müse software has a number of parameters that control the physiological features of the simulator. The parameters are grouped by category: Neurological, Respiratory, Cardiovascular, Fluids and Sounds.

Each physiological view lists the Basic parameters by default. However, when the **Basic/Additional** switch is activated, additional parameters become available.

Click **Basic** to return to Additional parameters   Click **Additional** to return to basic parameters

The Basic/Additional Switch

The following is a brief description of each parameter. Each parameter description lists the default settings for the Stan D. Ardman and Norma L. Female patients as well as the ranges, if available, for all patients.

Neurological - Parameters

The Apollo simulator can simulate a variety of neurological clinical indicators. T.

Neurological Parameters
Apply to Both Eyes
Eyes: Pupil Control
Eyes: Blinking
Eyes: Blink Speed
Reactive Pupils
Light Reactivity Speed
Secretions: Tearing
Secretions: Ears
Secretions: Nose
Secretions: Mouth
Diaphoresis
Convulsions
Seizures
ICP
NMB
Temperature: Body
Temperature: Blood

Eyes: Apply to Both Eyes

Both eyes can be controlled together by setting the **Apply To Both Eyes** parameter to **On**. When this option is selected, any change made to one eye, will automatically be made to the other eye.

> **Default:** Off

Eyes: Pupil Control

The pupil control parameters are used to control the diameter of the pupils in the eyes. Each eye has reactive pupils and functional eyelids that blink.

Currently, there are four pupil options that are used to control the diameter of the pupils in both eyes: Modeled, Reactive, Blown or a Fixed Pupil Size (2 mm to 8 mm).

When the Eyes are set to **Reactive**, the pupils re-size in response to changes in lighting condition. If both pupils are set to **Reactive**, both pupils re-size in a consensual manner.

If the Eyes are set to **Modeled**, the pupil size is driven by the pharmacology of morphine. In this mode, the baseline pupil size is 4.7 mm. With increasing effector site concentration of morphine, the pupils constrict (up to a maximum constriction of 2.8 mm). A dose of 4.6 mg of morphine results in 50% of the maximum effect (a pupil size of 3.75 mm). The reactivity to light is absent for this option and is only available in the **Reactive** mode. Presently, when the **Modeled** option is selected, only morphine has an effect on pupil size. The pupillary response to other drugs can be made "on the fly" or scripted using the Scenario Designer.

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

>**Default:** Reactive

Eyes: Blinking

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

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

The **Blinking** and **Closed** settings allow the user to have one or both eyes either blinking or closed and override the automatic response.

>**Default:** Auto

Eyes: Blink Speed

The **Blink Speed** parameter controls the eyelid blinking frequency and can be set to **Slow**, **Normal**, or **Fast**. 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

Convulsions

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

>Default: Off

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 TouchPro monitor. The value is **Modeled** by default.

> **Default**: Modeled
>
> **Range:** 0 mmHg - 65.0 mmHg

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
>
> **Range:** 0% - 100%

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 TouchPro software.

The body temperature is not linked to the physiologic models. However, changes can be made "on the fly" or scripted using the Scenario Designer.

> **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 TouchPro software. Note that changes in arterial temperature may alter the position of the standard oxyhemoglobin dissociation curve (shift). As temperature increases or pH decreases, more oxygen is released from hemoglobin and thus the patient's saturation decreases. The inverse is also true.

> **Default**: 37° C
>
> **Range**: 32.0° C - 42.0° C

Respiratory – Basic Parameters

Respiratory Parameters – Basic
Swollen Tongue
Airway Occluder
Laryngospasm
Needle Decompression
Bronchial Occlusion (Left and Right)
Respiratory Rate
Respiratory Rate Factor
Shunt Fraction
EtCO$_2$
SpO$_2$
NMB
Tidal Volume
Intrapleural Volume: Left Intrapleural Volume: Right
Fraction of Inspired O$_2$
Chest Tube Flow: Left Chest Tube Flow: Right

Swollen Tongue

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

> **Default**: Not Swollen
>
> **Range**: Not Swollen, Semi-Swollen and Swollen

Airway Occluder

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

> **Default**: Off

Laryngospasm

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

> **Default:** Off

Needle Decompression

The **Needle Decompression** parameter is used to activate the **Needle Decompression** hardware in the simulator to relieve a pneumothorax in the simulator. This causes a rush of air to be heard on successful decompression. The amount of decompression is automatically subtracted from the **Intrapleural Volume** set.

> **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.

> **Default:** Off

Respiratory Rate

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

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

> **Default**: Modeled
>
> **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 O_2, CO_2 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 O_2.*

EtCO$_2$

The **EtCO$_2$** parameter is used to set the end-tidal CO_2 to a fixed numeric value, measured in mmHg, regardless of the minute ventilation. The end exhalation point of the capnogram waveform will also reflect the set end-tidal CO_2 value. Setting the EtCO$_2$ has no effect on the arterial carbon dioxide values (PaCO$_2$), respiratory rate or tidal volume.

For example, when the EtCO$_2$ is set to 50 mmHg, the numeric end-tidal CO_2 will display 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

SpO$_2$

The SpO$_2$ parameter is used to override the normal pulmonary circulation and set the SpO$_2$ at a fixed numeric value, regardless of the oxygen applied. Resetting to **Modeled** returns control of the underlying SpO$_2$ to the physiological models. If SpO$_2$ is set to less than 75%, the eyes will automatically close when in the Auto mode.

> **Default:** Modeled
>
> **Range:** 0% - 100%

Neuromuscular Blockade (NMB)

The degree of NMB is automatically determined by pharmacokinetic and pharmacodynamic models, which are based on the neuromuscular blocking agents administered and the time course of their injection. 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
>
> **Range**: 0% - 100%

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.

For example, with the tidal volume set to 600 mL 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, either automatically via the model-driven controls or when the **Respiratory Rate** parameter is adjusted.

> **Default**: Modeled
>
> **Range**: 0 mL- 2500 mL

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. Values more than 1500 mL reduce the corresponding lung volume significantly. Breath sounds and chest rise are automatically diminished on the appropriate side due to decreased ventilation of the affected lung.

> **Default**: 0
>
> **Range**: 0 mL - 2500 mL

Fraction of Inspired O_2 (FiO$_2$)

This parameter is used to simulate changes in the **FiO$_2$,** such as would occur with the administration of supplemental oxygen.

