METI®

User Guide

Medical Education Technologies, Inc.®

iStan® Simulator Software and Users Guide©

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Application of Council Directive (s):	*Low Voltage Directive 73/23/EEC, EMC Directive 89/336/EEC*
Standard (s) to which Conformity is declared:	EN61010, EN55011, EN61000-3-2, EN61000-3-3, EN61000-4-2, EN61000-4-3, EN61000-4-4, EN61000-4-5, EN61000-4-6, EN61000-4-8, EN61000-4-11
Manufacturer's Name:	**Medical Education Technologies, Inc.**
Manufacturer's Address:	102 Cattlemen Road Sarasota, FL 34232 U.S.A.
Type of Equipment:	Patient Care Simulator — iStan®
Model No.:	iStan-100

I, the undersigned, hereby declare that the equipment specified above conforms to the above Directive (s) and Standard (s).

Place:	United States of America
Date:	May 20, 2008

CE

METI®
Medical Education Technologies, Inc.

(Signature)

Carlos Moreno

(Full Name)

Vice President of Engineering

(Position)

iStan Specifications

Size

Mannequin/Simulator	72” H x 22” W x 12” D (183cm x 56cm x 30cm)
Instructor Workstation	1” H x 14.1” W x 9.6” D (2.5cm x 36cm x 24cm)

Weight

Mannequin/Simulator	124lbs (56kg)
Instructor Workstation	5.4lbs (2.5kg)

Environmental Requirements

Ambient Temperature Range

Mannequin/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% noncondensing

Instructor Workstation

Operation:	50°F to 95°F (10°C to 35°C)
Storage:	-13°F to 113°F (-24°C to 45°C)
Relative Humidity:	0% to 90% noncondensing

Maximum Altitude

Instructor Workstation

Maximum operating altitude:	10,000 ft
Maximum storage altitude:	15,000 ft
Maximum shipping altitude:	35,000 ft

Power

Mannequin/Simulator

AC Input:	AC 90 – 240VAC, 50/60Hz
Consumption:	Maximum 150W (Charging), 100W nominal
Internal Batteries:	16.8V 100-watt-hour lithium-ion, rechargeable
Run Time:	7 to 8 hours (Typical)

Instructor Workstation

AC Input:	AC 100 – 240VAC, 50/60Hz
Consumption:	Maximum 85W (Charging)
Internal Battery:	10.8V 60-watt-hour lithium-polymer, rechargeable
Run Time:	2 to 4 hours (Typical)

Replacement Fuse

F1, DC Power In – 8A, 32VDC (250VAC), 5 x 20mm, IEC 60127-2/2 (Fast Acting)

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

Cautions/Warnings

Please read and understand these cautions and warnings before you begin using the iStan 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 iStan 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 the changing of fuses.
- Always remove the power cable and have simulator turned off when replacing fuses.
- Replace F1 with a 32VDC (250VAC), 5 x 20mm, IEC 60127-2/2 fast acting fuse/rated for 8 amperes.
- Always use the supplied power adapter to charge or run simulator from AC.

Latex Warning

METI simulators incorporate latex into their design. When performing certain maintenance procedures, the latex can become exposed. Users with latex sensitivity should take necessary precautions when handling the simulator while performing those procedures.

General Use Warnings

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 iStan system in rain. Apply water to the mannequin 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 CO_2 canisters in dry location between 32° and 104° F. (0 to 40°C). Do not expose CO_2 canister to heat above 140° F as rupture may occur.
- Never point CO_2 canister towards your face or someone nearby.
- Use only METI specified CO_2 canisters.
- Wear protective gloves and eye protection when removing canister from regulator assembly.

Bleeding and Secretion System

- DO NOT modify the tank or any assemble 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.

Mannequin

- Do not disassemble factory-assembled parts of the mannequin.
- Do not clean the mannequin with chemical solvents. Use water and a light soap solution only.
- Make sure that mannequin is set up on a stable, sturdy work surface to avoid collapsing and causing injury to users.
- iStan 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 mannequin 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 iStan.

Table of Contents

Introduction

As the worldwide leader in patient simulation technology and education, Medical Education Technologies, Inc.® (METI®) is excited to introduce iStan™. With METI's proprietary human physiology model at its core, iStan is designed to answer the need for a product that delivers more realism, more clinical features and more flexibility than other simulators. Simply put, iStan is like no other simulator before it.

iStan

iStan allows for the physical assessment of various clinical signs (e.g. heart/breath/bowel sounds, palpable pulses, chest excursion, airway patency, etc.) that are dynamically modeled using mathematical algorithms of human physiology and pharmacology.

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

In addition, iStan has the assessment, airway, cardiovascular, genitourinary, ACLS and trauma features familiar to METI customers plus many new specially designed features such as cyanosis and capillary refill, trismus, jugular vein distension, SpO_2 finger probe, fluids on board, bilateral autoinjection, intracranial pressure, intraosseous sites, flail chest and programmable speech.

Wireless and tetherless, iStan takes simulation education to a new and exciting level of realism.

Weight Distribution

iStan is uniquely designed to emulate human weight distribution. This means that when iStan is lifted, certain components (e.g., head) respond in similar fashion to the way human muscles react to support themselves when lifted. This design allows learners to gain an understanding of how to lift and move a real person.

Skin

Modeled from a cast of a real person, the skin of iStan truly acts, looks and feels like real human skin, right down to the goose bumps (*cutis anserina*). Small “pores” on iStan’s forehead have the ability to secrete clear fluid, simulating diaphoresis.

Information on how to care for iStan’s skin can be found in the **iStan Care and Maintenance** section.

Skeletal Structure

Designed from the inside out, METI has created the first patient simulator truly based around a human-like skeletal structure, a revolutionary development in itself. But iStan also closely mimics the anatomical workings of the human body at a level of realism not possible with other simulators. Spine, neck, arms and hips all mimic the degrees of movement of a real person.

Wireless

iStan is fully wireless and battery operated for amazing portability and versatility.

Contained in this User Guide

This User Guide has been designed for quick access to information on how to use and maintain your iStan system. Please make sure that you read and follow the **Cautions/ Warnings** on the pages preceding the **Table of Contents**. This is for your safety and your learner's safety, as well as for the protection of your simulator.

Each subsequent section has been designed to keep valuable information at your fingertips. Before using the system, follow the step-by-step instructions included in the **iStan Setup** section.

The **iStan Software Features** section provides instructions on the use of the various software features as well as how to create and save a new patient.

Using iStan includes information on how the simulator and software components work and the functionality that each supports. Various clinical interventions are explained in this section along with how these interventions isolate critically important learning objectives. In addition, a description is provided of the METI preconfigured patients, as well as detailed instructions on how to develop and save your own patients.

We encourage you to follow the iStan care and maintenance guidelines found in the **iStan Care and Maintenance** section, as this will ensure that your system is functioning optimally. Warranty details, as well as clean up and care information, are included in this section, making it a very important part of keeping your system in good working condition.

Equipment Overview

iStan has been designed to be used in any learning environment. iStan's standard features are easily integrated into a laboratory setting or remote locations.

Standard Components Inventory

iStan comes with all the necessary equipment for establishing an educational simulation center.

	Standard Equipment
	iStan Simulator
	Instructor Workstation
	Power Cord (Recharger)
	CO_2 Canisters (4)
	Inventory Kit
	Wireless Microphone
	Trauma Fill Tanks (2)

Detailed descriptions of this equipment can be found in the section iStan Standard Equipment (see *page 1.6).*

As you would with any shipment, cross-check this inventory with your METI packing invoice to verify that all components have been received.

Optional Components Inventory

Optional equipment is available to accommodate special customer requirements. For example, options like an air compressor, the Waveform Display Monitor and the Trauma/Disaster Casualty Kit enable instructors to create real-life scenarios at authentic locations.

	Optional Equipment
	Waveform Display Monitor
	Trauma/Disaster Casualty Kit (TDCK)
	Moulage Kit
	Intracranial Pressure
	iStan Replacement Lithium Battery Pack (4)
	Tool Kit
	iStan Learning Modules
	External Compressed Air Kit
	Air Compressor
	Hands-Free Training Cables

Detailed descriptions of this equipment can be found in the section Optional Equipment for iStan (*see page 1.9*).

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

iStan Standard Equipment

The design of the iStan system allows students to focus on the patient simulator while giving instructors the ability to create an endless number of possible clinical situations.

Full-Body Wireless Simulator

All patient assessments and clinical interventions are played out on the iStan mannequin, which represents a human patient. At 5 feet 10 inches (177.5 cm) in height and weighing 124 pounds (56 kg), iStan is fully operational in the supine, lateral, prone and seated positions. The simulator offers features like arm pronation and supination, breath, heart and bowel sounds, palpable pulses, patient voice, genitourinary features and airway management features.

The simulator is rechargeable using the **Power Cord** provided. *See page 5.7 for instructions on recharging the battery*.

Instructor Workstation

The Instructor Workstation is a laptop computer that utilizes METI HPS6 Software to operate as the main simulation control center.

The computer runs the underlying mathematical models that generate the physiological data that is realized on the simulator. Instructors control the simulator session from the Workstation by selecting patient profiles and scenarios that meet the objectives of the training module.

IMPORTANT: All METI computer components are preconfigured for use with the iStan system. There are no software installation or configuration steps required. Only approved METI applications should be installed or run on the iStan computer system.

CO_2 Canisters

Four CO_2 canisters are included with iStan for use with a disposable $ETCO_2$ detector.

Inventory Kit

iStan comes with a number of accessories and replacement components.

Included in the Inventory Kit are:

- Body bag
- iStan Start-Up Kit (Quick Start Chart, Setup Map, User Guide CD)
- iStan Logo Accessories
- Red food coloring
- Priming syringe
- Roll (4 ft) of VHB tape and roll of 2 inch wide red tape (for cricothyrotomy)
- iStan replacement skins (right arm, left arm and two cricothyrotomy skins)
- BP adapter kit
- Silicone lubricant
- Intraosseous replacements (manubrium, left tibial, right tibial)
- IV vein splice kit
- iStan priming tube
- iStan ECG posts
- Pacing/Defibrillation disks
- ICP interface cable (with optional ICP iStan)
- ICP drainage catheters (with optional ICP iStan)
- Condensation drain
- Wound umbilical assembly
- SpO_2 probe

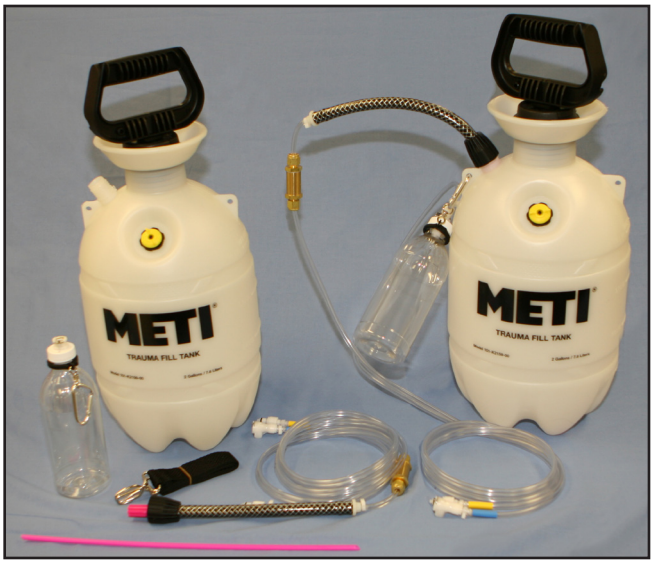
Wireless Microphone

iStan contains a wireless receiver that 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.

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

Trauma Fill Tanks

Fluids are supplied to the simulator using a trauma fill tank. Two tanks are supplied so that one tank may be used for distilled water and red food coloring (for simulated blood) and the other tank used for distilled water (for clear fluids).



These tanks should be cleaned after use, but even with cleaning, it is best to dedicate one tank to simulated blood.

Optional Equipment for iStan

Additional components enable the iStan system to be customized to fit the specific needs of a wide variety of education environments.

Waveform Display Monitor

When launched, the Waveform Display software appears on the Instructor Workstation. However, to view the patient physiological changes on a separate, larger viewing space, a Waveform Display Monitor can be purchased as an option for use with iStan. This monitor plugs directly into the Instructor Workstation using a video cable.

Once the Waveform Display Monitor is configured, the Waveform Display software appears automatically on the monitor when launched. Using the Waveform Display monitor and software, instructors and students can monitor the progress of various interventions and protocols on the patient.

Trauma Disaster Casualty Kit (TDCK)

The TDCK adds to the fidelity of a training session by providing the means to add a continuous flow of blood from the simulator while using the Moulage Kit to give a realistic look to the injury or condition (product #TF-005).

Moulage Kit

The Moulage Kit may also be ordered separately.

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

Intracranial Pressure

An Intracranial Pressure feature is available with iStan that allows for the simulation of intracranial lesions, hematomas, tumors, infection and impaired crebrospinal fluid (CSF) dynamics.

iStan Replacement Lithium Battery Pack

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

Tool Kit

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

External Compressed Air Kit

The External Compressed Air Kit gives the user the ability to connect iStan to a METI 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.

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

The External Compressed Air Kit includes a flexible 30ft (9m) hose attached to a preset air regulator, a fitting for air compressors and adapters for wall or tank air (product #AIR-006).

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.

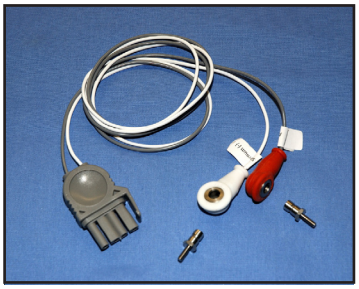
A 220VAC/50 Hz version of the Quiet In-Room Air Compressor (product #AIR-004) is also available.

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.

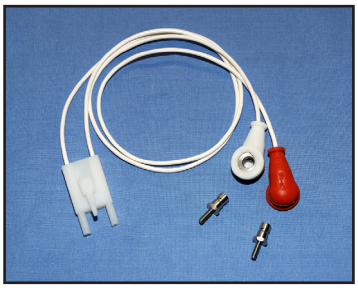
Three different cable designs are available to support the most popular defibrillation and pacing equipment. Each cable kit includes posts that attach to the defibrillator or pace locations on iStan.

Physio-Control (Medtronic, Inc.)



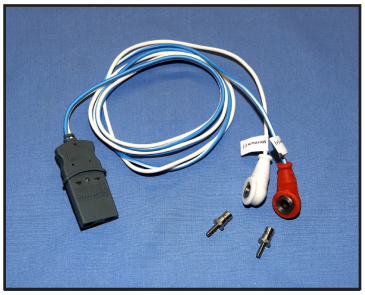
(product #ACC-005)

Zoll (Zoll Medical Corporation)



(product #ACC-006)

Philips (Koninklijke Philips Electronics, N.V.)



(product #ACC-007)

iStan Educational Development

IStan Basic and Advanced courses offer learners at all levels in-depth instruction in the setup, operation, development of scenarios and maintenance related to the use of iStan.

The iStan Basic course provides learners with an overview of the system and its components, as well as an introduction to patient creation and scenario design.

- iStan Basic - two days at METI facility (TRN-011)
- iStan Basic On-Site - two days at learner-defined facility (TRN-013)
- iStan Basic On-Site Physician Instructor - two days at learner defined facility with physician-led instruction (TRN-015)

The iStan Advanced course builds upon the concepts introduced in the prerequisite Basic course. After a quick review of the Basic course, Advanced instruction spends the majority of the two days providing learners with the ability to design patients and scenarios that can be used immediately upon completion of the course.

- iStan Advanced - two days at METI facility (TRN-012)
- iStan Advanced On-Site - two days at learner defined facility (TRN-014)
- iStan Advanced On-Site Physician Instructor - two days at learner defined facility with physician-led instruction (TRN-016)

iStan Learning Modules

METI Learning Modules enhance the use of the simulator by providing preprogrammed scenarios and corresponding support documentation (i.e. course objectives, instructor's notes) that can be readily integrated into a lesson plan, a specific curriculum or an educational program.

- iStan Disaster Medical Readiness (DMR) Learning Module - EDU-018
- iStan Advanced Cardiac Life Support (ACLS) Learning Module - EDU-020
- iStan Cardiopulmonary Critical Situations Learning Module - EDU-021
- iStan Adult Nursing Learning Module - EDU-022
- iStan Tactical Medical Care - Military (TMCM) Learning Module - EDU-024
- iStan Emergency Medical Services (EMS) Learning Module - EDU-023

The Program for Nursing Curriculum Integration for iStan

The METI Program for Nursing Curriculum Integration (PNCI®) focuses on the educational concepts and competencies of existing undergraduate nursing curriculums. Developed in partnership with leading nursing schools, the PNCI's foundation is the Integration Roadmap, a four-semester guide that identifies and charts opportunities for learning through simulation.

The Program for Nursing Curriculum Integration for iStan is product #EDU-019.

iStan Setup

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

	Setting Up iStan
1	Place iStan in the Work Area
2	Power on iStan
3	Power on the Instructor Workstation
4	Connect to the Wireless Network
	Connect and Power On Monitor (Optional)
	Insert the CO_2 Canister (Optional)
	Connect the SpO_2 Probe (Optional)
	Fill the Fluid Reservoirs (Optional)

Before Beginning Setup

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

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

Follow the sequence of steps carefully,

Complete all steps in order, and

Do not power on any components until instructed in the text.

KEEP all original shipping materials, including the BOXES - warranty and repair items must be return shipped to METI in their original packaging.

Because shipping materials should be stored and retained, be sure that all protective packing materials and unused ancillary computer parts are secured as well.

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

A **Setup Map** and **Quick Start Chart** cover these same steps in abbreviated fashion and are included in this User Guide.

Step 1: Place iStan in the Work Area

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

iStan and the Instructor Workstation may all be operated from their batteries, allowing for wireless use.

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

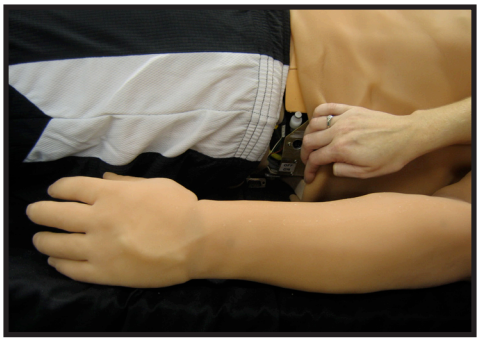
Before placing the simulator on a surface, be certain that surface can easily support 200 pounds.

NEVER lift the simulator by the LIMBS. Leverage the torso of the simulator and support the head while lifting.

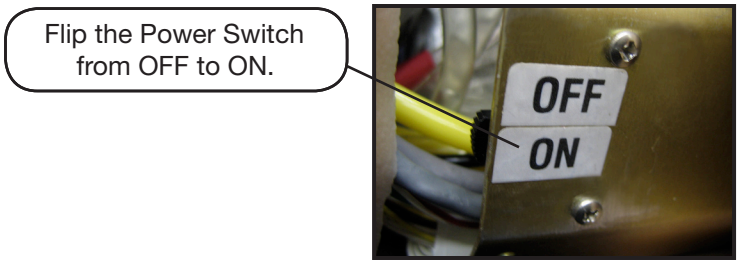
Step 2: Power on iStan

a. Carefully pull back the skin on iStan's left hip and move the protective foam aside.

b. Locate the power (toggle) switch on the edge of the side plate.



c. Flip the power switch to the ON position.



d. Carefully return the skin and foam to its position covering the switch.

iStan can be operated continuously for seven to eight hours without recharging or running from a power source.

For instructions on recharging the battery, see page 5.7.

Step 3: Power on the Instructor Workstation

a. Place the Instructor Workstation (laptop) at the location (e.g. desk, table, gurney) where it will be used.

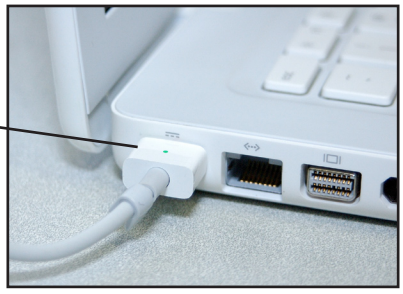
The Instructor Workstation has battery power. Check to be sure that the battery is fully charged before relying on the laptop without an AC power source.

To charge the Instructor Workstation:

(1) Plug the AC power adapter into the power port on the laptop.

(2) Plug the other end of the AC adapter into a surge-protected AC power outlet.

When battery power is low, the power cord may be attached to charge the Instructor Workstation

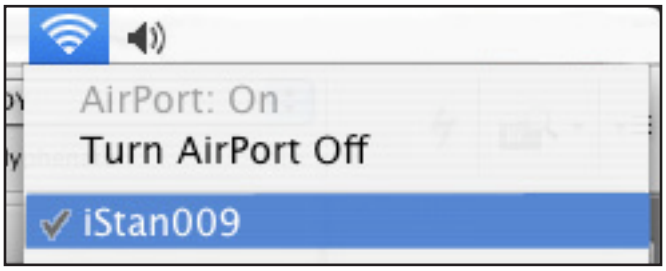


b. To turn on the Instructor Workstation, open the cover and press the power button located in the upper-right-hand corner of the keyboard area.

Step 4: Connect to the Wireless Network (If Necessary)

The wireless network should automatically connect when the Instructor Workstation is powered on. If there is an instance when the network does not automatically connect, follow these steps.

a. Click once on the airport icon located at the top-right-hand corner of the screen.



b. Select the airport network. It will be called **iSTANXXX** (where "XXX" is the unit number)

c. Enter the Password, which will be **istanxxx** (where "xxx" is the unit number).

d. Click **OK**.

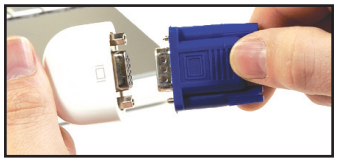
The HPS6 software can now be launched (*see Starting the Application on page 3.1)*.

Optional: Connect the Workstation to a Monitor

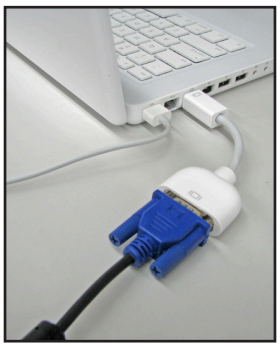
A monitor may be purchased to provide a separate means of viewing the Waveform Display software.

To connect the Waveform Display Monitor to Instructor Workstation:

a. Connect the Apple cable adapter to the video cable. Tighten the thumbscrews on the video cable to secure the connection.



b. Plug the remaining end of the Apple cable adapter into the port on the Instructor Workstation with the same icon.



c. Plug the remaining end of the video cable into the back of the Waveform Display Monitor and tighten the thumbscrews to secure the connection.

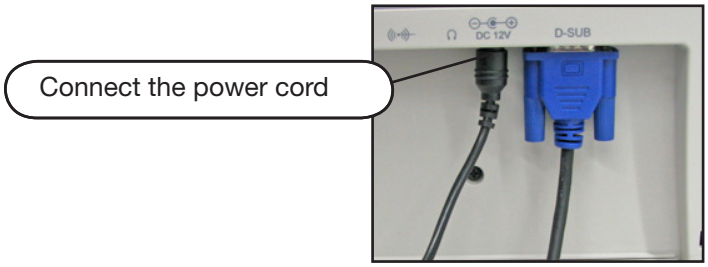
d. Press the power button on the Waveform Display Monitor. The waveform display software appears on the monitor.

For audio through the monitor, connect the audio cable and extension from the monitor's speaker port to the Instructor Workstation's external speaker port (*see Using the Waveform Display Monitor's Speakers on page 2.9)*.

Running the Monitor from a Power Source

To to run the monitor from a power source:

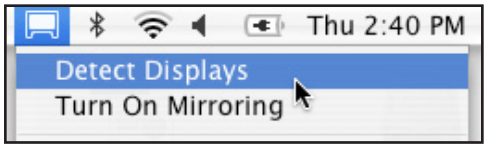
a. Connect the Waveform Display Monitor's AC power cord to the port in the back of the monitor.



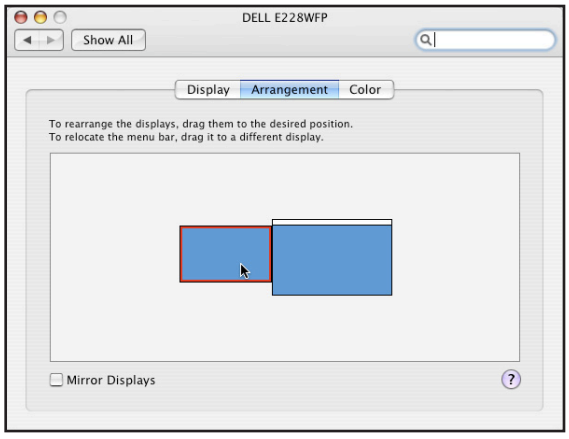
b. Plug the cable into a surge-protected AC power outlet.

Detecting the Monitor

If the Waveform Display Monitor does not display the waveform software, select the **Display** icon in the upper-right-hand corner of the screen and click on **Detect Displays.**



This option is also made available by selecting **System Preferences** under the Apple menu. When the Display window appears, select the Display icon. The Display window appears. Arrange the monitor's display by selecting **Arrangement** from the Display window and dragging the display icon to the desired location. The **Mirror Displays** box should NOT be checked.



Using the Waveform Display Monitor's Speakers

The Waveform Display Monitor has external speakers that can be connected to the Instructor Workstation so that the sounds produced come through the monitor's speakers instead of those on the Instructor Workstation.

Monitors also come with an audio cable and an audio extension cable. Use of the extension cable is dependent upon the distance between the Workstation and Display Monitor.

a. Plug one end of the audio cable into the speaker port (not the headphone port) at the back of the monitor.

b. Plug the other end of the audio cable into the analog external speaker port identified by the Headset Icon on the Instructor Workstation.

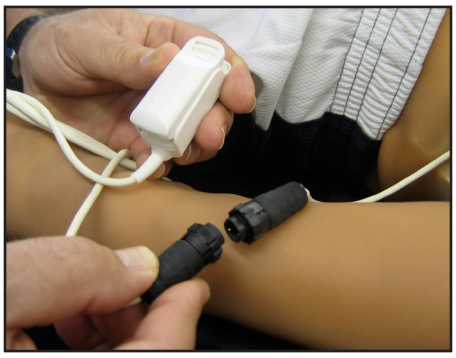
The system is now configured to display the Waveform Display software on the external monitor.

Optional: Connect the SpO_2 Probe

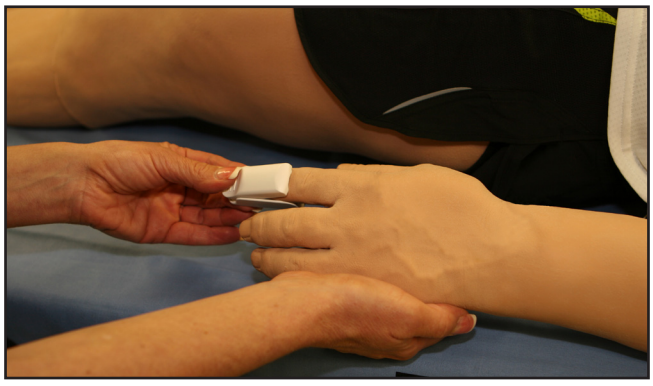
Connect and attach the SpO_2 probe before powering on iStan.

a. Lift the skin on iStan's left side and locate the SpO_2 jack in the simulator.

b. Connect the SpO_2 probe to the SpO_2 jack in the simulator.



c. Place the SpO_2 probe on iStan.



The probe is now integrated into the physiological model, the results of which are shown on the Waveform Display.

Optional: Insert the CO_2 Canister

Some scenarios rely on the simulation of exhalation of CO_2. The following instructions will show you how to safely connect the CO_2 canister to the umbilical in the simulator.

WARNING: Careful handling, including the use of hand and eye protection, is required in the use of 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.

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 towards your face or someone nearby.
- Use only METI specified CO_2 canisters.
- Do not remove cannister from regulator base until empty. Canister end becomes punctured when screwed into 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 regulator.
- Dry completely if the regulator becomes wet.
- Discontinue use of this equipment if leakage or visible damage is evident.

Insertion of the CO_2 Canister

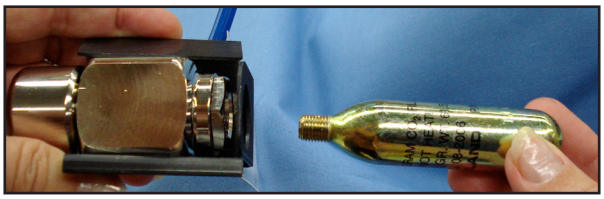
To insert the CO_2 canister:

a. Locate the regulator (shipped in the inventory bag).

b. While holding the regulator firmly, carefully screw the CO_2 canister into the regulator as far as it will go. The final turns will puncture the CO_2 canister, which is necessary for correct operation.

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

CAUTION: Unscrewing the canister before it is empty results in the sudden release of all high-pressure gas with a possibility of liquid CO_2 spray. Unprotected skin could receive freezing burns.



a. Lift the skin and move the foam at the simulator's right midsection and locate the CO_2 pneumatic umbilical hose inside the side tray.

b. Attach the blue CO_2 pneumatic umbilical hose to the connection on the regulator.

c. Place the CO_2 canister, regulator and hoses inside the simulator. Use the Velcro mounting surface to secure this assembly to the tray. A properly installed assembly will have the CO_2 canister sloping down toward the rear of the mannequin.

d. Carefully reposition the foam and pull the skin back over the simulator to its original location.

Once the canister and regulator assembly is in place, CO_2 is measurable with a disposable ET CO_2 detector during patient exhalations.

Based on the training environment, a CO_2 canister may last from 10 minutes (rapid breathing) to 25 minutes.

See important Cautions and Instructions for removing, transporting and disposing of the CO_2 canisters on page 5.23.

Optional: Prepare the Secretion System

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

A mixture of no more than 29ml (1 oz) red food coloring with 3.8 liters (1 gallon) of distilled water should be used to create “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 provides the means by which the simulated blood is transported to 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 assemble 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.

Assembling the Trauma Fill Tank

Careful assembly of the Trauma Fill Tank helps to ensure proper operation.

Step 1: Connect the Trauma Fill Tank Umbilical to the Tank Assembly

To connect the umbilical to the Trauma Fill Tank:

a. Insert the pink siphon tube approximately 1/2 inch into the pink hose insert. (Otherwise, the tank will pump only air.)

b. Lubricate (with silicone or water) the black o-ring on the pink hose insert.

c. Push into the threaded tank nipple until fully sealed.

d. Screw the hose nut onto the threaded tank nipple and firmly hand tighten.

Step 2: Attach the Overflow Bottle to the Tank Assembly

To attach the Overflow Bottle to the Trauma Fill Tank:

a. Connect the umbilical male connector to the female bottle lid fitting.

b. Clip the bottle to the tank using the attached biner mechanism.

Operating the Trauma Fill Tank

Be careful to complete the following steps correctly to ensure proper use and maintenance of the iStan 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 left thigh tank is smaller (0.8 liters) and used for clear fluids (urine, diaphoresis, tears and ear, nose and mouth secretions). The right thigh tank is larger (1.8 liters) and used for blood (chest tube drainage and ear, nose and mouth secretions).

Four (4) liters of simulated blood provides enough fluid to fill the right thigh reservoir twice. The amount of blood used in a training session will vary with the patient, the wounds simulated and the learner's experience.

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

Attach the tank's umbilical to the simulator by matching and connecting the fittings labeled in blue and yellow.

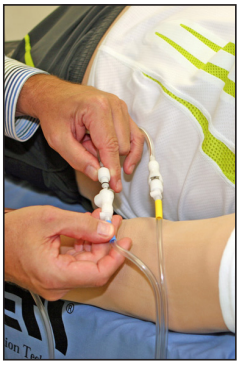
a. For clear fluids, separate the skin on the left side of the simulator at the hip to reveal a bundle of hoses.

For blood, the hoses can be located by separating the skin on the right side of the simulator at the hip.

b. Locate the blue FILL hose and yellow VENT hose.

c. Connect the FILL (with the blue label) and VENT (with the yellow label) hoses to the METI tank. Connections are male to female.

Connect the Vent Hose



Connect the Fill Hose

Both connections must be made for correct operation.

Step 3: Pressurize the Trauma Fill Tank and Fill the 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. Ensure the yellow relief valve on the front of the tank is closed.

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

c. Stroke the pump handle up and down from 25 to 35 times to transport approximately 1 liter of fluid to the reservoir. NEVER exceed 35 strokes while pressurizing the tank.

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

e. Watch the Overflow Bottle located on the tank assembly. When liquid begins to appear in this bottle, the reservoir is full. (Filling the 1.8 liter blood reservoir takes approximately 3 to 5 minutes while filling the 0.8 liter clear reservoir takes 1 to 3 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.

WARNING: NEVER leave a pressurized tank unattended.

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

Step 6: 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 *(see Cleaning the Simulator and the Fluid System on page 5.12)*.

Step 7: Clean the Trauma Fill Tank

Before storing the Trauma Fill Tank, make sure the equipment is clean *(see Cleaning the Trauma Fill Tank and Umbilical on page 5.19)*.

Step 8: 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 will contaminate 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.

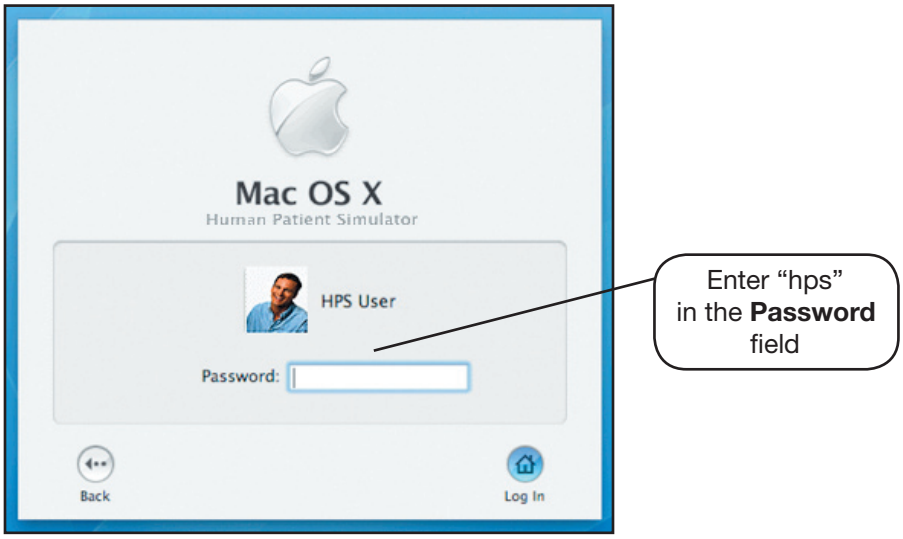
iStan Software Features

Starting the Application

Power on the Instructor Workstation (see the **iStan Setup** section for details).

After the OS X operating system loads, a small Users window appears, displaying two choices, Administrator and HPS User.

Select **HPS User**. The Login window opens, displaying the Password field.



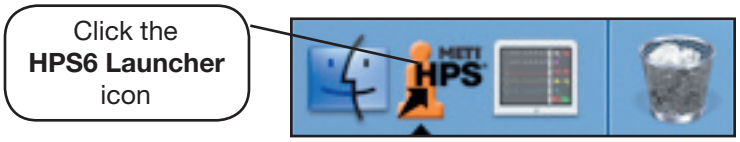
The Login Window

Enter “hps” in the **Password** field.

Click the **Login** button or press the **return** key on the keyboard.

The Instructor Workstation should automatically connect to the wireless network. If the network does not automatically connect, *follow the instructions on page 2.6* to establish a wireless connection.

To start the HPS6 application, click the **HPS6 Launcher** icon located in the Dock.

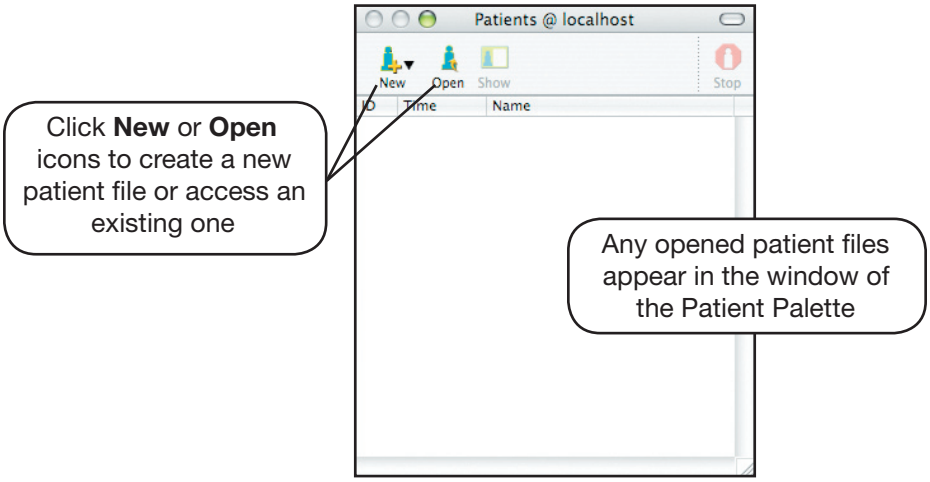


The Dock

The HPS6 application launches, displaying the HPS menu bar and the Patient Palette.

Patient Start Up

When the HPS6 application is launched, a small window called the Patient Palette appears. The Patient Palette displays a list of all the currently running patients.



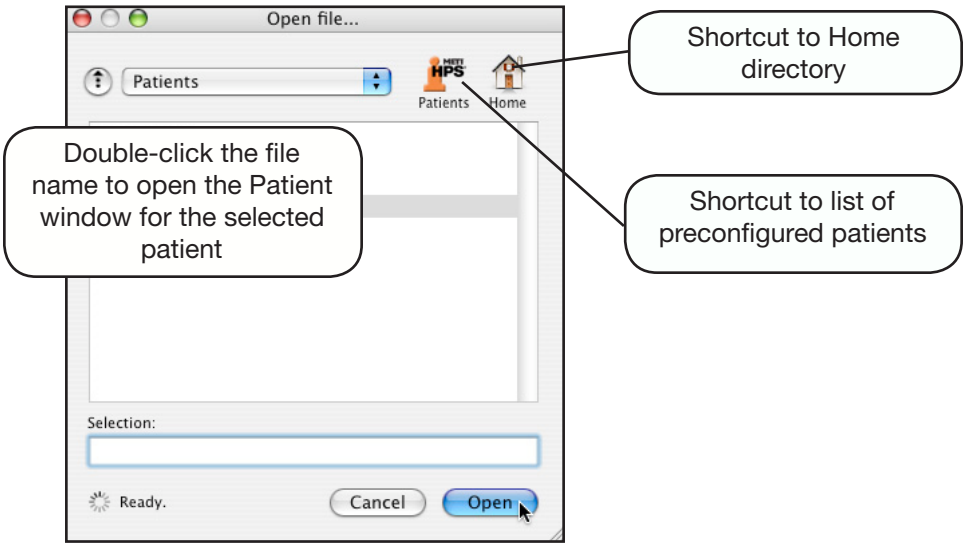
The Patient Palette

The toolbar icons (**New**, **Open**, **Show** and **Stop**) represent options that are also available on the HPS menu bar. The **Show** and **Stop** icons are disabled until a patient file is opened.

Patient files can also be opened using the menu options or the shortcut keys found on the menu.

Opening a Patient File

Once the software is launched, open a preconfigured or any saved, user-defined patient by clicking the **Open** icon in the upper-left corner of the Patient Palette. The **Open file...** window appears, displaying the available patient files.

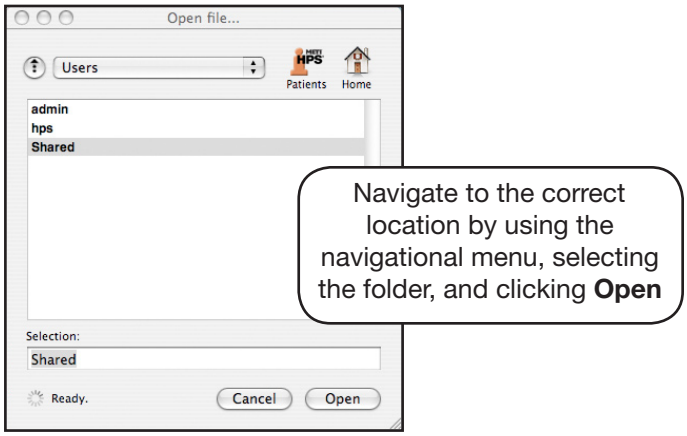


Opening a Patient File

Use the drop-down menu to navigate to the desired Patient file. You may also click the **Patients** icon to navigate directly to METI preconfigured Patients. Click the **Home** icon to navigate to the HPS User's top-level directory. Once you have located the desired Patient file, click on the file to select it and click the **Open** icon or double-click the file name to start the patient and open the Patient window.

Locating Patient Files

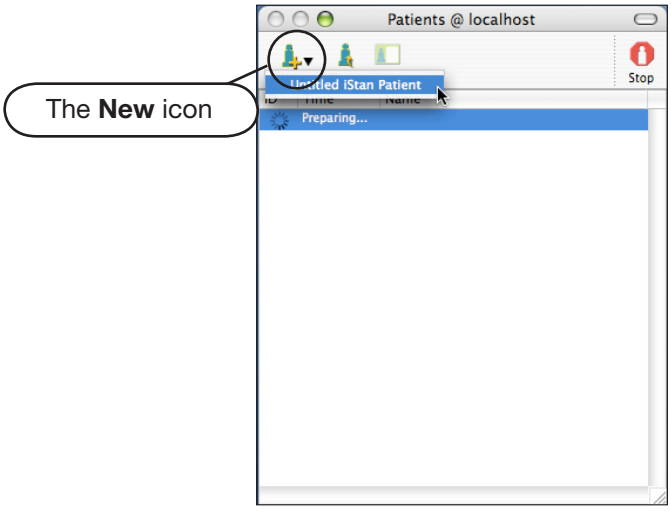
The preconfigured patient files are stored in the **Patients** directory within the HPSVersion6 folder. However, newly created files are saved in the **Users/Shared** directory, accessed using the drop-down menu on the **Open File** window to navigate to the proper location.



Locating Patient Files

Creating a New Patient

To create a new patient, click on the **New** icon and select the **Untitled iStan Patient** option.



Creating a New Patient

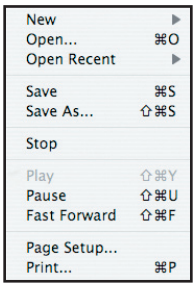
The Patient Palette indicates that the system is preparing the untitled iStan patient based on the underlying patient, iStan. By starting with iStan, who displays normal, healthy vital signs and physiology, new patients each have an established point from which to customize parameters. Once the new patient is prepared, the Patient window opens with the new, undefined patient.

Using the Patient Menu

The **Patient** menu located on the menu bar also contains the options for opening and creating new patients.

The Menu Bar

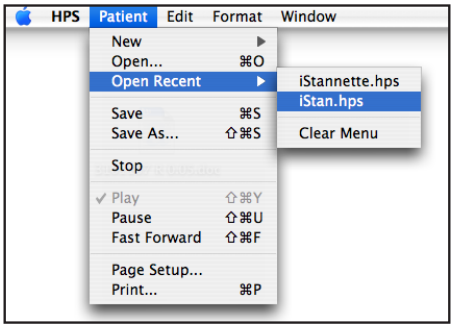
Several of these options can be used as alternatives to the buttons and icons on the Patient Palette and the Patient window. Options can be chosen by either selecting them with the cursor or by using the shortcut keys (described below) shown on the right next to the corresponding option.