> **Default**: 21%
>
> **Range**: 0% - 100%

Chest Tube Flow: (Left and Right)

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

> **Default**: 50 mL/min
>
> **Range**: 0 mL/min - 50 mL/min

Respiratory – Additional Parameters

Respiratory Parameters – Additional
Respiratory Rate
Tidal Volume
Tidal Volume Factor
pH Shift
PEEP
O2 Consumption
CO2 Production Factor
PaCO2 Set-point
PaO2 Set-point
I to E Ratio (1:X)
PetCO2-PaCO2 Factor
Respiratory Gain Factor
Respiratory Quotient
Volume/Rate Control Factor
Chest Wall Capacity
Chest Wall Compliance Factor
Distended Chest Wall Compliance Factor
Functional Residual Capacity
Lung Compliance Factor: Left Lung Compliance Factor: Right
Venous CO2 Shift
Bronchial Resistance Factor: Left Bronchial Resistance Factor: Right
Alveolar Enflurane
Fraction of Inspired Enflurane
Alveolar Halothane
Fraction of Inspired Halothane
Alveolar Isoflurane
Fraction of Inspired Isoflurane
Alveolar Nitrous Oxide

Respiratory Parameters – Additional
Fraction of Inspired Nitrous Oxide
Alveolar Sevoflurane
Fraction of Inspired Sevoflurane

Respiratory Rate

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

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

> **Default**: Modeled
>
> **Range**: 0 breaths per minute - 40 breaths per minute

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.

For example, with the tidal volume set to 600 mL 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, either automatically via the model-driven controls or when the **Respiratory Rate** parameter is adjusted.

> **Default**: Modeled
>
> **Range**: 0 mL - 2500 mL

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.*

pH Shift

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

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

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

> **Default**: 0
>
> **Range**: -(0.50) - 0.50

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.

> **Default:** 0.0 cmH_2O
>
> **Range:** 0.0 cmH_2O - 25.0 cmH_2O

O_2 Consumption

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

> **Default**: 250 mL per minute
>
> **Range**: 0 mL per minute - 2000 mL per minute

CO_2 Production Factor

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

> **Default:** 1
>
> **Range**: 0.50 - 4.00

PaCO$_2$ Set-point

The **PaCO$_2$ Set-point** parameter is a set-point for PaCO$_2$. The control-of-breathing model adjusts tidal volume and respiratory rate in order to bring the PaCO$_2$ toward this set-point. Factors that influence the success of this control effort include baseline tidal volume, baseline respiratory rate, respiratory gain, O$_2$ consumption, respiratory quotient, lung compliances, chest wall compliance, bronchial resistances, the presence of artificial airways in the simulator and the inspired gas mixture.

When the **PaCO$_2$ Set-point** is set to a new value, the physiological controls adjust the simulator's respiratory pattern in an attempt to attain the desired set-point. For example, when the set-point is raised from 40 to 50 mmHg, there is a transitory decrease in respiratory rate and tidal volume, as the physiological controls attempt to drive the PaCO$_2$ toward 50 mmHg. When the PaCO$_2$ reaches the new set-point, the simulator's respiratory rate and tidal volume should return to normal values.

> **Default**: 40 mmHg
>
> **Range**: 20.0 mmHg - 70.0 mmHg

PaO$_2$ Set-point

The **PaO$_2$ Set-point** parameter is a set-point for PaO$_2$. When PaO$_2$ is below the set-point value, progressive stimulation of spontaneous minute ventilation occurs. Both tidal volume and respiratory rate rise, which under appropriate conditions results in PaO$_2$ moving closer to the set-point. Factors that influence this control effort include baseline tidal volume, baseline respiratory rate, respiratory gain, O$_2$ consumption, respiratory quotient, lung compliances, chest wall compliance, bronchial resistances, the presence of artificial airways in the simulator and the inspired gas mixture. Minute ventilation is not affected for PaO$_2$ above the set-point.

For example, if **PaO$_2$ Set-point** is set to 100 mmHg and PaO$_2$ drops to 90 mmHg, ventilatory stimulation occurs. When the PaO$_2$ reaches the new set-point, the simulator's respiratory rate and tidal volume are again controlled to maintain PaCO$_2$ at the PaCO$_2$ set-point. Also, see **PaCO$_2$ Set-point**.

> **Default**: 100.00 mmHg
>
> **Range**: 20.0 mmHg - 100.0 mmHg

I to E Ratio (1:X)

The **I to E Ratio (1:X)** parameter sets the inspiratory-expiratory (I:E) ratio for spontaneous ventilation. At the default setting, the time for exhalation is twice that of inhalation.

> **Default**: 2
>
> **Range**: 0.5 - 7.0

PetCO$_2$ - PaCO$_2$ Factor

The **PetCO$_2$ - PaCO$_2$ Factor** adjusts the end-tidal CO$_2$ relative to the PaCO$_2$. At the default value of 1, PetCO$_2$ very closely approximates PaCO$_2$. When **PetCO$_2$ - PaCO$_2$ Factor** is set at a value of 2, PetCO$_2$ is approximately one half of PaCO$_2$. PetCO$_2$ depends on CO$_2$ 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 CO$_2$ levels have on the simulated patient's tidal volume and respiratory rate. Under default conditions (value = 1), when arterial CO$_2$ levels rise, the patient's respiratory rate and tidal volume show a transitory increase in an attempt to return the patient to the physiological control CO$_2$ set-point. If the **Respiratory Gain Factor** is increased to more than 1, the patient has a more pronounced response, while values less than 1 correspond to a blunted response.

> **Default**: 1
>
> **Range**: 0.00 - 10.00

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

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 O$_2$. 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

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**: 2300 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

Venous CO_2 Shift

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

This parameter is useful for giving a "bolus" of CO_2 to the venous system. The alveolar and arterial CO_2 levels rise rapidly in response to the added carbon dioxide but soon return to "pre-bolus" levels as increased ventilation efforts work to eliminate the added CO_2. Therefore, the rise in CO_2 levels is only transitory. This parameter can be used to simulate external CO_2 administration such as that used during laparoscopy.

> **Default**: 0 mmHg
>
> **Range**: 0.0 mmHg - 60.0 mmHg

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:** 0.00 - 250,000.00

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: Müse 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: Müse 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 Halothane

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

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

Note: Müse 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 Halothane

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

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

Note: Müse 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: Müse 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: Müse 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: Muse 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: Müse 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: Müse 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: Müse 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%

Chest Tube

The **Chest Tube** parameter is used to activate the chest tube hardware in the simulator. The **Prime** option has no physiologic impact. Instead, it is used to prepare the feature by allowing fluid to flow through the apparatus, thereby removing air from the line.

When a chest tube is placed into the simulator, this is sensed and recorded in the Event Log. It is also possible to have a scenario transition on chest tube placement, which can be scripted using the Scenario Designer.

> **Default**: Disable

Note: The Chest Tube and Needle Decompression features cannot be enabled simultaneously.

Chest Tube Flow

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

> **Default**: 50 mL per minute
>
> **Range**: 0 mL per minute - 100 mL per minute

Chest Tube Air Leak

The **Chest Tube Air Leak** parameter is used with the chest tube feature. A setting of 100% allows only air to be removed via the chest tube, while a setting of 0% allows only fluid to be removed. Settings between 0 and 100% create a mixture of air and fluid.

> **Default**: 0%
>
> **Range**: 0% to 100%

Cardiovascular – Basic Parameters

Cardiovascular Parameters – Basic
Blood Pressure
CVP
PAP
PCWP (Pulmonary Capillary Wedge Pressure)
Heart Rate
Heart Rate Factor
Cardiac Output
Cardiac Rhythm
Pulseless Electrical Activity
PVC Probability
Arterial Catheter
Central Venous Catheter
PA Catheter
PA Balloon
Defib
Pacing Current
Pacing Rate
Pacing Capture Threshold
Cold Fluid Inject

Blood Pressure

The **Blood Pressure** parameter is used to override the physiological modeling for blood pressure. 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.

> **Default:** Modeled
>
> **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, thereby overriding the physiologic modeling for central venous pressure. 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.

> **Default:** Modeled
>
> **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 override the physiological modeling for pulmonary artery pressure. The systolic and diastolic pressures can both be set to fixed numeric values, regardless of interventions performed. Resetting the parameter to **Modeled** returns control of the underlying pulmonary artery pressure to the physiological models.

> **Default:** Modeled
>
> **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.

> **Default:** Modeled
>
> **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. Use this parameter to "fix" or set the heart rate to a specific number.

> **Default**: Modeled
>
> **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 TouchPro as zero, but the patient will still have a blood pressure and pulses.

> **Default:** Modeled
>
> **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 TouchPro 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.

Default: Modeled

Options: Modeled

Asystole

Atrial Enlargement, Left

Atrial Enlargement, Right

Atrial Fibrillation

Atrial Fibrillation: HR 120

Atrial Fibrillation: HR 80

Atrial Flutter

Atrial Flutter: HR 150

Atrial Flutter with 2:1 AV Conduction

Atrial Tachycardia

AV Block, First-Degree

AV Block, Second-Degree, Mobitz I

AV Block, Second-Degree, Mobitz II

AV Block, Third-Degree

Bundle Branch Block, Incomplete Right

Bundle Branch Block, Left

Bundle Branch Block, Left with PVCs 25%

Bundle Branch Block, Left with PVCs

Bundle Branch Block, Right

Hypercalcemia

Hyperkalemia (Mild)

Hyperkalemia (Moderate)

Hyperkalemia (Severe)

Hypertrophy, Biventricular

Hypertrophy, Left Ventricular

Hypertrophy, Right Ventricular

Hypocalcemia

Hypokalemia

Hypothermia

Junctional

Junctional: HR 50

Long QT Syndrome

Mobitz Type I: Wenckebach

Mobitz Type II

Modeled

STEMI Anterior

STEMI Anterolateral

STEMI Inferior

STEMI Lateral

STEMI Posterior

STEMI Septal

STEMI LBB

Myocardial Ischemia, Mild

Myocardial Ischemia, Moderate

Myocardial Ischemia, Moderate with PVCs 10%

Myocardial Ischemia, Moderate with PVCs 25%

Myocardial Ischemia, Moderate with PVCs

Myocardial Ischemia, Severe

Normal Junctional

Normal Junctional: HR 50

NSTEMI

NSTEMI with PVCs 10%

NSTEMI with PVCs 25%

Paroxysmal Junctional Tachycardia

Paroxysmal Junctional Tachycardia: HR 130

PEA: Pulseless Electrical Activity

Pericarditis

Premature Atrial Contraction

Premature Ventricular Contraction 10%

Premature Ventricular Contraction 25%

Sinus

Sinus Bradycardia

Sinus Bradycardia: HR 40

Sinus Tachycardia

Sinus Tachycardia: HR 120

Sinus with PAC

Sinus with PVCs: 10%

Sinus with PVCs: 25%

ST Elevation with Chest Pain

Third Degree AV Block

Torsade de Pointes

Trifascicular Block

Ventricular Fibrillation, Coarse
Ventricular Fibrillation, Fine

Ventricular Tachycardia
Ventricular Tachycardia: HR 151
Ventricular Tachycardia, Pulseless
Ventricular Tachycardia, Pulseless: HR 151

Wellen's Syndrome

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 because of abnormal electrical activity of the ventricles).

Default: Modeled

Range: 0% - 90%

Arterial Catheter

The arterial pressure displayed on the Patient Status Display or TouchPro software is set using this parameter. A non-pulsatile, "zero" pressure signal is emitted when the **Atmosphere** position is selected and can be used to simulate zeroing a pressure transducer. This may also be used to remove the arterial pressure waveform, if desired. The **Left Ventricle** position is useful for simulating cardiac catheterization procedures, or for demonstrating left ventricular end-diastolic pressure and its relationship to pulmonary artery occlusion ("wedge") and central venous pressure.

> **Default**: Peripheral Artery
>
> **Options:** Atmosphere
> Peripheral Artery
> Left Ventricle

Central Venous Catheter

The venous pressure displayed on the Patient Status Display or TouchPro software is set using this parameter. A non-pulsatile, "zero" pressure signal is emitted when the **Atmosphere** position is selected and can be used to simulate zeroing a pressure transducer. This may also be used to remove the central venous pressure waveform, if desired (e.g., beginning of an SCE with an "unmonitored" patient).

> **Default**: Right Atrium
>
> **Options:** Atmosphere
> Extrathoracic Vein
> Intrthoracic Vein
> Right Atrium

Pulmonary Artery (PA) Catheter

The pulmonary artery pressure displayed on the Patient Status Display or TouchPro software is set using this parameter. A non-pulsatile, "zero" pressure signal is emitted when the **Atmosphere** position is selected and can be used to simulate zeroing a pressure transducer. This may also be used to remove the pulmonary artery pressure waveform, if desired (e.g., beginning of an SCE with an "unmonitored" patient). The pulmonary artery catheter can be "floated" into position by sequencing through the right heart positions. This may also be scripted into a scenario using the Scenario Designer.

> **Default**: Pulmonary Artery
>
> **Options:** Atmosphere
> Intrathoracic Vein
> Right Atrium
> Right Ventricle
> Pulmonary Artery

Pulmonary Artery (PA) Balloon

Inflation of the pulmonary artery catheter balloon is simulated by switching to the **Inflated** option of the **PA Balloon** parameter. The appropriate pulmonary artery occlusion or "wedge" waveform is then displayed on the Patient Status Display or TouchPro software.

> **Default**: Deflated
>
> **Options:** Deflated
>
> Inflated

Defibrillation (Defib)

The **Defib** 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. **Defib** 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 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

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

Cold Fluid Inject

The Cold Fluid Inject parameter is used to simulate the injection of 10 mL saline into the pulmonary artery (PA) catheter. The appropriate Thermodilution waveform and cardiac output measurement are then displayed on the TouchPro software.

Cardiovascular – Additional Parameters

Cardiovascular Parameters – Additional
Baroreceptor Maximum Pressure
Baroreceptor Minimum Pressure
Left Ventricle Contractility Factor
Right Ventricle Contractility Factor
Systemic Vascular Resistance Factor
Venous Capacity Factor
Systemic Arteries Compliance Factor
Pulmonary Arteries Compliance Factor
Pulmonary Vasculature Resistance Factor
Venous Return Resistance Factor
Baroreceptor Gain (Overall) Factor
Baroreceptor Gain (Cardiac) Factor
Baroreceptor Gain (Peripheral) Factor
Chest Compression Efficacy
Tamponade Volume
Ischemic Index Sensitivity
Ischemic Index Averaging
Aortic Valve Resistance Factor
Mitral Valve Resistance Factor
Pulmonic Valve Resistance Factor

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 <u>not</u> 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 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 <u>not</u> show a corresponding increase.