The Patient Menu

Opening a Recent Patient File

As a shortcut, patients files that have been used recently can be opened from the menu bar by selecting the **Open Recent** option from the **Patient** menu.



Opening a Recently Viewed Patient

The last ten patient files that have been opened are displayed in a menu to the right of **Open Recent**. Once a patient file is selected, the Patient window opens to display the corresponding patient.

Utilizing Shortcut Keys

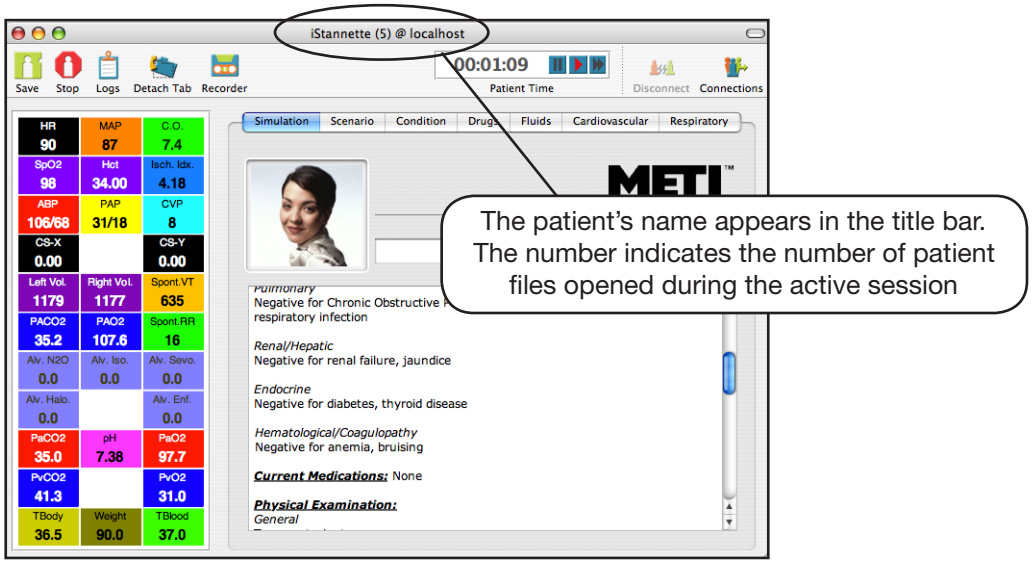
Many options shown on the HPS menu offer shortcut key alternatives that are displayed to the right of the option's name.

Save As... Option with Shortcut Keys

For example, the **Save As** option is performed by simultaneously selecting the **Shift**, **Command** (⌘), and **S** keys, represented by the symbols on the right.

The Patient Window

Once the patient file is prepared and loaded, the Patient window appears with the name of the patient (e.g. iStannette) as well as the name of the host server (e.g. localhost).



The Patient Window

This window opens by default to display the Heads Up Display and the **Simulation** tab.

Using the Patient Toolbar Icons

The Patient toolbar is located beneath the title bar, displaying several icons used to provide basic system functionality.

Menu options for these functions can also be found on the menu bar.

The Patient Toolbar

Save

Clicking the **Save** icon saves the active patient file. Files can also be saved using the Save option located in the **Patient** menu or by simultaneously holding down the Command (⌘) and **S** keys.

When the **Save** icon is clicked, the current version of the patient file overwrites (replaces) the previous version. Preconfigured patients, such as iStannette, cannot be overwritten, so selecting **Save** prompts a warning requiring the patient to be saved to the Users/Shared directory as a new patient file.

When saving a new patient file, the **Save file as ...** window appears, providing the means of naming the patient file and navigating to a location in the directory where the file can be stored.

Stop

Clicking the **Stop** icon prompts a warning to save the patient file.

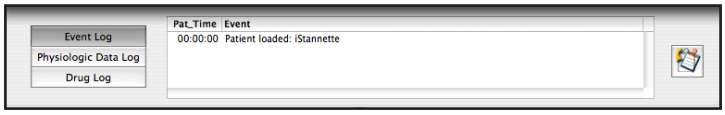
Lost Changes Warning Box

Clicking the **Save** button on the Warning box functions in the same way as choosing the **Save** icon (see Save above) while clicking **Cancel** returns the user to the Patient window without saving the file. Clicking **Don't Save** closes the active Patient window without recording any unsaved changes to the patient file.

The patient file can also be stopped by clicking the **Stop** icon on the Patient Palette.

Logs

Clicking the **Logs** icon opens the Logs Drawer at the bottom of the Patient window.



The Logs Drawer

The buttons on the Logs Drawer provide access to the **Event Log**, **Physiologic Data Log** and **Drug Log**. The menu option for showing the Logs Drawer is found under the **Window** menu in the menu bar. When the Logs Drawer opens, the Event Log appears by default.

The **Logs Drawer** displays three buttons on the left:

Event Log (default) - chronological list of parameter adjustments, patient assessments, interventions and administered drugs

Physiologic Data Log - record of patient's heart rate, blood pressure, arterial blood gas values and temperatures

Drug Log - chronological list of all drugs administered to the patient, either as a bolus, via an infusion, or autoinjected.

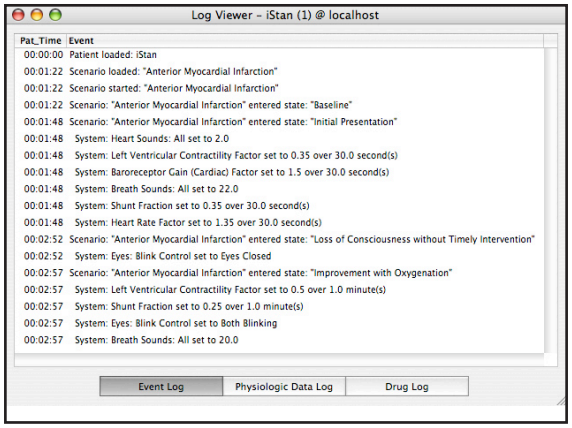
Each time the patient is started, the system automatically captures the information that is stored in these three logs. The files that represent this data are saved in the **Logs** folder located inside the HPSVersion6 folder on the hard drive.

Clicking the **Log Viewer** button on the **Logs Drawer** creates a separate window for the selected log.

Opening a Log Viewer

The Event Log

The Event Log displays a chronological list of events that are time-stamped based on the simulated running time of the patient in hours, minutes and seconds.



The Event Log

Parameter modifications and some patient assessment or user interventions such as pulse palpation, defibrillation or pacing are listed in the Event Log, which also document if the intervention was initiated by the user or resulted from a change specified in a running scenario.

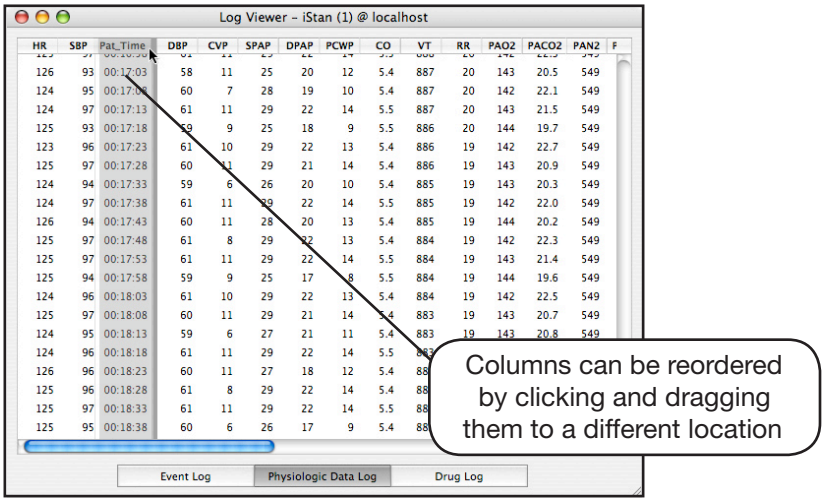
The **Event Log** does not record events such as the application of a facemask to the patient, changes in ventilator settings or the auscultation of heart or breath sounds. Patient assessment or similar user interventions must be recorded independently.

The Physiologic Data Log

The **Physiologic Data Log** lists more than 20 different physiological parameters, and is updated every five seconds and recorded based on the simulated time of the patient in hours, minutes and seconds.

Selecting an item on the log pauses the updating process, the auto-scrolling, until that item is clicked again, removing its selection.

The order in which the physiological data appears can be rearranged in both the Logs Drawer and the Log Viewer. To rearrange, click on the column header and drag the column to the desired location.



Moving Data in the Physiologic Data Log

Because a large amount of data is recorded in the **Physiologic Data Log**, the horizontal and vertical scroll bars can be used to locate needed information.

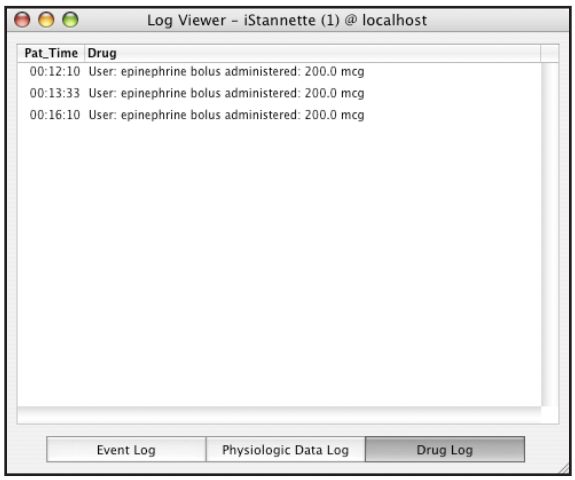
The Drug Log

The **Drug Log** records all drugs administered to the patient, either as a bolus, via an infusion, or autoinjected.

Bolus dose logs display when the drug was given, the drug's name, the dose amount administered and the origin of the dosage (i.e. User or Scenario).

Drug infusion logs record when the infusion was started (or discontinued), the drug's name and the rate of infusion, either as dose per unit time or as the dose per kilogram per unit time (normalized infusion). An infusion is considered to be "running" at the set rate until the infusion is altered, turned off or the patient is stopped.

Each entry is recorded based on the simulated time of the patient in hours, minutes and seconds.

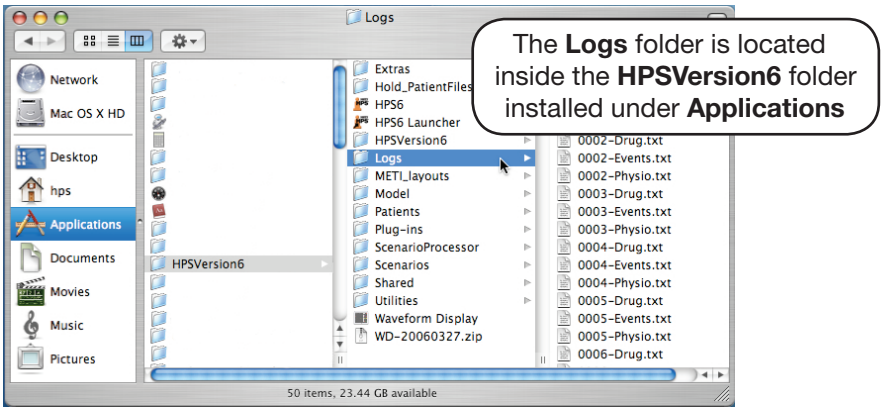


Bolus Data in the Drug Log

Bolus doses in the **Drug Log** are recorded as individual entries and are not the cumulative dose given to the patient. In the example shown above, a single epinephrine dose of 200 mcg followed by a second epinephrine dose of 200 mcg appears as two separate entries of 200 mcg and 200 mcg (as shown in the image above), NOT as one entry of 200 mcg followed by a total of 400 mcg.

The Logs Folder

The **Logs** folder holds the data files from each of the logs for every patient session. Located in the HPSVersion6 folder, the **Logs** folder is accessed by navigating the Mac OS X drive.

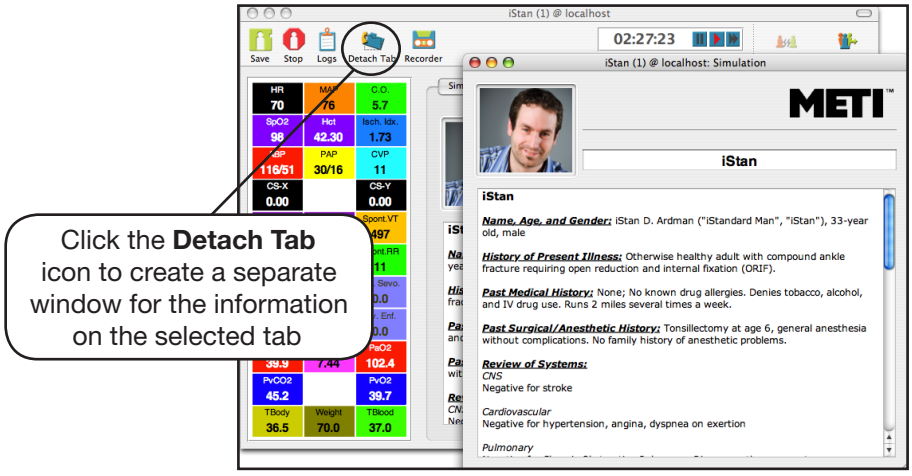


The Logs Folder

The three log files created for each patient session correspond to the Drug, Event and Physiologic Data logs for that session. A number is created sequentially as a prefix to each file (in groups of three) with the largest number representing the most recent session. The log files are tab-delimited, which allows them to be imported into Excel.

Detach Tab

When the **Detach Tab** icon is clicked, a separate window appears displaying the active tab.



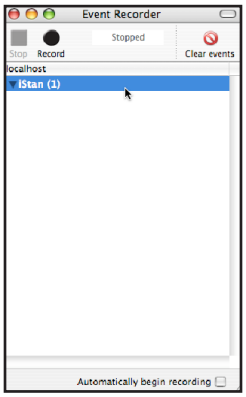
A Detached Simulation Tab

When a tab such as the **Condition** tab has multiple menu options (e.g. **Trauma** and **Assessment**), then the active option is displayed in the new window. Multiple tabs can be detached and used to isolate specific controls.

The menu option for detaching tabs is found under the **Window** menu in the HPS menu bar.

Recorder

Clicking the **Recorder** icon opens the Event Recorder, a separate window that initially displays a list of the patients opened during the current session.



Event Recorder

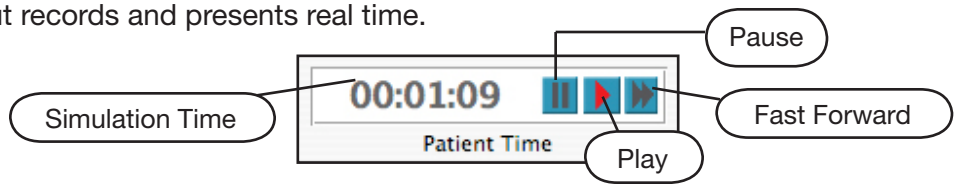
To record events, select the patient and click the **Record** button. Each event created using the parameters available under the various tabs is recorded and listed in the Event Recorder window.

To stop the recording process, click the **Stop** button. To clear an event, select the event and click the **Clear event** button. To clear all events, select the patient name and click the **Clear events** button.

The menu option for displaying the Event Recorder is located under the **Window** menu *(see Using the Event Recorder on page 3.63)*.

Patient Time

The **Patient Time** display keeps track of the simulation time. By default, the digital readout records and presents real time.



Patient Time

Three buttons appear to the right of the readout showing icons for the **Pause**, **Play** and **Fast Forward** functions. The active button has a red icon.

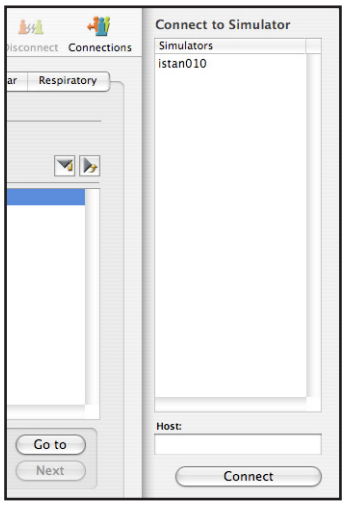
Pause - "freezes" the simulation in its current state. Any ongoing parameter changes, drug effects or scenario events remain suspended until either the Play or Fast Forward buttons are clicked. While time is paused, all parameters cycle through a continuous loop of approximately 10 seconds. Changes made during the use of Pause are not saved or put into effect.

Play - keeps track of the simulation time for the patient. Parameter changes, drug effects and scenario events play out at their normal, model-driven rate.

Fast Forward - runs the physiological models at approximately four times normal speed. Parameter changes, drug effects and scenario events continue at an accelerated pace until either the **Pause** or **Play** buttons is clicked. Spontaneously breathing patients breathe at an accelerated rate.

Connection Icons

The two connection icons, **Disconnect** and **Connections**, appear on the right side of the Patient toolbar. Clicking the **Connections** icon opens the **Connect to Simulator** drawer.



Connection Icons and Connect to Simulator Drawer

A list of available simulators appears in the Connect to Simulator drawer.

Select the appropriate simulator and click **Connect**, or

Double-click on the appropriate simulator.

Even if only one simulator is present (which is often the case), the connection process must be followed.

When the software and simulator are successfully connected, the connection drawer closes and the **Disconnect** icon is enabled.

To close the drawer without connecting to the simulator, click on the **Connections** icon. To disconnect the software from a patient mannequin, click on the **Disconnect** icon.

To switch the simulator from one active patient to another:

Click the **Disconnect** icon on the toolbar or the **Disconnect** button on the Drawer.

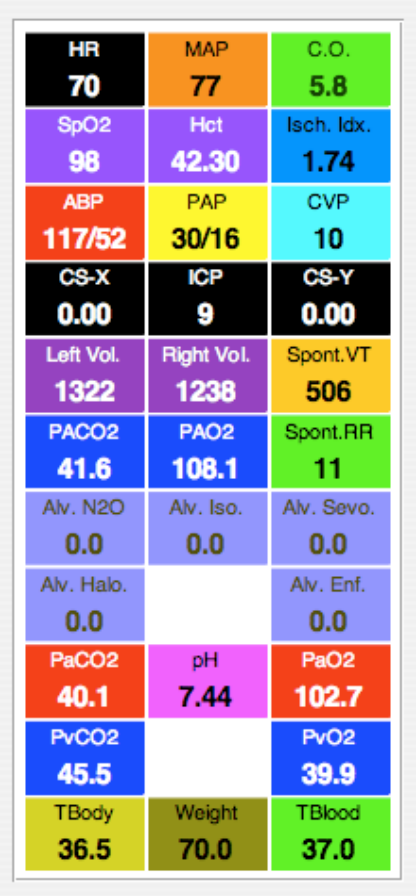
Select the desired patient file in the Patient Palette and click the **Show** icon.

Click the **Connections** icon to open the drawer.

Select the simulator in the **Connect to Simulator** drawer and click the **Connections** icon or the **Connect** button at the bottom of the drawer.

Viewing the Heads Up Display (HUD)

The Heads Up Display (HUD), located on the left side of the Patient window, displays 31 selected patient parameters that register the patient's physiological condition.



The Heads Up Display (HUD)

When adjustments are made to the parameters in the software, the underlying models determine all the appropriate physiological changes, and the effects of the adjustments appear on the HUD.

HUD Parameters			
Parameter	**Name**	**Units**	**Notes**
HR	Heart Rate	bpm (beats/min)	
MAP	Mean Arterial Pressure	mmHg	
C.O.	Cardiac Output	lpm (liters/min)	
SpO_2	Pulse Oximeter Saturation	%	
Hct	Hematocrit	%	Determined dynamically based on blood and fluid losses and intravenous infusion of colloids, crystalloids, packed red blood cells and whole blood, hence helping determine the O_2 transport in the blood.
Isch. Idx.	Ischemic Index	(unitless)	See page 3.17
ABP	Arterial Blood Pressure	mmHg	
PAP	Pulmonary Arterial Pressure	mmHg	
CVP	Central Venous Pressure	mmHg	
CS-X	Cervical Spine X Coordinate		Based on sensored horizontal movement of the head.
ICP	Intracranial Pressure	mmHg	
CS-Y	Cervical Spine Y Coordinate		Based on sensored vertical movement of the head.
Left Vol.	Left Lung Volume	ml	Measured volume inside the mannequin, ideally, the alveolar volume.
Right Vol.	Right Lung Volume	ml	Measured volume inside the mannequin, ideally, the alveolar volume.
Spont. VT	Spontaneous Tidal Volume	ml	Not a measured volume, but a desired tidal volume generated by the models. Tidal volumes measured at the patient circuit (mechanical ventilation) generally do not match the value displayed on the HUD and often report a value less than the desired tidal volume.
$PACO_2$	Alveolar Carbon Dioxide	mmHg	The partial pressures of respiratory gases (CO_2 and O_2) in the patient's alveoli. A software model of the lungs controls these values.
PAO_2	Alveolar Oxygen	mmHg	The partial pressures of respiratory gases (CO_2 and O_2) in the patient's alveoli. A software model of the lungs controls these values.
Spont. RR	Spontaneous Respiratory Rate	bpm (breaths/min)	Determined by the underlying physiological models. For a spontaneously breathing patient, this value should match the observed respiratory rate of the mannequin. For a mechanically ventilated patient, Spont. RR does not match the value displayed on the ventilator.
Alv. N_2O	Alveolar Nitrous Oxide	mmHg	The partial pressures of the anesthetic agent in the mannequin's lungs.
Alv. Iso.	Alveolar Isoflurane	mmHg	The partial pressures of the anesthetic agent in the mannequin's lungs.
Alv. Sevo.	Alveolar Sevoflurane	mmHg	The partial pressures of the anesthetic agent in the mannequin's lungs.
Alv. Halo.	Alveolar Halothane	mmHg	The partial pressures of the anesthetic agent in the mannequin's lungs.
Alv. Enf.	Alveolar Enflurane	mmHg	The partial pressures of the anesthetic agent in the mannequin's lungs.
pH	pH	(unitless)	Respiratory acidosis or alkalosis simulated in real time depending on the alveolar concentration of CO_2.
PaO_2	Arterial Oxygen	mmHg	
$PaCO_2$	Arterial Carbon Dioxide	mmHg	
PvO_2	Venous Oxygen	mmHg	
$PvCO_2$	Venous Carbon Dioxide	mmHg	
TBody	Body Temperature	˚C	Not tied to the underlying physiological models. Fahrenheit unavailable.
Weight	Patient Weight	kg	Sets the patient's weight used by the pharmacological models. The patient's body mass index and body structure (e.g. lean, muscular, obese, tall or short) cannot be altered or defined.
TBlood	Blood Temperature	˚C	Linked to the oxyhemoglobin dissociation curve. Thus, hyperthermia causes a rightward shift, while hypothermia causes a leftward shift to the standard oxyhemoglobin dissociation curve. Beyond this, not tied to the underlying physiological models. Fahrenheit unavailable.

The Ischemic Index

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

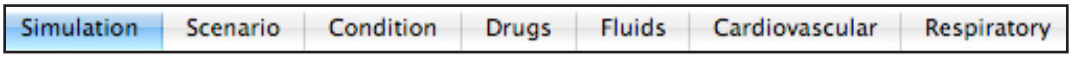
Favorable supply/demand ratios (slower heart rates, higher blood oxygenation levels) generally result in a higher Ischemic Index value, whereas unfavorable supply/demand ratios (faster heart rates, lower blood oxygenation levels) generally result in a lower Ischemic Index value.

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 in the **Cardiovascular** tab under the **Heart** menu. 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.

Working with Tabs

Beneath the toolbar on the right side of the Patient window is a series of tabs that provide access to the physiological controls used during a simulator exercise.



The Seven Tabs

The tabs display seven different categories offering varying functionality:

Simulation (default) - view patient information and medical history

Scenario - run and create patient scenarios

Condition - set parameters for assessment and trauma conditions

Drugs - administer drugs

Fluids - affect plasma and blood volumes as well as urine output

Cardiovascular - set a wide array of parameters affecting cardiovascular physiology

Respiratory - control airway, lung and respiratory control parameters

Clicking on a tab displays the functionality available for selecting and setting parameters within the identified category. Several categories are further divided into sub-categories found on a pull-down menu.

Numeric and Discrete Parameters

On the **Condition**, **Cardiovascular** and **Respiratory** tabs, parameter settings provide a large number of alternatives creating a wide range of physiological responses.

There are two types of parameters:

> **Numeric** - set either a measured value (e.g. 20 ml) or a multiplied value (e.g. Heart Rate Factor 2.0 is two times the baseline Heart Rate)
>
> **Discrete** - select one of two or multiple options

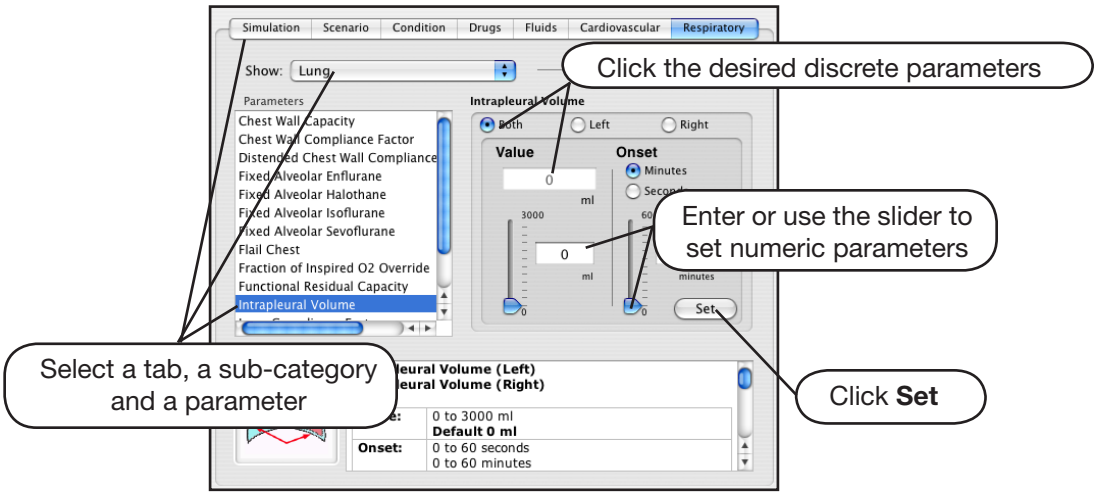
Once a parameter is selected and set, the patient's physiology changes according to the model for that parameter.

Numeric parameters are generally changed by clicking in the relevant field and entering a new value in place of the existing one. In some cases, a slider is available that moves through the range of parameter values until established at the desired numeric value.

Discrete parameters are changed by clicking on the appropriate option (radio button).

Parameter Settings

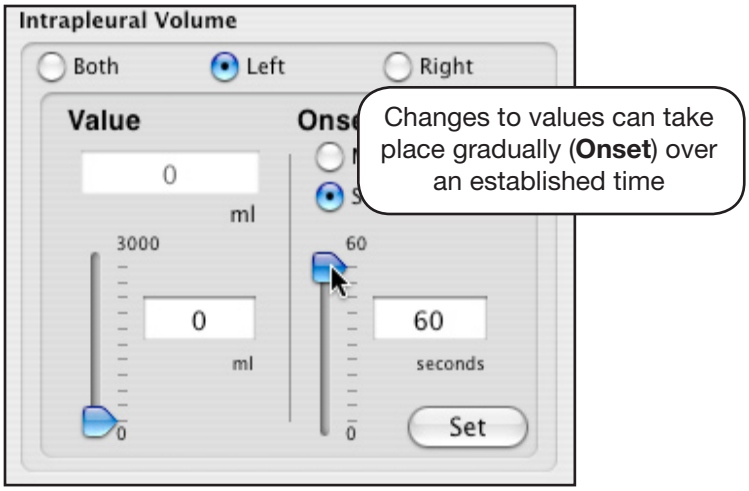
Once a parameter is selected, the panel to the right displays the available settings.



Setting Parameters

Click the radio buttons for the desired discrete parameters and enter or use the slider to establish the numeric parameters. Then, click the **Set** button.

The new parameter values immediately begin to affect the patient's physiology. Depending on the parameter and its settings, changes can be dramatically instantaneous or can take place more slowly over time.



Values Increasing Over 60 Seconds

In the example above, **Intrapleural Volume** in the left lung is set at 730 ml over 60 seconds. Gradually, the effects of this change will appear on the HUD as the volumes for the left lung decreases. If the **Onset** time had been set to 0 (the default), the change would have taken place immediately.

In some instances, the parameter setting produces a model-driven response.

Five parameters have this capability:

Fixed Neuromuscular Blockade (located under **Assessment** on the **Condition** tab and under **Respiratory Control** on the **Respiratory** tab)

Fixed Heart Rate (located under **Heart** on the **Cardiovascular** tab)

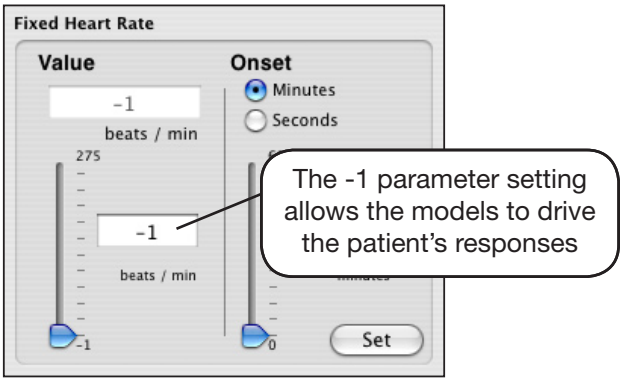
Fraction of Inspired O_2 Override (located under **Lung** on the **Respiratory** tab)

Respiratory Rate Override (located under **Respiratory Control** on the Respiratory tab)

Tidal Volume Override (located under **Respiratory Control** on the **Respiratory** tab)

These parameters all have a default setting of -1 that signals the software to perform physiological changes based on the models without instructor intervention.

In the example below, setting the **Fixed Heart Rate** to -1 means the heart rate automatically rises when the selected patient becomes hypovolemic. The loss of volume is factored into the mathematical models and results in a compensatory rise in the simulator's heart rate.



Setting an Automatic Response

Setting the value to any other number (e.g. 60 beats/min) fixes the parameter at that number regardless of the underlying patient physiology and learner interventions such as drug administration.

Saving Data

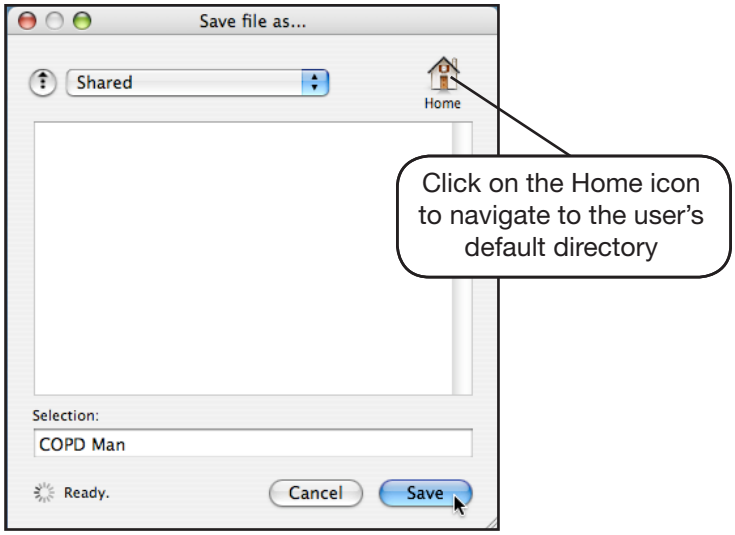
Patient information can be saved locally on the hard drive or transferred to external storage via a CD or a USB memory device. Files are created in a simple text (TXT) format. Consequently, transferred files can be printed on any computer (PC or Mac) that has printing capability.

Backing up files is especially important when custom patients and scenarios have been created. Whenever important files exist, it is recommended that the files be stored on a second source and a hard copy of the records be generated.

Saving Patient Files

Before the Patient window is closed, the patient file can be saved using either the **Save** icon on the Patient window or the **Save** or **Save As** options located on the **Patient** menu. Clicking the **Stop** icon on the Patient window also prompts a warning that provides an option to save.

If the file is being saved for the first time, the **Save file as ...** window appears. Navigate to the Shared directory. As a shortcut, clicking on the Home icon navigates automatically to the user's default directory.



Saving a New Patient File

Enter the new name in the **Selection** field and click **Save**.

All customized patients and scenarios should be saved in the Users/Shared folder.

By default, patient files are stored in the preset /Users/Shared folder. However, files can be stored in any folder on the hard drive. The navigational pull-down menu at the top of the window provides the means for locating the appropriate folder.

Saving as Text or PDF Files

HPS files can be saved in a text (TXT) format, so the files can be opened by any word processing software.

Saving as a Text file removes most formatting. To print in the most readable format, open the file and reformat the document. The contents of the text document can also be selected, copied, and pasted into word processing software for further modification.

Screenshots of the current screen may be saved in a PDF format by selecting Print from the Patient menu to activate the Print dialog. On the Print dialog, open the PDF pull-down menu on the lower left and select the Save as PDF option. The Save dialog appears, providing a **Save As** field for the file's name and a **Where** navigational field to locate the place where the file is to be saved. Click Save to save the screenshot as a PDF.

Moving Files Using a USB Memory Device

Once files have been saved on the Instructor Workstation, they can be moved to another computer using a USB memory device.

To transfer files using a USB memory device:

Insert the USB memory device into an available USB port on the Instructor Workstation. An icon appears on the desktop indicating that the memory device has been recognized.

USB Memory Device Icon

Locate the appropriate folder on the hard drive under HPSVersion6 containing the file(s) to be saved.

Drag the file(s) from the folder on the hard drive to the memory device icon on the desktop. The files are copied automatically onto the device.

Double-click on the memory device icon to open the window for the device and confirm the files have been copied.

Drag the icon to the Trash to disconnect the memory device.

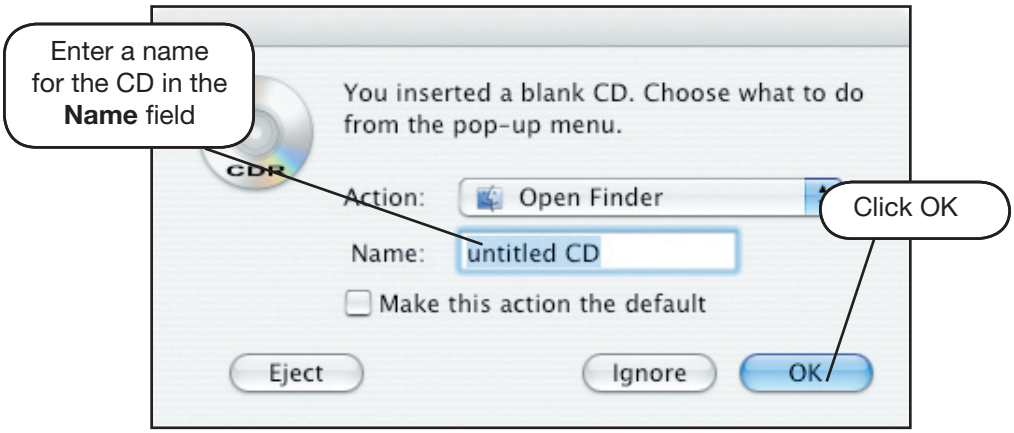
Remove the memory device from the USB port.

Moving Files Using a CD

Saved files can be moved to another computer using a CD.

To transfer files using a CD-ROM:

Insert a blank CD in the CD drive on the front of the Instructor Workstation. A dialog box appears with a field highlighted by default for labeling the CD.



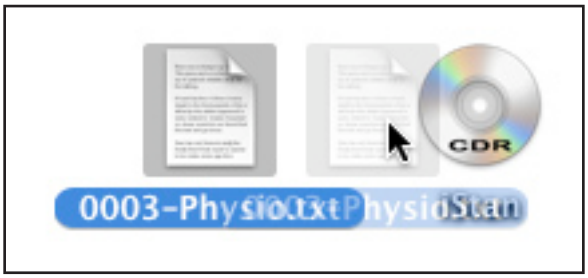
Naming the CD

Enter the new name in the **Name** field (overwriting the default name).

Click **OK**.

Locate the folder with the information you wish to save (e.g. log files, custom patients, custom scenarios).

Select and drag the appropriate files from the drive to the CD.



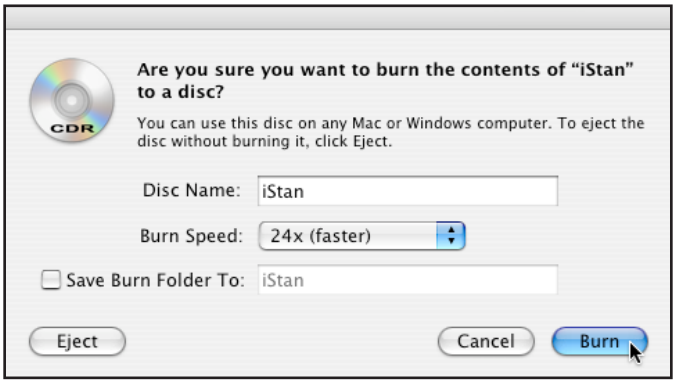
Dragging Files to a CD

Double-click on the CD icon to open the window for the CD and confirm the files have been copied.

Drag the CD file to the Trash icon on the Dock. When the CD file is over the Trash, the icon changes to a Burn CD icon.

Burn CD Icon

A dialog box appears with the options to Burn, Cancel or Eject.



Burn CD Dialog

CDs can also be burned by selecting the **File** menu from the Finder and then selecting the Burn Disc option.
Click the **Burn** button on the dialog box. Once burning is complete, the CD reappears on the desktop.

To remove the CD from the CD-ROM drive, drag the CD file to the Trash icon in the Dock. The icon changes to an Eject icon, and the CD is ejected.

CDs can also be ejected by selecting the CD file and choosing the **Eject** option from the Finder's **File** menu or by pressing the **Eject** key.

Printing Files

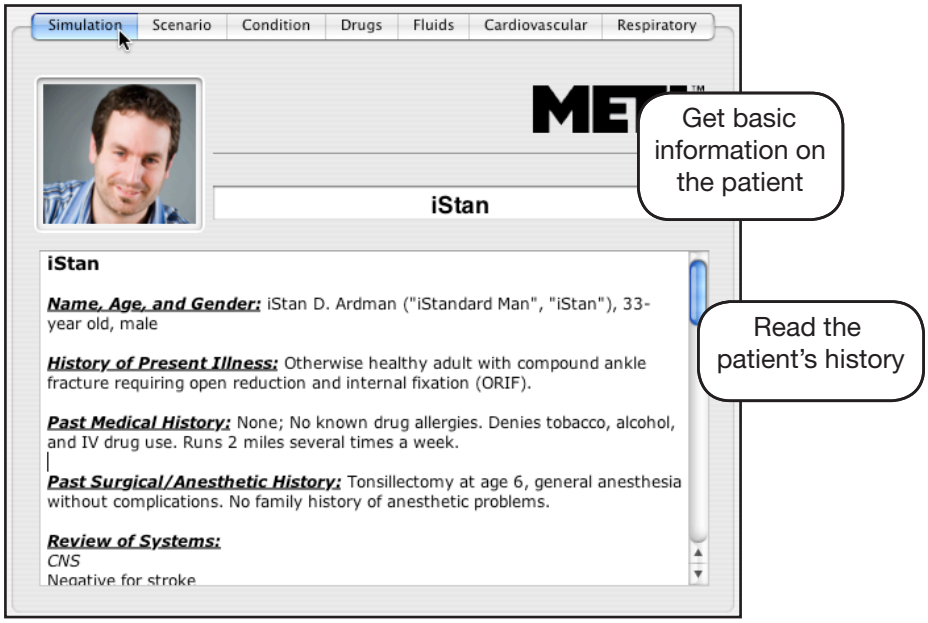
Printing should not be performed from the Instructor Workstation. Instead, transfer the needed files to a CD or USB memory device and insert the CD or memory device into a computer with printing capabilities.

Tabs

Patient physiology and background is created and controlled through the HPS6 software using the patient parameter settings in tabbed sections that organize all of the various parameters by system and functionality.

The Simulation Tab

The **Simulation** tab appears when the patient file is opened. This tab provides basic information about the patient such as the patient's name, history and photograph.

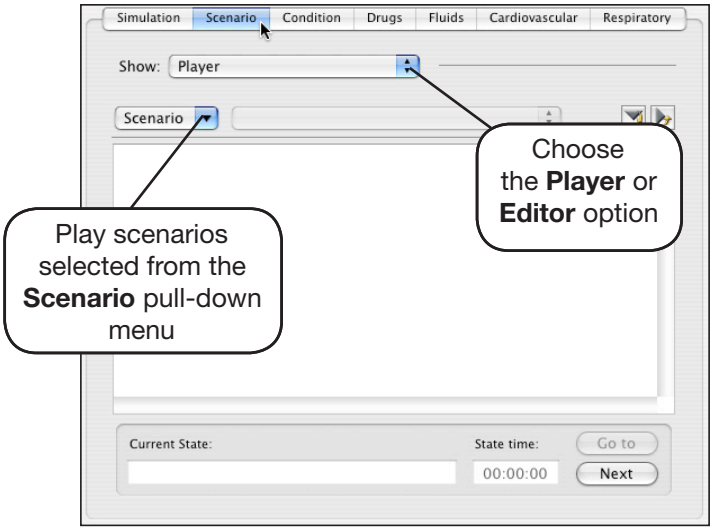


The Simulation Tab

Information on user-created patients must be provided by the instructor.

The Scenario Tab

Selecting the **Scenario** tab opens a window providing the tools needed to create or play patient scenarios that duplicate clinical situations by automatically simulating patient responses to a series of events.



The Scenario Tab

By default, **Player** is selected in the **Show** pull-down menu and the Scenario Player is displayed on the **Scenario** tab.

Initially, 12 preconfigured scenarios can be opened from the Scenario menu:

- Angina with Cardiac Arrest
- Anterior Myocardial Infarction
- Asthmatic with Pneumothorax
- COPD Exacerbation with Respiratory Failure
- Heart Failure with Pulmonary Edema
- Inferior Myocardial Infarction
- Organophosphate Exposure
- Pneumonia with Septic Shock
- Severe Young Asthmatic
- Splenic Rupture with Pneumothorax
- Stab Wound to the Chest
- Subdural Hematoma

Additional scenarios can be created or scenarios can be modified using the Scenario Editor (discussed later in this section).

Playing Scenarios

Any patient may be selected for any available scenario; however, patients with preestablished conditions may not work well with scenarios anticipating a patient with a different physiological status. For example, selecting a patient with profound neuromuscular blockade for a scenario expecting a spontaneously breathing patient will not yield the results expected by the scenario author.

To play a scenario:

Open the scenario using the **Scenario** pull-down menu on the Scenario tab.

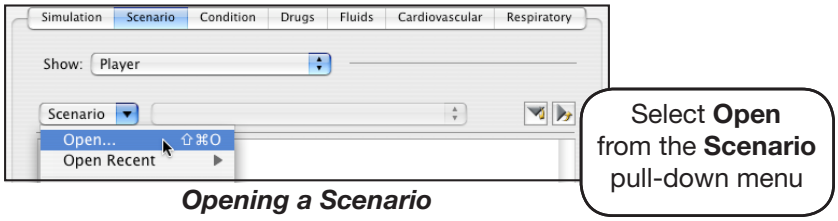
Navigate between the states of the scenario by using the buttons at the bottom of the **Scenario** tab.

Add interventions (learner, instructor, or automatic) when desired.