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

> **Default**: 72 mmHg
> **Range**: 20 mmHg - 160 mmHg

Left Ventricle Contractility Factor

The **Left Ventricle Contractility Factor** 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

Right Ventricle Contractility Factor

The **Right Ventricle Contractility Factor** parameter adjusts the contractility of the right ventricle and has a direct effect on pulmonary artery pressure and an inverse effect on central venous pressure. Use this parameter to raise or lower pulmonary artery pressure (PAP) or to change the central venous pressure (CVP).

>**Default**: 1
>
>**Range**: 0 - 10.00

Systemic Vascular Resistance Factor

The Systemic Vascular Resistance Factor 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

Venous Capacity Factor

The **Venous Capacity Factor** 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

Systemic Arteries Compliance Factor

The **Systemic Arteries Compliance Factor** 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: 0.20 - 5.00

Pulmonary Arteries Compliance Factor

The **Pulmonary Arteries Compliance Factor** 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

Pulmonary Vasculature Resistance Factor

The **Pulmonary Vasculature Resistance Factor** 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

Venous Return Resistance Factor

The **Venous Return Resistance Factor** 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

Baroreceptor Gain (Overall) Factor

The **Baroreceptor Gain (Overall) Factor** 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 (Cardiac) Factor

The **Baroreceptor Gain (Cardiac) Factor** 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 (Peripheral) Factor

The **Baroreceptor Gain (Peripheral) Factor** 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

Chest Compression Efficacy

The **Chest Compression Efficacy** parameter is used to determine the effectiveness of chest compressions administered by the caregiver. The 100% setting indicates that chest compressions are completely effective, while the 0% setting prevents them from having any effect on intrathoracic pressure.

> **Default:** 100%
>
> **Options:** 100%
>
>   0%

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

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. ≥ 0.90
Mild ST Segment Depression	0.90 > I.I. ≥ 0.70
Moderate ST Segment Depression	0.70 > I.I. ≥ 0.60
Premature Ventricular Contractions (PVCs)	0.60 > I.I. ≥ 0.40
Ventricular Tachycardia (VTach)	0.40 > I.I.
Ventricular Fibrillation (VFib)	1 minute after VTach
Asystole	1 minute after VFib

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

Ischemic Index Averaging

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

Use this parameter to speed up the recovery from the model-driven "death spiral." By setting the parameter to 0.5, a patient pulls out of the "death spiral" at a faster rate than with a setting of 0.99. However, the favorable conditions (i.e., better oxygenation and/or lower heart rate) must exist before the number is made smaller. If not, the patient's descent increases at a faster rate.

> **Default**: 0.99
>
> **Range**: 0.50 - 1.00

Aortic Valve Resistance Factor

The **Aortic Valve Resistance Factor** 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

Mitral Valve Resistance Factor

The **Mitral Valve Resistance Factor** 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

Pulmonary Vasculature Resistance Factor

The **Pulmonary Vasculature Resistance Factor** 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

Pulses

The table(s) below shows the defaults and ranges for the pulses and pulse deficits.

Pulse	Default	Range
Carotid (Left and Right)	On	N/A
Carotid Deficit	60	0 - 300
Left Brachial	On	N/A
Right Brachial	On	N/A
Brachial Deficit	80	0 - 300
Radial Deficit	90	0 - 300
Left Femoral	On	N/A
Right Femoral	On	N/A
Femoral Deficit	70	0 - 300
Left Popliteal/Pedal	On	N/A
Right Popliteal/Pedal	On	N/A
Popliteal/Pedal Deficit	80	0 - 300

Apollo Prehospital

Pulse	Default	Range
Left Carotid	On	N/A
Right Carotid	On	N/A
Carotid Deficit	60	0 - 300
Left Brachial	On	N/A
Right Brachial	On	N/A
Brachial Deficit	80	0 - 300
Left Radial	On	N/A
Right Radial	On	N/A
Radial Deficit	90	0 - 300
Left Femoral	On	N/A
Right Femoral	On	N/A
Femoral Deficit	70	0 - 300
Left Popliteal	On	N/A
Right Popliteal	On	N/A

Pulse	Default	Range
Popliteal Deficit	80	0 - 300
Left Dorsalis Pedis/ Left Posterior Tibial	On	N/A
Right Dorsalis Pedis/ Right Posterior Tibial	On	N/A
Dorsalis Pedis/ Posterior Tibial Deficit	80	0 - 300

Apollo Nursing

Pulse	Default	Range
Left Carotid	On	
Right Carotid	On	
Carotid Deficit	60	
Left Brachial	On	
Right Brachial	On	
Brachial Deficit	80	
Left Radial	On	
Right Radial	On	
Radial Deficit	90	
Left Femoral	On	
Right Femoral	On	
Femoral Deficit	70	
Left Popliteal	On	
Right Popliteal	On	
Popliteal Deficit	80	
Left Dorsalis Pedis	On	
Right Dorsalis Pedis	On	
Dorsalis Pedis Deficit	80	
Left Posterior Tibial	On	
Right Posterior Tibial	On	
Posterior Tibial Deficit	80	

Fluids

The Fluids icon provides a means of controlling the amount of fluid lost by or infused into the patient. The amount of fluid to be lost or infused and the time frame during which the fluid loss or infusion takes place can be entered.

Fluid Parameters
Fluid Loss Blood
Fluid Loss Plasma
Colloid Infusion
Crystalloid Infusion
PRBC Infusion
Whole Blood Infusion
Bleeding: Upper
Bleeding: Lower

Fluid Loss Blood

When used, the **Fluid Loss Blood** parameter reflects 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 - 4000 mL

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 - 4000 mL

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 - 4000 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 - 4000 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 - 4000 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 - 4000 mL

Bleeding: Upper

The **Bleeding: Upper** parameter is used to activate bleeding from the Upper Moulage port (located in the right shoulder).

Default: Off

Bleeding: Lower

The **Bleeding: Lower** parameter is used to activate bleeding from the Lower Moulage port (located in the right hip).

> **Default:** Off

Note: For Bleeding: Upper and Bleeding: Lower, the default blood loss is set to a small arterial bleed. To change the type or rate of bleeding, refer to the section Setting a Patient's Baseline.

Under **Patient Management** complete the following:

1. Click on **Baseline**
2. On the **Patient Baseline** screen, click the **Fluids** icon
3. Adjust **Bleeding Type: Upper** and/or **Bleeding Type: Lower** as desired
   Default: Arterial
   Options: Arterial, Venous
4. Adjust **Bleeding Size: Upper** and/or **Bleeding Size: Lower** as desired
   Default: Small
   Options: Small, Medium, Large
5. Click **Complete**

For pre-configured (locked) SCEs, the **Bleeding Type** and **Bleeding Size** cannot be altered.

Sounds

A variety of simulated sounds are available to enhance realism. A patient must be running in Müse for any sounds to be available.

Speech Sounds

Speech Sounds include a male or female voice that can utter pain rating indicators from 0 to 10, various phrases and a series of other utterances. Unlike Vocal Sounds, Speech Sounds only play once.

To play a Speech Sound, click the **Speech Sounds Controls** balloon and a list of Speech Sounds will appear. Select the desired sound. The sound plays, and the list disappears.

To replay the last sound, click the Play button in the Speech balloon.

Speech Sounds
"10, 9, 8, 7, 6..."
"0" through "10" - Pain Ratings
"Aching"
"Dull"
"I can't breathe"
"My belly hurts"
"My chest is tight"
"My leg hurts"
"No"
"Ouch"
"Ow, that hurts"
"Pressure"
"Sharp"
"Sometimes"
"Stabbing"
"Yes"
Grunt
Loud Cough
Scream
Short Loud Cough
Short Soft Cough
Soft Cough

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.

Bowel Sounds
Normal
Hypoactive
Hyperactive
None

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

Bowel Sounds Locations
All Bowel Sounds
LUQ Bowel Sounds
RUQ Bowel Sounds
LLQ Bowel Sounds
RLQ Bowel Sounds

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.

Breath 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 **Breath Sounds**. The Breath Sounds menu will appear.

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

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

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

>   **Default**: Normal
>
>   **Options:** Normal
>
>   Crackles
>
>   Diminished
>
>   Gurgling
>
>   Pleural Rub
>
>   Rhonchi
>
>   Wheezing

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

Heart Sounds

Heart sounds are synchronized with the cardiac cycle and can be auscultated over the left and right sternal border, left lower sternal border and apex.

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.

>   **Default:** Normal
>
>   **Options:** Normal
>
>   S3
>
>   S4
>
>   S3 and S4
>
>   Early Systolic Murmur
>
>   Mid Systolic Murmur
>
>   Late Systolic Murmur
>
>   Pan Systolic Murmur
>
>   Late Diastolic Murmur

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

Throat Sounds

The **Stridor** throat sound option is selected using the **Throat Sounds** parameter.

Throat sounds can be adjusted by clicking on the Sound icon on the Run screen. When the Sounds panel appears, select **Throat Sounds**. The Throat Sounds menu will appear. Use the Mute/Unmute button to turn the sounds on or off.

>>**Default**: None

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

Vocal Sounds

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 **Vocal Sounds**. The Vocal Sounds menu will appear.

>>**Default**: None

>>**Options:** None

>>>Crying

>>>Gagging

>>>Gasping

>>>Groaning

>>>Long Loud Cough

>>>Long Soft Cough

>>>Wheezing

>>>Mumbling

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

WIRELESS VOICE LINK

This information is intended to assist in preparing Wireless Voice Link (WVL) devices for use in conjunction with Athena.

Voice Over Internet Protocol (VoIP)

The simulator may be equipped with VoIP features that allow the facilitator to:

- Communicate through the manikin
- Communicate to additional participants (e.g. other facilitators, proctors, or observers)

The VoIP feature includes the following elements

- Headset
- Voice Communication controls integrated into Müse
- Voice Communications controls in a standalone software

Voice Over Internet Protocol (VoIP) Headset

The simulator comes with one (1) headset:

VoIP Headset

The headset has a noise canceling microphone and offers mono sound through one speaker to allow the facilitator to remain aware of their environment.

The headset

- is wired and connects to the facilitator laptop vis USB
- includes speaker volume and microphone mute controls integrated into the USB cable

Additional headsets are available for purchase from CAE. The capability to use your own headset is also supported. This includes wireless models. If you have questions regarding the compatibility of your headset please contact CAER Healthcare customer service.

For additional information on the headset please consult the manufacturer's website.
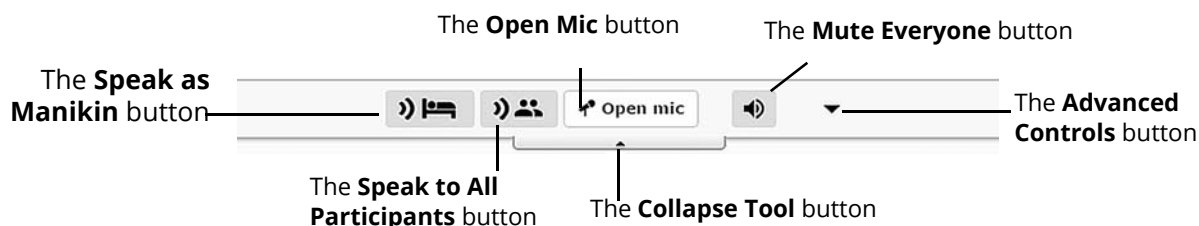
Voice Communications Controls in Müse

The voice communications controls are located in a supplemental toolbar at the top of the Müse software.

To speak as the manikin, click and hold down the **Speak as Manikin** button. This can also be achieved by holding down the spacebar on the computer keyboard.

Note: When speaking as the manikin. all incoming communications will be locked. It is recommended that you hold down the Speak as Manikin button only as long as necessary.

To speak to participants, click and hold down the **Speak to Participants** button. To keep the communication channel with participants open without holding down the button, use **Open Mic**.

The **Mute Everyone** button mutes all incoming communications.

The **Open Mic** button

The **Mute Everyone** button

The **Speak as Manikin** button

The **Advanced Controls** button

The **Speak to All Participants** button

The **Collapse Tool** button

Supplemental Toolbar

Clicking the **Advanced Controls** button opens the **Advanced Controls** tool.

Voice Communication Controls in Standalone Software

Additional participants can be added to the voice communications network. Each additional participant will need a dedicated computer as well ads their own headset. Additional participants can access the voice communication controls by the following steps:

1. Connect their dedicated computer to the simulator's WiFI network. See "Connect to the Wireless Network" section of the user guide for additional details.

2. Launch a supported web browser and navigate to the Müse splash page (i.e. http://1932.198.XX.5 where "XX" is the simulator's IP address

3. Click the "Voice Communications" link in the top right corner of the Müse splash page

The controls in the standalone voice communication software are identical to those in the Müse toolbar except that the toolbar is always expanded and the **Advanced Controls** are always visible.