Patients respond realistically to all scenario events and interventions.

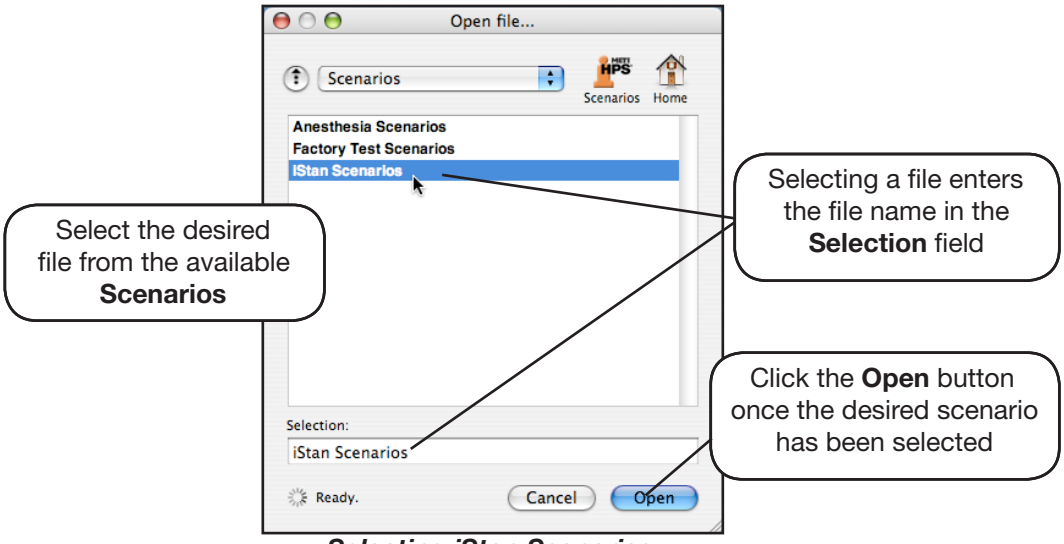
Opening a Scenario

To open a scenario, select either **Open** or **Open Recent** from the **Scenario** pull-down menu.



Opening a Scenario

Selecting **Open** activates the **Open file** window, displaying the available scenario files.



Selecting iStan Scenarios

In the **Open file** window:

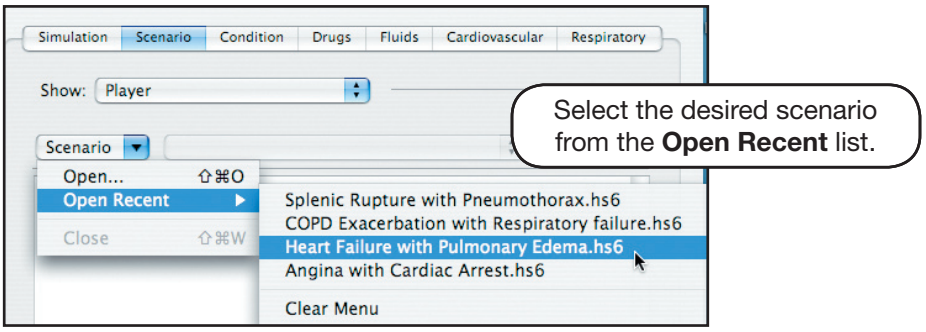
Locate the folder that contains the scenarios using the navigational pull-down at the top of the window. (The preconfigured scenarios are located in the iStan Scenarios folder.)

Select the desired scenario file.

Click **Open** (or double-click on the scenario file).

The chosen scenario appears in the Scenario panel.

When you select **Open Recent** from the **Scenario** pull-down menu, the most recently used (with a limit of ten) scenarios appear as options.



Opening a Recently Used Scenario

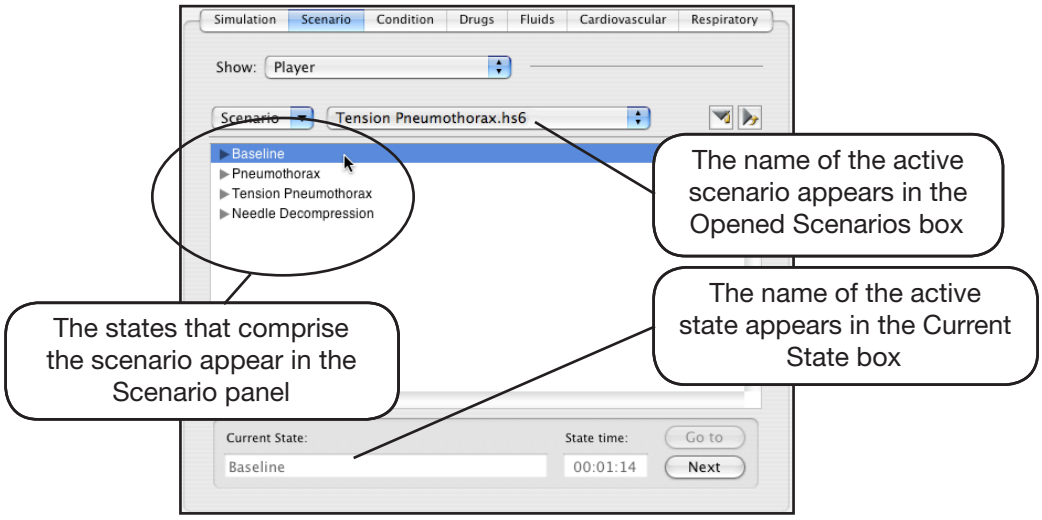
Select the desired scenario from the list.

The chosen scenario appears in the Scenario panel.

Multiple scenarios can be opened at one time. Additionally, it is possible to run multiple patients with multiple scenarios, but doing so may result in a drop in the computer's performance.

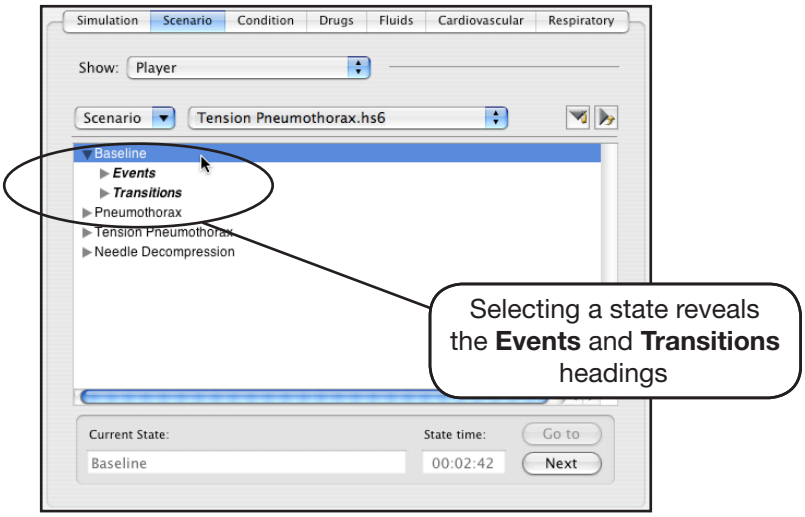
Understanding the Scenario Script

When a scenario appears, the states that comprise the scenario appear in the Scenario panel.



An Opened Scenario

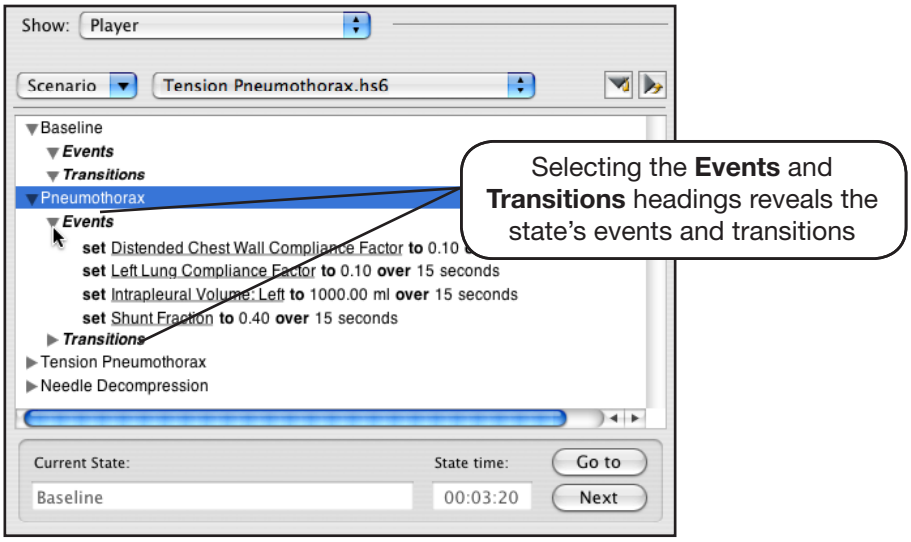
The simulation begins in the first listed state. In the example above, this state has been labeled Baseline. Selecting a state reveals the Events and Transitions headings for that state.



Selecting a State

Each state contains both headings, but not all states have events and/or transitions.

Select a state's **Events** or **Transitions** heading to see the events or transitions for that particular state.



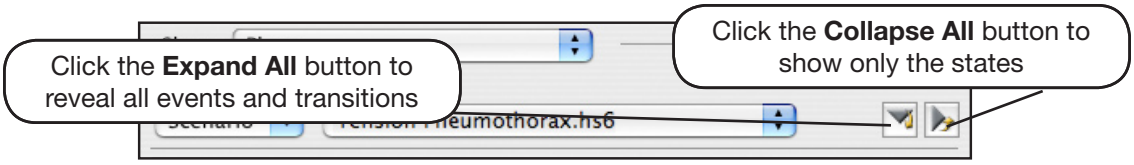
Expanding Events and Transitions

States may contain any number of events and/or transitions.

Events set specific parameters that take place when a state is active. Certain events are set to take place over a period of time.

Transitions offer conditional parameters that take place only when (and if) conditions are met. In other words, when a parameter fulfills a condition (e.g. if Time in State > 240 seconds), a specific action takes place (e.g. then go to Ventricular Tachycardia). *For more information on Transitions, see page 3.53*.

To view all the events and transitions for a scenario, click the **Expand All** button.



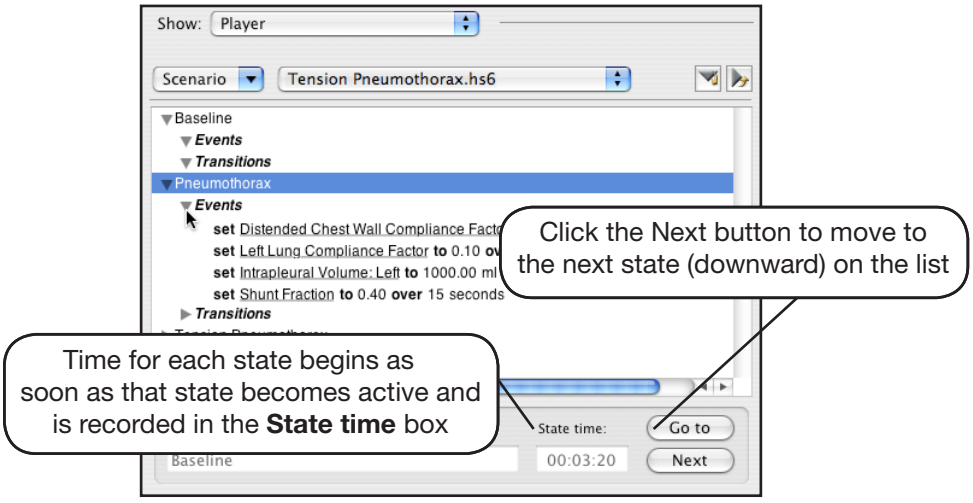
Expand All and Collapse All Buttons

Click the **Collapse All** button to return to a view showing only the scenario's states.

Navigating Between States

Generally, scenarios are designed with states that begin at the top and ending at the bottom. The preconfigured scenarios included with iStan are designed in this fashion. However, scenarios can be created that intentionally skip or repeat states, often depending on the nature of the intervention. Since scenarios are usually developed with a specific order in mind, reversing or altering that order may cause unrealistic results.

To move from the active state to the state that follows, click the **Next** button.

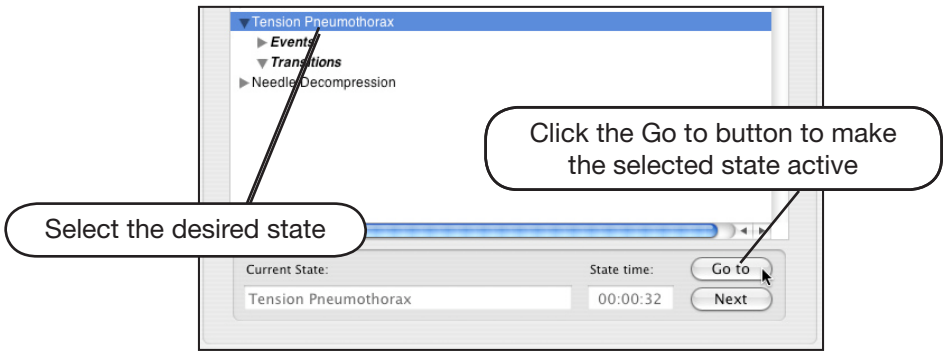


Moving from One State to the Next State

The name of the new active state appears in the **Current State** box and the time that state has been active is shown in the State time box.

In the example above, clicking **Next** while the **Pneumothorax** state is active makes the **Tension Pneumothorax** state, the next state in sequence, the active state.

To move from the active state to any other state (no matter the sequence), select the desired state and click the **Go to** button.

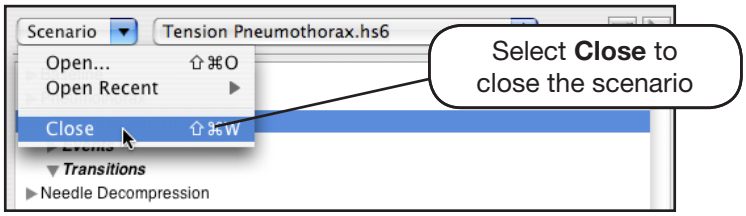


Changing States with the Go to Button

The selected state becomes active and its name appears in the **Current State** box.

Closing Scenarios

Scenarios run until closed. To close a scenario, select the **Close** option from the **Scenario** menu.



Closing a Scenario

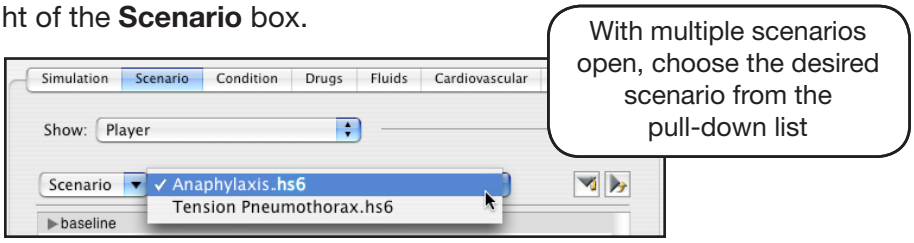
Even though a scenario has closed, the physiological changes made to the patient during the scenario remain.

Working with Multiple Scenarios

The patient's condition may be affected by events from any active scenario; therefore, running multiple scenarios enables the instructor to alter patient physiology using the states defined in more than one scenario.

Switching Scenarios

To switch between multiple open scenarios, select the desired scenario from the pull-down list to the right of the **Scenario** box.



Switching between Open Scenarios

The selected scenario becomes available for manual adjustments, but the physiological changes dictated by both scenarios continue to take place.

It is also possible to simultaneously run multiple patients with scenarios, but this is not recommended because computer performance is often hampered when two or more patients and the Waveform Monitor Display are operating.

Repeating Scenarios

The physiological changes made to the patient remain unless returned to their baseline numbers by further events and transitions in the scenario. In other words, the condition of the patient retains the effects of the scenario events unless specifically reset.

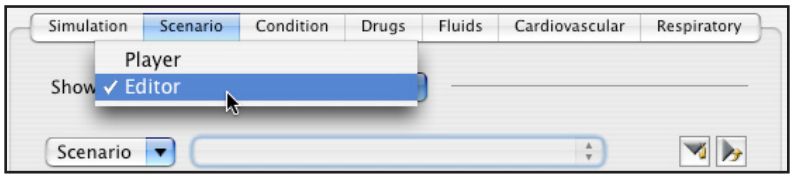
To be sure that a scenario is identically repeated, close the original scenario and stop the patient. Then, reopen the same patient and open the same scenario.

Editing Scenarios

In addition to the twelve preconfigured scenarios, new or revised scenarios can be created and saved using the Scenario Editor.

To create or edit a scenario:

Select the **Editor** option from the Show menu at the top of the Scenario tab.



Selecting the Scenario Editor

Select the **New**, **Open** or **Open Recent** option from the **Scenario** menu to choose whether to create a new scenario or to open and edit an existing one.

Add states, events and transitions as desired by selecting the **New State, New Event** and **New Transition** options from the **Scenario** menu.

Save the new or modified scenario using the **Save** or **Save As** options from the **Scenario** menu. Naming the file using the **Save file** as navigational window during the Save function also names the scenario.

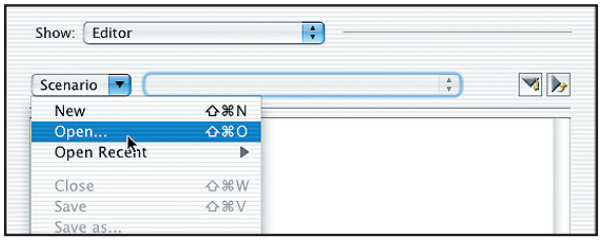
Once a scenario has been saved to a folder on the hard drive, that scenario is available for all patients.

A more detailed explanation of the method of editing and creating scenarios is contained in the pages that follow.

Modifying Existing Scenarios

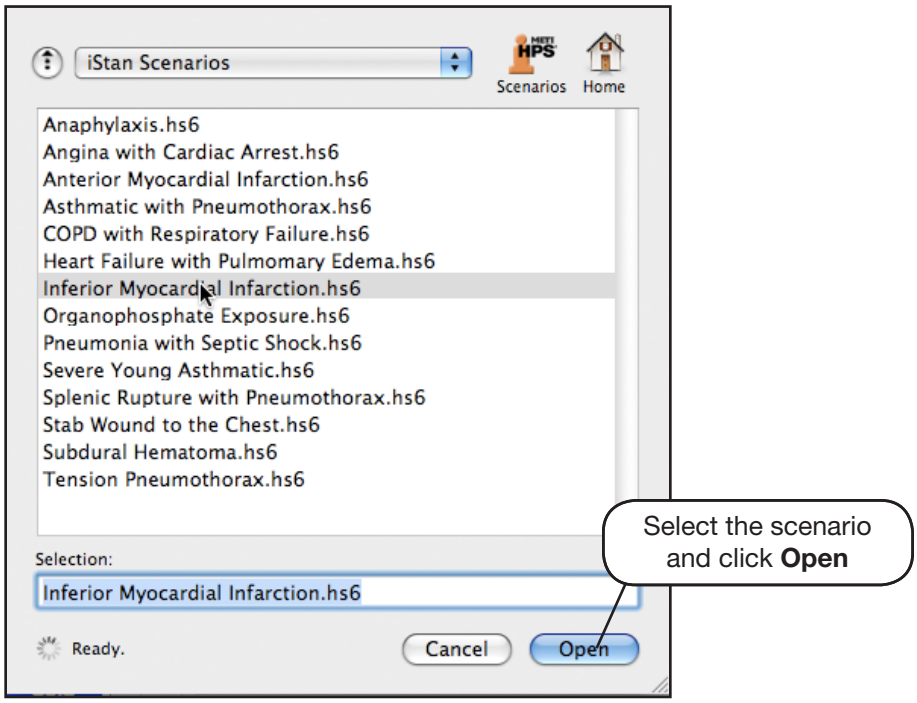
Either to permanently change or to create a new version of an existing scenario, in the Scenario Editor:

Open an existing scenario by selecting the **Open** or **Open Recent** option from the **Scenario** menu.



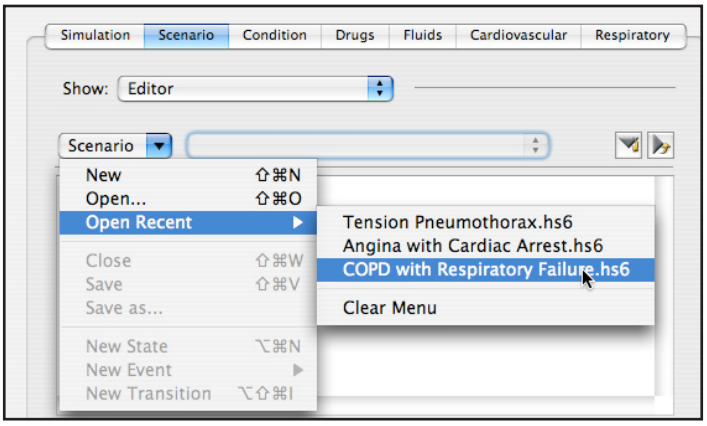
Opening an Existing Scenario

When **Open** is selected, the **Open file** window appears, providing the navigational tools to locate, select and open the appropriate scenario file.



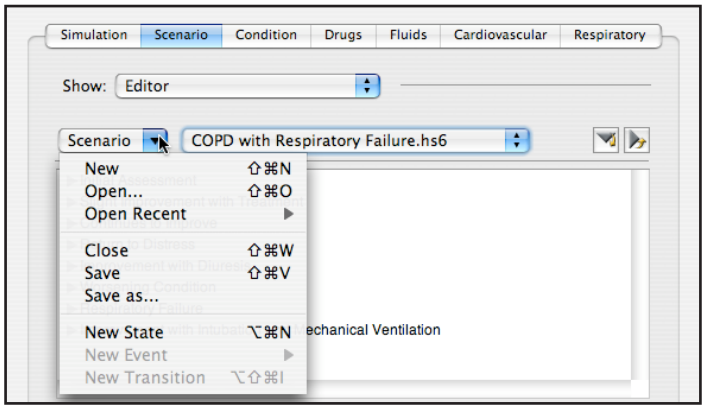
Opening the Scenario File

Selecting the **Open Recent** option displays the most recently used (with a limit of ten) scenarios as options.



Opening a Recently Used Scenario

The scenario file opens in the Scenario Editor. When the opened scenario appears, options become active for adding, editing and saving states, events and transitions on the Scenario menu.

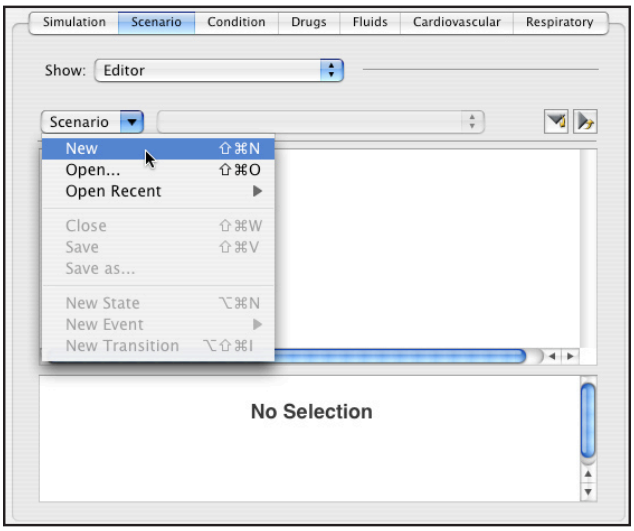


The Editor Scenario Menu

See below for details on adding or editing new states (*see page 3.38*), new events (*see page 3.41*) or new transitions (*see page 3.53*).

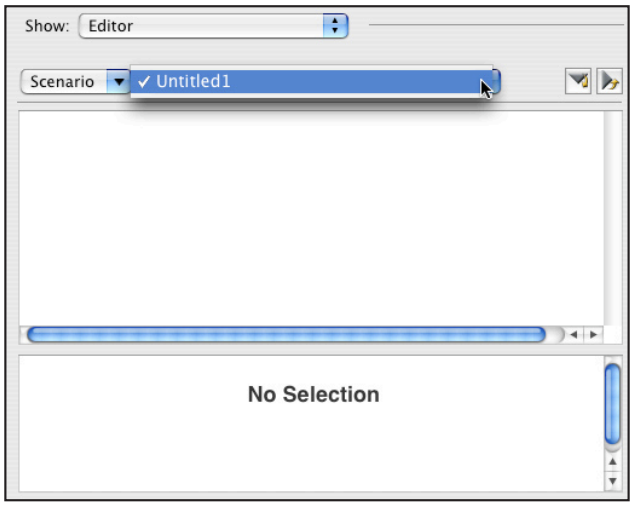
Developing New Scenarios

To create a new scenario in the Scenario Editor, select **New** from the **Scenario** menu.



Opening a New Scenario

The new scenario initially displays only an **Untitled** name and a blank Scenario panel.



The New Scenario's Initial Panel

Once the Untitled scenario appears, options are available on the **Scenario** menu for adding states, events and transitions as well as for saving the new scenario.

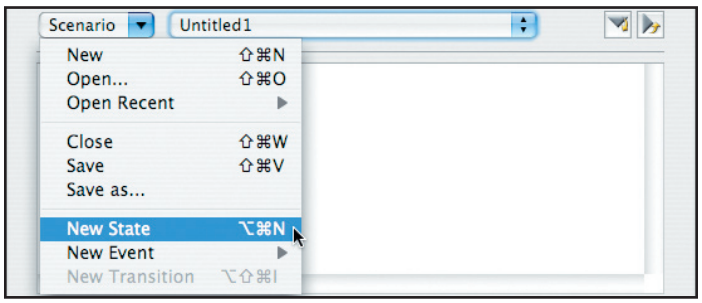
See below for details on adding or editing new states (*see page 3.38*), new events (*see page 3.41*) or new transitions (*see page 3.53*) or for saving the scenario (*see page 3.61*).

Adding, Editing and Deleting States

Scenarios are organized by the states that are simulated with the patient as diagnoses and interventions take place. As organizing structures, states by themselves do not cause changes to the patient's physiology. Those occur based on the events and transitions defined for the state.

States are added in a set sequence and cannot be moved. Creating states in the order they occur in the scenario enables easier navigation using the **Next** button, but navigation can occur in any order and scenarios may involve skipped or repeated states, dependent on user intervention (*see page 3.32*).

To create a new state, select the **New State** option from the **Scenario** menu.

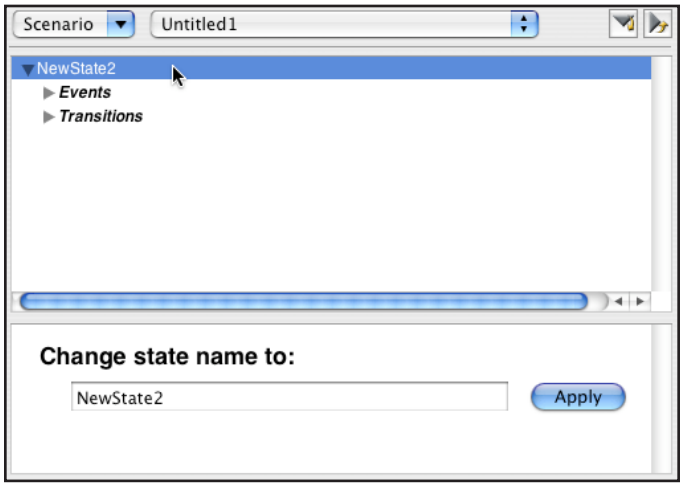


Creating a New State

The new state (initially named **NewState**) appears in the Scenario panel.

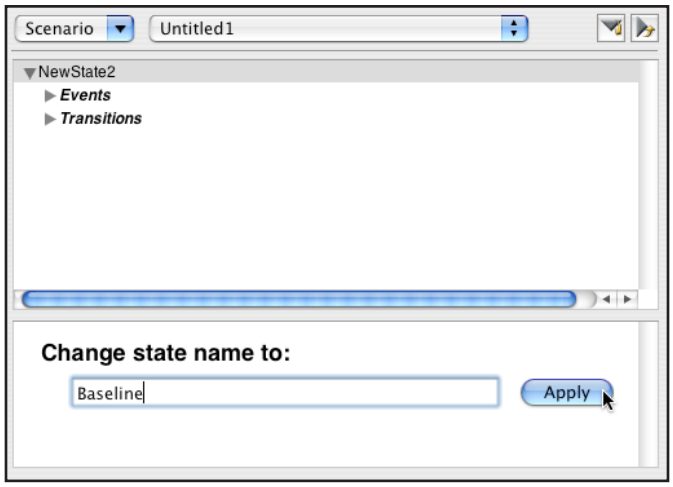
Selecting a New State

Select **NewState** to display the **Events** and **Transitions** headings and to activate the **Change state name to** field in the lower panel.



Display a New State

Enter the new name in the **Change state name to** field and click the **Apply** button.



Renaming a New State

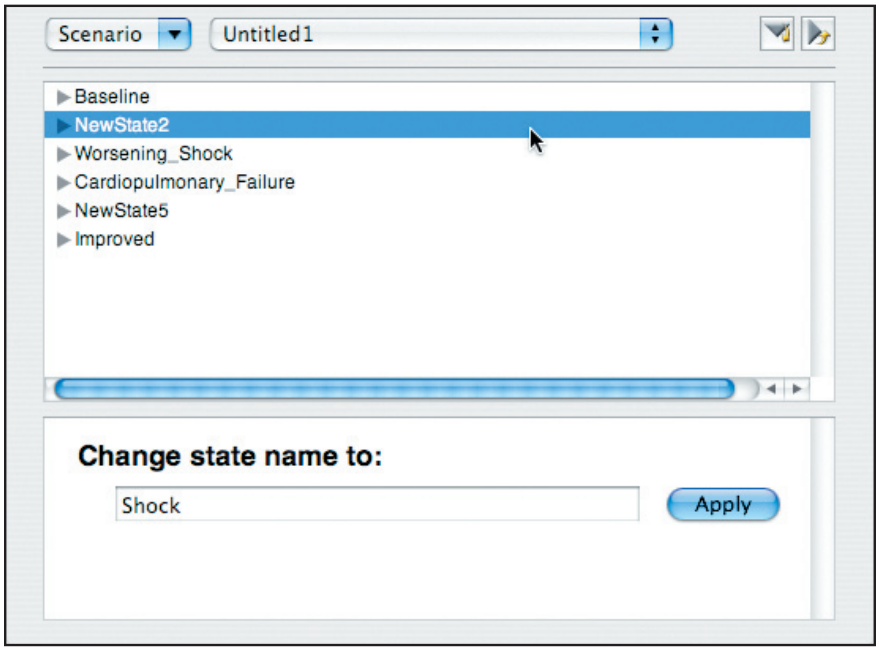
The new name appears in the Scenario panel.

To edit the name, select the state in the Scenario panel, highlight the old name in the **Change state name to** field, enter the new name, and click **Apply**.

After creating the state, events and transitions are added to define the state. (See below for details regarding adding events and transitions.)

Additional states in the scenario are added in order and cannot be moved.

If the exact sequence of states is unknown when the scenario is first being created, it may be helpful to add unidentified states between known states to ensure a proper progression of states when the scenario is finished. These unidentified states can then be later defined as necessary intermediate states or deleted if they are unneeded.



Editing State Names and Deleting States

States can be deleted by first selecting the state and then choosing **clear** from the **edit** menu or pressing the **delete** key.

All events and transitions defined for the deleted state are also deleted.

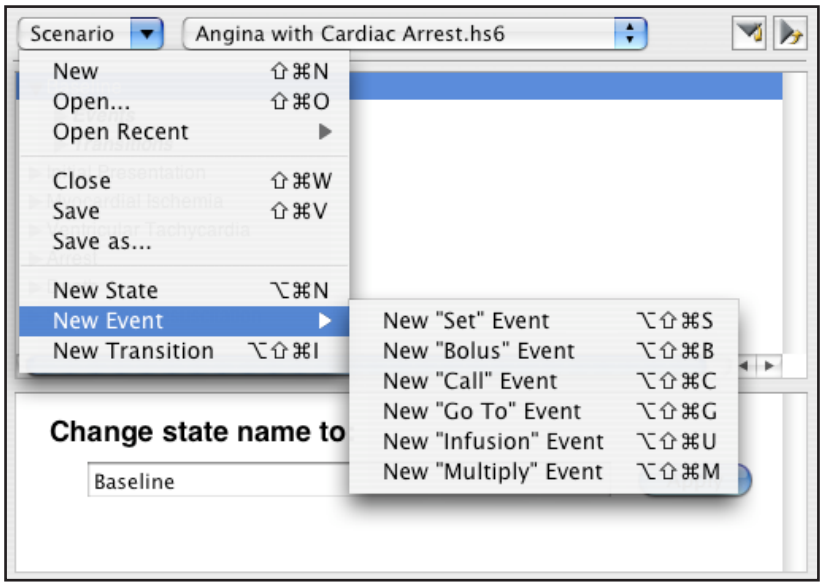
Adding, Editing and Deleting Events

Events set the specific parameters that take place when the state is active. An event may alter a parameter (e.g. Increase the Heart Rate Factor), administer a drug (bolus or infusion) or trigger the move to a new destination within the scenario.

To add events to a state:

Select the state in the Scenario panel

Choose an option from the list displayed by selecting the **New Event** option from the **Scenario** menu.



Editing Event Names and Deleting Events

Set the parameters for the event. (The type of parameter is determined by the type of event.)

Editing an Event

Once an event has been created, it can be modified by selecting it and entering new values for its parameters. This occurs in the same way that the event was created and defined.

Deleting an Event

To delete an event, select the event and press the **delete** key. Deletions are irreversible. Always be sure that the event is not needed before performing the delete function.

Events can also be deleted by selecting them and then selecting the **Clear** option from the **Edit** menu.

There are six different options for new events:

New "Set" Event

New "Bolus" Event

New "Call" Event

New "Go To" Event

New "Infusion" Event

New "Multiply" Event

Each of these options has a unique purpose and different parameter settings.

"Set" Events

A "set" event establishes a specific parameter within a scenario. All adjustable parameters (i.e. numerical and discrete) can have a "set" event. A parameter that has a "set" value remains unaffected at that setting until changed by another event, such as another set event or a user intervention.

In some cases, the "set" event can have an "onset" time, thereby allowing for smoother hemodynamic or respiratory changes. For example, the event **set Heart Rate Factor to 1.5 over 1 minute** changes the Heart Rate Factor parameter from the patient's default value to a value of 1.5 over a minute's time. In these cases, the destination value (e.g. 1.5) can be greater than or less than the starting value.

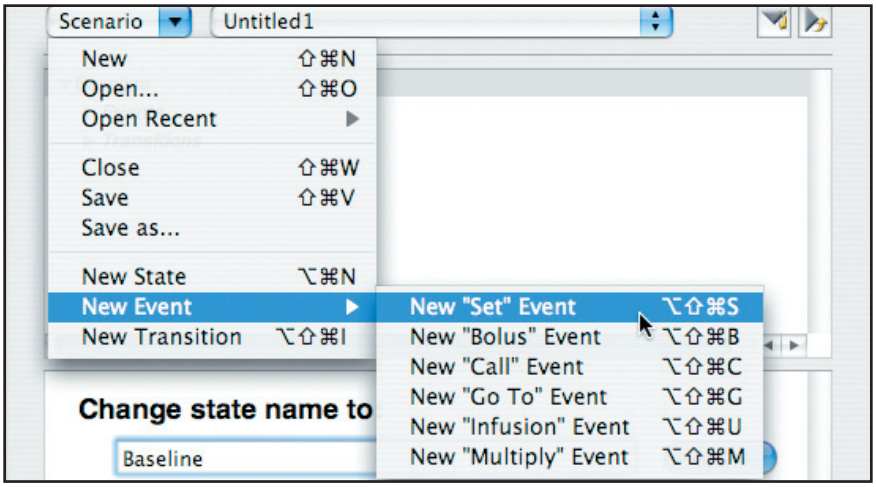
When a parameter is set to a specific value, the instructor can change the parameter to a new value to override the scenario's instructions. However, if an "onset" time is established in the scenario instructions, it is NOT possible to override the command until the onset of the value has completed.

"Set" events should be avoided in transitions. As an example, to set the eyes to closed when SpO_2 is less than 90 percent, create a transition called "If SpO_2 < 90%, then go to state Eyes Closed." The "Eyes Closed" state would then contain an event "set Eyes: Blink Control to Eyes Closed."

To establish a “set” event:

Select the appropriate state.

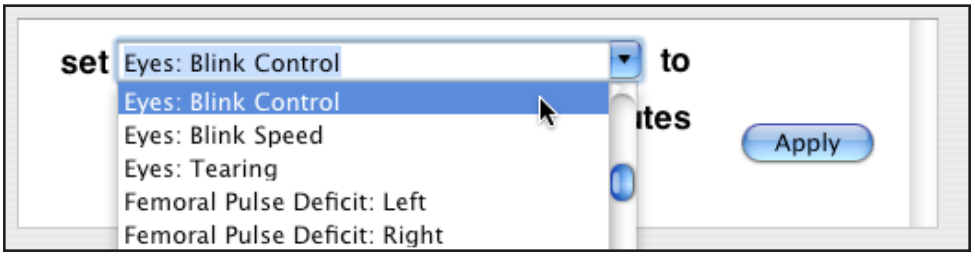
Choose **New “Set” Event** from the **New Event** option of the **Scenario** menu.



Selecting a New “Set” Event

The phrase **set ? to ?** appears beneath the **Events** heading of the selected state.

Select **set ? to ?**. The lower panel changes to display three fields beginning with the set field.

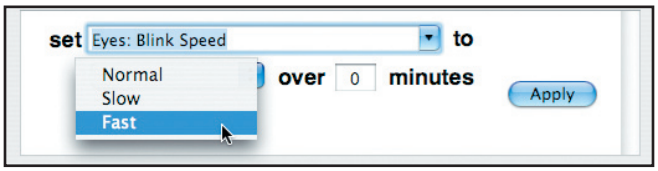


Selecting a Parameter to Set

Using the pull-down list, complete the **set** field by selecting the parameter.

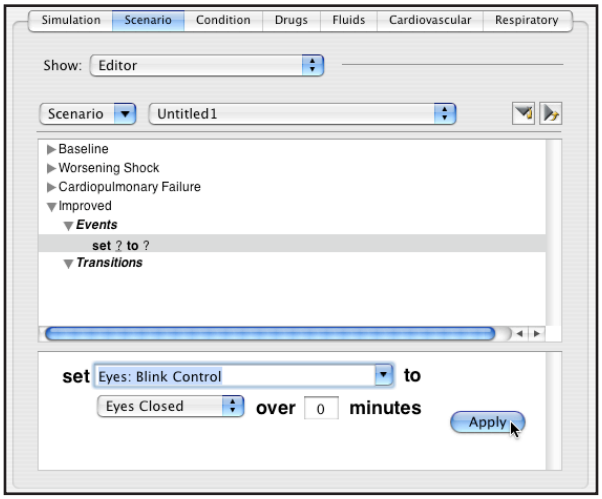
Generally, the default value for the parameter appears in the value field on the second line.

Depending on the nature of the parameter, change the value field by entering a new value or by selecting a value from a pull-down list.



Selecting a Value for the Parameter

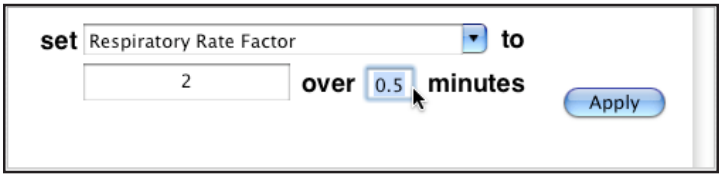
Once the correct value is selected or entered, click the **Apply** button.



Setting the Parameter Values

The new "set" event appears under the **Events** heading of selected state.

(OPTIONAL for ONSET values) If the parameter is numerical and is to be onset over time, complete the final field in the panel by entering a decimal value for minutes. (e.g. 0.5 is equivalent to 30 seconds.)



Selecting an Onset Value for the Parameter

Click **Apply**.

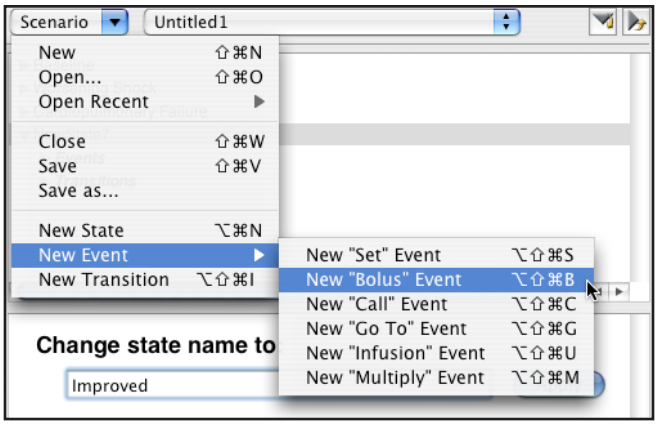
"Bolus" Events

A "bolus" event is used to administer a drug bolus within the scenario. For example, the event **give bolus of epinephrine 1000 mcg** in an active state automatically administers 1000 mcg of epinephrine to the patient, irrespective of any user input or the patient's physiology. The effects of the drug are not removed until the patient is stopped or until additional physiological changes have reversed their influence.

To add a "bolus" event:

Select the appropriate state.

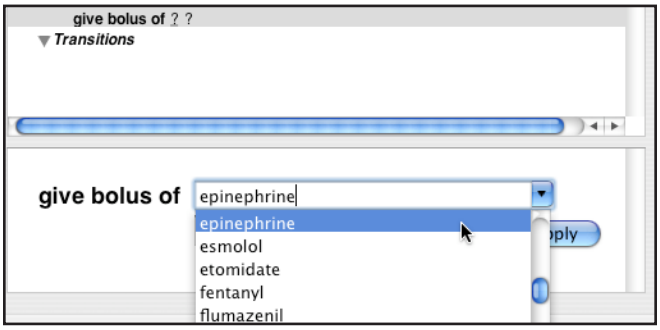
Choose **New "Bolus" Event** from the **New Event** option of the **Scenario** menu.



Selecting a New "Bolus" Event

The phrase **give bolus of ??** appears beneath the **Events** heading of the selected state.

Select **give bolus of ??**. The lower panel changes to display two fields beginning with the **give bolus of** field.

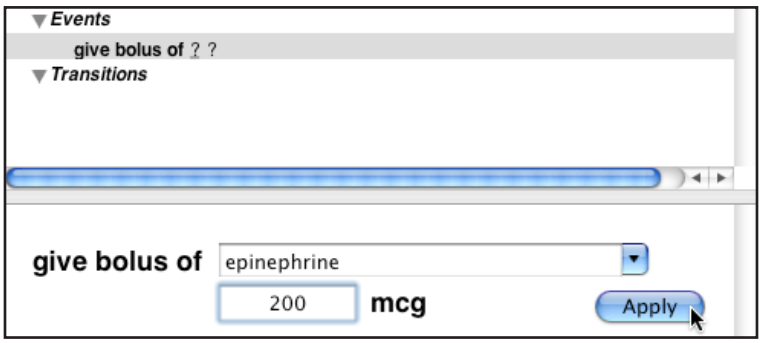


Selecting the Drug for the Bolus Event

Using the pull-down list, select the appropriate drug from the list and complete the **give bolus of** field.

Depending on the drug selected, the second field displays a measurement of either **mg** or **mcg** (milligrams or micrograms).

Highlight the **?** in the measurement field and enter the bolus dose (e.g. 1000 mcg).



Entering and Applying the Bolus Dose

Click **Apply**.

The new "bolus" event appears under the **Events** heading of selected state.