Advanced Controls Tool

The **Call Sign Name**

The **Advanced Controls Tool** button

The **Your Controls** section

The **Adjust Mic Volume** button

The **Manikin Controls** section

The **Mute Incoming Manikin Communications** button

The **Participant Controls** section

The **Mute Incoming Participant Communications** button

The **Prevent Participant from Hearing You** button
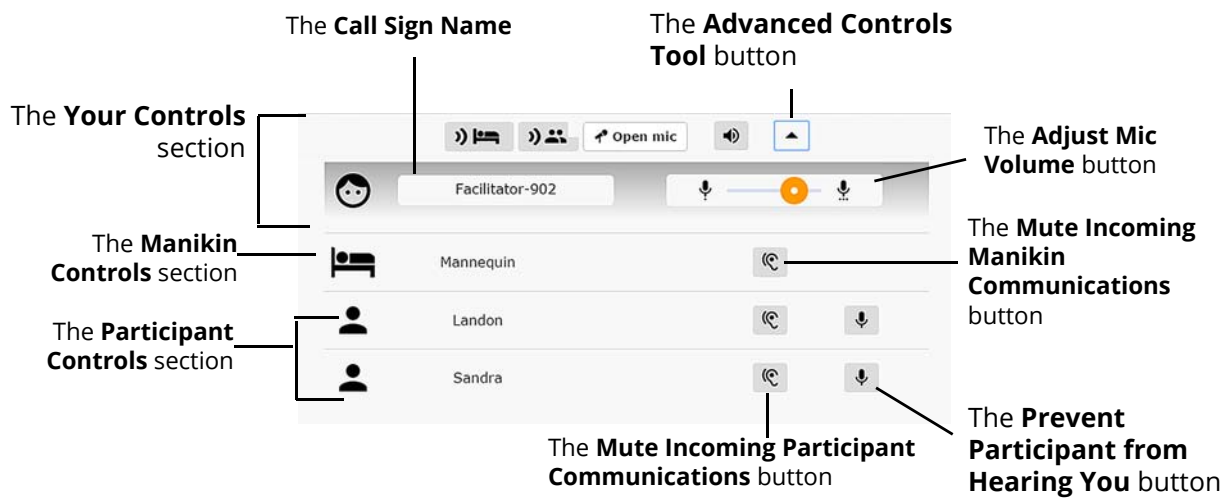
Advanced Controls Tool

• **Call Sign Name:** Is automatically attributed (e.g. Facilitator-902). Your call sign name can be edited by clicking it and typing a new one.

• **Advanced Controls Button:** Clicking the Advanced Controls button on the supplemental toolbar opens the Advanced Controls tool. Clicking it a second time collapses the Advanced Controls tool.

• **Adjust Mic Volume Slider:** Allows your mic volume (i.e. gain) to be adjusted. This is applicable to both speaking as the manikin and speaking to participants.

• **Mute Incoming Manikin Communication Button:** Mutes all communications from the mic located in the manikin. Clicking it a second time unmutes communications from the manikin.

Participant Controls:

◦ **Prevent Participant From Hearing You Button:** Prevents that participant from hearing you. Clicking it a second time allows them to hear you again

◦ **Mute Incoming Participant Communication Button:** Mutes communications from that specific participant. Clicking it a second time allows you to hear them again.

Cautions and Warnings

This device complies with part 15 of the FCC Rules and with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions:

1. This device may not cause interference

2. This device must accept any interference, including interference that may cause undesired operation of the device

Cet appareil est conforme aux normes d'Industrie Canada exempts de licence RSS (s). Son fonctionnement est soumis aux deux conditions suivantes:

1. Cet appareil ne doit pas provoquer d'interférences

2. Cet appareil doit accepter toute interférence, y compris les interférences pouvant provoquer un fonctionnement indésirable de l'appareil

Any modifications made to this device without the express approval of CAE could void the user's authority to operate this equipment.

What's Included

The WVL package includes the following items:

- Wireless Voice Link Handset (1)
- Olympus ME52W Standalone Microphone (1)
- AAA Alkaline Batteries (2)
- Quick Start Guide (1)

How Wireless Voice Link Works

The WVL is a radio pair that operates in the 2.4 GHz unlicensed radio band. The handset communicates wirelessly with the base station located inside the simulator. The base station converts the digitized microphone stream from the handset and outputs it via the base station to the headphone and line out jacks. The output projects through the head speakers inside the simulator.

To accommodate multiple WVL pairs in close proximity, each WVL is assigned two RF channels on which to operate. The RF channels divide up the 2.400 – 2.4835 GHz spectrum in 80 single frequencies to prevent the WVLs from interfering with each other.

Due to the nature of the unlicensed 2.4 GHz band, there may be other devices such as Wi-Fi, microwave ovens or Bluetooth® radios operating in the 2.4 GHz band as well. Therefore, two channels are used to transmit the audio stream redundantly to avoid interference. In case there is an interference in one channel, the other can be used to extract the audio stream.

To operate correctly, both the handset and base station should be set to the same frequency using the DIP switches located in the devices. If the interference is too high, the WVL firmware has the ability to change channels automatically to avoid interruption. This process occurs simultaneously in both the handset and the base station without the need for user intervention. The units revert back to the original frequency set on the DIP switches when both devices are restarted using the power switch.

Recommendations for Use

To receive the best sound quality from the WVL, please note the following recommendations:

- Do not separate the WVL pair with more than two walls
- Use channels 0 through 11 for the best sound quality
- Use channels 12 through 31 if more than 12 simulators are present in one area

Wireless Voice Link Devices

There are two unique devices that make up a WVL pair: the handset device and the base station device. The base station device is located inside the simulator, while the handset device is battery powered and carried by the user. The handset transmits voice input through a microphone to the base station receiver, where it is transmitted to the speakers in the simulator's head. The two different devices can be identified by their cases.

The handset device has a cover that extends over the length of the antenna.

WVL Handset

The base station device antenna is almost fully exposed.

WVL Base Station

Physical Features

The following features are located on the top of the WVL devices:

- **Headphone jack:** Used to plug in headphones or an iPhone compatible headphone/microphone combination
- **Microphone jack:** Used to plug in a standalone microphone
- **Red power light:** Indicates when the unit is powered on by blinking. Also indicates when the Mute button is activated by solidly staying on.
- **Green connection light:** Indicates an RF link connection between the handset and base station by blinking
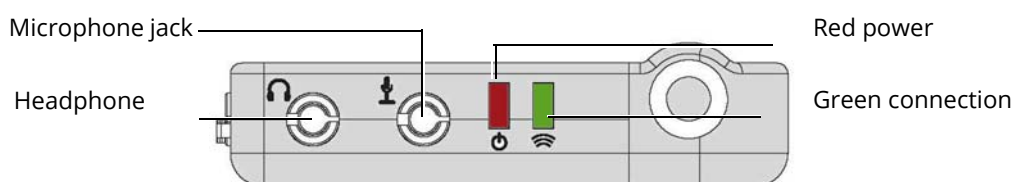
WVL Front View

The following features are located on the side of the WVL devices:

- **Battery compartment:** Houses two AAA batteries and the DIP switch
- **DC power jack:** Accommodates a 5VDC/0.2A power source
- **ON/OFF switch:** Turns WVL handset power on or off
- **Line out jack:** Connects the WVL to the simulator's audio amplifier
- **Volume/mute dial:** Controls microphone gain and microphone mute on the handset
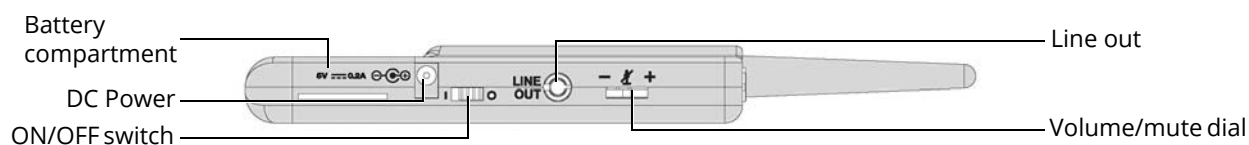
WVL Side View

On the WVL handset, the volume/mute dial controls the microphone volume or mutes the microphone.

On the WVL base station, the dial serves as the volume control for the speakers inside the simulator. Moving the dial toward the plus sign increases the volume. Moving the dial toward the minus sign decreases the volume and setting. On the handset, pressing straight down on the volume dial in the center mutes the microphone.
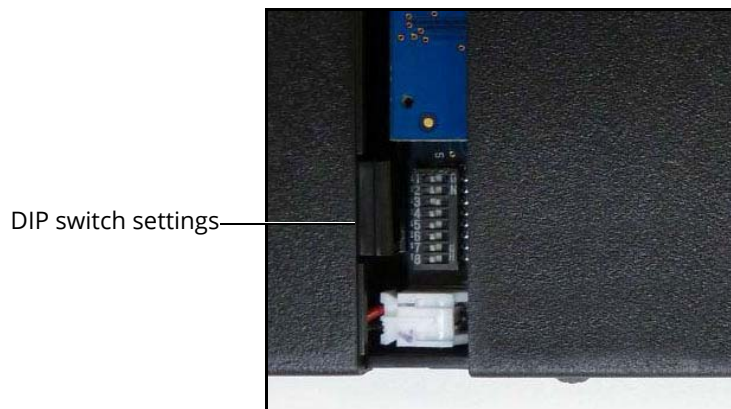
Preparing the Base Station in the Simulator

When using the base station in the simulator, ensure the batteries are removed and the following items are attached:
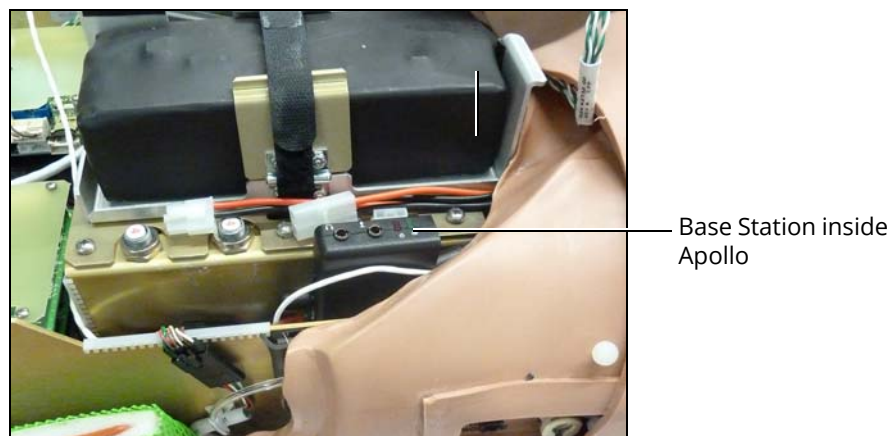
- Power cable
- Line out cable

The DIP switch is located in the battery compartment of the base station.

DIP switch settings

Dip Switch Settings

The base station should come already connected and installed inside the simulator.


Base Station inside Apollo

The Base Station Connected and Installed

To prepare the base station:

1. Set the base station DIP switch positions 6 and 7 to OFF, and 8 to ON

2. Turn the power off and on using the power switch on the outside of the base station to ensure the DIP switch changes take effect
3. Leave the power switch on the outside of the base station in the on position
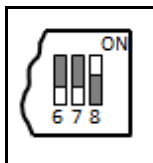
DIP Switch Settings for the Base Station

Note: Since the base station receives power from the simulator, the power switch on the outside of the base station must remain in the ON position. Use this power switch to refresh DIP switch settings. Do not turn the simulator off and on to refresh the DIP switch settings.

Preparing the Handset for Use

To prepare the handset for use:

1. Insert two AAA batteries into the battery compartment
2. Set the handset DIP switch positions 6 and 7 to OFF and position 8 to ON
3. Turn the power switch off and back on to ensure the DIP switch changes take effect
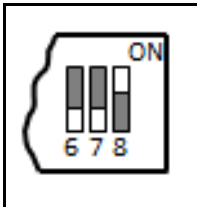
DIP Switch Settings for the Handset

While DIP switch positions 6 through 8 affect the handset and base station settings, DIP switch positions 1 through 5 are used to set the radio frequency channel used for communication between the handset and the base station.

# Selecting the Radio Frequency Channel

There are two ways to configure the radio frequency (RF) channel spacing. The first method reduces channel-to-channel interference, but allows only 12 channels to operate simultaneously. The second method increases the number of channels that can be used simultaneously to 20 channels. However, this method diminishes the channel-to-channel noise immunity.

All of the WVL pairs in the same vicinity must use channels from either RF Channel Group 1 or 2. The channels used must belong to the same group. The DIP switch determines the initial communication frequencies that the WVL pair use to communicate when the power of the base station and handset is first turned on. If there is too much interference at the initial channel, the WVL pair changes frequency automatically and continues operating. The WVL pair will repeat this process automatically as needed.

Multiple WVL pairs can be set to the same initial frequency. However, setting different initial frequencies helps the WVL pairs quickly find a stable operating frequency.

For example, if there are 12 or fewer simulators in the same vicinity, set all of the WVL pairs to use channel 0 of RF Channel Group 1. To give unique initial RF frequencies, assign each WVL pair to its own RF channel with the settings found in CH 0 through CH 11.

If you have 13 to 20 simulators in the same vicinity, set all of the WVL pairs to use channel 12 of RF Channel Group 2. To give unique initial RF frequencies, assign each WVL pair to its own RF channel with the settings found in CH 12 through CH 31.
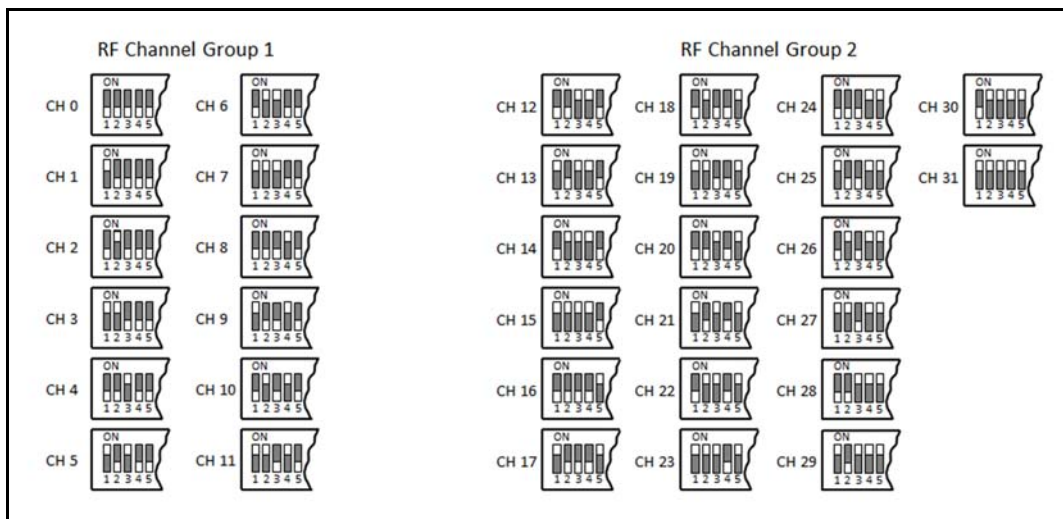
RF Channel Selection Methods

For a complete list of the initial frequencies associated with the RF Channels, see *RF Channel Initial Operating Frequencies.*

Powering Up the WVL Pair

To power up the WVL pair:

- Power on the base station by turning on the simulator

  The base station power switch is in the on position by default.