"Call" Events

A "call" event includes the events and transitions of one state within another state. In other words, a **call State B** event added to State A makes the events and transitions of State B a part (or subroutine) of State A. In this way, the use of a "call" event allows states to be used multiple times without the necessity of redefining their events and transitions.

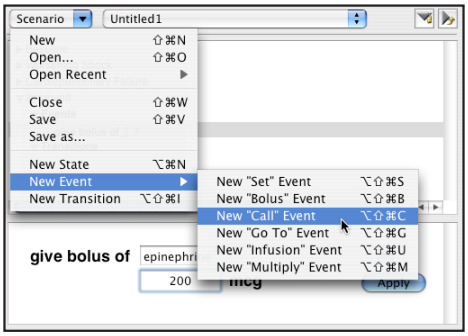
For example, in a scenario where the same three events are repeated in multiple states, a state named "Do Three Things" can be used to define those three events, so that this state can be subsequently called to be included in other states when appropriate.

A "call" event only works within one scenario and only works to call states.

To add a "call" event:

Select the appropriate state.

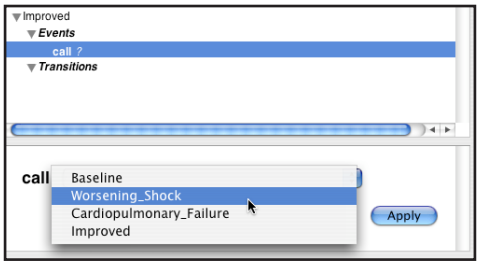
Choose **New "Call" Event** from the **New Event** option of the **Scenario** menu.



Selecting a New "Call" Event

The phrase **call ?** appears beneath the **Events** heading of the selected state.

Select **call ?**. The lower panel changes to display the **call** field.

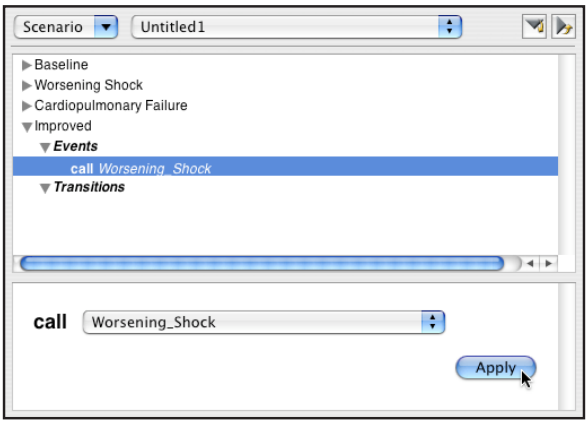


Selecting a State to Call

Using the pull-down list, select the appropriate state from the list to complete the call field.

Click **Apply**.

The new "call" event appears under the **Events** heading of selected state.



A "Call" Event

"Go To" Events

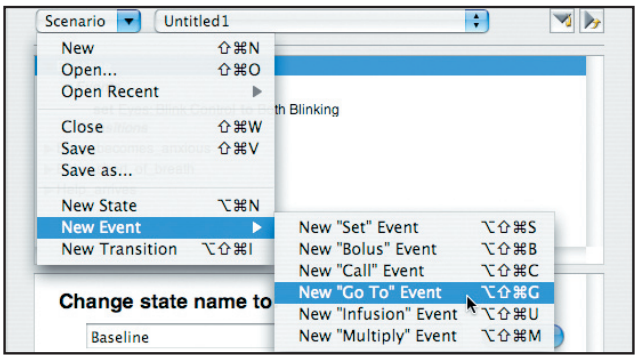
A "go to" event moves the scenario automatically from one state to another state. In other words, instead of navigating manually between states using the **Next** and **Go to** buttons on the Scenario Player, the instructor can design the scenario to move from state to state without additional involvement. However, the use of a "go to" event advances the scenario without any modifications, so interventions have no effect until this movement is complete.

A "go to" event only works within one scenario and only works to move to another state. Because a "go to" event moves the scenario to a different state, no other events listed after the "go to" event take effect.

To add a "go to" event:

Select the appropriate state.

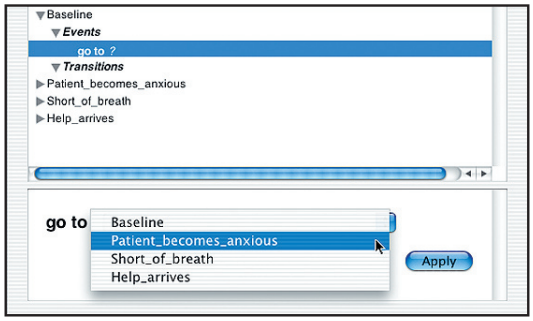
Choose **New "Go To" Event** from the **New Event** option of the **Scenario** menu.



Selecting a New "Go To" Event

The phrase **go to ?** appears beneath the **Events** heading of the selected state.

Select **go to ?**. The lower panel changes to display the **go to** field.

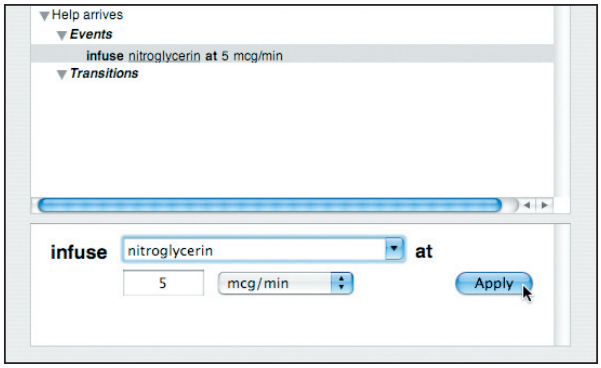


Choosing a State to go to from the Selected State

Using the pull-down list, select the appropriate state from the list to complete the go to field.

Click **Apply**.

The new “go to” event appears under the **Events** heading of selected state.



A “Go To” Event

“Infusion” Events

An “infusion” event is used to administer a drug infusion (or to stop a drug infusion) within the scenario. Once an infusion is administered, it continues to run until stopped either through an additional event in the scenario or user intervention. Infusions are set at an infused rate (mcg/min) or as a normalized infusion (mcg/kg/min).

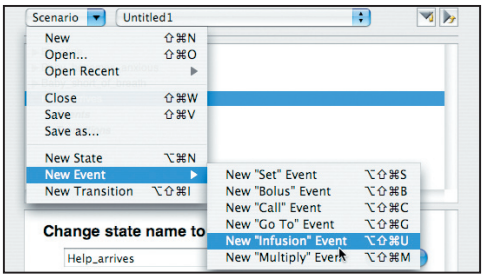
For example, the event **infuse nitroglycerin at 5 mcg/min** starts a 5 mcg/min infusion of nitroglycerin, irrespective of any user input or the patient’s physiology.

The effects of the drug are not removed until the patient is stopped or until additional physiological changes have reversed their influence.

To add an “infusion” event:

Select the appropriate state.

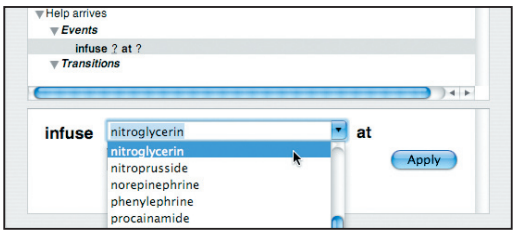
Choose **New “Infusion” Event** from the **New Event** option of the **Scenario** menu.



Selecting a New “Infusion” Event

The phrase **infuse ? at ?** appears beneath the **Events** heading of the selected state.

Select **infuse ? at ?**. The lower panel changes to display two fields for entering the drug name and the rate of dosage.

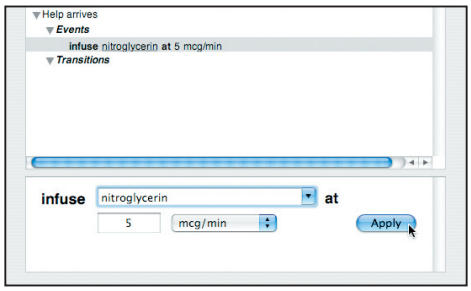


Choosing the Drug to be Infused

Using the pull-down list, select the appropriate drug from the list to complete the **infuse** field.

Complete the infusion dosage by entering an amount in the dosage field and selecting a rate of infusion (i.e. **mcg/min** or **mcg/kg/min**) from the measurement pull-down list.

Click **Apply**.



An "Infusion" Event

The new "infusion" event appears under the **Events** heading of selected state.

"Multiply" Events

A "multiply" event is used to apply a factor to a numerical parameter that increases or decreases the existing value of that parameter. Unlike a "set" event, which can multiply the default value of a numerical parameter, the "multiply" event factors against the patient's current physiological values.

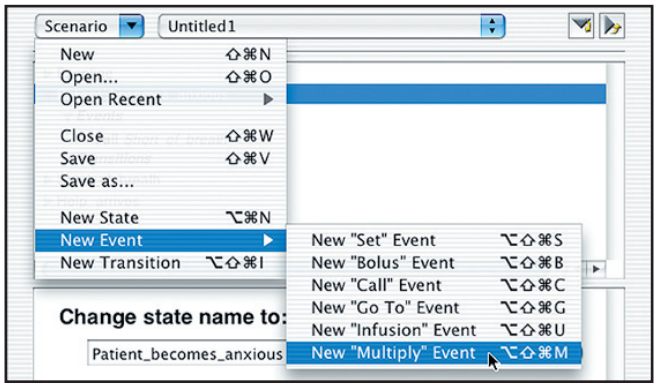
For example, the event **multiply Heart Rate Factor by 1.5 over 1 minute(s)** changes the heart rate from its current value to a value 1.5 times greater over the course of a minute. On the other hand, the event **multiply Heart Rate Factor by 0.5 over 1 minute(s)** reduces the current heart rate in half over that same time period. (In contrast, setting the Heart Rate Factor of 1.5 over 1 minute establishes a heart rate 1.5 times the patient's default value and NOT the current value.)

As shown in the example above, the "multiply" event can have an "onset" time, thereby allowing for smoother hemodynamic or respiratory changes. Only when the onset of the value has completed can the instructor manually change the parameter's values.

To add a "multiply" event:

Select the appropriate state.

Choose **New "Multiply" Event** from the **New Event** option of the **Scenario** menu.

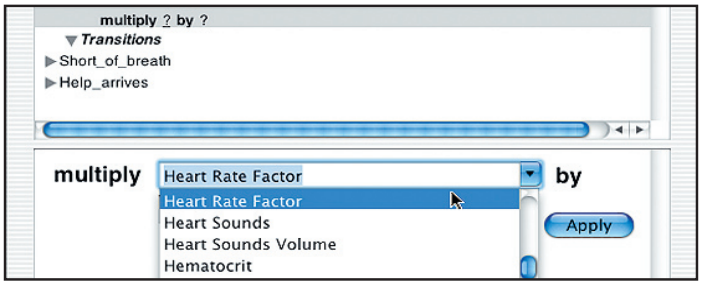


Choosing New "Multiply" Event

Selecting a New "Multiply" Event

The phrase **multiply ? at ?** appears beneath the **Events** heading of the selected state.

Select **multiply ? to ?**. The lower panel changes to display three fields beginning with the **multiply** field.



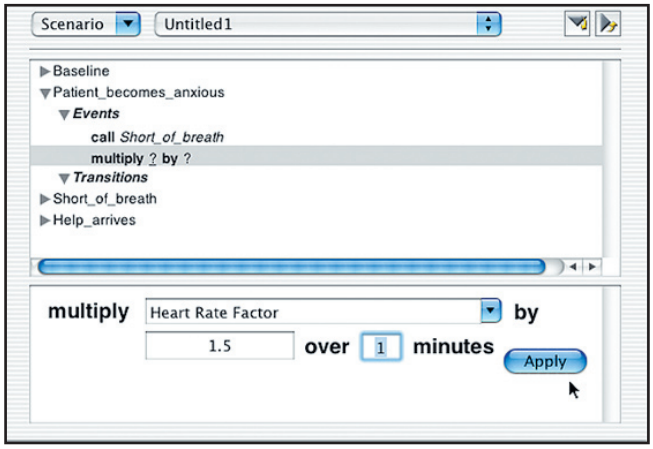
Choosing the Parameter to be Multiplied

Using the pull-down list, complete the **multiply** field by selecting the parameter.

Choose only numerical parameters that may be factored. Discrete parameters (e.g. Breath Sounds, Pupil Dilation) are shown in the list, but selecting these parameters may produce unexpected results.

Highlight the **?** in the value field to enter a factor to increase or decrease the parameter's rate.

(OPTIONAL for ONSET values) If the parameter is to be onset over time, complete the final field in the panel by entering a decimal value for **minutes**. (e.g. 0.5 is equivalent to 30 seconds and 2.0 is two minutes.)



Choosing the Parameter to be Multiplied

Once the correct value is selected or entered, click the **Apply** button.

The new "multiply" event appears under the **Events** heading of selected state.

Adding, Editing and Deleting Transitions

Transitions are conditional expressions (if X, then Y) that direct the scenario based on preestablished contingencies. The first part of the expression (the "if" phrase) establishes the contingency while the second part (the "then" phrase) defines the action to be taken. "If" phrases specify relationships (i.e. equals, greater than, less than, etc.) between values for time, drugs, conditions and physiological factors and the command set forth in the "then" phrase.

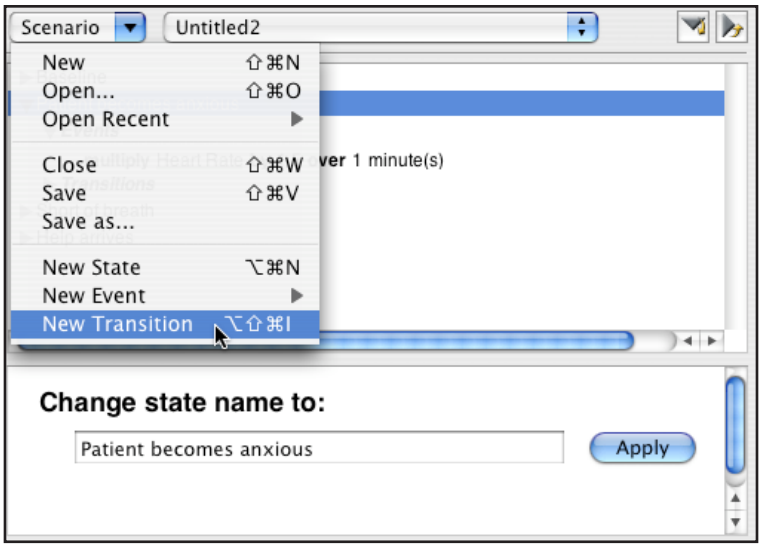
For example, the transition "**if** Time in State > 60 seconds **then go to** Patient_short_of_breath" moves the scenario to the Patient_short_of_breath state after the specified amount of time, 60 seconds, has passed. Other transitions could offer alternative paths in the scenario by requiring an action to be set in motion by the patient's physiological condition or the cumulative dosage of a drug administered to a patient. In some cases, these actions will not occur because they are triggered only when the condition is met.

"Set" events should be avoided in transitions. As an example, to set the eyes to closed when SpO_2 is less than 90 percent, create a transition called "If SpO_2 < 90%, then go to state Eyes Closed." The "Eyes Closed" state would then contain an event "set Eyes: Blink Control to Eyes Closed."

To add transitions to a state:

Select the state in the Scenario panel.

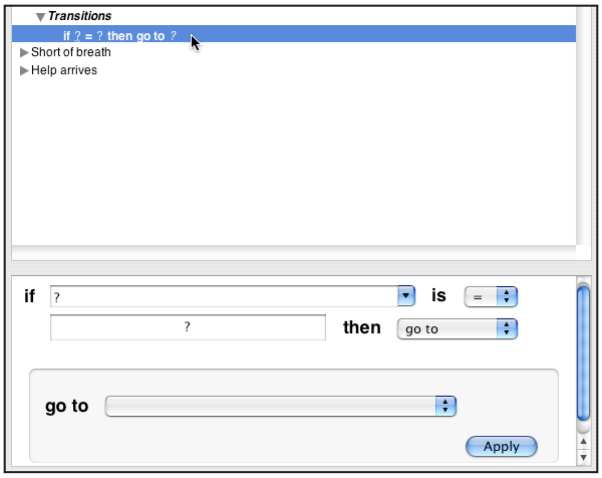
Choose the **New Transition** option from the **Scenario** menu.



Selecting a New Transition

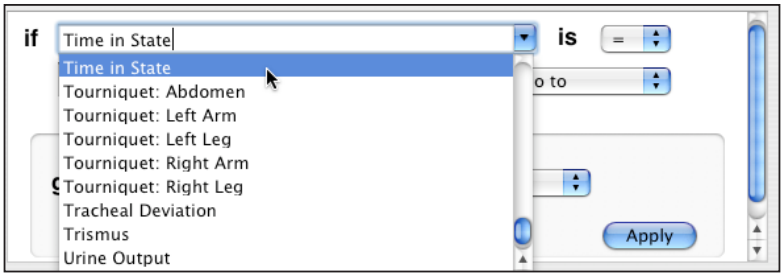
The phrase **if ? = ? then go to ?** appears beneath the **Transitions** heading of the selected state.

Select **if ? = ? then go to ?.** The lower panel changes to display five fields beginning with the if field.



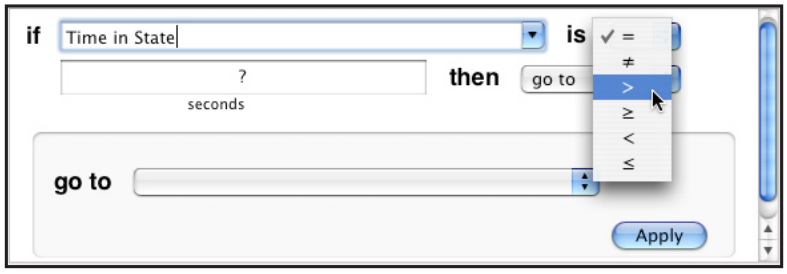
Selecting the Transition

Using the pull-down list, select the desired condition from the **If** field.



Selecting the Condition

When a condition is selected, the field below changes to display the measurement for the condition field's value.



Selecting a Relationship for the Condition

Select the relationship from the pull-down list in the field to the right of "**is**."

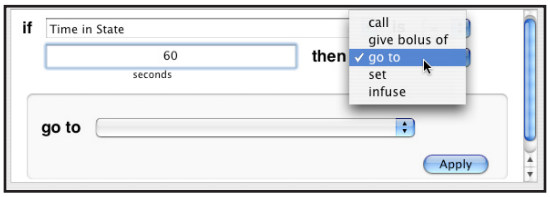
There are six available relationships.

Condition Relationships	
Symbol	**Meaning**
=	equal to
≠	not equal to
>	greater than
≥	greater than or equal to
<	less than
≤	less than or equal to

Enter or select a value for the value box that follows the relationship field.

If a numerical parameter is chosen as the condition, the measurement that appears the value box corresponds to the chosen parameter. If a discrete parameter is selected, a pull-down list with the available parameter settings becomes active.

As conditions in transitions, drug parameters are measured on a per kilogram (of the patient's weight) basis. Transitions are triggered when the administered dose meets or exceeds the entered value (in mcg/kg or mg/kg) divided the patient's weight (e.g., 70 kg for iStan).



Choosing an Action

The chart on the following page shows the units of measure for each of the available drug units.

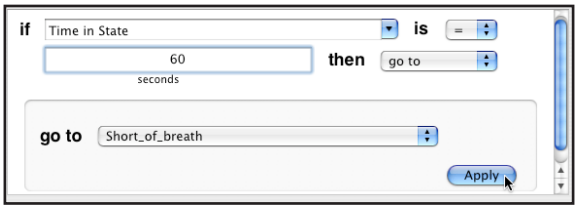
Drug	Units	Drug	Units	Drug	Units
Adenosine	mg/kg	**Esmolol**	mg/kg	**Nitroglycerin**	mcg/kg
Alfentanil	mcg/kg	**Etomidate**	mg/kg	**Nitroprusside**	mcg/kg
Amiodarone	mg/kg	**Fentanyl**	mcg/kg	**Norepinephrine**	mcg/kg
Atracurium	mg/kg	**Flumazenil**	mg/kg	**Pancuronium**	mg/kg
Atropine	mg/kg	**Glycopyrrolate**	mg/kg	**Phentolamine**	mg/kg
Bicarbonate	mcg/kg	**Isoproterenol**	mg/kg	**Phenylephrine**	mcg/kg
Bretylium	mg/kg	**Ketamine**	mg/kg	**Procainamide**	mg/kg
Calcium	mg/kg	**Labetalol**	mg/kg	**Propranolol**	mg/kg
Cisatracurium	mg/kg	**Lidocaine**	mg/kg	**Propofol**	mg/kg
Curare	mg/kg	**Lorazepam**	mg/kg	**Quinidine**	mg/kg
Diazepam	mg/kg	**Methohexital**	mg/kg	**Remifentanil**	mcg/kg
Digoxin	mg/kg	**Metocurine**	mg/kg	**Rocuronium**	mg/kg
Diltiazem	mg/kg	**Metoprolol**	mg/kg	**Succinylcholine**	mg/kg
Dobutamine	mcg/kg	**Meperidine**	mg/kg	**Sufentanil**	mcg/kg
Dopamine	mcg/kg	**Midazolam**	mg/kg	**Thiopental**	mg/kg
Doxacurium	mg/kg	**Mivacurium**	mg/kg	**Vasopressin**	Units/kg
Droperidol	mg/kg	**Morphine**	mg/kg	**Vecuronium**	mg/kg
Edrophonium	mg/kg	**Naloxone**	mcg/kg	**Verpamil**	mg/kg
Ephedrine	mg/kg	**Neostigmine**	mg/kg		
Epinephrine	mcg/kg	**Nifedipine / sl**	mg/kg		

Complete the then field by selecting the action caused by fulfillment of the specified condition.

The fields following the "**then**" field change to provide the appropriate definition for the chosen action. These fields correspond to the fields used to define events discussed earlier in this User Guide.

Action	Reference Pages
call	See Pages 3.46 and 3.47
give bolus of	See Pages 3.45 and 3.46
go to	See Pages 3.48 and 3.49
set	See Pages 3.42 through 3.44
infuse	See Pages 3.49 and 3.50

Complete the action expression by entering or selecting information for each of the fields.



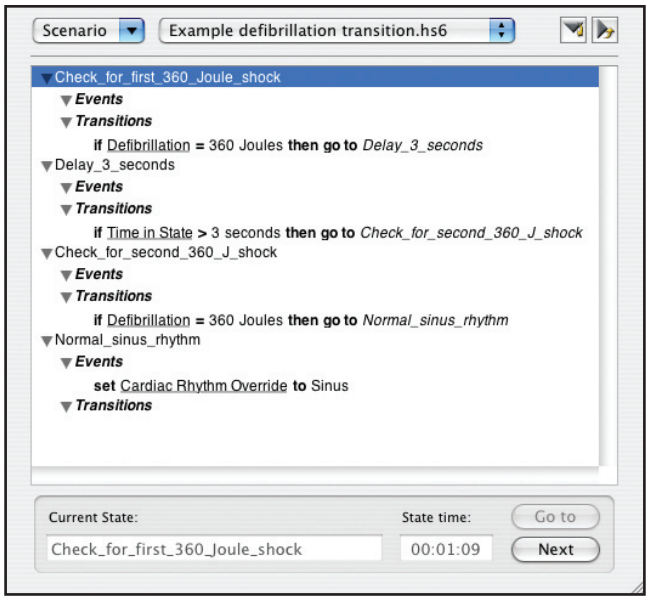
Completing the Transition

Click **Apply**.

The new transition appears under the Transitions heading of the selected state.

Defibrillation Transitions

When creating automated transitions using the Defibrillation variable, note that after defibrillation the system takes up to three seconds for the values to return from the sensed value (e.g. 360 Joules) to the original value of zero. To prevent unintended successive transitions, a state with a three-second delay may be required between successive states that transition on defibrillation.



Sample Transitions for a Defibrillation Scenario

Editing Transitions

Once a transition has been created, it can be modified by selecting the transition in the Scenario panel and altering both the parameters and their values. Transitions are edited in the same manner in which they are created.

Deleting Transitions

To delete a transition, select the transition in the Scenario panel and press the **delete** key. Deletions are irreversible. Always be sure that the transition is not needed before performing the delete function.

Transitions can also be deleted by selecting them and then selecting the **Clear** option from the **Edit** menu.

Changing the Location of Events and Transitions

Events and transitions can be moved within the scenario by using either a drag and drop method or the **Cut** and **Paste** commands. (*For a review of dragging, See Dragging on page 7.4 of the Appendix*).

Within a state, events occur simultaneously regardless of order except in the cases of “call” or “go to” events. When a “call” event occurs, the called state’s events take place prior to any subsequent events in the original state. Whenever a “go to” event occurs, the scenario shifts to the “go to” state and no further events are run from the original state.

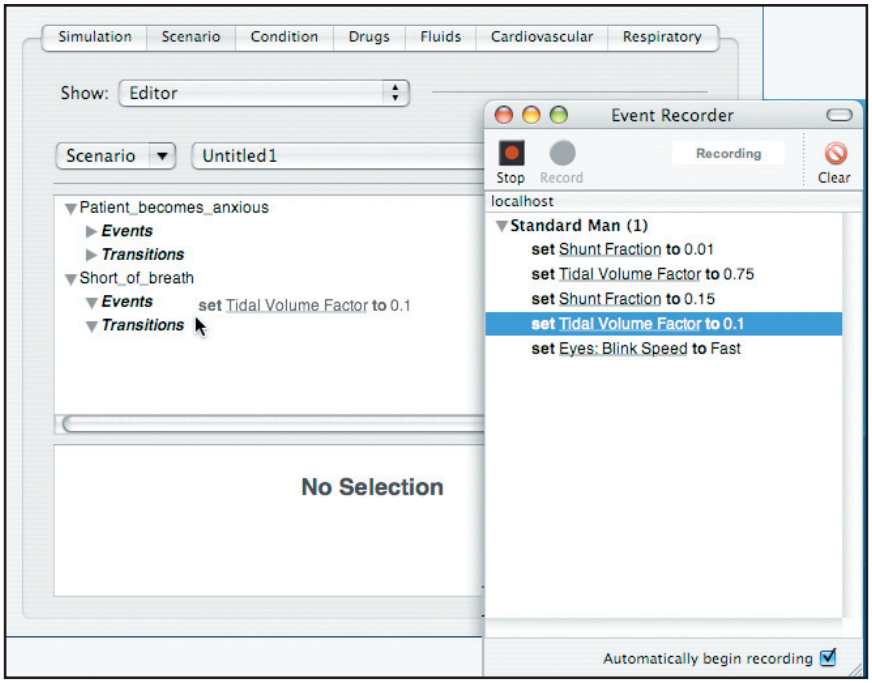
Transitions occur only when their conditions are met.

Events and transitions can be moved to correct any problems with their original locations.

To drag an event or a transition to a different location:

Click on the event or transition and hold the mouse button down.

Drag the event or transition to the new location. (An indicator line appears as the event or transition name is dragged past possible locations.)



Dragging an Event to a New Location

Release the mouse button, dropping the event or transition into the desired location.

To cut and paste an event or transition into a different location:

Select the event or transition.

Choose the **Cut** option from the **Edit** menu [or use the Command ( ) + **X** shortcut keys]. The event or transition disappears from its original location.

Select the new state where the event or transition will be located.

Choose the **Paste** option from the **Edit** menu [or use the Command ( ) + **V** shortcut keys].

Copying Events and Transitions

Events and transitions can be copied and pasted within any state of the scenario by using the **Copy** and **Paste** commands.

To copy and paste an event or transition into another state in the scenario:

Select the event or transition. (Only one event or transition can be selected at a time.)

Choose the **Copy** option from the **Edit** menu [or use the Command ( ) + **C** shortcut keys]. The event or transition is copied onto the unseen clipboard.

Select the new state where the event or transition will be located.

Choose the **Paste** option from the **Edit** menu [or use the Command ( ) + **V** shortcut keys]. If needed, the newly copied event or scenario can now be edited.

Using the same method, an event or transition can also be copied and pasted into a different scenario.

To copy and paste an event or transition into another scenario:

Select the event or transition. (Only one event or transition can be selected at a time.)

Choose the **Copy** option from the **Edit** menu [or use the Command ( ) + **C** shortcut keys]. The event or transition is copied onto the unseen clipboard.

Open the second scenario using the **Open** or **Open Recent** options from the **Scenario** menu.

Select the state in the second scenario where the event or transition will be located.

Choose the **Paste** option from the **Edit** menu [or use the Command ( ) + **V** shortcut keys]. If needed, the newly copied event or scenario can now be edited.

Saving Scenarios

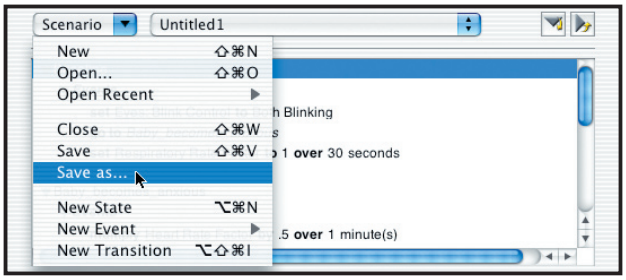
To use the scenario with any patient the scenario file must be named and saved.

Modified preconfigured files must be renamed before they can be saved. Renamed preconfigured scenarios and user-created scenarios can be overwritten, so multiple saves can be performed on those scenarios as changes are made. Saving a scenario file removes the previous version of that scenario.

Initially, new scenarios appear in sequence as **Untitled** files (e.g. **Untitled1** or **Untitled2**).

To save a scenario:

Select the **Save** [or use the **Shift** + Command ( ) + **V** shortcut keys] or the Save as option from the **Scenario** menu. When saving a preconfigured file, only the **Save as** option functions because the file must be renamed.



Selecting Save As

Named scenario files are saved automatically with the **Save** option.

New, unnamed scenario files that are saved or any files saved using the **Save as** option activate the **Save file as** navigational window.

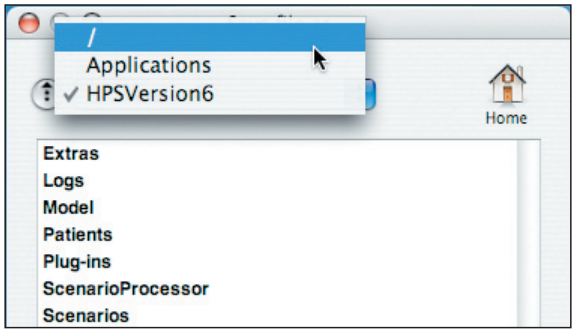
Navigate to the /Users/Shared folder, where the scenario files are to be stored. As a shortcut, click the **Home** icon to go to the **Users** directory for quick access to the **Shared** folder.

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

The full file path for a scenario or patient is limited to a maximum of 104 characters.

For example:
/Users/Shared/subdirectory1/subdirectory2/reallygoshdanglongpatientorscenariofilename

If a longer file path name is created, the scenario cannot be saved.



Navigating to the Scenario File's Folder

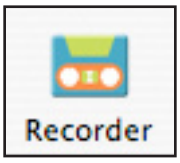
Click **Save**.

The scenario file is now available to all users with access to the folder where the file was saved.

Using the Event Recorder

The **Event Recorder** records parameter changes made to the active patient. These recorded changes can subsequently be added to a scenario as events. By observing the physiological changes to the patient, modifications to the parameter values can be made using the **Event Recorder** prior to adding those events to the scenario.

Open the **Event Recorder** by clicking the **Recorder** icon on the Patient toolbar.



The Recorder Icon

The **Event Recorder** opens as a separate window, displaying a list of the names of all the patient files opened during the session. Patient files that have been closed are included in this list.

By default, the status field shows that the Event Recorder is **Stopped**.

Select the active patient whose events are to be recorded.

Starting to Record

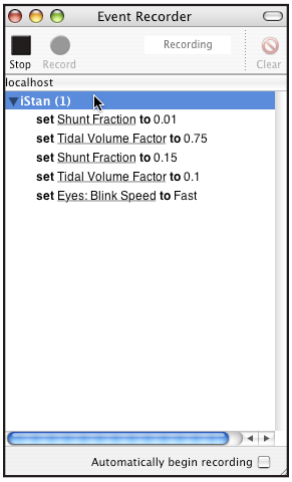
Click the **Record** icon.

The status field shows that the Event Recorder is Recording.

A red blinking circle appears in the Stop icon while events are recorded.

Set the new parameters, observing the physiological changes in the patient.

Parameters are set using the Condition, Drugs, Fluids, Cardiovascular and Respiratory tabs, discussed later in this section.



Recording Events

Reset the parameters until the desired physiology is achieved.

As an example, the **Event Recorder** shown below displays the **Shunt Fraction** and **Tidal Volume Factor** parameters found in the **Respiratory Control** section beneath the **Respiratory** tab and the **Eyes: Blink Speed** parameter found in the **Assessment** section of the **Condition** tab.

The **Tidal Volume Factor** parameter has been reset in this example (from 0.75 to 0.1).

Managing Events in the Event Recorder

Events and closed patient files can be deleted from the Event Recorder.

To remove an event, select the event and either press the delete key or click the Clear icon. To clear all the events from an active patient, select the patient file and either press the delete key or click the **Clear Events** icon. To remove a closed patient file (and all its events), select the patient file and either press the **delete** key or click the **Remove** icon.

To stop recording events, click the **Stop** icon.

Events recorded in the Event Recorder cannot be saved unless moved to a scenario. (See **Copying Recorded Events to a Scenario**.)

To close the Event Recorder, click the red button in upper left-hand corner of the window or, with the Event Recorder active, choose the **Close Window** option from the **Window** menu.

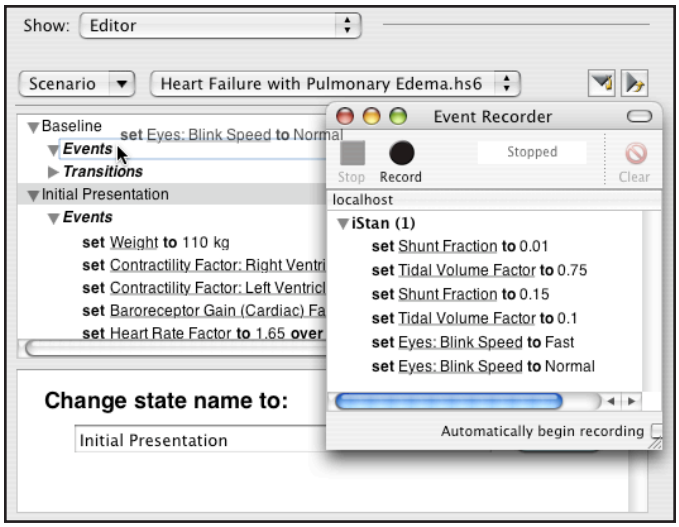
Copying Recorded Events to a Scenario

Recorded events can be copied from the **Event Recorder** to a scenario in the **Scenario Editor** by using either a drag and drop method or the **Copy** and **Paste** commands. (*For a review of dragging, See Dragging on page 7.4 of the Appendix*).

To copy a recorded event to a scenario using drag and drop:

Select the event to be copied in the **Event Recorder**, holding down the mouse button.

Drag the event to its new location in the scenario. A blue line appears to indicate where the event is being placed.



Dragging a Recorded Event to a Scenario

Release the mouse button. The event is now in the scenario.

To copy a recorded event to a scenario using the **Copy** and **Paste** commands:

Select the event to be moved in the Event Recorder.

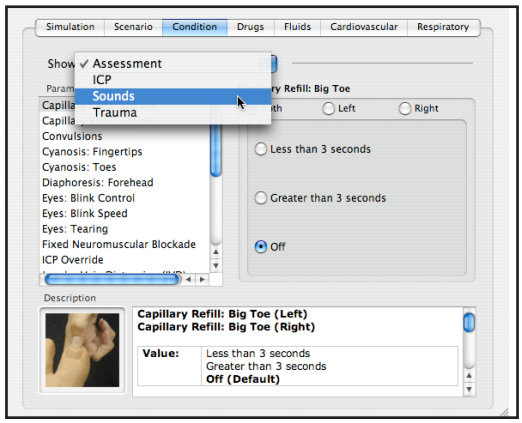
Choose the **Copy** option from the HPS **Edit** menu [or use the Command ( ) + **C** shortcut keys]. The event is copied onto the unseen clipboard.

Select the state in the scenario where the event will be located.

Choose the **Paste** option from the HPS Edit menu [or use the Command ( ) + **V** shortcut keys]. If needed, the newly copied event can now be edited.

The Condition Tab

Selecting the **Condition** tab opens a window that provides a means of changing parameter settings that control patient conditions related to assessment, ICP, sounds and trauma. By default, **Assessment** is selected in the **Show** pull-down menu located above a panel with a list of **Parameters** and a panel with settings for those parameters. At the bottom of the window is a **Description** of the selected parameter.



The Condition Tab

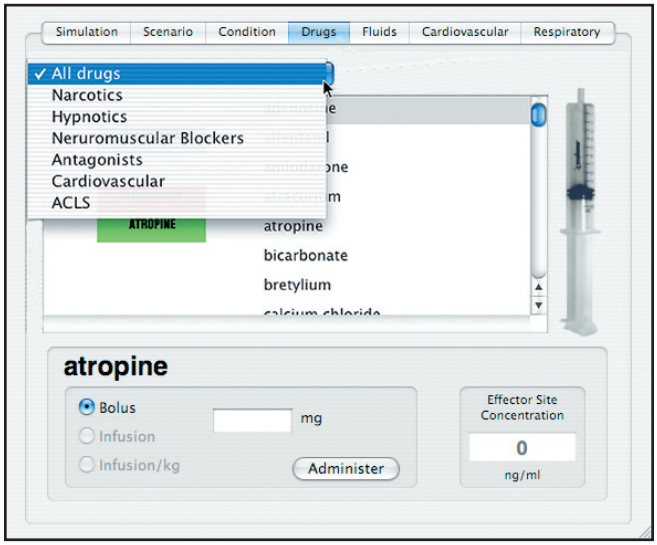
Each parameter has settings designed to accurately affect the patient's physiology.

Assessment	ICP	Sounds	Trauma
Capillary Refill: Big Toe	Autoregulation Gain Factor	Bowel	Autoinjection Enable
Capillary Refill: Thumb	Catheter: Intercranial Pressure	Breath	Bleeding: Ch1 - Location
Convulsions	Cerebral Autoregulation Status	Heart	Bleeding: Ch1 - Type of Hemorrhage
Cyanosis: Fingertips	CO_2 Reactivity Factor	Throat	Bleeding: Ch2 - Location
Cyanosis: Toes	Craniectomy	Voice	Bleeding: Ch2 - Type of Hemorrhage
Diaphoresis: Forehead	CSF Injection/Removal		Bleeding: Flush
Eyes: Blink Control	CSF Outflow Resistance Factor		Chest Compression Efficacy
Eyes: Blink Speed	Head Elevation		Chest Tube Air Flow Rate
Eyes: Pupil Diameter	ICP Override		Chest Tube Air Leak Type
Eyes: Tearing	Intercranial Elastance Factor		Chest Tube Enable
Fixed Neuromuscular Blockade	Intercranial Venus Resistance Factor		Chest Tube Flow Rate
ICP Override	Position of CO_2 Regulation Curve		Flail Chest
Jugular Vein Distension (JVD)	Time Constant of CO_2 Reactivity		Intrapleural Volume
Microphone Volume			Needle Decompression
Perfusion Intensity			Pericardial Fluid (Acute)
Secretion: Ears			Secretion: Ears
Secretion: Mouth			Secretion: Nose
Secretion: Nose			Secretion: Mouth
Temperature: Blood			Trismus
Temperature: Body			
Trismus			
Weight			

The Drugs Tab

Selecting the **Drugs** tab opens a window that provides a means of administering medications from the Instructor Workstation. Based on normal clinical practices, medications may be given as a bolus, an infusion or as an infusion based on the patient's weight in kilograms (normalized infusion).

By default, **All drugs** is selected in the pull-down menu located above the window showing the available drugs. In the **All drugs** view, each drug is listed in alphabetical order, regardless of classification.



The Drugs Tab

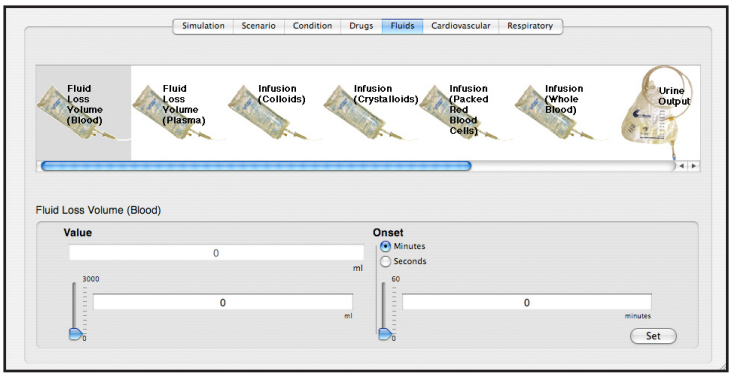
The pull-down menu offers the option of selecting a specific drug category.

Drug Category
All Drugs
Narcotics
Hypnotics
Neuromuscular Blockers
Antagonists
Cardiovascular
ACLS

Once a drug is selected in the window, the bottom panel displays the settings for administering the selected drug. When the Pharmacology Editor is used to create a new drug and that drug is used to modify the system or the patient, a separate category, User Generated, appears at the bottom of the menu. For information on the Pharmacology Editor *see Appendix C - Drug Integration* at the end of this User Guide.

The Fluids Tab

Selecting the **Fluids** tab opens a window that provides a means of controlling the amount of fluid lost by or infused into the patient. The upper panel provides scrollable access to the various fluid parameters and the bottom panels display the controls for entering the amount of fluid to be lost or infused and establishing the time frame during which the fluid loss or infusion will take place.



The Fluids Tab

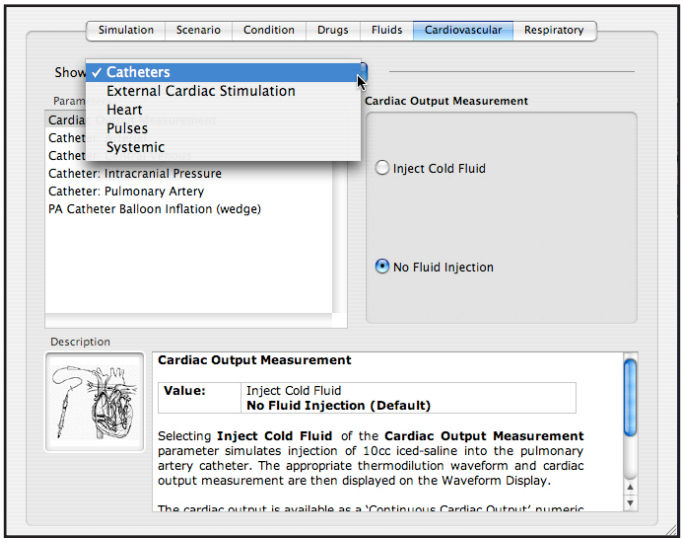
Currently, there are seven fluids that can be controlled using the Fluids tab.

Fluids
Fluid Loss Volume (Blood)
Fluid Loss Volume (Plasma)
Infusion (Colloids)
Infusion (Crystalloids)
Infusion (Packed Red Blood Cells)
Infusion (Whole Blood)
Urinary Output

See also page 4.45 for Fluid Parameters Affecting Circulation and *page 4.54 for Urinary Output.*

The Cardiovascular Tab

Selecting the **Cardiovascular** tab opens a window providing a means of changing parameter settings that control patient conditions related to the circulatory system. **Catheters** is selected in the **Show** menu located above the Parameters panel and the panel with the settings for those parameters. At the bottom of the window is a **Description** of the selected parameter.