- Power on the handset by setting the power switch to the on position

  The red power light on each unit blinks when the unit is on. Once both units are powered on and communicating with each other, the green connection light flashes once every second.

  If the green connection light fails to blink, ensure both units are set to the same RF channel.

  If you make changes to the DIP switch settings, toggle the power switches of the handset and base station off and back on to ensure the changes takes effect.

Using the iPhone/Standalone Microphone

DIP switch position 6 on the handset determines if the iPhone microphone input or the standalone microphone input is enabled. When DIP switch position 6 is set to the OFF position, the standalone microphone jack is enabled for the standalone microphone, provided by CAE.
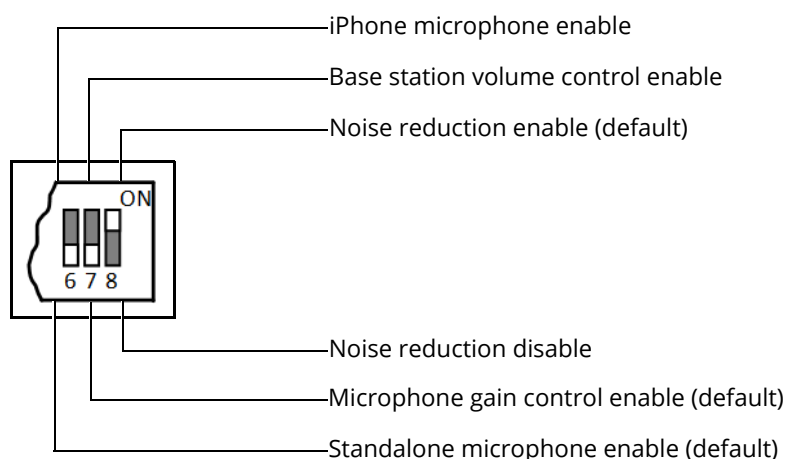
Handset and CAE -provided Microphone

To use a microphone compatible with an iPhone (three-pole jack), set DIP switch position 6 to ON. Please note that an iPhone-compatible microphone is not provided as part of the product package. Any microphone with a common 3.5 mm input jack can be used with the handset when DIP switch position 6 is set to ON.

Special Handset Settings

Advanced settings for the handset DIP switch are available.

iPhone microphone enable

Base station volume control enable

Noise reduction enable (default)

Noise reduction disable

Microphone gain control enable (default)

Standalone microphone enable (default)

Advanced DIP Switch Settings

DIP switch settings are only refreshed when the handset is powered on. To ensure the DIP switch changes take effect, turn the power off and back on after making changes.

To enable noise reduction and minimize background noise in high ambient noise environments, place the position 8 DIP switch in the ON position.

Battery Capacity Indicator

The red power light flashes one time every second when the battery capacity is good. When the battery capacity is nearly depleted, the red power LED flashes twice in quick succession every second. This indicates the batteries need to be replaced.

To get the most battery life out of the handset, the handset should be powered down when it is not in use.

Troubleshooting

CAE Customer Service is available to help with issues, should they arise. However, sometimes you can speed up the customer service process by performing diagnostics before calling, and eliminating some problems on your own with the help of the following instructions.

Note: The loss of WiFI connection for approximately 60 seconds may also cause a loss of Voice over IP connection. To solve this, click **Disconnect** then click **Connect** once the WiFI connection has been reestablished.

Power Problems

The red power light on the handset does not flash when power switch is turned on.

- Check that the batteries are inserted correctly. Install a fresh set of batteries, if needed

The red power light on my base station is not flashing when the simulator is powered on.

- Check that the cables from the simulator are installed in the base station correctly

Audio Problems

The sound output from the simulator is low when using a microphone on my lapel.

- Increase the microphone gain on the handset by moving the dial towards the plus sign

  Note: DIP switch 7 must be in the OFF position for this to work.

I'm hearing feedback from the microphone when I am close to the simulator.

- Decrease the microphone gain on the handset by moving the dial towards the minus sign

  Note: DIP switch 7 must be in the OFF position for this to work.

The sound output from the simulator is too high or too low.

- The volume level is configured at the factory for optimal performance. However, if you want to adjust the volume level of the base station (located inside the simulator), set the handset DIP switch 7 to ON. Remember to turn the handset power off and on after each DIP-switch change. After this step is complete, you will be able to adjust the volume level of the base station by adjusting the handset volume dial.

The sound output from the simulator is noisy when the speaker is not speaking.

- You can use the noise reduction feature by setting the handset DIP switch position 8 to ON

The simulator voice output is cut off when the speaker is speaking quietly.

- In this case, there are three possible options:
1. Attempt to talk louder

    2.Increase the microphone gain

    3.Disable the noise reduction feature by setting the handset DIP switch 8 to OFF

RF Channel Initial Operating Frequencies

RF Channel	Frequency 1 (GHz)	Frequency 2 (GHz)
0	2.402	2.480
1	2.405	2.477
2	2.408	2.474
3	2.411	2.471
4	2.414	2.468
5	2.417	2.465
6	2.420	2.462
7	2.423	2.459
8	2.426	2.456
9	2.429	2.453
10	2.432	2.450
11	2.435	2.447
12	2.402	2.480
13	2.404	2.478
14	2.406	2.476
15	2.408	2.474
16	2.410	2.472
17	2.412	2.470
18	2.414	2.468
19	2.416	2.466
20	2.418	2.464
21	2.420	2.462
22	2.422	2.460
23	2.424	2.458
24	2.426	2.456
25	2.428	2.454
26	2.430	2.452
27	2.432	2.450
28	2.434	2.448
29	2.436	2.446
30	2.438	2.444
31	2.440	2.442

VIDEO TUTORIALS

The video tutorials section on *caehealthcare.com* provides answers to many frequently asked questions and demonstrate a number of useful procedures that will help get the most out of your CAE simulator.

Scan or Click For Access To Video Tutorials

caehealthcare.com

For more information about CAE products, contact your regional sales manager or the CAE distributor in your country, or visit caehealthcare.com.
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