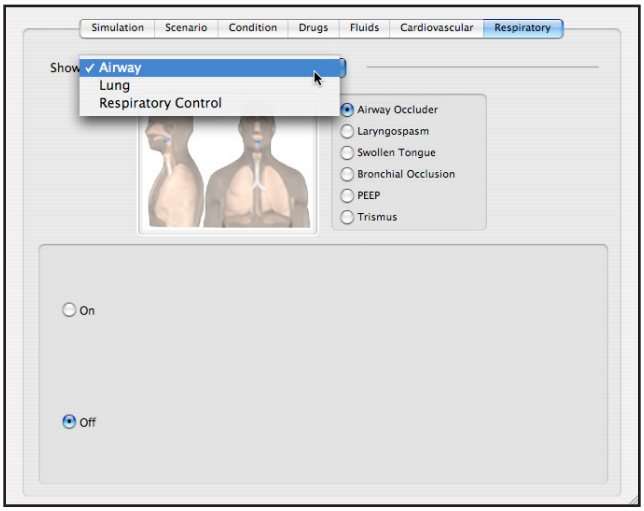
The Cardiovascular Tab

The Show menu contains five sub-sections, each with its own set of parameters.

Catheters	External Cardiac Stimulation	Heart	Pulses	Systemic
Cardiac Output Measurement	**Defibrillation**	**Baroceptor Gain (Cardiac) Factor**	**Carotid**	**Baroceptor Gain (Overall) Factor**
Catheter: Arterial	**Pacing Capture Threshold**	**Cardiac Rhythm Override**	**Brachial**	**Baroceptor Gain (Peripheral) Factor**
Catheter: Central Venous	**Pacing Current**	**Contractility Factor: Left Ventricle**	**Radial**	**Baroceptor Maximum Pressure**
Catheter: Intracranial Pressure	**Pacing Rate**	**Contractility Factor: Right Ventricle**	**Femoral**	**Baroceptor Minimum Pressure**
Catheter: Pulmonary Artery		**Fixed Heart Rate**	**Popliteal**	**Elastance: Extrathoracic Arteries**
PA Catheter Balloon Inflation (wedge)		**Heart Rate Factor**	**Posterior Tibial**	**Elastance: Intrathoracic Arteries**
		Ischemic Index Averaging	**Dorsalis Pedis**	**Elastance: Pulmonary Arteries**
		Ischemic Index Sensitivity		**Resistance Factor: Pulmonary Vasculature**
		Pericardial Fluid (Acute)		**Resistance Factor: Systemic Vasculature**
		Resistance Factor: Aortic Valve		**Resistance Factor: Venous Return**
		Resistance Factor: Mitral Valve		**Venous Capacity Factor**
		Resistance Factor: Pulmonic Valve		

The Respiratory Tab

Selecting the **Respiratory** tab opens a window providing a means of changing parameter settings that control patient conditions related to the pulmonary system. **Airway** is selected by default in the **Show** menu, which also contains options for **Lung** and **Respiratory Control**. These two options also display a Parameters panel and a panel with the settings for those parameters. At the bottom of the **Lung** and **Respiratory Control** windows is a **Description** of the selected parameter.



The Respiratory Tab

The **Show** menu contains three sub-sections, each with its own set of parameters.

Airway	Lung	Respiratory Control
Airway Occluder	Chest Wall Capacity	CO_2 Production Factor
Laryngospasm	Chest Wall Compliance Factor	CO_2 Set-point
Swollen Tongue	Distended Chest Wall Compliance Factor	Fixed Neuromuscular Blockade
Bronchial Occlusion	Fixed Alveolar Enflurane	I to E Ratio (1:x)
PEEP	Fixed Alveolar Halothane	O_2 Consumption
Trismus	Fixed Alveolar Isoflurane	$PetCO_2$-$PaCO_2$ Factor
	Fixed Alveolar Sevoflurane	Respiratory Gain Factor
	Flail Chest	Respiratory Quotient
	Fraction of Inspired O_2 Override	Respiratory Rate Factor
	Functional Residual Capacity	Respiratory Rate Override
	Intrapleural Volume	Shunt Fraction
	Lung Compliance Factor	Tidal Volume Factor
	pH Shift	Tidal Volume Override
	Venous CO_2 Shift	Volume/Rate Control Factor

Using iStan

Once iStan has been set up (*see Section 2: iStan Setup*), the software has been loaded and a patient started and connected (*see Section 3: iStan Software Features*), the simulator is ready for learner interventions.

The Patient Window

Changes to the patient's physiology can be manifested in the simulator and on the Waveform Display using the software accessed on the Patient window. To run a scenario, select the **Scenario** tab to access the **Player** menu (*see page 3.27*). Physiological changes can also be made directly using the Condition, Drugs, Fluids, Cardiovascular and Respiratory tabs.

Certain features, such as the pupil size of the eyes, require physical adjustments. In addition, further realism can be created by using moulage techniques with the simulator.

Patient Profiles

An unlimited number of unique patient profiles are possible for iStan, which comes with five patient profiles already configured that can provide a baseline for modified or customized patients:

iStan - a healthy 33-year-old male

iStannette - a healthy, pregnant 29-year-old female

iGranny - an elderly former smoker

iSoldier - a slightly larger male than iStan with a higher metabolic rate

iTruck Driver - a 61-year-old male with a history of tobacco and alcohol use

iStan

iStan	
Name, Age and Gender	iStan D. Ardman ("iStandard Man", "iStan"), 33-year old, male
History of Present Illness	Otherwise healthy adult with compound ankle fracture requiring open reduction and internal fixation (ORIF).
Past Medical History	None; No known drug allergies. Denies tobacco, alcohol, and IV drug use. Runs 2 miles several times a week.
Past Surgical/ Anesthetic History	Tonsillectomy at age 6, general anesthesia without complications. No family history of anesthetic problems.
Review of Systems	CNS: Negative for stroke Cardiovascular: Negative for hypertension, angina, dyspnea on exertion Pulmonary: Negative for Chronic Obstructive Pulmonary Disease, asthma, recent upper respiratory infection Renal/Hepatic: Negative for renal failure, jaundice Endocrine: Negative for diabetes, thyroid disease Hematological/Coagulopathy: Negative for anemia, bruising
Current Medications	None
Physical Examination	General: Healthy adult male, average build, in no distress Weight, Height: 70 kg, 6 feet 0 inches (72 inches) Vital Signs: HR 70 beats per minute, BP 116/51 mmHg, RR 11 breaths/minute, SpO2 98% Airway Full dentition, no loose teeth, full range of motion of neck and temporomandibular joints, wide oral opening, 4 finger breath mandible, Mallampati Classification 1 Lungs: Relaxed respiration, with clear bilateral breath sounds Heart: Regular rate and rhythm. Normal S1, S2; no S3, S4, murmur, or rub
Laboratory, Radiology and Other Relevant Studies	Hemoglobin 14.4 g/100 ml and Hematocrit 42.3%
Narrative	A healthy adult male who runs two miles several times a week suffers a compound ankle fracture and requires ORIF. Patient has no systemic illness or other health problems. He received general anesthesia uneventfully as a child and there is no family history of anesthesia problems. Physical examination reveals no anesthetic concerns. Patient refuses regional anesthesia and requests general anesthesia.

iStannette

iStannette	
Name, Age and Gender	iStannette, 29-year old, female
History of Present Illness	40-week intra-uterine pregnancy, uncomplicated prenatal course.
Past Medical History	None; No known drug allergies. Denies tobacco, alcohol, and IV drug use.
Past Surgical/ Anesthetic History	None. No family history of anesthetic problems.
Review of Systems	CNS: Negative for stroke, seizure syncope Cardiovascular: Negative for hypertension, angina, dyspnea on exertion Pulmonary: Negative for Chronic Obstructive Pulmonary Disease, asthma, recent upper respiratory infection Renal/Hepatic: Negative for renal failure, jaundice Endocrine: Negative for diabetes, thyroid disease Hematological/Coagulopathy: Negative for anemia, bruising
Current Medications	None
Physical Examination	General: Term parturient Weight, Height: 90 kg (pre-pregnancy weight was 70 kg), 5 feet 8 inches (68 inches) Vital Signs: HR 90 bpm, BP 106/68 mmHg, RR 16 breaths/minute, SpO2 98% Neurologic: Intact; reflexes are hyperactive Airway: No loose teeth. Full range of motion of neck, 3 finger breath (fb) oral opening, 3 fb mandible, Mallampati Classification 3 Lungs: Breath sounds clear and equal bilaterally Heart: Regular rate and rhythm without murmur, rub or gallop Abdomen: Term pregnancy with 40 cm fundal height, Fetal Heart Rate 150's Extremities: 1+ pretibial edema; pulses 2+ bilaterally
Laboratory, Radiology and Other Relevant Studies	CBC: Hemoglobin 11.6 g/100 ml; Hematocrit 34% Electrolytes: All within normal limits Chest X-ray: Clear ECG: Normal sinus rhythm at 90 beats per minute, normal complexes
Narrative	None.

iGranny

iGranny	
Name, Age and Gender	iGranny, 73-year-old, female
History of Present Illness	Otherwise healthy, geriatric adult.
Past Medical History	No known drug allergies. Essential hypertension for the past 26 years. 1 Pack-a-day smoker for the past 40 years (quit smoking 10 years ago.) Walks 2 miles a day.
Review of Systems	CNS: Negative for stroke Cardiovascular: Positive for hypertension, angina, dyspnea on exertion Pulmonary: Positive for Chronic Obstructive Pulmonary Disease, Emphysema Renal/Hepatic: Negative for renal failure, jaundice Endocrine: Negative for diabetes, thyroid disease Hematological/Coagulopathy: Negative for anemia, bruising
Current Medications	Hydrochlorthiazide 10mg every day by mouth and Aspirin 81mg every day by mouth
Physical Examination	General: Healthy geriatric female, average build, no distress Weight/Height: 55kg, 5 feet 2 inches (62 inches) Vital Signs: HR 84 beats per minute, B/P 154/87, RR 17 breaths/minute, SpO2 96% Airway: Full dentition with upper dentures, full range of motion of neck and temporomandibular joints, wide oral opening, 3 finger breath mandible, Mallampati Classification 1 Lungs: Relaxed respiration, with clear bilateral breath sounds Heart: Normal S1,S2; negative S3, S4, murmur or rub, History of Right Bundle Branch Block
Laboratory, Radiology and Other Relevant Studies	Hemoglobin 14.4 g/100 ml and Hematocrit 42.3%
Narrative	A healthy geriatric female who walks in the shopping mall two miles a day. Patient has no systemic illness other than hypertension since the age of 47-years-old. She has delivered 3 live cesarean births without complications. She has received anesthesia without complications. Both parents deceased of natural causes. No family history of cardiac disease. Patient is being seen for general yearly check-up.

iSoldier

iSoldier	
Name, Age and Gender	iSoldier, 20-year old, male
History of Present Illness	Otherwise healthy adult
Past Medical History	None; No known drug allergies. Denies tobacco, alcohol, and IV drug use. Runs 4 miles several times a week.
Past Surgical/ Anesthetic History	None. No family history of anesthetic problems.
Review of Systems	CNS: Negative for stroke Cardiovascular: Negative for hypertension, angina, dyspnea on exertion Pulmonary: Negative for Chronic Obstructive Pulmonary Disease, asthma, recent upper respiratory infection Renal/Hepatic: Negative for renal failure, jaundice Endocrine: Negative for diabetes, thyroid disease Hematological/Coagulopathy: Negative for anemia, bruising
Current Medications	None
Physical Examination	General: Healthy adult male, average build, in no distress Weight, Height: 85 kg, 6 feet 0 inches (72 inches) Vital Signs: HR 78 beats per minute, BP 108/51 mmHg, RR 14 breaths/minute, SpO2 97% Airway: Full dentition, no loose teeth, full range of motion of neck and temporomandibular joints, wide oral opening, 4 finger breath mandible, Mallampati Classification 1 Lungs: Relaxed respiration, with clear bilateral breath sounds Heart: Regular rate and rhythm. Normal S1, S2; no S3, S4, murmur, or rub
Laboratory, Radiology and Other Relevant Studies	Hemoglobin 14.4 g/100 ml and Hematocrit 42.3%
Narrative	The soldier is typically free from chronic disease requiring ongoing medical care and slightly larger than the 70 kg iStan used in civilian scenarios. Because he is involved in intense physical activity, the soldier's basal metabolic rate is higher than a civilian counterpart. Forced to work in extreme thermal conditions, core temperature may be altered. Hot climates are particularly troublesome: ambient heat, the increased metabolic rate from physical activity, and an inability to dissipate heat through multiple layers of clothing (to include flak jackets) combine to produce an individual who is hyperthermic, hypermetabolic, and dehydrated. Sweat losses as high as 3000 ml/hr have been reported in athletes undergoing intense physical activity. Hypovolemia from dehydration is compounded by the significant blood losses associated with combat injuries.

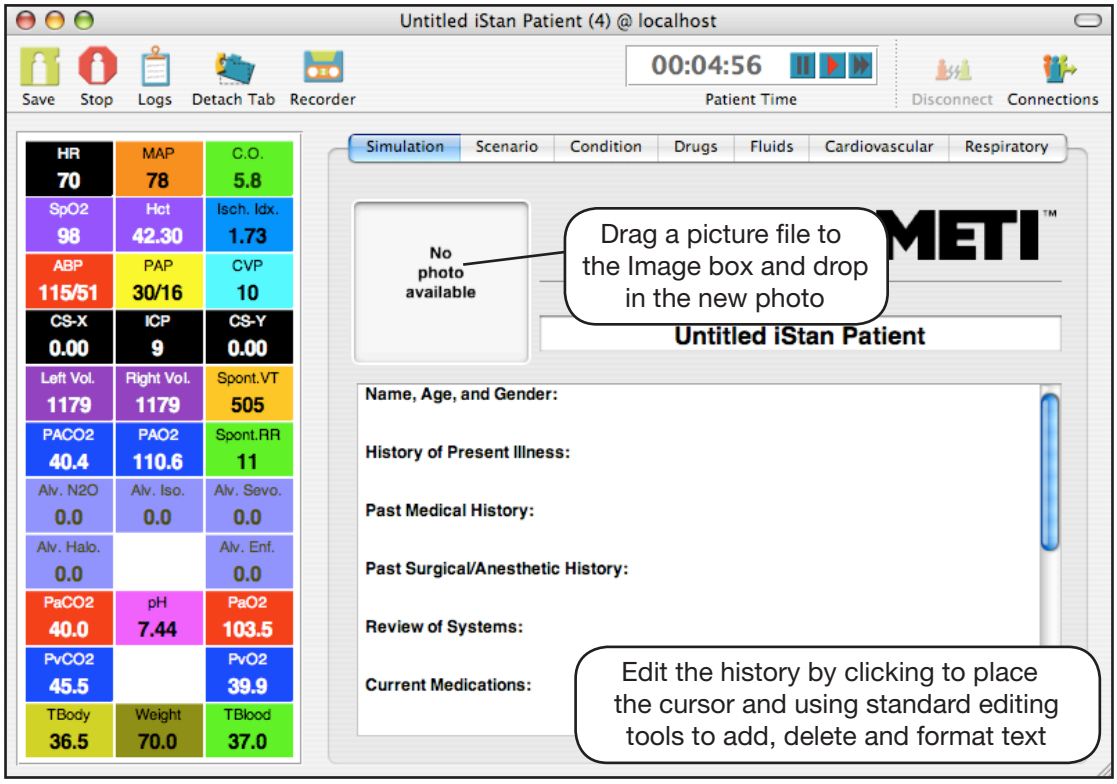
iTruck Driver

iTruck Driver	
Name, Age and Gender	iTruck Driver, 61-year old, male
History of Present Illness	Referred for surgical repair of infra-renal abdominal aortic aneurysm.
Past Medical History	Allergic to Penicillin which causes hives and wheezing. Essential hypertension for 20 years. Currently taking enalpril (Vasotec) and furosemide (Lasix). Coronary artery disease with anterior wall myocardial infarction five years ago. Stable angina since, left substernal chest pain radiating down left arm, with 1-2 episodes per month. Never at rest, most often with anxiety (e.g., fighting with wife) and always relieved with sublingual nitroglycerin. Sees cardiologist regularly, who states that the patient is optimally medically managed. Recent thallium scan shows reversible perfusion defect in lateral wall. Cardiac echo reveals normal valve function, increased left atrial and left ventricular size, hypokinetic anteroseptal wall, estimated Ejection Fraction=37%. Cardiac catheterization: PA=49/28 mmHg, PAOP (wedge) = 18 mmHg, CO=4.5 l/minute, diffuse coronary artery disease but no surgically correctable lesions. Long history of cigarette smoking (2 and a half packs of cigarettes per day for 41 years and Chronic Obstructive Pulmonary Disease. Chronic cough, white sputum, 1-2 teaspoons every day. Denies wheezing. No shortness of breath at rest but dyspnea on exertion at 2-3 blocks walking. Admits to regular alcohol use in the form of 2-4 beers each night. Denies DTs. Denies IV drug use.
Past Surgical/ Anesthetic History	Transurethral resection of the prostate (TURP) 10 years ago under spinal anesthesia with no complications. Leg (tibial) fracture 20 years ago under general anesthesia with no complications. No family history of anesthetic problems.
Review of Systems	CNS: Negative for stroke, seizure, syncope Cardiovascular: As above Pulmonary: As above. Denies asthma or recent upper respiratory infection Renal/Hepatic: Negative for renal failure, jaundice Endocrine: Negative for diabetes, thyroid disease Hematological/Coagulopathy: Negative for anemia, bruising
Current Medications	enalapril (Vasotec); furosemide (Lasix); nitroglycerin SL
Physical Examination	General: Healthy adult male in no distress Weight, Height: 100 kg, 6 feet 0 inches (72 inches) Vital Signs: HR 74 beats per minute, BP 180/97 mmHg, RR 13 breaths/minute, SpO2 95% Airway: Upper and lower dentures, full range of motion neck , 3 finger breath (fb) oral opening, 3 fb mandible, Mallampati Classification 2 Lungs: Distant but clear bilateral breath sounds Heart: Regular rate and rhythm. Normal S1, S2; no S3, S4, murmur, or rub
Laboratory, Radiology and Other Relevant Studies	CBC: Hemoglobin 16.0 g/100 ml; Hematocrit 47% Electrolytes: All within normal limits Chest X-ray: No infiltrates ECG: Normal sinus rhythm, no ischemic changes
Narrative	None.

Developing a New Patient

Patients are created either by modifying an existing patient or by clicking the **New** icon on the Patient Palette and selecting the **Untitled Adult Patient** option (*see Creating a New Patient on page 3.4*).

When a new patient is created, the Patient Window appears without information regarding the new patient's name, history or photograph. However, the initial underlying physiology of the new patient is that of iStan, the healthy, preconfigured patient.



An Untitled iStan Patient

To complete the patient, new information needs to be added and the physiology changed (if desired).

Adding a Photograph

If desired, load a picture file (e.g. TIFF, JPEG, GIF) onto the laptop, select the file from the desktop, drag the file to the Image box to the left of the patient's name, and release the file. The new picture appears in the Image box, replacing the text, "No Image Available."

The recommended dimensions for the patient picture are 120x110 pixels. Larger pictures take longer to save and extend the time needed to open a patient file.

Completing the Patient History

To create the patient's history, click the mouse in the appropriate spot on the history field and enter the desired text. The standard **Cut**, **Copy**, **Paste** and **Clear** functions are available via the **Edit** menu when text is highlighted. Text formatting (i.e. Bold, Underline, Italics) is available via the **Format** menu.

To remove the entire history, click anywhere in the text and choose the **Select All** option from the **Edit** menu before pressing the **delete** key. New text can be entered on the blank page.

Any changes to the history must be saved to have them for future reference.

Changing the Patient's Physiology

A patient's physiology is changed by adjusting the parameters available beneath the various tabs located on the Patient window.

To create new physiology for the patient:

1. Select the appropriate tab (e.g. **Cardiovascular** tab, **Respiratory** tab, etc.).
2. Select, when available, the appropriate tab sub-category (from the **Show** pull-down menu).
3. Choose the desired parameter (e.g. **Heart Rate Factor**, **Breath Sounds,** etc.).
4. Change the values of the selected parameter.
5. Allow the patient's vital signs to stabilize. Cardiovascular changes usually equilibrate rapidly whereas respiratory changes may take several minutes to stabilize.
6. Save (when desired) the new patient.

New patients are saved using the **Save** icon on the Patient Window or the **Save** option located on the **File** menu. For more information on saving patient files, *see Saving Patient Files on page 3.22*.

Altering an Existing Patient

Any existing patient, either iStan, one of the other preconfigured patients or a previously saved user-defined patient, can be changed to display a different name, background or physiology.

The original file for a preconfigured patient cannot be overwritten, so a new file name must be created for edited versions of the preconfigured patients. Unless permanently modifying a user-defined patient file, any changes to a user-defined patient should be saved using the **Save As** option under the **File** menu. All changes must be saved to preserve the patient file for future use.

Editing the Patient History

To edit the patient's history, highlight and type over the existing text. The standard **Cut**, **Copy**, **Paste** and **Clear** functions are available via the **Edit** menu when text is highlighted. Text formatting (i.e. Bold, Underline, Italics) is available via the **Format** menu. To remove the entire history, click anywhere in the text and choose the **Select All** option from the **Edit** menu before pressing the **delete** key. New text can be entered on the blank page.

Any changes to the history must be saved to have them for future reference.

Changing the Patient's Physiology

A patient's physiology is changed by adjusting the parameters available beneath the various tabs located on the Patient Window.

To edit an existing patient:

1. Select the appropriate tab (e.g. **Cardiovascular** tab, **Respiratory** tab, etc.).
2. Select, when available, the appropriate tab sub-category (from the **Show** pull-down menu).
3. Choose the desired parameter (e.g. **Heart Rate Factor**, **Breath Sounds,** etc.).
4. Change the values of the selected parameter.
5. Allow the patient's vital signs to stabilize. Cardiovascular changes usually equilibrate rapidly whereas respiratory changes may take several minutes to stabilize.
6. Save (when desired) the new patient.

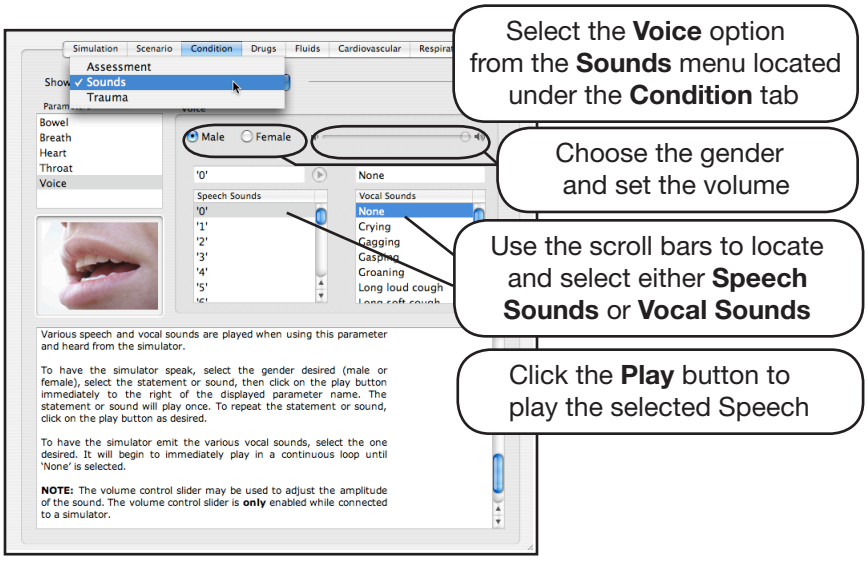
Edited patients may be saved using the **Save** icon on the Patient Window or the **Save As** option located on the **File** menu. For more information on saving patient files, *see Saving Patient Files on page 3.22*.

Auditory and Ocular Physiological Signs

The iStan simulator has tri-state eyes and can be programmed to speak certain phrases, to provide pain ratings and to make a range of vocal sounds. iStan, with instructor support, can also answer learner questions via a speaker system and microphone.

Programmable Speech

The **Voice** parameter is located on the **Condition** tab as one of the options located under the **Sounds** menu.



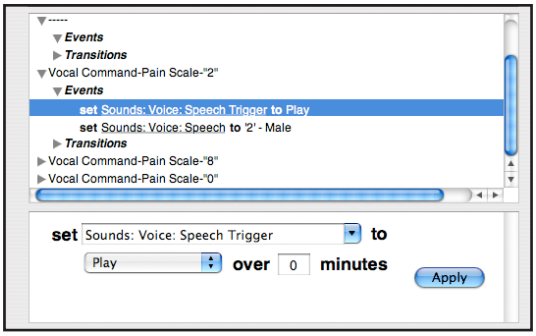
Programming Speech

Speech Sounds include a male or female voice that can utter a pain rating indicator from 0 to 10 or a series of possible other sounds.

To play one of the **Speech Sounds**:

1. Choose the desired gender, Male or Female.
2. Use the slider bar to set the volume.
3. Select the desired sound from the scrollable **Speech Sounds** list. The selected sound appears in the **Speech Sounds** field above the list.
4. Click the **Play** button located to the right of the **Speech Sounds** field.

When programming **Speech Sounds**, a trigger for the sounds must be set prior to the chosen sound parameter. The trigger is set using a “Set” Event and choosing the **Sounds: Voice: Speech Trigger** option.



Setting a Speech Trigger

After setting an event to trigger the speech to play, set a subsequent event for the vocal response. Note in the example above that three states have been created to allow for varying degrees of pain response.

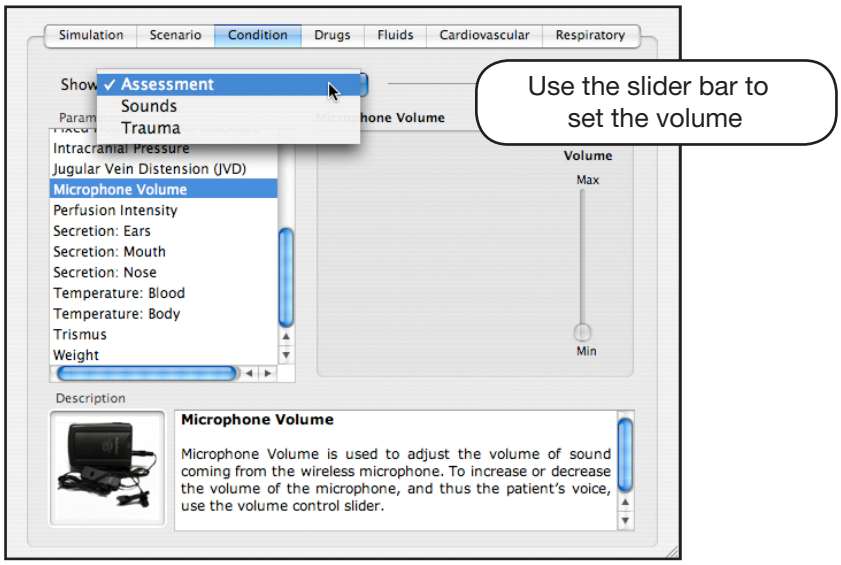
Unlike **Speech Sounds**, **Vocal Sounds** play continuously and are emitted immediately when selected from the scrollable **Vocal Sounds** list. To stop playing one of the **Vocal Sounds** select None from the list. The active sound appears in the **Vocal Sounds** field above the list. The following **Speech** and **Vocal Sounds** are currently available:

Speech Sounds	Vocal Sounds
"0" through "10" - Pain Ratings	None
"Aching"	Crying
Countdown	Gagging
"Dull"	Gasping
Grunt	Groaning
"I can't breathe"	Long loud cough
Loud cough	Long soft cough
"My belly hurts"	Mumbling
"My chest is tight"	Wheezing
"My leg hurts"	
"No"	
"Ouch"	
"Ow, that hurts"	
"Pressure"	
Scream	
"Sharp"	
Short loud cough	
Short soft cough	
Soft cough	
"Sometimes"	
"Stabbing"	
"Yes"	

Wireless Voice Capability

In addition to the pre-programmed speech, any response can be transmitted through the speakers using the wireless microphone.

The microphone volume can be adjusted on the microphone and through the software using the **Microphone Volume** option located under the **Assessment** menu on the **Condition** tab.



Adjusting Microphone Volume

The patient must be connected to iStan for any volume adjustment to be effective.

Reactive Eyes

Each eye has reactive pupils and functional eyelids that blink.

The settings for Pupil Diameter are located on the **Condition** tab and accessed by selecting the **Eyes: Pupil Diameter** option from the **Assessment** menu.

Currently, there are three pupil options that are used to control the diameter of the pupils in both eyes: **Automatic** (default), **Model Driven** or a Fixed Pupil Size (8 to 2 mm).

Setting the Pupil Diameter to **Automatic** causes the pupils to re-size in response to changes in light. If both pupils are set to **Automatic**, both pupils re-size accordingly. Other settings allow the user to fix one or both pupils to a specific size.

If the Pupil Diameter is set to **Model Driven**, the pupil size is driven by the pharmacology of morphine. Pupil reactivity to light is not possible with this option. The pupillary response to other drugs can be scripted using the Scenario Editor.

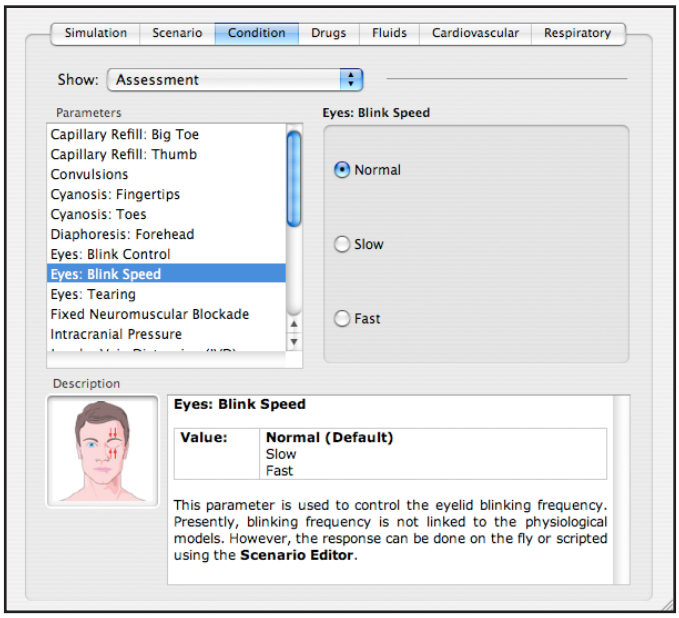
Additionally, eyelids can be programmed to open and close spontaneously or can be fixed in the closed position. The settings for Blink Control are located on the **Condition** tab and accessed by selecting the **Eyes: Blink Control** option from the **Assessment** menu.

Setting Blink Control

Choosing the **Automatic** setting (which is also the default setting) sets the eyes in a blinking mode but allows the simulator to react to physiological changes that cause the eyes to close such as unresponsiveness or a comatose condition.

Though set in the **Eyes Closed** position, the eyelids can still be manually opened for clinical inspection.

Blinking frequency can be set at one of three speeds: **Normal** (the default), **Slow** and **Fast**. To adjust the blinking frequency, select the **Eyes: Blink Speed** option from the **Assessment** menu on the **Condition** tab and select the desired speed.



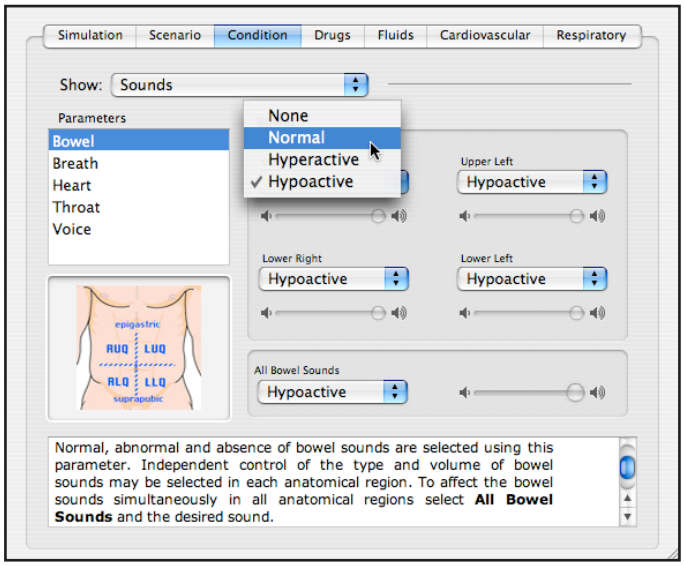
Adjusting Blink Speed

Basic Assessment Features

iStan has a variety of assessment parameters, some of which can be set to provide learners with the ability to evaluate certain physiological conditions.

Bowel Sounds

Learners can auscultate bowel sounds over each of four gastrointestinal quadrants, the **Upper Right**, **Upper Left**, **Lower Right** and **Lower Left**. The sounds can be independently set in each anatomical region to **Normal**, **Hyperactive**, **Hypoactive** or **None** (bowel sounds are absent).



Setting Bowel Sounds

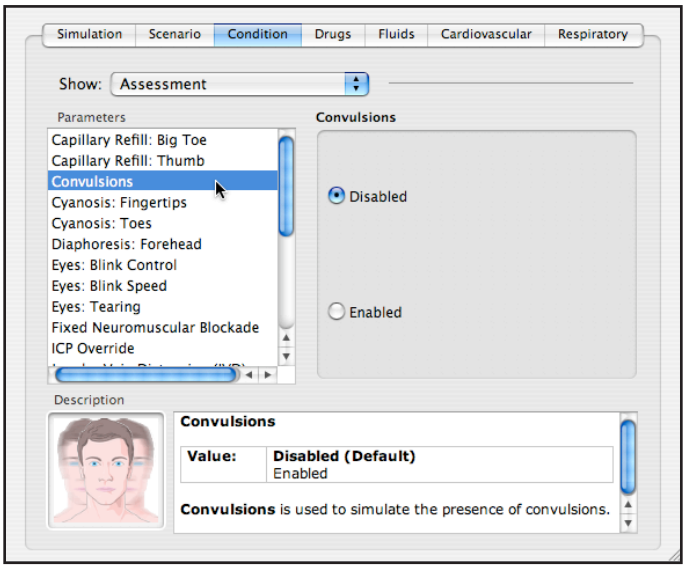
Choose the sound and the volume for each quadrant or for all four quadrants using the pull-down menu and slider bar beneath that quadrant's description.

The patient must be connected to iStan for any volume adjustment to be effective.

The **Bowel Sounds** parameter is located on the **Condition** tab beneath the **Sounds** menu.

Convulsions

iStan simulates convulsions when the **Convulsions** parameter is **Enabled**.

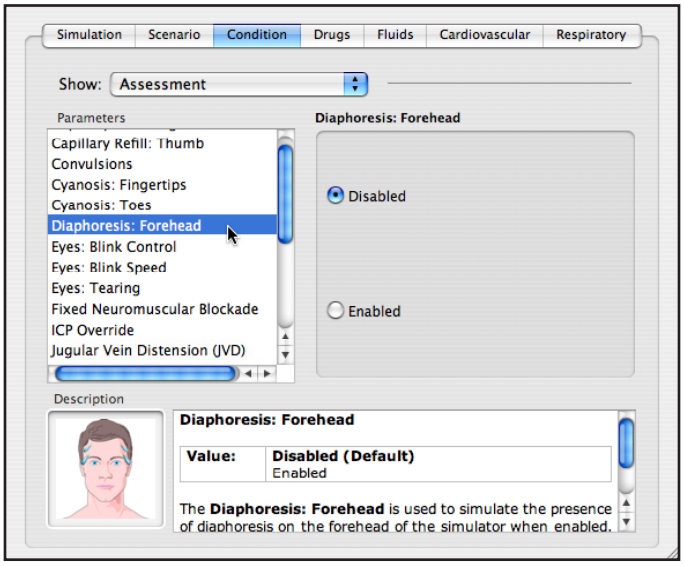


Convulsions

The **Convulsions** parameter is located on the **Condition** tab beneath the **Assessment** menu.

Diaphoresis

Diaphoresis of the forehead is simulated when the **Diaphoresis: Forehead** option is **Enabled**.



Diaphoresis

Clear fluids must be present to operate the Diaphoresis feature. *See page 2.13* for instructions on preparing iStan's Secretion system.

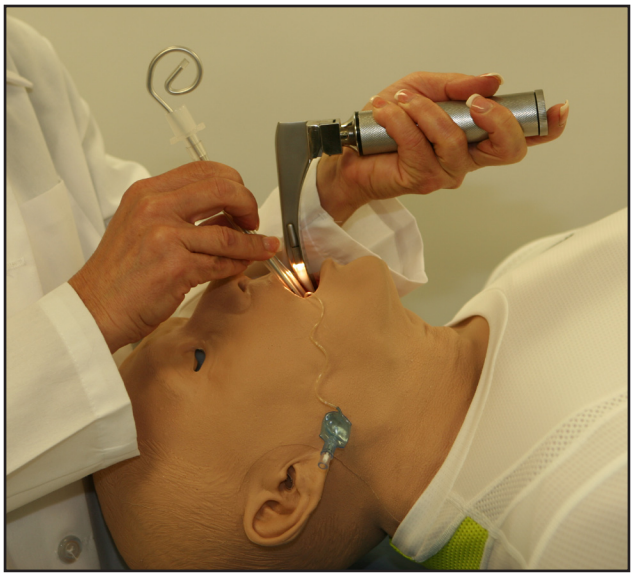
Airway

iStan's anatomically realistic upper airway provides for the opportunity to intubate (as well as apply other airway interventions) the patient, while various clinical signs (i.e. breath sounds, chest excursion, 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.

Airway Features			
Anatomy, Physiology and Clinical Signs	**Clinical Interventions, Patient Monitoring and Scenarios.**	**Software Control**	**Manual Control**
Realistic Upper Airway (Oropharynx, Nasopharynx and Larynx)	**Allows direct laryngoscopy, oral and nasal intubation and use of specialty airway devices. Senses if ET tube is correctly inserted.**	None required.	None required.
Trachea, Left and Right Mainstem Bronchi	**Tracheal intubation results in bilateral chest excursion and breath sounds. Endobronchial intubation results in unilateral chest excursion and breath sounds.**	None required.	None required.
Esophagus, Lower Esophageal Sphincter and Stomach	**Esophageal intubation results in gastric distension and the absence of breath sounds, chest excursion and CO_2 output.**	None required.	None required.
Posterior Pharynx Swelling	**Obstructs view of larynx to prevent intubation, but allows mask ventilation "can't intubate, can 0ventilate" scenario.**	TAB: **Respiratory** SHOW: **Airway**	None required.
Tongue Swelling (Moderate and Severe)	**Hinders, but does not prevent intubation.**	TAB: **Respiratory** SHOW: **Airway** OPTION: **Swollen Tongue**	None required.
Laryngospasm	**Closes vocal cords and prevents intubation and ventilation. When used with posterior pharynx swelling, creates a "can't intubate, can't ventilate" scenario.**	TAB: **Respiratory** SHOW: **Airway**	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.**	TAB: **Respiratory** SHOW: **Airway**	None required.
Trismus	**Simulates the presence of a masculatory muscle spasm.**	TAB: **Respiratory** SHOW: **Airway**	None required.
Articulated Mandible	**Allows for jaw thrust when sensors in the lower jaw are grasped in a clinically appropriate manner.**		
Cricothyroid Membrane	**Allows needle cricothyrotomy, transtracheal jet ventilation, retrograde wire techniques and cricothyrotomy.**	None required.	*See Cricothyrotomy, page 4.27.*
Breakaway Teeth	**Upper front teeth can be dislodged if laryngoscopy is performed incorrectly.**	None required.	*See Breakaway Teeth, page 4.28.*

Realistic Upper Airway

The upper airway of iStan is designed to allow for intubation and laryngoscopy. Oral and nasal intubation can be performed using a variety of airway devices, including LMAs (3 cm), endotracheal tubes (7.5 cm), nasal-pharyngeal airways (30 mm) and oropharyngeal airways (90 mm).



Sensors detect right mainstem intubation, and the action is recorded in the Events log. In addition, the simulator exhibits a right unilateral chest rise, and the appropriate physiological changes result.

Intubation incorrectly applied into the esophagus will cause 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.

Articulated Mandible

An articulated mandible permits jaw thrust so when sensors in the lower jaw are grasped in a clinically appropriate manner, the mandible may be extended.

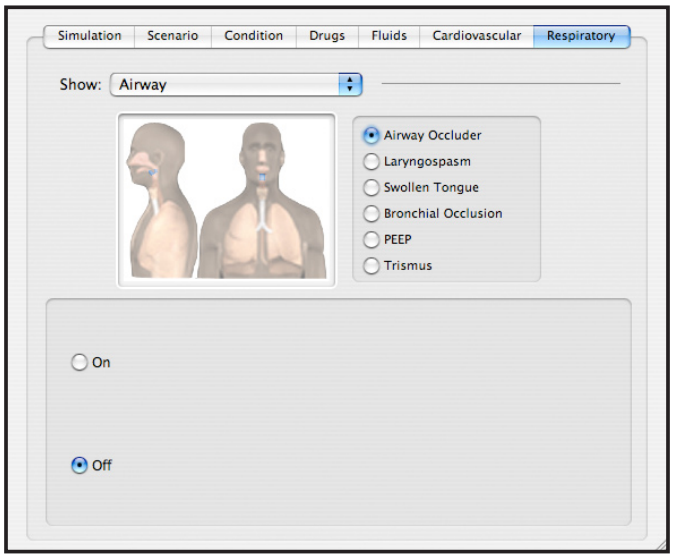
This action is recorded in the Events log.

Variable Upper/Lower Airway Resistance

Airway interventions can be necessitated and complicated by a number of variables. Located in the **Airway** menu found under the **Respiratory** tab are six parameters that affect ventilation and intubation.

Airway Occluder

Swelling of the posterior oropharynx (airway occluder) 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.

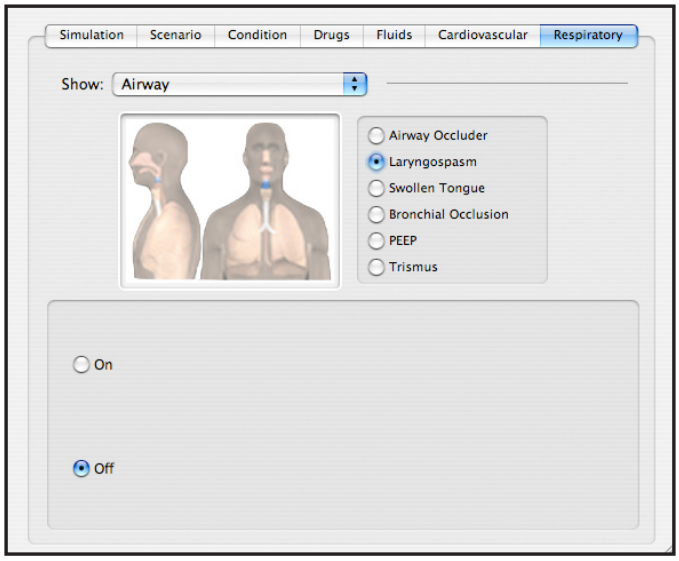


Selecting Airway Occluder

After locating the **Airway Occluder** option in the **Airway** menu found under the **Respiratory** tab, select the **On** button to activate the feature. The **Airway Occluder** option is set by default to **Off**.

Laryngospasm

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

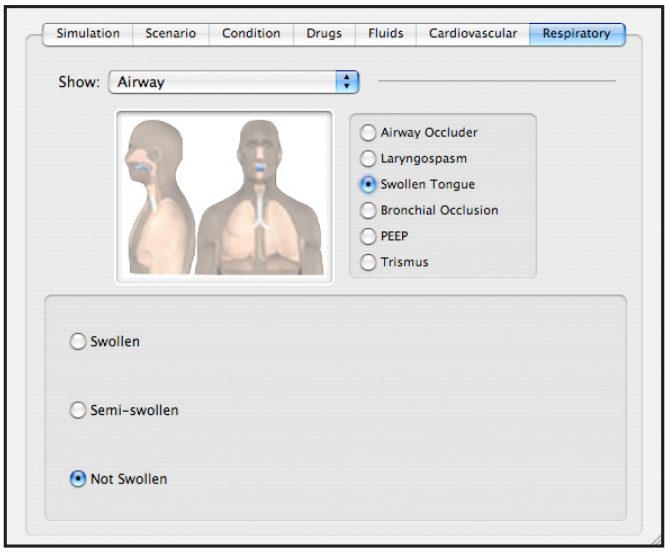


Selecting Laryngospasm

Activate the **Laryngospasm** option in the **Airway** menu by clicking the **On** button. The **Laryngospasm** option is set by default to **Off**.

Tongue Edema (Swelling)

Tongue swelling can be activated to varying degrees (moderate or severe).

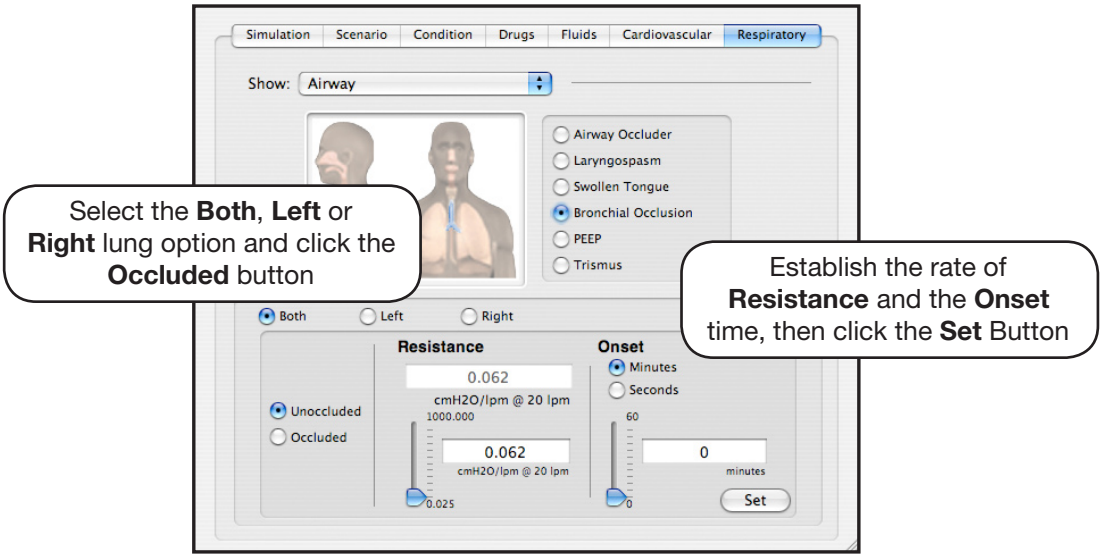


Selecting Swollen Tongue

After selecting the **Swollen Tongue** parameter from the **Airway** menu, choose either the **Swollen** (for severe swelling) or **Semi-swollen** option by clicking the corresponding button. The **Swollen Tongue** option is set by default to **Not Swollen**.

Bronchial Occlusion

Bronchial Occlusion completely obstructs the right and left bronchi, simulating a lower airway obstruction (e.g. mucus plug). Improper intubation creates a mainstem occlusion, yielding an inability to ventilate the lungs. However, the right and left bronchi are not occluded individually.



Setting Bronchial Occlusion

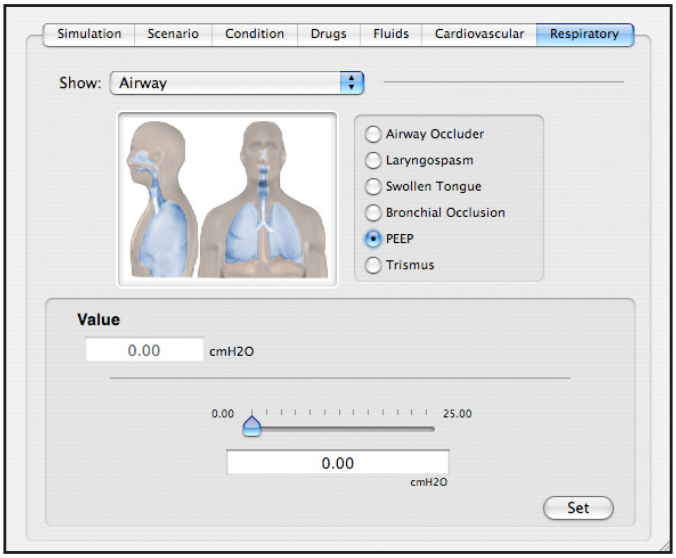
After selecting the **Bronchial Occlusion** parameter from the **Airway** menu, choose either the **Both**, **Left** or **Right** lung option and then click the **Occluded** button.

The rate of **Resistance** can also be set using either the slider bar or the rate fields. Using a slider bar or the time field, the **Onset** option allows for the increase in resistance to take place over a set period of time. Once the resistance and onset time have been entered, click the **Set** button to activate.

The default setting for **Bronchial Occlusion** is **Unoccluded** in **Both** lungs at a rate of 1 cmH_20/lpm@ 20 lpm.

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.



Setting PEEP

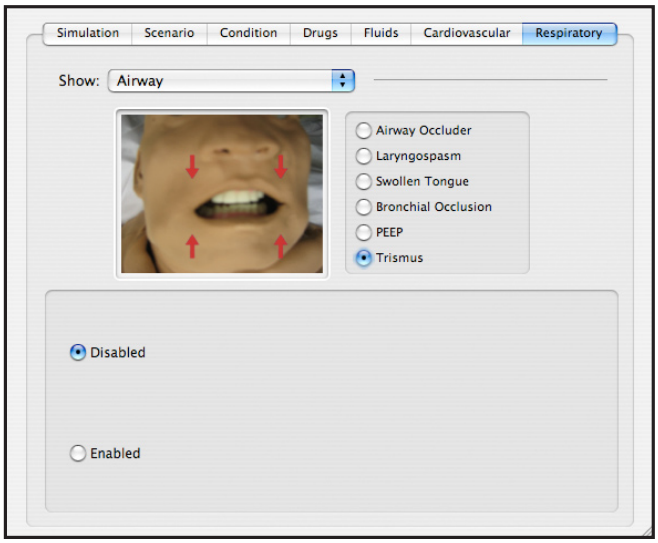
After selecting the **PEEP** option from the **Airway** menu, use either the slider bar or enter an amount in the rate field to establish the rate of pressure before clicking the **Set** button.

PEEP must be set in both the software and on the ventilator.

Trismus

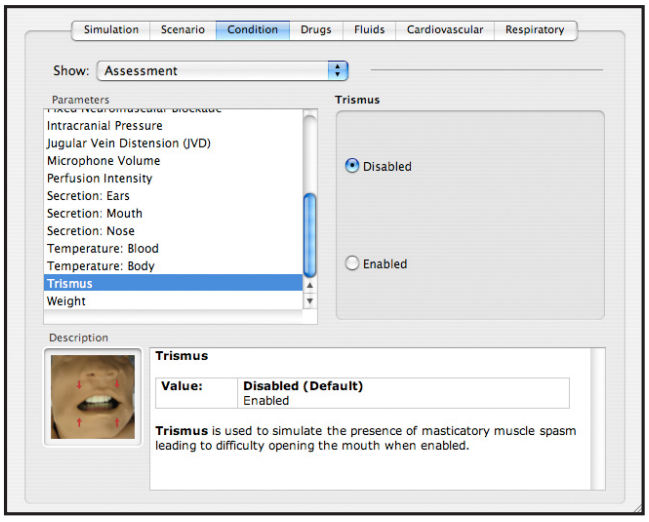
Enabling **Trismus** simulates the presence of a masculatory muscle spasm and thus makes opening the mouth difficult.

Trismus can be located under the **Airway** menu on the **Respiratory** tab.



Selecting Trismus

And, **Trismus** can also be found under the **Condition** tab in the **Assessment** menu.



Trismus located under the Condition Tab

To activate **Trismus**, click the **Enable** button.

Cricothyrotomy

To replicate a needle cricothyrotomy:

Spray the silicone lubricant onto the airway adjunct prior to the simulation session.

Locate the simulated cricothyroid membrane sealed with tape underneath the neck skin.

Follow standard clinical techniques and palpate to find the cricothyroid space.

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.

Users must replace the tape that simulates the cricothyroid membrane after each cricothyrotomy.

A replacement neck skin, airway lubricant and spools of tape are available in the Replacement Kit.

Replacing the Cricothyrotomy Tape

Remove the old, punctured tape completely from the cricoid feature and use alcohol (an alcohol prep pad works well) to clean the glue residue from the surface. 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 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 to 3.0 inch (7 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.

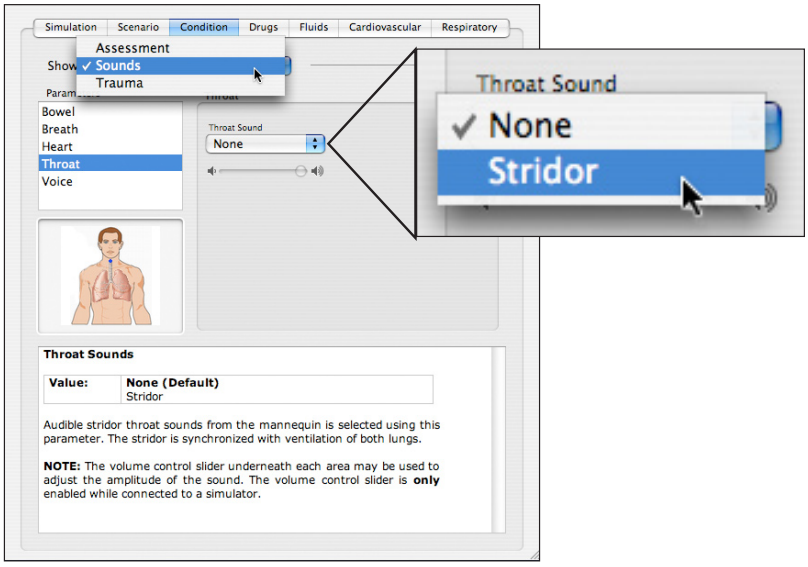
Teeth with Breakaway Incisors

iStan 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.

Throat Sounds

Stridor throat sounds can be enabled by navigating to the **Sounds** menu beneath the **Condition** tab and choosing the **Throat** option. Then, select the **Stridor** option under the **Throat Sound** menu.



Selecting Throat Sounds

The volume of the stridor sounds can be adjusted using the slider bar.

The patient must be connected to iStan for any volume adjustment to be effective.

None is the default **Throat Sound**.

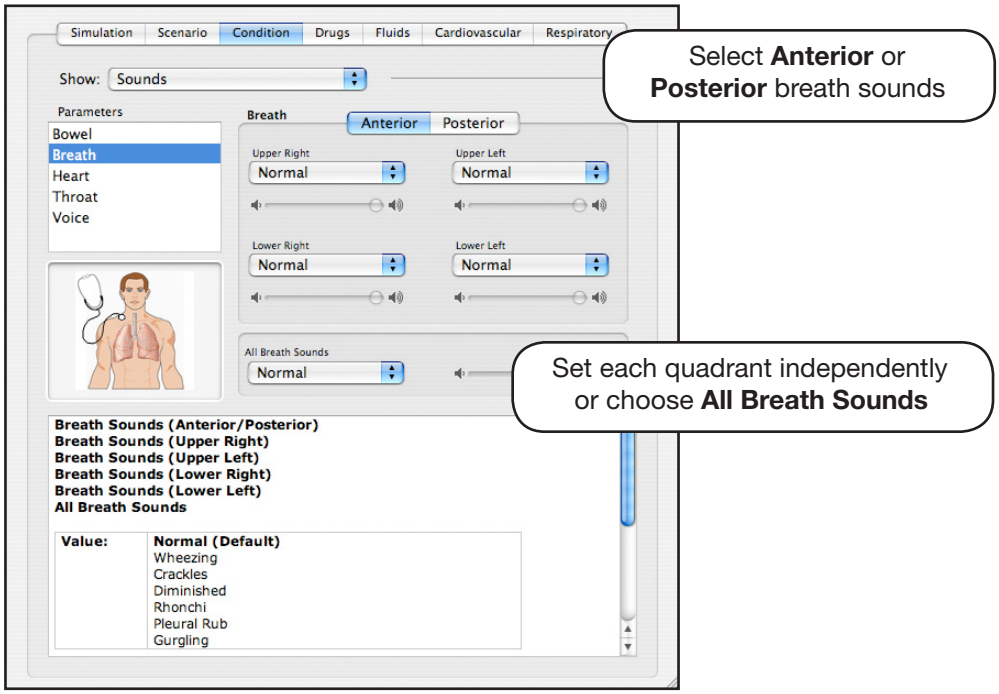
Pulmonary

iStan uses both physical and mathematical models to achieve an extremely accurate simulation of respiration. iStan's lungs react realistically to intubation as well as to pathophysiologic states. The patient's chest rises and falls synchronously with the inflationary state of the underlying lungs.

Pulmonary System			
Anatomy, Physiology and Clinical Signs	**Clinical Interventions, Patient Monitoring and Scenarios.**	**Software Control**	**Manual Control**
Spontaneous, Self-Regulating Breathing	**Normal tidal breathing and pathophysiological conditions such as atelectasis, pneumothorax, asthma and COPD.**	None required, but adjustable TAB: **Respiratory** SHOW: **Respiratory Control**	None required.
Exhaled CO_2	**Measure the presence or absence of CO_2.**	None required, but adjustable TAB: **Respiratory** SHOW: **Respiratory Control**	CO_2 canister is inserted, *see page 2.11.*
Symmetric and asymmetric Lung Ventilation	**Tracheal, pathophysiologic conditions such as pneumothorax.**	None required, but adjustable TAB: **Respiratory** SHOW: **Respiratory Control**	None required.
Chest Excursion	**Synchronized with ventilation (spontaneous or mechanical). 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 TAB: **Condition** SHOW: **Sounds**	None required.
Pulse Oximetry	**Oxyhemoglobin saturation (SpO_2) automatically correlates with the oxygen concentration in the lungs and the intrapulmonary shunt fraction.**	None required, but adjustable TAB: **Respiratory** SHOW: **Respiratory Control**	SpO_2 probe is attached, *see page 2.10.*
Arterial Blood Gases	**PaO_2, $PaCO_2$ and pH are continuously calculated and displayed on the HUD.**	None required, but adjustable TAB: **Respiratory** SHOW: **Respiratory Control**	None required.
Venous Blood Gases	**PvO_2 and $PvCO_2$ are continuously calculated and displayed on the HUD.**	None required, but adjustable TAB: **Respiratory** SHOW: **Respiratory Control**	None required.

Breath Sounds

Breath sounds are independently synchronized with ventilation of the left and right lungs. Eight anterior and six posterior speakers provide breath sounds that can be auscultated.



Choosing Breath Sounds

The **Breath Sounds** parameter is located on the **Sounds** menu beneath the Condition tab.

Select either the **Anterior** or **Posterior** sounds. In addition to the **Normal** sounds, each quadrant is capable of independently emitting six additional sounds:

- Wheezing
- Crackles
- Diminished
- Rhonchi
- Pleural Rub
- Gurgling

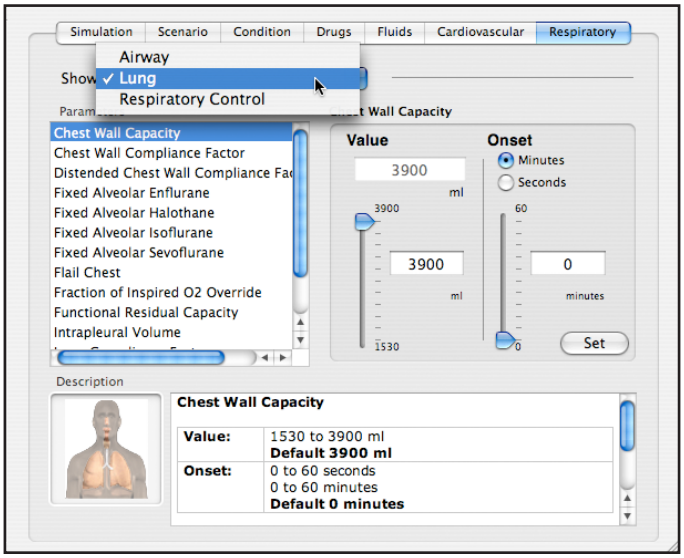
Use the slider bar beneath the selected area to control the volume of the sounds.

The patient must be connected to iStan for any volume adjustment to be effective.

By default, **Normal** breath sounds are heard.

Lung Parameters

Lung and chest wall capacity and compliance can be controlled through a set of options located on the **Lung** menu found on the **Respiratory** tab.



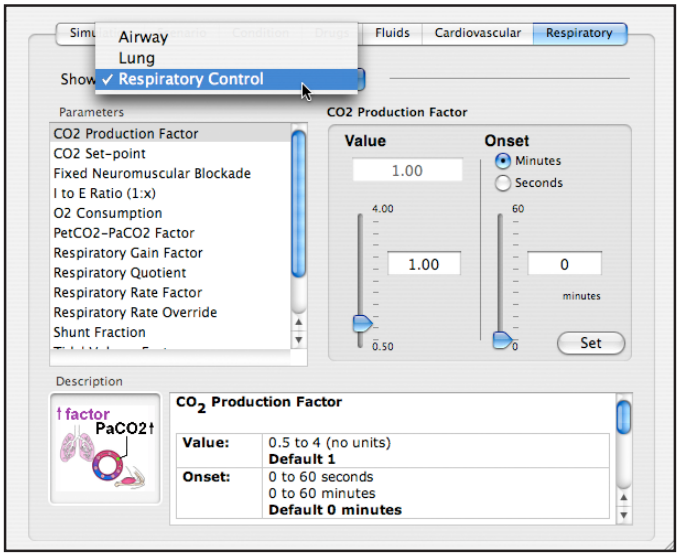
Selecting the Lung Menu

In addition to offering settings for volume and pressure in the lungs, these parameters also allow for the administration of oxygen as well as certain anesthetics. A parameter is also provided to allow **Intrapleural Volume** to accumulate to simulate conditions such as pneumothorax, hydrothorax or hemothorax. Lung parameters include:

- Chest Wall Capacity
- Chest Wall Compliance Factor
- Distended Chest Wall Compliance Factor
- Fixed Alveolar Enflurane
- Fixed Alveolar Halothane
- Fixed Alveolar Isoflurane
- Fixed Alveolar Sevoflurane
- Flail Chest
- Fraction of Inspired O_2 Override
- Functional Residual Capacity
- Intrapleural Volume
- Lung Compliance Factor
- pH Shift
- Venous CO_2 Shift

Respiratory Control Parameters

The patient's respiratory drive can be controlled through a set of options located on the **Respiratory Control** menu found on the **Respiratory** tab.



Selecting the Respiratory Control Menu

Respiratory Control parameters include:

- CO_2 Production Factor
- CO_2 Set-point
- Fixed Neuromuscular Blockade
- I to E Ratio (I:x)
- O_2 Consumption
- $PetCO_2$ - $PaCO_2$ Factor
- Respiratory Gain Factor
- Respiratory Quotient
- Respiratory Rate Factor
- Respiratory Rate Override
- Shunt Faction
- Tidal Volume Factor
- Tidal Volume Override
- Volume/Rate Control Factor

Cardiovascular

iStan produces realistic heart sounds and a wide range of pathophysiologic conditions synchronized to the QRS complex of the ECG and audible to a standard stethoscope.

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 with the QRS complex of the ECG. 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. TAB: **Condition** SHOW: **Sounds**	None required.
3-Lead or 5-Lead ECG	**ECG waveforms can be viewed on a standard monitor and/or on the Waveform Display Monitor. Normal and abnormal cardiac rhythms are linked to patient physiology (e.g. blood pressure, cardiac output).**	None required; specific rhythms can be selected. TAB: **Cardiovascular** SHOW: **Heart**	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. TAB: **Cardiovascular** SHOW: **Heart**	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. TAB: **Cardiovascular** SHOW: **Pulses**	None required.
Manual Blood Pressure	**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.
Invasive Hemodynamic Monitoring	**Various hemodynamic physiological indicators are registered and can be monitored.**	None required, but adjustable. TAB: **Cardiovascular** SHOW: **Catheters**	None required.
Baroreceptor Reflex	**Cardiovascular system automatically compensates for changing hemodynamic conditions.**	None required, but adjustable. TAB: **Cardiovascular** SHOW: **Heart** and **Systemic**	None required.
Circulation	**Normal and abnormal circulation (e.g. hypovolemia, hypervolemia and right/left heart failure) can be adjusted.**	None required, but adjustable. TAB: **Cardiovascular** SHOW: **Heart**	None required.
Jugular Vein Distension	**The jugular veins can be distended for assessment.**	None required, but adjustable. TAB: **Condition** SHOW: **Assessment**	None required.

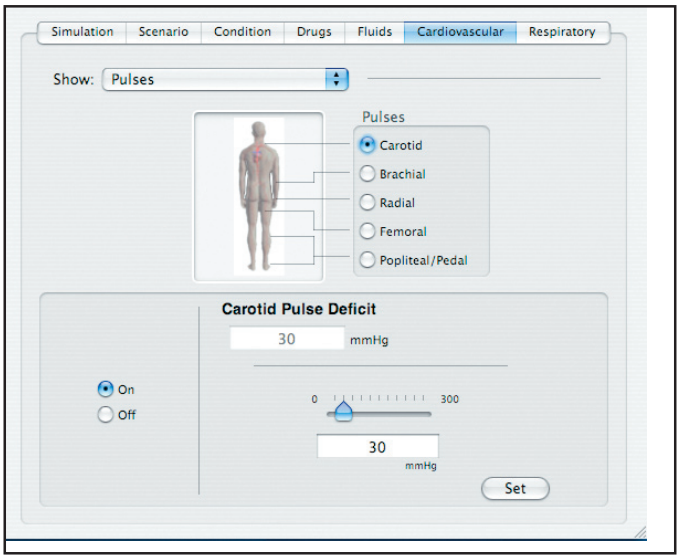
Pulses

Fourteen pulse locations are activated, through sensors, by touch:

- Carotid (2)
- Brachial (2)
- Radial (2)
- Femoral (2)
- Popliteal (2)
- Posterior Tibial (2)
- Dorsalis Pedis (2)

When a pulse is activated and when that pulse is no longer being palpated the action is recorded on the Events Log for later review.

The **Pulses** menu is located under the **Cardiovascular** tab.



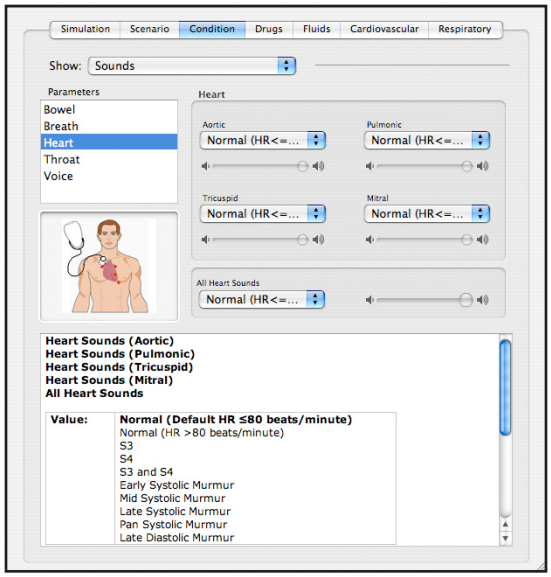
Pulses

A pulse deficits occurs when the systolic arterial blood pressure falls below the threshold indicated at the bottom of the screen.

Palpable Pulse Thresholds			
Carotid	**60mmHg**	**Popliteal**	**80mmHg**
Brachial	**80mmHg**	**Posterior Tibial**	**80mmHg**
Radial	**90mmHg**	**Dorsalis Pedis**	**80mmHg**
Femoral	**70mmHg**		

Heart Sounds

Heart sounds can be independently set by adjusting the volume and the sound for each auscultatory area. The first heart sound involves valvular closure from the aortic and pulmonic valves, and the second heart sound is composed of the sound from mitral and tricuspid valve closure.



Choosing Heart Sounds

By default, heart sounds are set at a normal sound at a rate of less than or equal to 80 beats per minute with their default volume equally for all areas. Each area may be set to the following sounds:

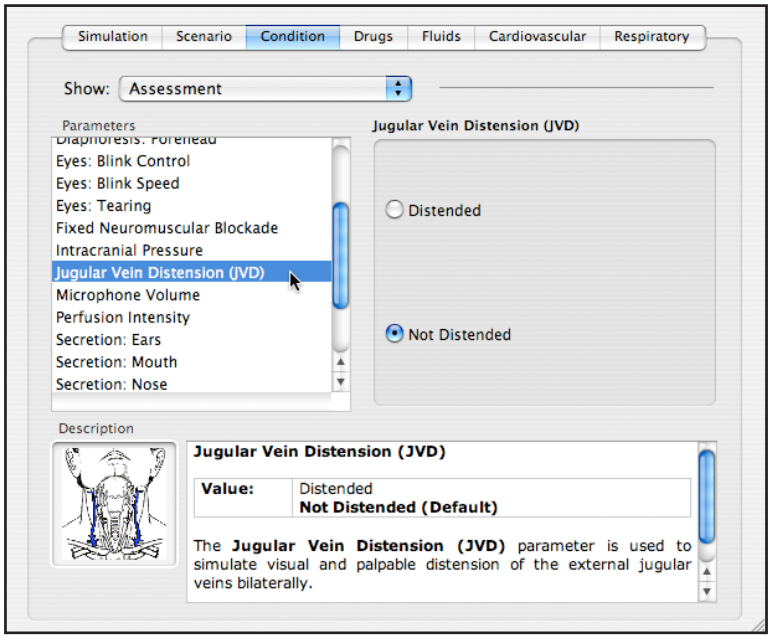
- Normal (HR less than or equal to 80 beats per minute)
- Normal (HR greater than 80 beats per minute)
- S3
- S4
- S3 and S4
- Early Systolic Murmur
- Mid Systolic Murmur
- Late Systolic Murmur
- Pan Systolic Murmur
- Late Diastolic Murmur

Normal and abnormal heart sounds are synchronized with the QRS complex of the ECG. Heart sounds can be auscultated over the left and right sternal border, right lower sternal border and apex.

The **Heart Sounds** parameter is located on the **Sounds** menu beneath the **Condition** tab.

Jugular Venous Distension (JVD)

Distension of the jugular veins can be activated bilaterally to provide a visual and palpable assessment tool.

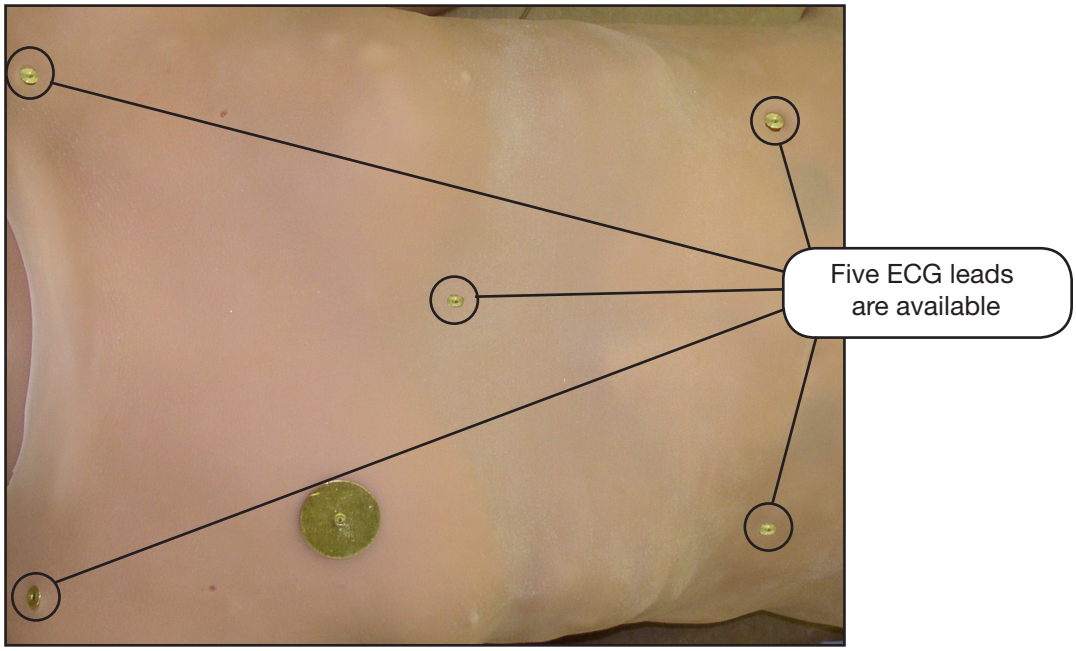


Choosing Jugular Vein Distension

The **Jugular Vein Distension** parameter is located on the **Assessment** menu beneath the **Condition** tab.

3-Lead or 5-Lead ECG

A 3-lead or 5-lead ECG is emitted from the appropriate positions for display on a standard monitor. A contact is available on iStan's chest for each of five cables.

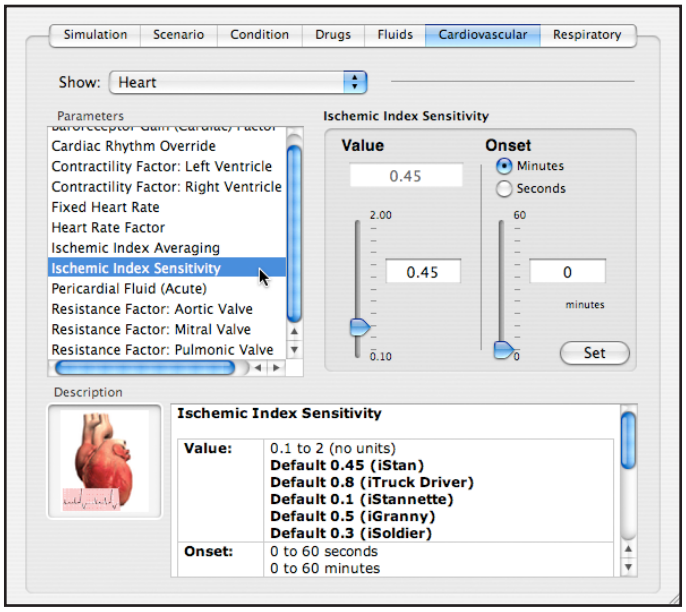


The simulator generates a normal sinus ECG, as well as a broad range of abnormalities such as myocardial ischemia, sinus tachycardia and bradycardia, ventricular fibrillation and asystole. The hemodynamic response to the arrhythmias is physiologically correct. Myocardial oxygen balance and cardiac ischemia 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.

Myocardial Ischemia

A myocardial ischemia rhythm from moderate to severe can be set using the **Cardiac Rhythm Override** parameter located under the **Heart** menu on the **Cardiovascular** tab.

In addition, the **Ischemic Index Sensitivity** parameter, also located on the **Heart** menu, can be used to set the relative sensitivity of the patient to myocardial ischemia.



Selecting Ischemic Index Sensitivity

The lower the value the patient has, the less sensitive the patient is to poor oxygenation and the less likely the patient is to go into a “death spiral.”

The **Ischemic Index Averaging** parameter, located above **Ischemic Index Sensitivity** on the **Heart** menu, 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.

For additional information on the Ischemic Index, *see page 3.17.*

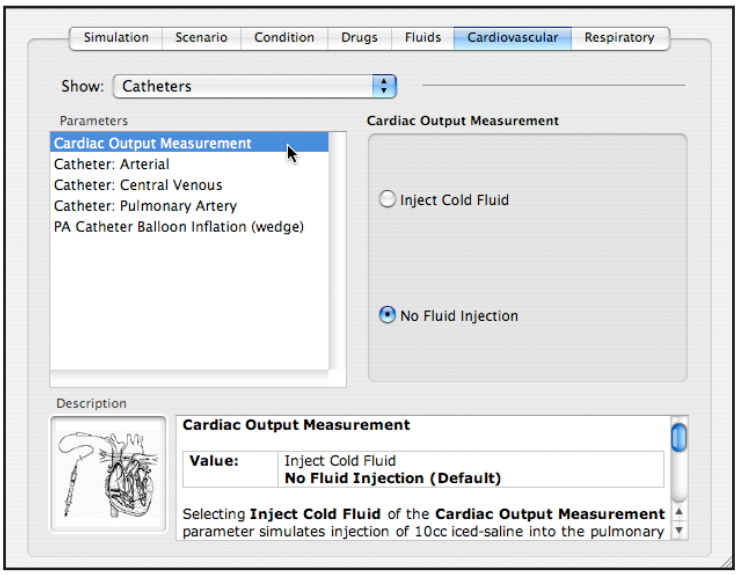
Invasive Hemodynamic Monitoring

The invasive hemodynamic monitoring package provides the capability to measure and monitor:

- Arterial blood pressure
- Left ventricular pressure
- Central venous pressure
- Right arterial pressure
- Pulmonary artery pressure
- Pulmonary artery occlusion (wedge) pressure
- Thermodilution cardiac output

The introduction and progressive insertion of a pulmonary artery catheter, synchronous with the appropriate waveforms, can be simulated with the results shown on the patient Waveform Display.

The **Catheters** menu that contains the parameters affecting hemodynamic monitoring is located on the **Cardiovascular** tab.

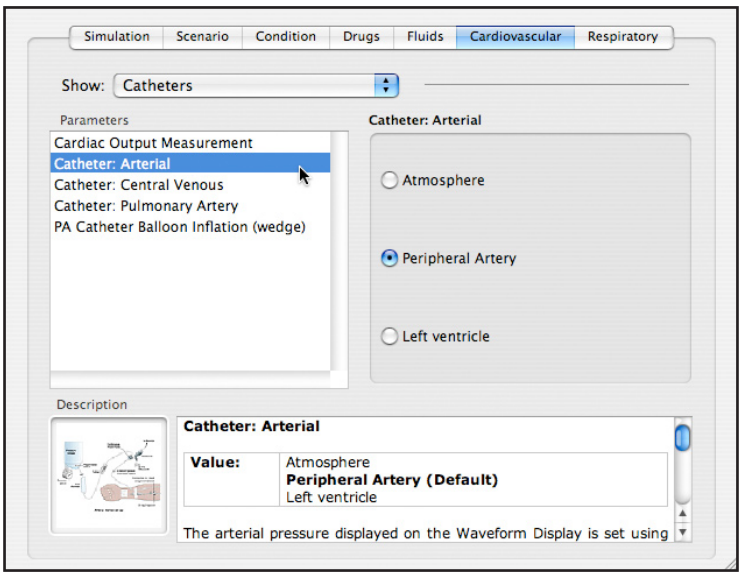


Selecting Cardiac Output Measurement

Cardiac Output Measurement can simulate the injection of 10cc iced saline into the pulmonary artery catheter.

The cardiac output is available as a “Continuous Cardiac Output” numeric on the Waveform Display.

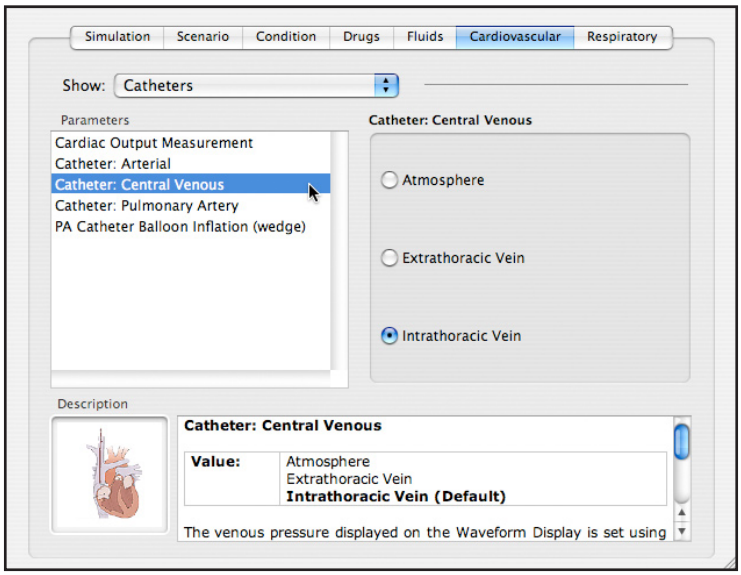
Catheter: Arterial can simulate zeroing a pressure transducer using the **Atmosphere** selection or cardiac catheterization procedures using the **Left Ventricle** selection.



Selecting Catheter: Arterial

The arterial pressure displayed on the Waveform Display is set using this parameter.

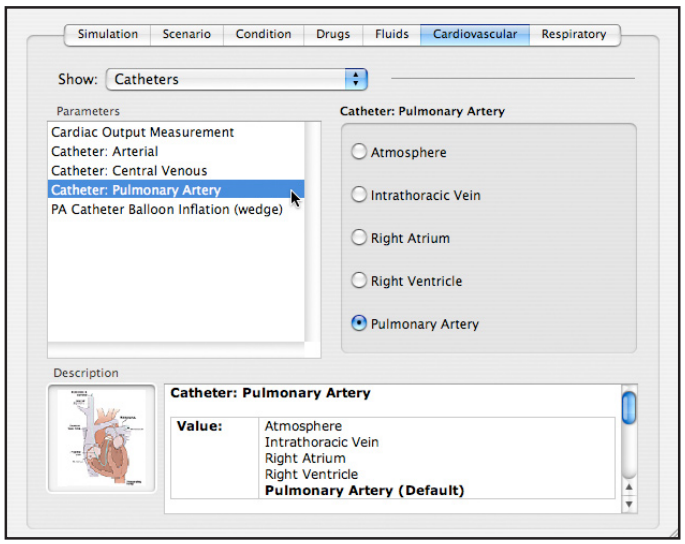
Catheter: Central Venous can simulate zeroing a pressure transducer using the **Atmosphere** selection.



Selecting Catheter: Venous

The central venous pressure displayed on the Waveform Display is set using this parameter.

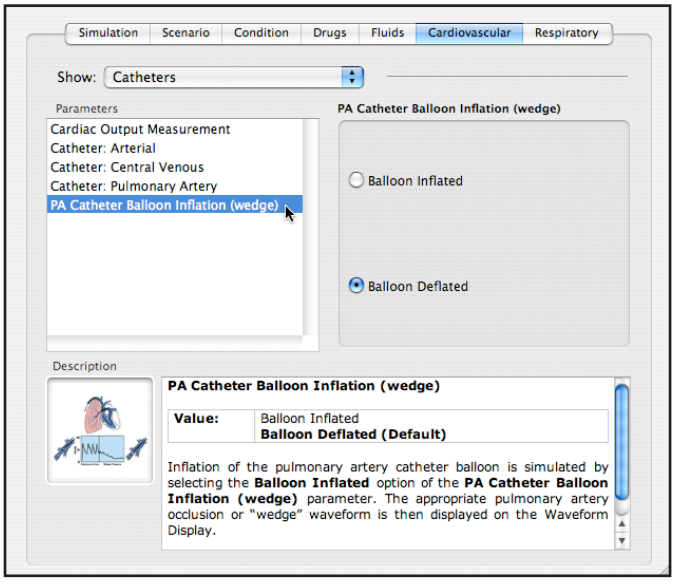
Catheter: Pulmonary Artery can simulate zeroing a pressure transducer using the **Atmosphere** selection.



Selecting Catheter: Pulmonary Artery

The pulmonary artery pressure displayed on the Waveform Display is set using this parameter.

Inflation of the pulmonary catheter balloon is simulated by selecting the **Balloon Inflated** option on the **PA Catheter Balloon Inflation (wedge)** parameter.



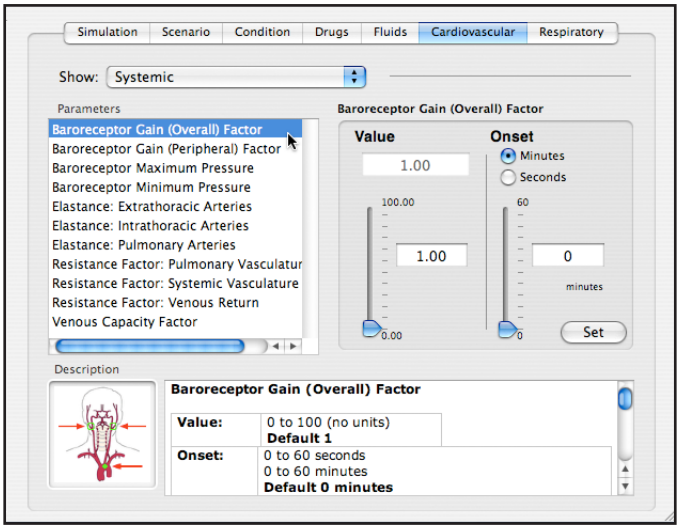
Selecting PA Catheter Balloon Inflation (Wedge)

The appropriate pulmonary artery, or "wedge," waveform is then displayed on the Waveform Display.

Baroreceptor Reflex

iStan's cardiovascular system automatically compensates for changing hemodynamic conditions.

The **Baroreceptor Gain (Overall) Factor** adjusts the influence of mean arterial pressure (MAP) on heart rate, contractility, systemic vascular resistance, and venous capacity. Use the **Baroreceptor Gain (Overall) Factor** to adjust how vigorously the heart and vasculature respond to blood pressure changes.

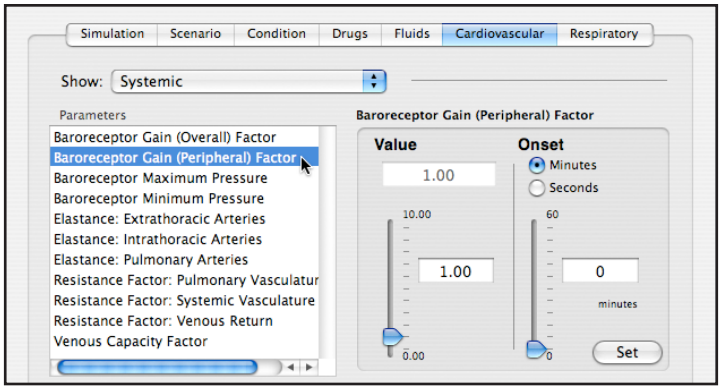


Selecting Baroreceptor Gain (Overall) Factor

A **Value** above 1.00, the default, causes a stronger response to MAP changes. A **Value** less than 1.00 corresponds to baroreceptor depression.

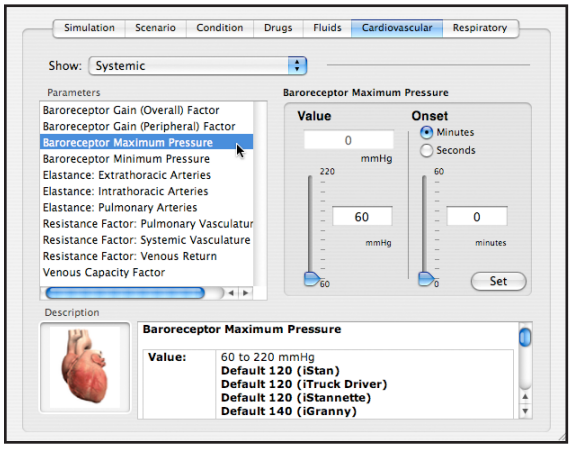
The **Baroreceptor Gain (Overall) Factor** parameter can be located under the **Systemic** menu.

To adjust how vigorously the vascular responds to blood pressure changes, adjust the **Value** of the **Baroreceptor Gain (Peripheral) Factor** parameter located under the **Systemic** menu.

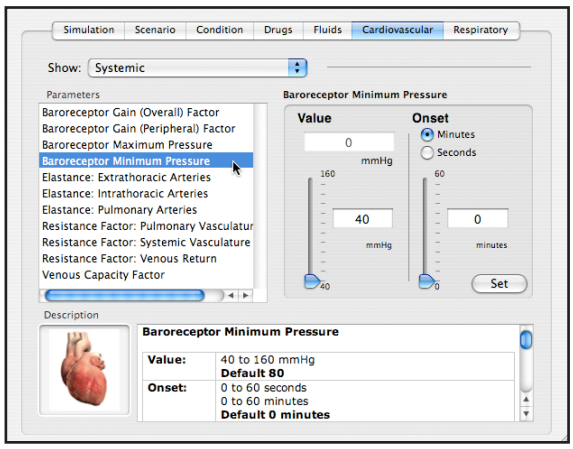


Selecting Baroreceptor Gain (Peripheral) Factor

The **Baroreceptor Maximum Pressure** and **Baroreceptor Maximum Pressure** parameters define the mean arterial pressure (MAP) at which baroreceptor inhibitory activity on the heart is at its maximum and minimum.



Baroreceptor Maximum



Baroreceptor Minimum

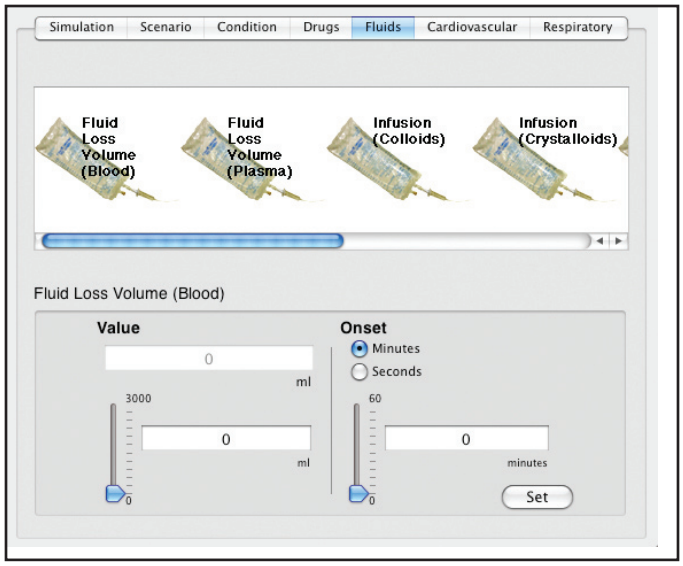
It is important to set both the **Baroreceptor Maximum Pressure** and **Baroreceptor Maximum Pressure** parameters at the same time for the software to recognize the baroreceptor reset.

Circulation

Circulation can be affected by blood or plasma loss, the infusion of fluids or changes to the contractility of the left or right ventricles.

Controlling Fluids

Selecting the **Fluids** tab opens a window that provides a means of controlling the amount of fluid lost by or infused into the patient. The upper panel provides scrollable access to the various fluid parameters and the bottom panels display the controls for entering the amount of fluid to be lost or infused and establishing the time frame during which the fluid loss or infusion will take place.



The Fluids Tab

There are six parameters on the **Fluids** tab that affect circulation.

Fluid Parameters Affecting Circulation	
Fluid Event	**Use/Effect**
Fluid Loss Volume (Blood)	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.
Fluid Loss Volume (Plasma)	Reflects a decrease in plasma volume. "Fluid Loss" decreases the plasma volume without changing the red blood cell volume. It refers collectively and generically to all fluid losses, including evaporative, transcellular (e.g. ascites, pleural effusion), bowel and third space fluid losses.
Infusion (Colloids)	Reflects an addition to the plasma volume without changing the red blood cell volume. Colloids include modified fluid gelatin starch solutions (pentastartch and hetastarch), dextran and human albumin.
Infusion (Crystalloids)	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, for example, normal saline, dextrose in water and Ringer's Lactate.
Infusion (Packed Red Blood Cells)	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.
Infusion (Whole Blood)	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.

To control fluids lost or infused:

1. Select the fluid by clicking on the icon in the scrollable window. The bottom panel displays that fluid's control settings.
2. In the **Value** panel, use the slider to choose a value or enter the value in the field to the right of the slider.
3. In the **Onset** panel, click a radio button to select in **Minutes** or **Seconds** the time measurement for the fluid loss or infusion.
4. Use the slider to choose the amount of time over which the fluid loss or infusion will take place or enter that amount in the field to the right of the slider.
5. Click **Set**.

The amount of fluid lost or infused appears in the **Value** fields as the loss or infusion takes place. This amount increases until the total value is achieved at the end of the onset time.

Hematology Model

The physiological model calculates hematocrit values (i.e. percentage of total blood hemoglobin) dynamically and continuously, taking into account blood and fluid losses, as well as the intravenous infusion of fluids such as whole blood, packed red blood cells, colloids and crystalloids.

Instructors can create patients with both normal and pathophysiological hematocrit levels. In addition, learners discover how administering various fluids affects hematocrit, the oxygen-carrying capacity of blood, and the resulting patient response.

The following important assumptions were made in the design of the Hematology Model:

- Blood is comprised of two components: red blood cells and plasma.
- Plasma is comprised of two components: colloid and crystalloid. The term colloid is used to describe substances that generate a clinically significant colloid osmotic pressure, for example, fresh frozen plasma, albumin and hetastarch. The term “crystalloid” is used to describe salt solutions for infusion, for example, normal saline, dextrose in water and Ringer’s Lactate.
- The mixing of blood and its various constituents is instantaneous and homogeneous. In other words, one liter of crystalloid administered intravenously equilibrates immediately and homogeneously throughout the entire circulation.
- This initial Hematology Model does not yet distinguish between the differing clinical effects of colloids versus crystalloids. For example, osmotic pressures and capillary leakage rates are not taken into account. Likewise, fluid kinetics and how fluids distribute within the circulation, the interstitial, and intracellular spaces are also not presently modeled.

In the Hematology Model, the following model variables, definitions and relationships have been established:

Red Blood Cell Volume: The volume of red blood cells within the circulation.

Plasma Volume: The volume of plasma within the circulation.

Total Blood Volume: The volume of blood (i.e. Red Blood Cell Volume + Plasma Volume) within the circulation.

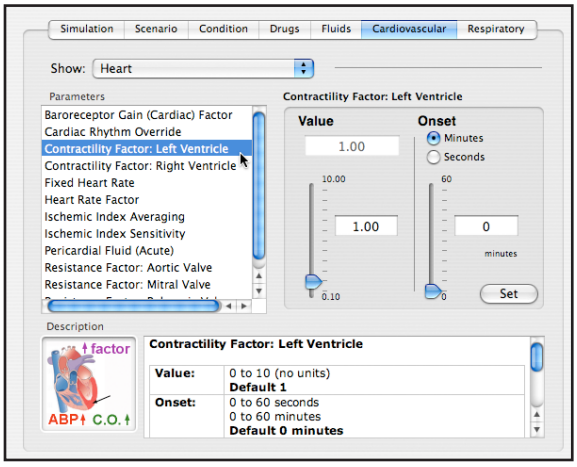
Blood Volume Loss: The amount or rate of decrease in the total blood volume. A given amount or rate of blood loss proportionally decreases both the Red Blood Cell Volume and the Plasma Volume according to the current hematocrit.

Plasma Volume Loss: The amount or rate of decrease in the plasma volume. A given amount or rate of plasma loss decreases the plasma volume without changing the red blood cell volume. Plasma Volume Loss refers collectively and generically to all plasma fluid losses, including evaporative, transcellular (e.g. ascites, pleural effusion), bowel and third space losses.

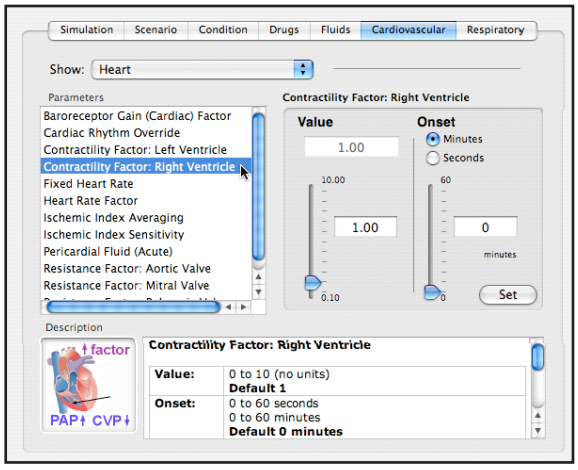
Hematocrit: The ratio of Red Blood Cell Volume to Total Blood Volume, expressed as a percentage.

Adjusting Contractility

Cardiac output and blood pressure can be adjusted using the **Contractility Factor: Left Ventricle** and **Contractility Factor: Right Ventricle** parameters.



Contractility Factor: Left Ventricle



Contractility Factor: Right Ventricle

The **Contractility Factor** parameters are located under the **Heart** menu on the **Cardiovascular** tab.

Manual Blood Pressure

Blood pressure can be taken manually on the left arm.

Non-invasive blood pressure monitoring techniques can be used by attaching the standard cuff modified with a T-fitting and adapters.

The extension from the T-fitting is connected to the hose located inside the left upper-arm skin.

Connect the T-fitting extension to the hose and take the noninvasive blood pressure reading using the return-to-flow technique.

Store the modified blood pressure cuff with the system for future use.

Korotkoff Sounds (5 phases)

Korotkoff sounds can be auscultated on the left arm.

To auscultate Korotkoff sounds,

1. Place the stethoscope on the left arm, just above the brachial pulse.
2. Let the cuff pressure drop slowly by opening the valve on the bulb slightly.
3. Monitor the pressure displayed on the cuff gauge.

All five phases should be recognized:

Phase I - Clear, repetitive, tapping sounds (Systolic)

Phase II - Longer beats, with some swishing sounds

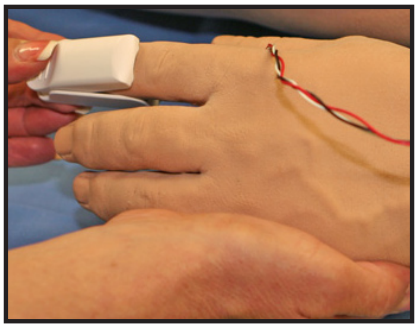
Phase III - Crisp, more intense rhythm sounds

Phase IV - Muffled, less distinct sounds

Phase V - Sounds disappear completely (Diastolic)

SpO_2 Probe

The SpO_2 probe is integrated with the Waveform Display and the physiological model.

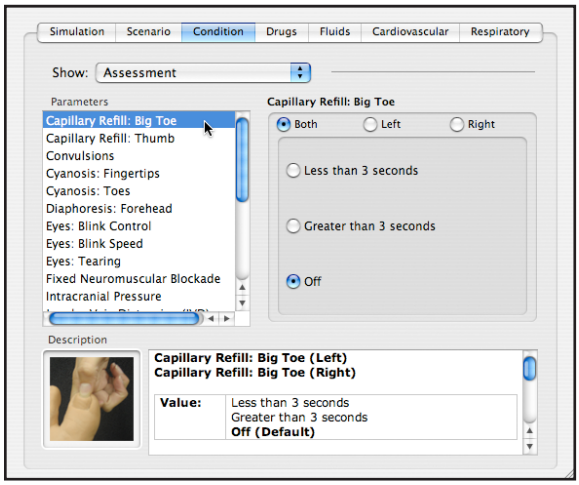


The connection for the SpO_2 probe is located on the left side of the simulator.

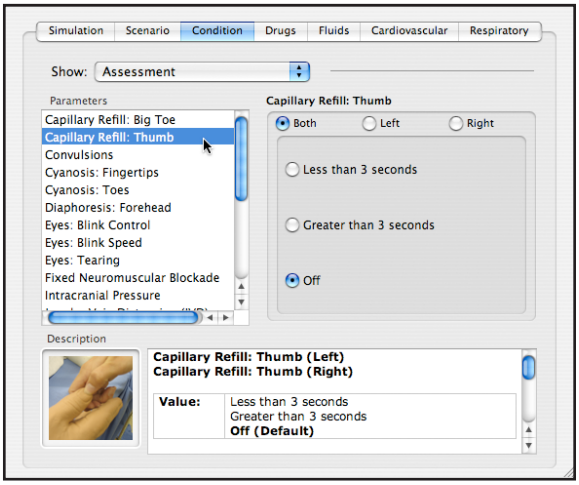
Instructions on connecting the SpO_2 probe are shown on *page 2.10*.

Capillary Refill (Big Toes/Thumbs)

The **Capillary Refill** parameters can be used to simulate the capillary nail refill test performed by blanching the nail bed.



Capillary Refill: Big Toe



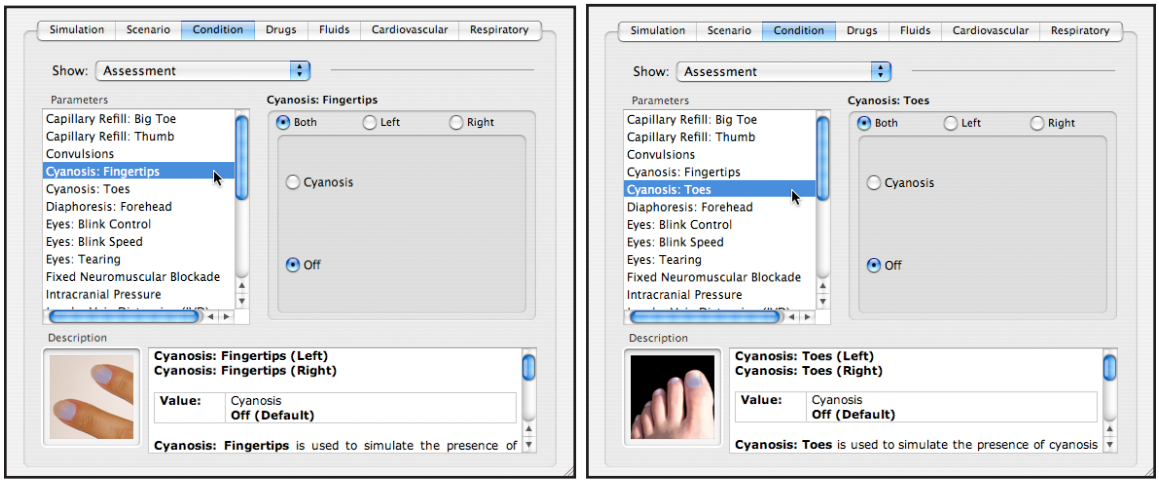
Capillary Refill: Thumb

When activated the nail bed refills based upon the selection of greater than or less than three seconds. The intensity of the cyanosis may be set with the **Perfusion Intensity** parameter located on the **Assessment** menu on the **Condition** tab (*see page 4.53*).

The **Capillary Refill** parameters are located under the **Assessment** menu on the **Condition** tab.

Cyanosis (Fingertips/Toes)

The **Cyanosis** parameters can be used to simulate the presence of cyanosis in the nail beds of the fingers or toes.



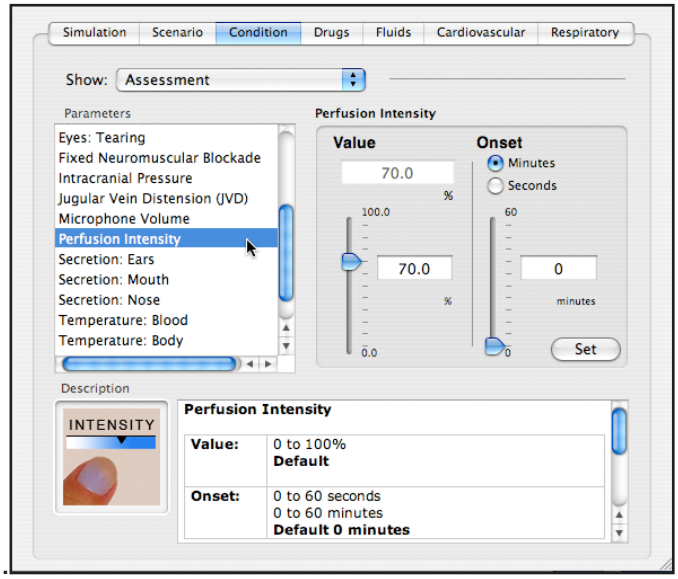
Cyanosis: Fingertips ***Cyanosis: Toes***

The intensity of the cyanosis may be set with the **Perfusion Intensity** parameter located on the **Assessment** menu on the **Condition** tab (*see page 4.53*).

The **Cyanosis** parameters are located under **Assessment** on the **Condition** tab.

Perfusion Intensity

The intensity of the brightness used to simulate cyanosis and capillary refill can be adjusted using the **Perfusion Intensity** parameter.



Perfusion Intensity

Perfusion intensity is used to match the intensity of the feature to that of the ambient surroundings. In poor light, set the feature to a low setting, and in brighter light, set the feature to a higher setting.

The **Perfusion Intensity** parameter is located on the **Assessment** menu on the **Condition** tab.

Genitourinary System

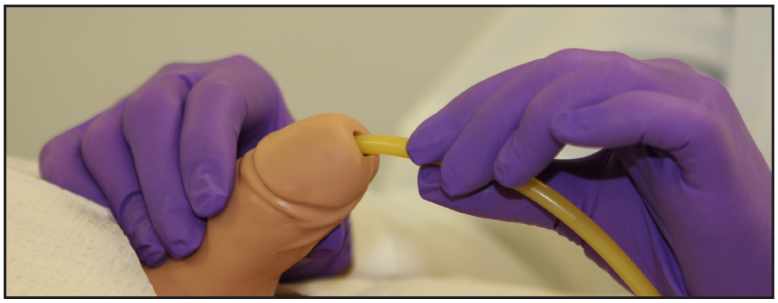
The simulator allows for the insertion of urinary catheters and excretion of urine with a flow rate that is controlled by the instructor.

Urinary Catheterization

Prior to use, ensure the clear secretions tank is full.

Catheterize the simulator using a standard 14 to 16 gauge urinary catheter lubricated with silicone spray.

If color is desired, place the desired amount of yellow food coloring in the Foley bag.

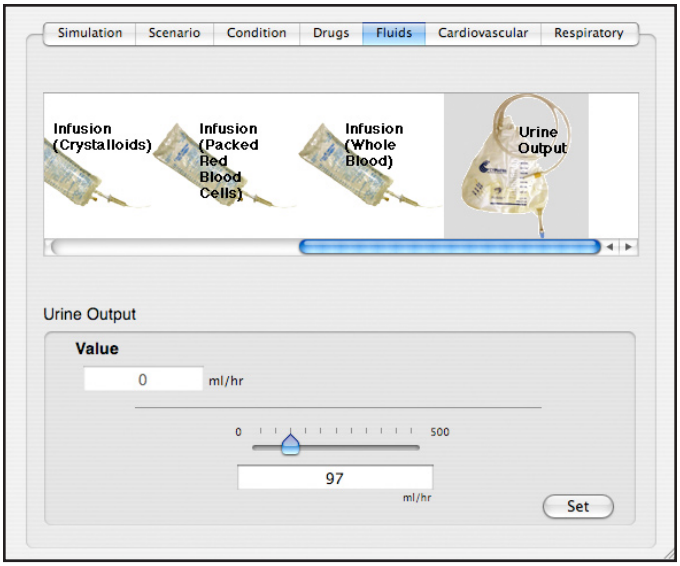


The bladder for the simulated urine is accessed directly via the urethra.

Set the **Urine Output** to the maximum level (500 ml/hr) in the software.

Urinary Output

Urinary output can be controlled by adjusting the **Urine Output** value on the **Fluids** tab.



Selecting Urine Output

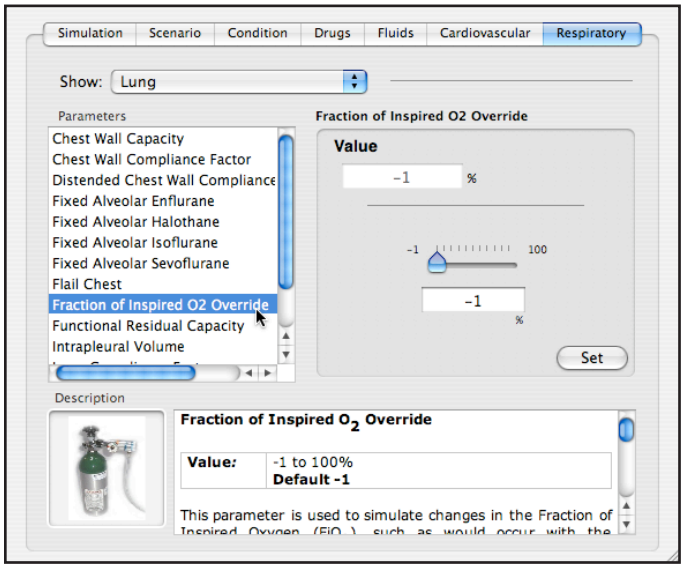
Advanced Cardiac Life Support (ACLS) System

The iStan includes several realistic Advanced Cardiac Life Support (ACLS) System modules offering advanced hands-on skills acquisition in airway management and ventilation, chest compression, as well as the use of defibrillators and transthoracic cardiac pacers.

Advanced Cardiac Life Support System			
Anatomy, Physiology and Clinical Signs	**Clinical Interventions, Patient Monitoring and Scenarios.**	**Software Control**	**Manual Control**
Airway Management and Ventilation	**Alveolar and arterial gas concentrations appropriately reflect the efficacy of ventilation and oxygen administration.**	Oxygen administration input by the instructor. TAB: **Respiratory** SHOW: **Lung**	None required.
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. TAB: **Condition** SHOW: **Trauma**	None required.
Cardiac Arrhythmias	**The desired arrhythmia can be selected.**	The response to clinical intervention must be controlled by the instructor. TAB: **Cardiovascular** SHOW: **Heart**	None required.
Defibrillation	**iStan supports operation with a variety of manual and automatic external defibrillators.**	Defibrillation can be simulated by the instructor. TAB: **Cardiovascular** SHOW: **External Cardiac Simulation**	See **Defibrillation** below for defibrillation disk locations and instructions.
Cardiac Pacing	**Transthoracic cardiac pacemaker can be used with iStan. Pacing results in appropriate physiological changes in blood pressure and cardiac output.**	The instructor can set the level at which electrical capture and mechanical capture occur. TAB: **Cardiovascular** SHOW: **External Cardiac Simulation**	See **Pacing** below for cardiac pacing disk locations and instructions.
Bilateral Autoinjection	**Atropine may be administered through an autoinjector simulator by applying pressure on the lateral aspect of each thigh.**	None required, but adjustable. TAB: **Condition** SHOW: **Trauma**	None required.

Airway Management

Oxygen administration can be simulated using the **Fraction of Inspired O_2 Override** parameter located under the **Lung** menu on the **Respiratory** tab.



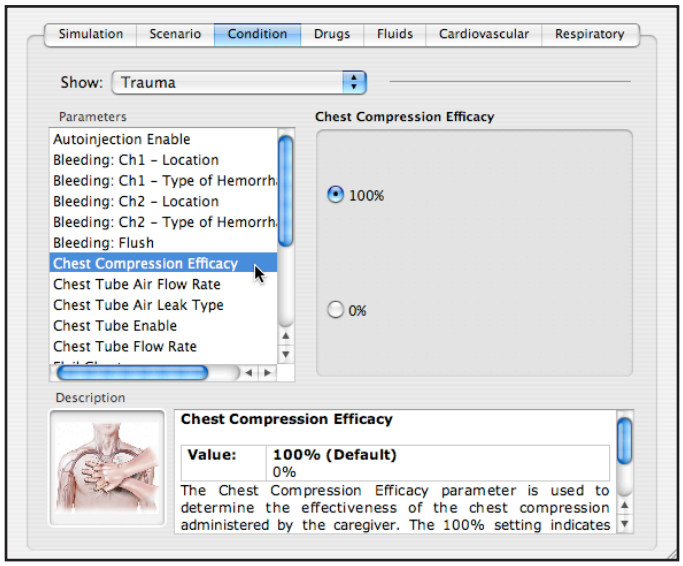
Fraction of Inspired O_2 Override

The percentage of oxygen administered is controlled using the slider bar. The Fraction of Inspired O_2 (FiO_2) setting is measured as a percentage, but can be converted to the liters per minute that flow through the nasal cannula using the following table:

Oxygen Therapy	FiO_2 Setting
1 liter per minute nasal cannula	24%
2 liters per minute nasal cannula	30%
3 liters per minute nasal cannula	36%
4 liters per minute nasal cannula	42%
5 liters per minute nasal cannula	48%
6 liters per minute nasal cannula	54%
10 liters per minute	78%
15 liters per minute	100%

Chest Compression

iStan supports normal hand placement and standard compression techniques. The effectiveness of chest compression can be controlled using the **Chest Compression Efficacy** parameter located on the **Trauma** menu beneath the **Condition** tab.



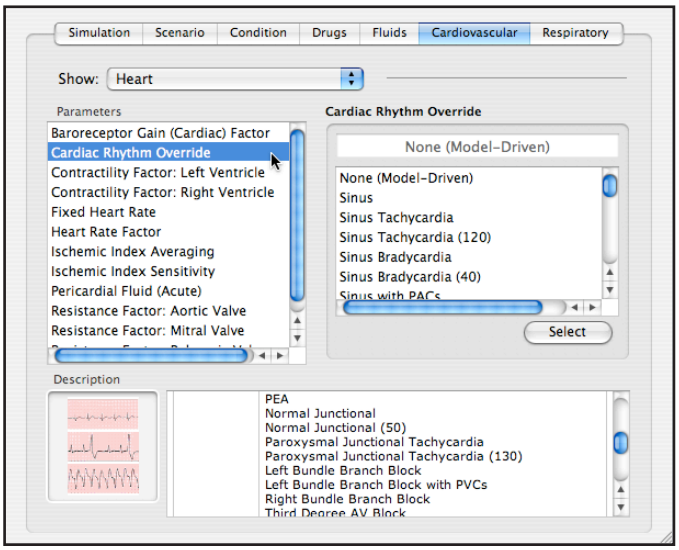
Chest Compression Efficacy

When **Chest Compression Efficacy** is set to 0%, chest compressions have no effect on intrathoracic pressure.

When Chest Compression is set at 100%, maintaining downward pressure on iStan's lower sternum stops respiration and releasing the pressure allows the respiratory system to breathe again. Pressing on iStan's sternum repeatedly increases the CVP and PAP blood pressure readings on the HUD and Waveform Display.

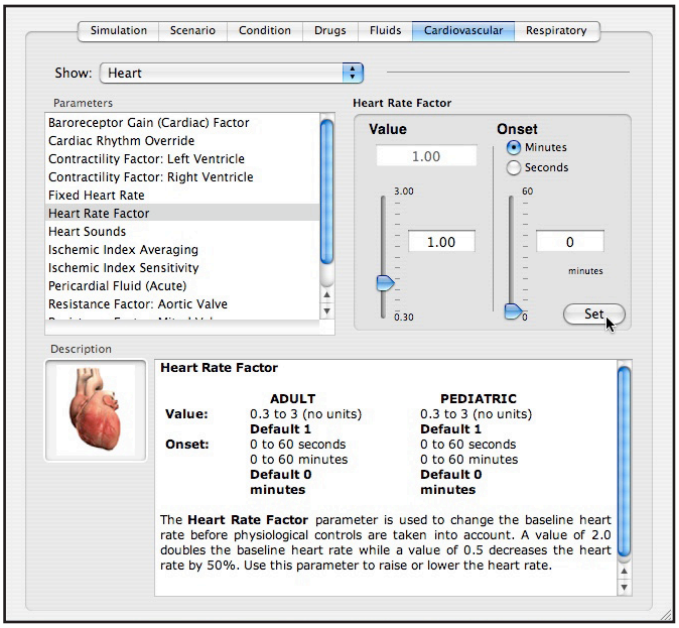
Cardiac Arrhythmias

The patient's underlying cardiac rhythm can be set using the **Cardiac Rhythm Override** parameter located on the **Heart** menu beneath the **Cardiovascular** tab.



Cardiac Rhythm Override

Certain settings indicate rhythms that have a corresponding fixed heart rate shown by parentheses. For example, if **Sinus Tachycardia (120)** is selected, the heart rate automatically becomes 120bpm. Rhythm settings that are not followed by parentheses may be adjusted using the **Heart Rate Factor** parameter also located on the **Heart** menu.



Heart Rate Factor

Heart rate can be increased or decreased by resetting the **Heart Rate Factor**.

Defibrillation

iStan 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, 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.

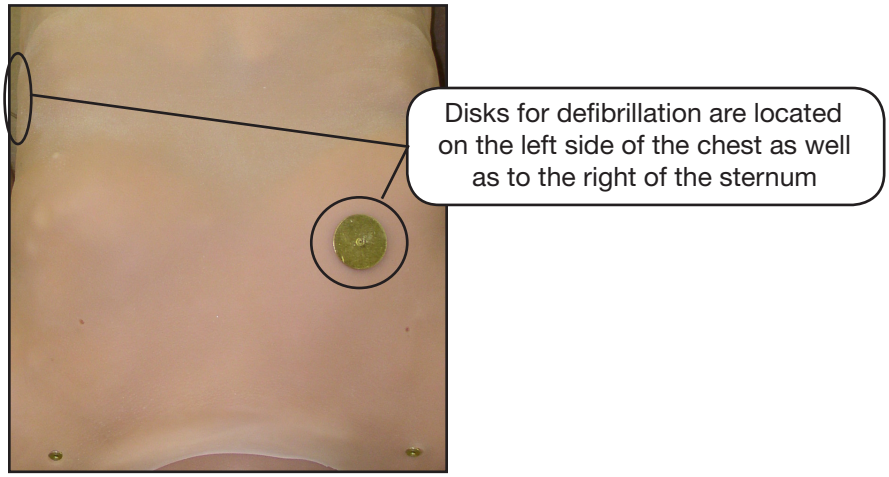
The following cautions should be observed:

- 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 and 360 joules with a monophasic 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 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 iStan 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.

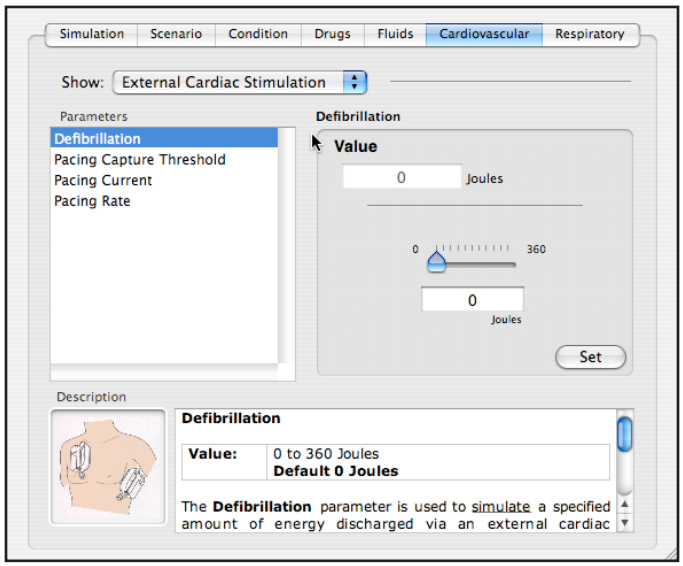
The minimum electrical charge recognized by the circuitry within the simulator is 20 joules.

For paddle placement on the chest, the simulator has two anterior defibrillation disks, which can be unscrewed leaving threaded connections if required.



Monophasic and Biphasic defibrillators can be used with either paddles or hands-free connectors.

The **Defibrillation** parameter is available for virtual defibrillation.



Defibrillation

The **Defibrillation** parameter is located under the **External Cardiac Simulation** menu on the **Cardiovascular** tab.

Simulate the energy discharge by moving the slider bar or entering the desired charge into the **Joules** field beneath the bar. When you click the **Set** button, the energy causes the appropriate spike in the ECG. Cardioversion does not occur, however, and the heart returns to the pre-defibrillation rhythm unless changed using the **Cardiac Rhythm Override** parameter *(also see Cardiac Arrhythmias, page 4.58)*.

Cardiac Pacing

A standard transthoracic cardiac pacemaker can be connected to the simulator using the anterior contacts. The software automatically detects and responds to pacing signals (from 20 to 200 mA, in increments of 10).

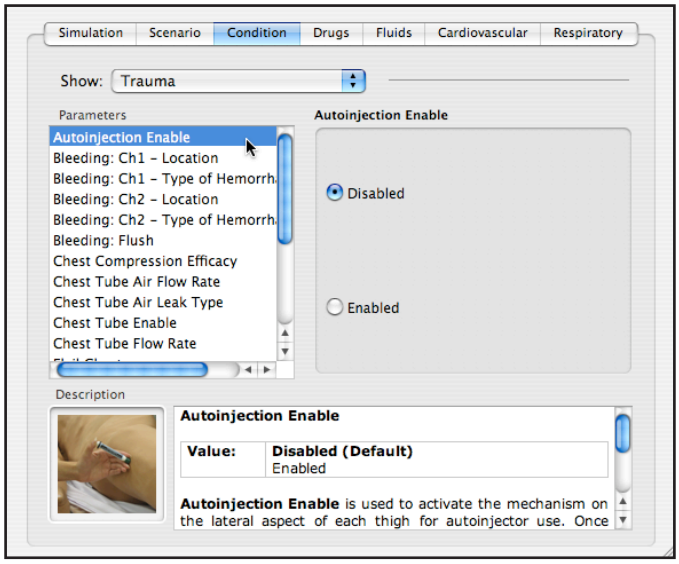
Three parameters can be used to simulate pacing within the software:

- **Pacing Capture Threshold** - determines the minimum pacing current necessary to pace the heart.
- **Pacing Current** - simulates a specific amount of current discharged by an external cardiac pacemaker.
- **Pacing Rate** - determines the cardiac rate when the **Pacing Current** is at or above the **Pacing Capture Threshold**

All three parameters are located in the **External Cardiac Stimulation** menu on the **Cardiovascular** tab.

Bilateral Autoinjection

Atropine may be administered into the lateral aspect of either thigh via autoinjection using the **Autoinjection Enable** option on the **Trauma** menu under the **Condition** tab.



Autoinjection Enable

Clicking Enable activates a mechanism that automatically registers the administration of atropine 2mg intramuscularly. NO NEEDLE should be used to avoid damage to the simulator.

Trauma System

The iStan simulator is equipped with a number of features specific to trauma care. The following provides a general overview of each feature.

Trauma System			
Anatomy, Physiology and Clinical Signs	**Clinical Interventions, Patient Monitoring and Scenarios.**	**Software Control**	**Manual Control**
Chest Tube Placement	**Chest tubes can be inserted bilaterally into the mid-axillary line of the fifth intercostal space. Suction equipment can be applied to withdraw fluid from the simulated intrapleural space.**	The instructor must adjust the amount of physiologic intrapleural fluid present. TAB: **Condition** SHOW: **Trauma**	Chest tube setup, *page 4.64*.
Needle Decompression	**Decompression of a pneumothorax can be performed bilaterally by inserting a needle at the midclavicular line of the second intercostal space.**	The instructor must adjust the amount of physiologic intrapleural air present. TAB: **Condition** SHOW: **Trauma**	Needle decompression setup, *page 4.66*.
Secretions	**Blood or clear fluid may be secreted from either the nose, mouth or ear.**	The response to clinical intervention must be controlled by the instructor. TAB: **Cardiovascular** SHOW: **Heart**	*See Secretion System setup, page 2.13*.
Intracranial Pressure	**Cerebrospinal fluid may be injected or removed, head elevation decreases ICP, and a craniectomy may be simulated.**	The response to clinical intervention must be controlled by the instructor. TAB: **Condition** SHOW: **ICP**	ICP probe setup, *page 4.71*.
Bleeding/ Hemorrhage	**Two simultaneous bleeding sites may be used. Bleeding is linked to physiology and may take place at all four limbs as well as the chest/belly.**	Defibrillation can be simulated by the instructor. TAB: **Cardiovascular** SHOW: **External Cardiac Simulation**	*See Secretion System setup, page 2.13*.
Flail Chest	**Abnormal mobility and loss of normal chest wall movement can present on the lower right side of the thoracic wall.**	The instructor can set the level at which electrical capture and mechanical capture occur. TAB: **Condition** SHOW: **Trauma**	None required.

Chest Tube

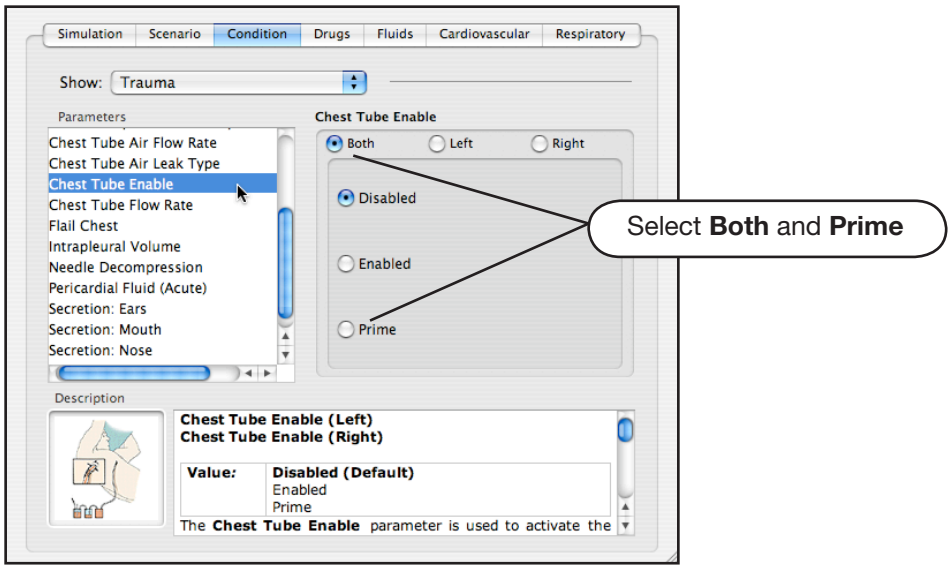
A 26- or 28-Fr chest tube can be inserted at the mid-axillary line of the fifth intercostal space on either side of the simulator. Using ordinary chest tube equipment, fluid and air can be withdrawn from the pleural space. The volume removed influences the patient's physiology to reflect improvement in pulmonary mechanics and gas exchange.

Correct insertion of the chest tube is entered into the log for use during debriefing and can be used as a scenario transition.

The chest tube feature is primed and enabled using the **Chest Tube Enable** parameter located under the **Trauma** menu on the **Condition** tab.

To prime the Chest Tube feature:

1. Insert the chest tube into the simulator as far as possible.
2. Select the **Both** and **Prime** options under **Chest Tube Enable**.



Chest Tube Enable

3. Once water begins to flow, remove the tube.
4. Click **Enabled** and select the location (**Both**, **Left** or **Right**) to be utilized.

Three additional parameters allow the user to set air flow and fluid rate as well as to determine the type of air leak:

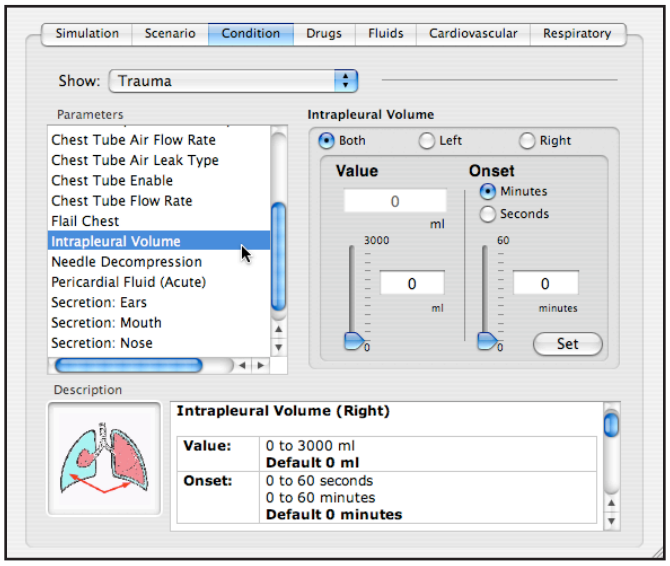
- **Chest Tube Air Flow Rate** - determines the quantity of air that drains with the chest tube output.
- **Chest Tube Air Leak Type** - sets whether the leak is a pneumothorax or an air leak with the chest tube or the chest wall.
- **Chest Tube Flow Rate** - specifies the rate at which fluid can be removed from the simulated pleural space via a chest tube drainage system.

All three parameters are located in the **Trauma** menu on the **Condition** tab.

The **Intrapleural Volume** parameter allows intrapleural volume to accumulate, for example, as happens during pneumothorax, hydrothorax and hemothorax.

To simulate a pneumothorax, set the corresponding intrapleural volume to a value greater than 0 ml. Values above 1500 ml reduce the corresponding lung volume significantly. Breath sounds are automatically diminished on the appropriate side due to decreased ventilation of the affected lung.

When intrapleural volume is set to a value greater than 500 ml, chest movement stops.



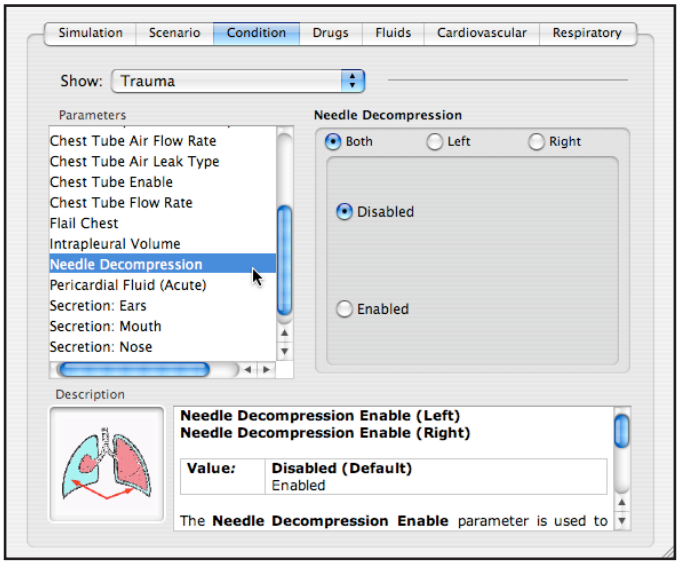
Intrapleural Volume

The **Intrapleural Volume** parameter is located on the **Trauma** menu under the **Condition** tab.

For information regarding cleanup after using the Chest Tube feature, *see pages 5.12 through 5.15*.

Needle Decompression

To set up a Pneumothorax Needle Decompression, enable the feature using the **Needle Decompression** option on the **Trauma** menu under the **Condition** tab.



Needle Decompression

Select **Enable** to activate the feature.

Needle decompression can be performed bilaterally into the small hole located in the mid-clavicular line of the second intercostal space. Insert a 3 to 6 cm long, 14-gauge needle until the hissing sound of the valve release is heard.

The **Intrapleural Volume** parameter (*see page 4.65*) can be used to allow intrapleural volume to accumulate.

Effective needle decompression immediately reduces the intrapleural volume. The hissing sound stops when intrapleural volume is zero.

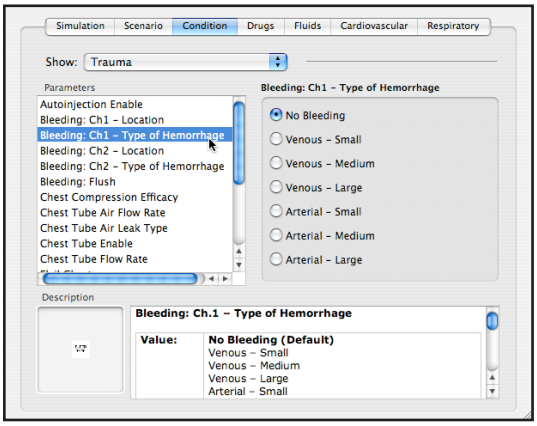
Bleeding/Hemorrhage

iStan is capable of bleeding simultaneously at two sites. The integrated hemorrhage system allows for the physical and modeled simulation of venous or arterial bleeding at moulaged wound sites at all four limbs as well as at the chest/belly.

Blood loss is continuously reported to the physiological models. The models respond to the reported blood loss with the appropriate cardiovascular and respiratory system changes to heart rate, blood pressure, and respiratory parameters.

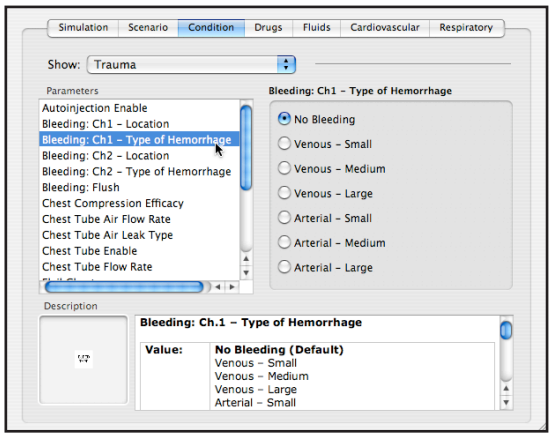
Two parameters control the bleeding feature.

The **Bleeding: Ch.1 – Location** parameter is used to activate the site of bleeding.



Bleeding: Ch.1 - Location

The **Bleeding: Ch.1 – Type of Hemorrhage** is used to control the type (venous or arterial) and size (small, medium or large) of a bleed.



Bleeding: Ch.1 - Type of Hemorrhage

Both **Bleeding** parameters are located on the **Trauma** menu under the **Condition** tab.

When selected, bleeding results in an automatic loss of blood from the physiologic models with subsequent changes in hemodynamics. Venous settings produce a continuous bleed at three user-adjustable flow rates. Arterial settings produce a pulsing flow based on the patient's heart rate, at three user-adjustable flow rates. Blood loss will occur at a rate dependent on wound size and Mean Arterial Pressure (MAP).

For instructions on filling the fluid reservoirs see page 2.13.

Hemorrhage Setup

The user determines the type and placement of the bleeding moulage for the lesson. An optional Moulage Kit *(see page 1.10)* 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 Vaseline to the area of bleeding.

Using one of the moulage wounds from the Moulage Kit:

1. Secure the wound over the simulator using the integrated straps.
2. Connect this haptic to the wound umbilical, the hose running along the arm or leg downward from the red Bleeding Connector for each limb (or abdomen).

The Bleeding Connectors for the legs can be found behind the skin on either side of the simulator at the hip. The Bleeding Connector for the arms can be found protruding from the upper arm skins. The Bleeding Connector for the abdomen is also located behind the skin on the right side of the simulator at the hip. Look for a male shut-off fitting marked with a red label.

Hemorrhage Control

The bleeding rates at moulaged wound sites are monitored for effective hemorrhage control therapy (e.g. Hemostat, Tourniquet). Data from the physiological blood models is recorded in the physiologic logs for use during debriefing.

For information regarding cleanup after using the Hemorrhage feature, *see page 5.12*.

Tourniquet Application

A tourniquet may be applied to stop the flow of blood.

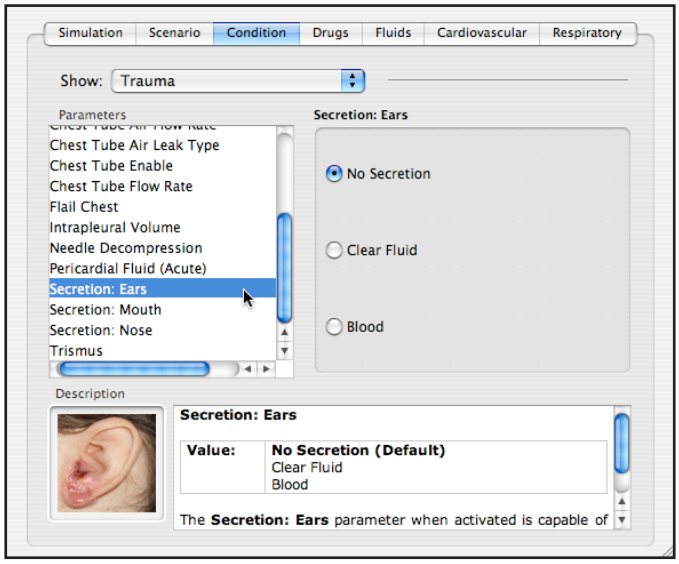
The wound umbilical contains an 18-inch section of soft tubing that allows the use of a tourniquet to stop the flow of blood. Use the included tape to hold the hose in the correct location for tourniquet usage.

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.

To stop bleeding, apply the tourniquet between the wound and heart.

Secretions

Either blood or clear fluid can be secreted from the ears, nose or mouth. This feature is activated by selecting the appropriate fluid from the **Secretion** option.



Secretion: Ears

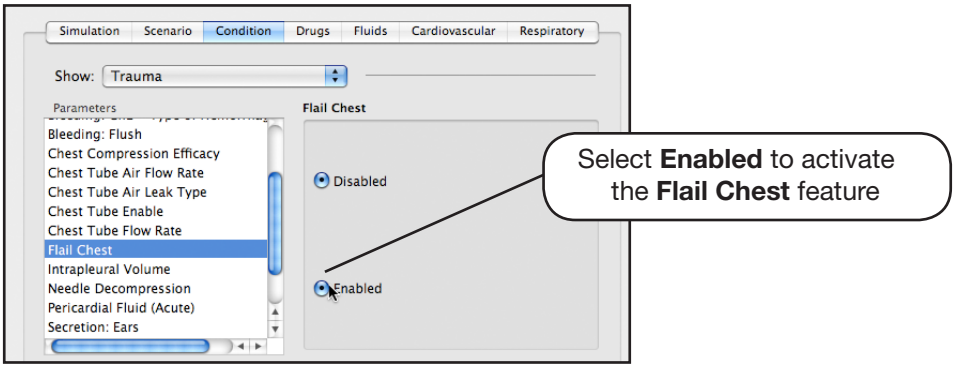
The **Secretion** parameters are located on both the **Assessment** and **Trauma** menus under the **Condition** tab.

For instructions on filling the fluid reservoirs *see page 2.13*.

For information regarding cleanup after using the Secretions feature, *see pages 5.13 through 5.15*.

Flail Chest

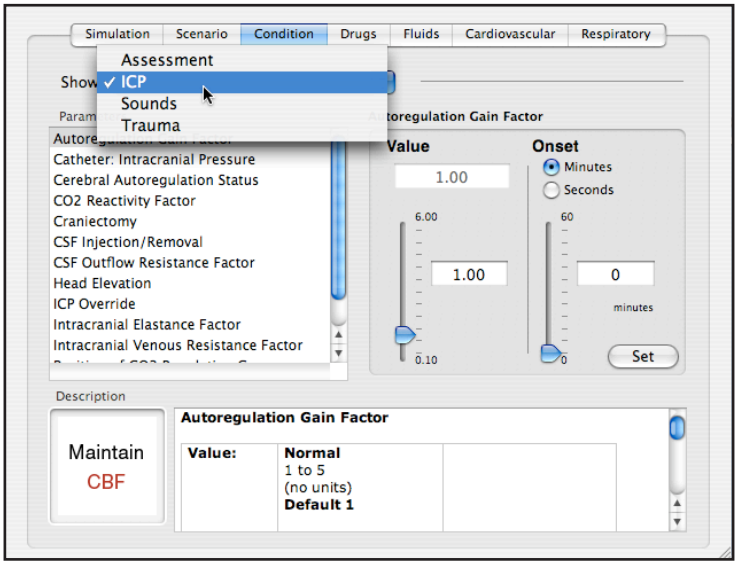
To activate the flail chest, click the Enabled option on **Flail Chest** parameter located on both on the **Trauma** menu under the **Condition** tab.



Selecting the Flail Chest Feature

Intracranial Pressure

Available as an option, the Intercranial Pressure feature allows for increases in intracranial pressure caused, for example, by intracranial lesions, hematomas, tumors, infection and impaired cerebrospinal fluid (CSF) dynamics. These changes in intercranial pressure can be simulated using the parameters located under the **ICP** menu on the **Condition** tab.



Selecting the ICP Menu

A series of parameters offers a variety of means to simulate various pathological conditions:

- **Autoregulation Gain Factor** - adjusts the gain of the system that controls arterial resistance and compliance.
- **Cerebral Autoregulation Status** - can be used to create a new patient with a status of **Chronic Hypertension**.
- **CO_2 Reactivity Factor** - determines the change in cerebral blood flow in response to a change in $PaCO_2$.
- **CSF Outflow Resistance Factor** - controls the rate of cerebrospinal fluid outflow.
- **ICP Override** - sets the ICP (uninfluenced by physiological models) on the Waveform Display. This parameter is also available on the **Assessment** menu.
- **Intracranial Elastance Factor** - determines the rigidity of the intracranial compartment. Increases in this factor reduce intracranial compliance.
- **Intracranial Venous Resistance Factor** - produces an increase in the resistance of the terminal intracranial veins when the value is increased.

- **Position of CO_2 Regulation Curve** - determines the $PaCO_2$ set point at which smooth muscle tension in large and small pial arteries is at the baseline value.
- **Time Constant of CO_2 Reactivity** - adjusts the delay between changes in $EtCO_2$ and a change in pH at the cerebral arterioles.

In addition, the following therapeutic interventions are available:

- **Catheter: Intracranial Pressure** - sets the ICP numerical value displayed on the Waveform Display or on the intracranial channel of a physiologic monitor.
- **Craniectomy** - simulates a decompressive craniectomy to lower ICP as a last resort when all other methods to decrease ICP have failed.
- **CSF Injection/Removal** - simulates the addition or removal of cerebrospinal fluid from the craniospinal space.
- **Head Elevation** - can be adjusted by degrees to decrease intracranial pressure.

Intracranial pressure (ICP) is displayed on both the HUD and as a numeric reading on the Waveform Display. Mean arterial pressure (MAP) is also displayed as a numeric on the Waveform Display.

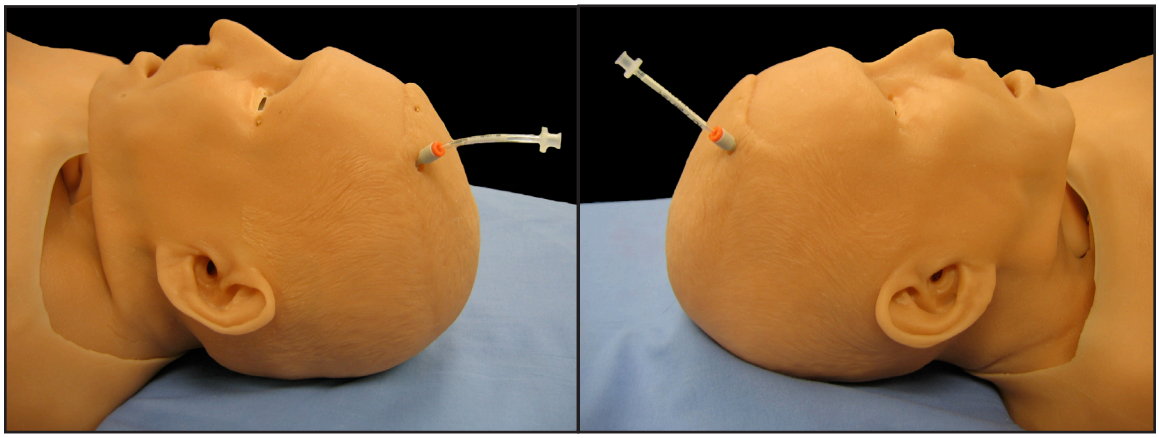
ICP, cerebral blood flow (CBF), cerebral perfusion pressure (CPP) and MAP are all recorded on the Physiologic Data Log and may be reviewed during debriefing.

For information regarding cleanup after using the ICP feature, *see page 5.16*.

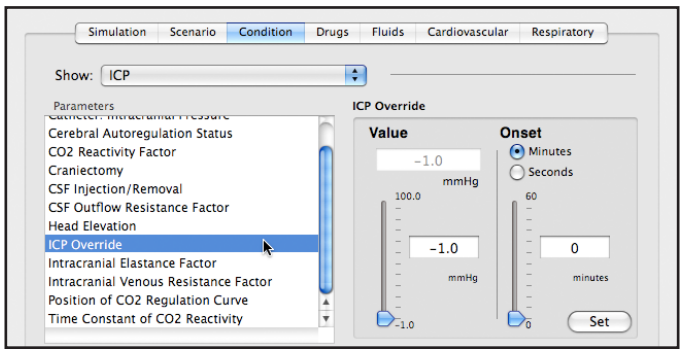
Ventriculostomy

As part of the optional intercranial pressure feature, drainage of CSF through a ventriculostomy can be simulated using a ventricular drain and monitor. Two ports, one on each side of the skull, can be used to withdraw fluid from an internal ICP reservoir.

1. Connect the ICP Interface cable between the simulator and the Ventricular Drain's pressure transducer.
2. Connect the patient monitor's invasive pressure cable to the ICP Interface cable's second port.
3. Connect the ICP Fluid Adapter to iStan's head (on the left or right).



4. Temporarily connect this hose to an empty IV bag line to capture fluid during this set-up stage.
5. Select **ICP Override** from the list of **Parameters** located under the **ICP** menu on the **Condition** tab.



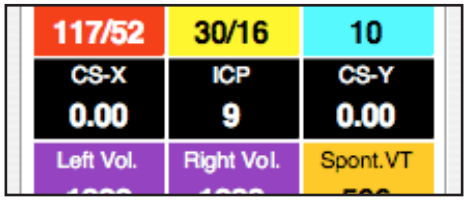
6. Set the value to the maximum mmHg. Air bubbles and/or fluid will exit from ICP reservoir, through tube and into the container.
7. When bubbles and/or fluid has stopped, select **ICP Override**.

8. Set the value to 0 mmHg.
9. Inject 120cc of distilled water into the ICP reservoir via the ICP Fluid Adapter.
10. Connect the ICP Fluid Adapter to a primed Ventricular Drain device line.
11. Set the “0” reference point on the device to be level with iStan’s ear canal.
12. Select **ICP Override** again.
13. Set the value to the maximum mmHg. Allow the flow to prime the Ventricular Drain completely.
14. Return the ICP Override parameter setting to **-1** (Model Driven).

For information regarding cleanup after using the ICP feature, *see page 5.16*.

Cervical Spine Immobilization

Two sensors, one in the head and a second in the torso, detect and record cervical spine movement. This information also appears on the HUD under the readings for CS-X (horizontal movement) and CS-Y (vertical movement).



Flexion and torsion of the head and detection of c-spine immobilization is entered into the physiologic log for use during debriefing.

For information on securing the neck and head to restrict movement, *see page 5.9*.

Pharmacology System

iStan supports pharmacological interventions through pre-programmed pharmacokinetic and pharmacodynamic parameters that are established for more than 50 intravenous drugs.

Standard syringes and infusion devices can be utilized to administer medications and fluids through veins on the left and right arms.

Additionally, medications and fluids can be administered through the permanent access catheters located at the right jugular and the left femoral veins.

Pharmacology System			
Anatomy, Physiology and Clinical Signs	**Clinical Interventions, Patient Monitoring and Scenarios.**	**Software Control**	**Manual Control**
IV Access	**The right and left arms of the simulator provides intravenous access locations at the dorsal and cephalic veins. IV cannulations may be set to receive a flash.**	None required.	See **IV Access** and **Flash** below.
IV Medication Administration	**Bolus injections are administered utilizing standard syringes while continuous IV infusions can be administered using infusion devices. Injections can be administered in the IV arm or in two permanent access catheters located at the right jugular and left femoral veins.**	Administered IV medications must be set by the instructor. TAB: **Drugs** *See page 3.67*	All administered IV medications are collected in the bag attached to the IV Drain hose located on the simulator's right hip.
IV Fluid Administration	**IV fluids can be administered in the IV arm or in the two permanent access catheters located at the right jugular and left femoral veins.**	Administered IV fluids must be set by the instructor. TAB: Fluid**s** PARAMETER: **Infusion** (Colloids, Crystalloids, Packed Red Blood Cells or Whole Blood) *See page 3.68*	All administered IV medications are collected in the bag attached to the IV Drain hose located on the simulator's right hip.
Intraosseous Infusion	**Intraosseous sites are available at the sternum and bilaterally at the tibia.**	None required.	None required.

Permanent IV Access Ports

Permanent IV access ports are located at the right jugular and left femoral veins.

To use the IV access ports:

1. In preparation, drain the fluid reservoir by connecting a 60cc syringe to the drain port on the right side of the simulator.
2. Withdraw air and excess moisture from the reservoir until a vacuum is formed (the plunger is difficult to pull).
3. Connect a 60cc syringe filled with distilled water to the Jugular IV port and prime the line with approximately 15cc.
4. Move the 60cc syringe to the Femoral IV port and prime the line with approximately 15cc.
5. Using an empty 60cc syringe connected to the IV Source port located in the mid-clavicular region, withdraw trapped air from the system until the plunger is difficult to move.
6. Connect a 60cc syringe filled with distilled water to the IV Source port and firmly inject all 60cc. This primes the arms and charges the system for Flash and Venipuncture support.

Intravenous fluids and medications can be administered by attaching the hose from a standard IV solution set to the port.

Approximately 250 ml of fluid may be administered without opening the drain (located on the right hip of the simulator) to allow for additional fluids.

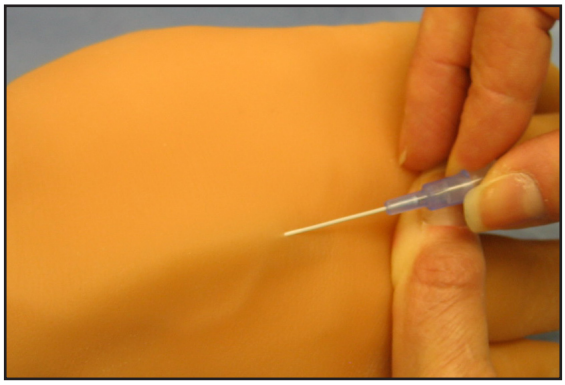
For additional realism, use tinted red distilled water when priming the IV Source port. *Also see Flash, page 4.77*.

For information regarding cleanup after using the IV/IO feature, *see page 5.16*.

IV Access

IV access is available at the dorsal and cephalic veins of iStan's right and left arms.

1. Cannulate the arm veins using standard venous access needles and catheters. Use only 20 to 22 gauge needles.



2. In the HPS6 software select and adjust the appropriate drug from the Drugs tab (*see page 3.67*) to make manual modifications to influence the patient's physiology.

Flash

IV cannulations receive a flash when the internal reservoir is primed.

WARNING: If a flash does NOT occur, do NOT inject any fluid and remove the needle immediately. Repeat the priming directions on *page 4.78* and ensure you have injected the needle properly and into the simulated vein.

To prime the internal reservoir:

1. Locate the IV Source catheter in the left mid-clavicular region.
2. Use a 60cc syringe to withdraw any air or excess moisture from the reservoir through the catheter.
3. Fill the reservoir with approximately 60cc of distilled water mixed with red food coloring.

For additional realism, use tinted red distilled water when priming the IV Source port.

For information regarding cleanup and maintenance after using the IV/IO feature, *see pages 5.16 through 5.18*.

Intraosseous Infusion

iStan has three intraosseous (I/O) sites, one at the sternum and one on each tibia, where the patient can be infused.

To prime the tibia and sternal I/O sites,

1. Using the 60cc syringe, inject 30cc of distilled water into the Jugular IV port.
2. Carefully roll up the thigh skin and roll down the leg skin or pull back the chest skin covering the I/O port.
3. Pull the I/O insert from the I/O port until the priming tube can be accessed.

4. Insert a syringe into the tube.
5. Pull the plunger until fluid begins to flow. (Optionally, inject 15cc of distilled water mixed with red food coloring to simulate the color of aspirated fluid.)
6. Replace the insert.

Fluids can now be aspirated from a correctly applied intraosseous infusion.

For information regarding cleanup after using the IV/IO feature, *see page 5.16*.

Monitoring Patients

The Waveform Display provides a visual reading of key cardiovascular parameters. The display can be customized to suit the needs of a given scenario.

Waveform Display Parameters

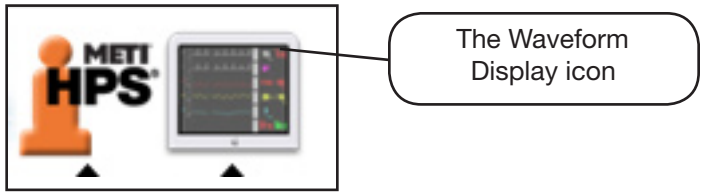
There are eight parameters available that may be displayed as waveforms. When the waveforms for one or more ECG leads are displayed, the Heart Rate appears to the right of first ECG lead. The Pulse Oximetry Plethysmogram waveform appears with the SpO_2 reading to the right. Arterial Blood Pressure, Central Venous Pressure and Pulmonary Artery Pressure display both a waveform and a numeric value. An additional 12 parameters may have their numeric values displayed.

Waveform Display Parameters

Patient Parameter	Label	Waveform	Numeric
ECG Leads I, II, III, V	ECG I, II, III, V	√	Heart Rate
Pulse Oximetry Plethysmogram	Pleth	√	SpO_2
Arterial Blood Pressure	ABP	√	√
Central Venous Pressure	CVP	√	√
Pulmonary Artery Pressure	PAP	√	√
Pulmonary Capillary Wedge Pressure	PCWP		√
Thermodilution Cardiac Output	Thermodilution C.O.		√
Pulse/Heart Rate	Pulse		√
Mean Arterial Pressure	MAP		√
SpO_2	SpO_2		√
Continuous Cardiac Output	Continuous C.O.		√
Blood Temperature	Blood Temperature		√
Body Temperature	Body Temperature		√
Rectal Temperature	Rectal Temperature		√
Axial Temperature	Axial Temperature		√
Noninvasive Blood Pressure	NIBP		√
Intracranial Pressure	ICP		√

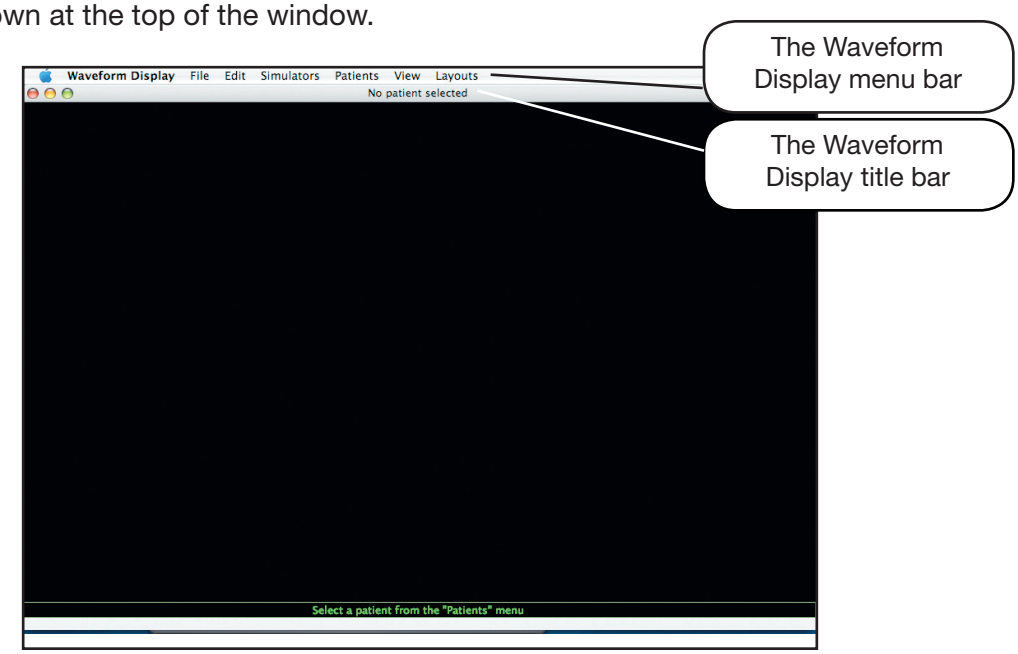
Accessing the Waveform Display

If the (Optional) Waveform Display Monitor, or another monitoring device, has been correctly powered on (*see page 2.8*), the Waveform Display software automatically launches with the HPS6 software when login is completed for the Instructor Workstation (*see page 3.1*). However, if the Waveform Display application has been closed or is not running, open the application by clicking on the Waveform Display icon located on the Dock.



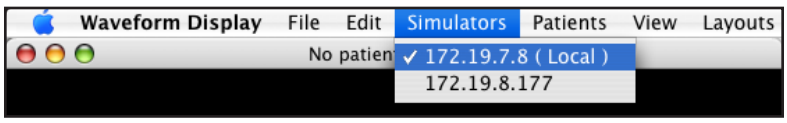
Waveform Display Icon

When the Waveform Display opens, a blank screen appears and the Waveform Display menu is shown at the top of the window.



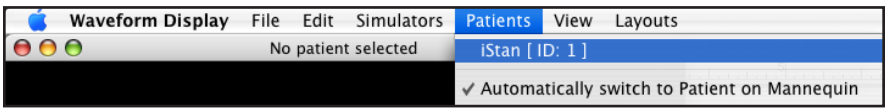
The Waveform Display with No Patient Selected

Beneath the menu bar, **No Patient Selected** should appear in the Waveform Display title bar. If **No Simulator Selected** appears, select the simulator from the **Simulators** menu.



Selecting a Simulator

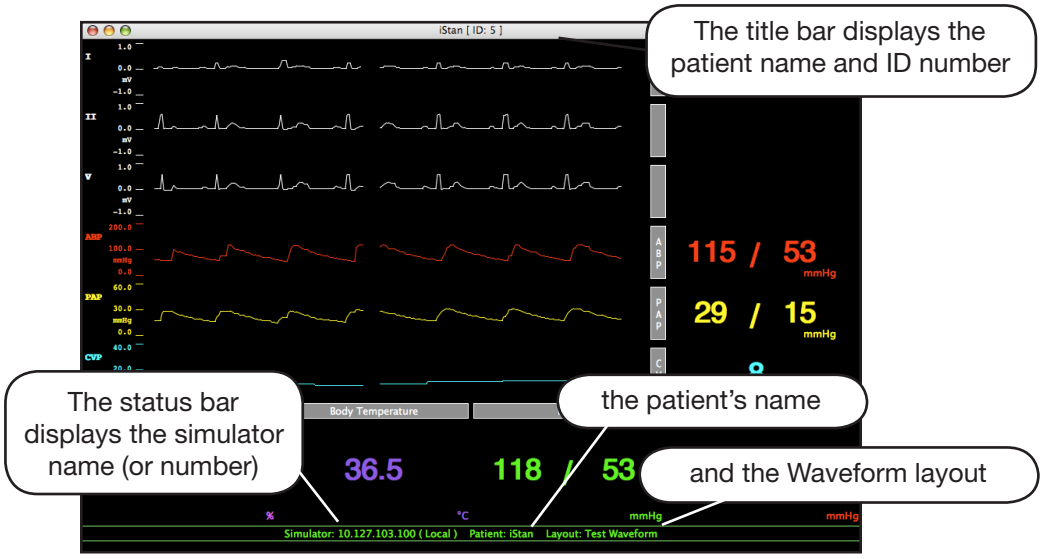
In most cases, only one simulator will be available.Once a simulator is chosen, select a patient from the **Patients** menu.



Selecting a Patient

The **Patients** menu contains a list of all patient files currently running. If no patient is running, open a patient file from the Patient Palette.

The patient's information is loaded and displayed on the Waveform Display Monitor.



The Waveform Display with Patient Information

In the Waveform Display window, the patient's file name and ID number appears in the Title bar at the top while the status bar at the bottom contains the simulator's identification, the patient's name, and the active waveform layout.

To change the patient, select a new name from the **Patients** menu.

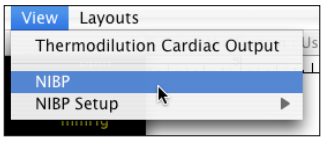
NOTE: By default, the option **Automatically switch to Patient on Mannequin** is selected. When this option is chosen and multiple patients are running, the waveform software automatically reflects the physiology of the active patient.

Modifying the Waveform Display

The default configuration can be modified to change or customize the layout, suspend or reset alarms and change or mute the audio.

Viewing NIBP

Initially, the NIBP panel appears with no (--- / ---) value. To take an isolated reading of the current, noninvasive blood pressure, select the **NIBP** option from the **View** menu.

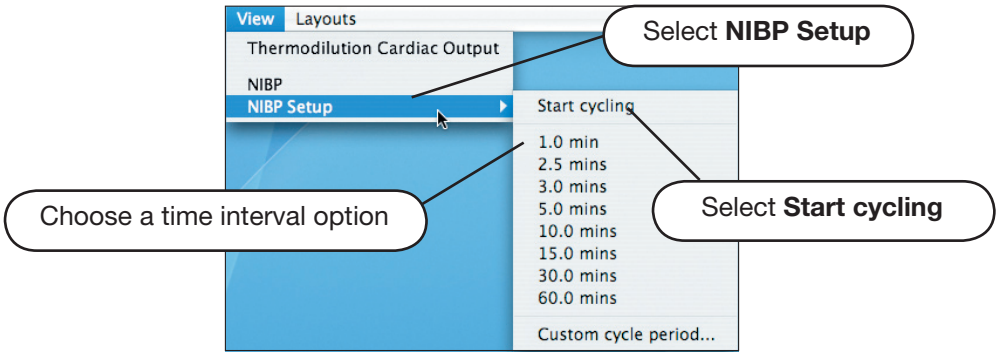


Selecting NIBP to View

The NIBP reading appears in the NIBP panel and remains in view until another reading is taken.

Setting Up NIBP to Cycle

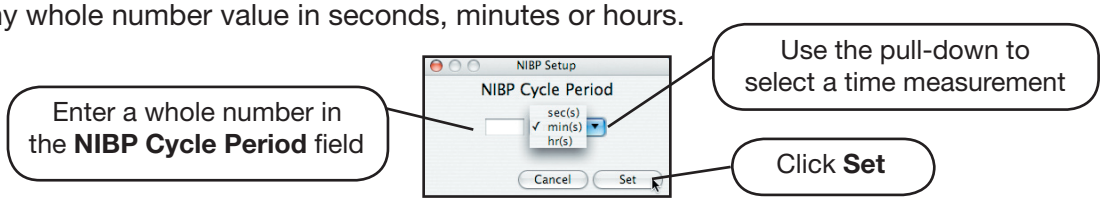
To schedule an NIBP reading at a set interval, select the **NIBP Setup** option from the **View** menu, and then choose a time interval.



Selecting NIBP Setup

Once a time interval is selected, select the **Start cycling** option to begin the NIBP reading cycle.

If you wish a different time interval than those shown on the menu, select the **Custom cycle period** option to activate the NIBP Setup dialog, which provides fields for setting any whole number value in seconds, minutes or hours.



Customizing an NIBP Cycle Period

From the NIBP Setup command menu select the **Stop cycling** option to discontinue the timed readout and **Start cycling** to restart the timed process.

Changing the Layout

At any one time, the Waveform Display can show up to six waveforms plus an additional four numeric readouts.

There are five preconfigured **METI Layouts**:

EMS-ED-Telemetry - preconfigured with a waveform and numeric readout for ECG Lead II and numeric readouts for SpO_2 and noninvasive blood pressure (NIBP).

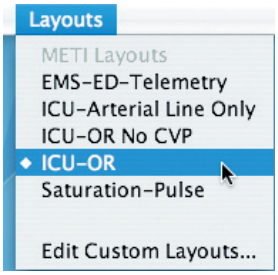
ICU-OR Arterial Line Only - preconfigured with waveform and numeric readouts for ECG Lead II, ECG Lead V, ABP, Pleth and a numeric readout for Body Temperature.

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, Thermodilution C.O., Blood Temperature and Body Temperature.

ICU-OR (default layout) - preconfigured with waveform and numeric readouts for ECG Lead II, ECG Lead V, ABP, PAP, CVP and Pleth, and numeric readouts for NIBP, Thermodilution C.O., Blood Temperature and Body Temperature.

Saturation-Pulse - preconfigured with numeric readouts for SpO_2 and pulse.

Select the appropriate layout from the list located under the Layouts menu.



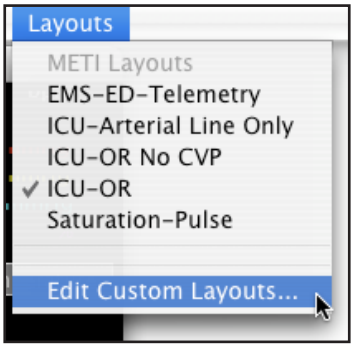
Selecting a Layout

Only the ICU-OR layout makes use of every parameter panel and the preconfigured layouts cannot be overwritten or changed, but any configuration of waveform/numeric and numeric values can be created by customizing the layout (*see below*).

When customized layouts are created, they appear in the Layouts menu beneath a **Custom Layouts** heading.

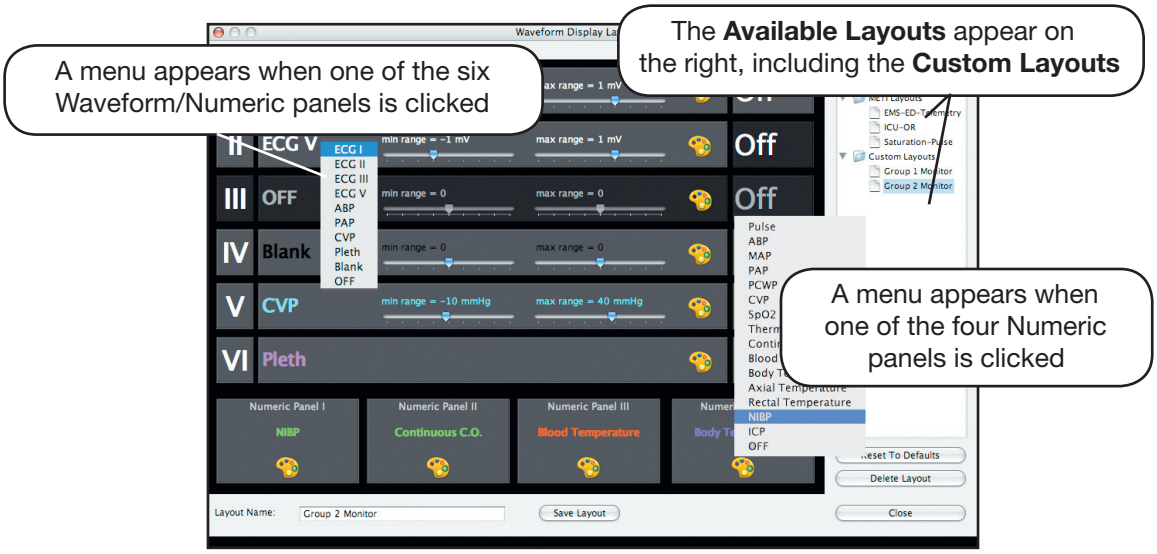
Customizing the Layout

To customize the Waveform Display layout, select the **Edit Custom Layouts** option from the **Layouts** menu.



Selecting Edit Custom Layouts

The Waveform Display Layout Editor appears, displaying the current layout. This layout can then be modified by selecting waveform/numeric or numeric parameters for the various panels.



The Waveform Display Layout Editor

To change the settings on a waveform/numeric panel (one of the top six panels):

1. Click the panel to edit. A menu with 10 options pops up.
2. Select the appropriate menu option:
   a. Select one of the options.
   b. Select **Blank** if the display is to leave an unused space for the panel.
   c. Select **OFF** if the display is to omit the panel, allowing additional space for the remaining waveform readouts.
3. Use the slider bars to adjust the minimum and maximum ranges for the readings.
4. Click the Palette icon to the right of the panel to open a window with a color spectrum used to change the color of the waveform and numeric displays.
5. Click on the box on the far right to set the numerics to On or Off. (Waveform parameters set to the OFF position have numerics set to Off by default.)

To change the settings on a numeric panel (one of the bottom four panels):

1. Click the panel to edit. A menu with 19 options pops up.
2. Select the appropriate option:
   a. Select one of the options.
   b. Select **OFF** if the display is to darken the panel, leaving the space empty.
3. Click the Palette icon at the bottom of the panel to open a window with a color spectrum used to change the color of the numeric display.

To clear changes, click the **Reset to Defaults** button on the lower right-hand side of the window.

When changes are complete, save the new layout. (*See page 4.87*).

Changes are lost if the Waveform Display Layout Editor is closed without saving the new layout.

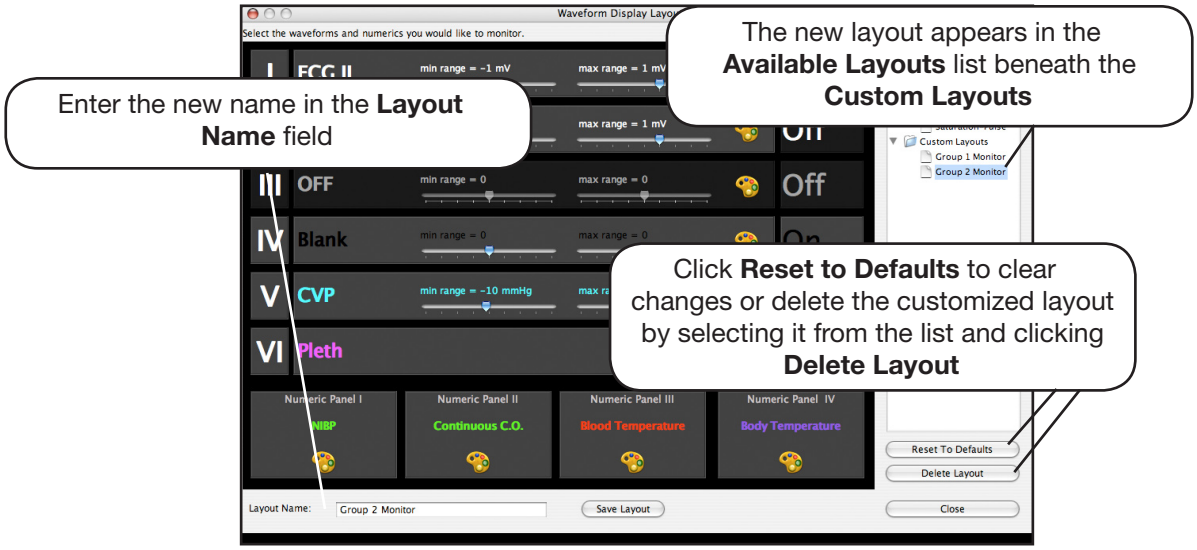
Saving a Customized Layout

To save the new format once changes are complete:

1. Highlight the name in the **Layout Name** field.
2. Enter the name of the new layout.
3. Click the **Save Layout** button.

The customized layout now appears listed among the **Custom Layouts** in the **Available Layouts** panel on the right. This layout also appears in the **Layouts** menu.

Once changes have been saved, click the **Close** button to close the Waveform Display Layout Editor. The Waveform Display now displays the newly saved customized layout.



A Customized Layout for the Waveform Display

Deleting a Customized Layout

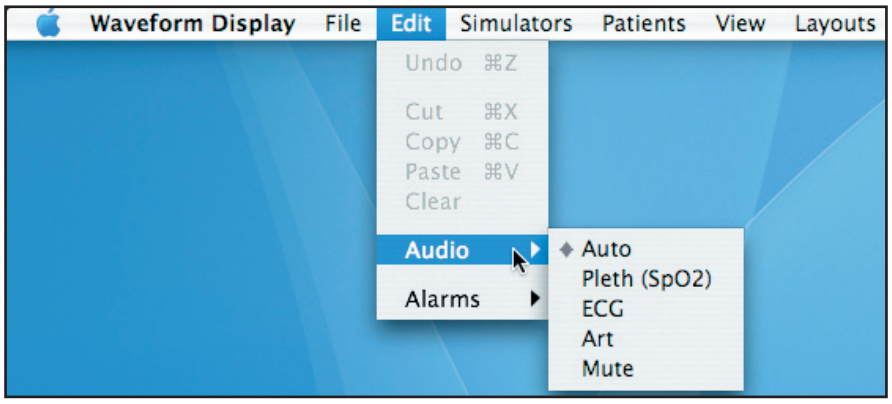
To delete a customized layout:

1. Select the layout from the list beneath **Custom Layouts** in the **Available Layouts** panel.
2. Click the **Delete Layout** button.

The customized layout is deleted.

Changing the Audio

The Waveform Display includes an audio feature with a choice of clinical monitoring sounds. To choose a setting, open the **Edit** menu and click **Audio** to access the sound options.



Selecting the Audio Menu

All settings are synchronized with the patient's heartbeat.

There are five available audio settings:

Auto (default) - depending on the layout, sounds are selected in order of these parameters: Pleth (SpO_2), ECG, and Art. If, for example, both Pleth and Art parameters are in the layout, the sounds related to the Pleth readout are heard. To hear the sounds of the Art readout when either the Pleth or ECG parameters are also present, the **Art** option must be chosen.

Pleth (SpO_2) - pitch changes according to the value of the SpO_2. When the SpO_2 value increases, the pitch becomes higher, and when the SpO_2 value decreases, the pitch becomes lower.

ECG - rate of sound reflects changes to the patient's heart rate while maintaining a constant unvarying pitch unaffected by the patient's condition.

Art - rate of sound reflects changes to the patient's Arterial Blood Pressure (Art) while maintaining a constant unvarying pitch unaffected by the patient's condition.

Mute - eliminates all sounds based on the patient's heartbeat. Does not remove any alarms set to sound when minimum and maximum levels of the layout's parameters are met.

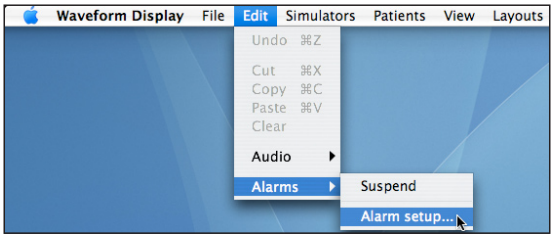
Choose the appropriate sound from the **Audio** menu.

Setting the Alarms

The Waveform Display includes an alarm feature that registers a two-tone (high-low) sound when patient parameter readings fall below or exceed a specified minimum or maximum setting. The alarm feature can be turned on (the default) or off by selecting the option from the **Alarms** menu located beneath **Edit** on the menu bar.

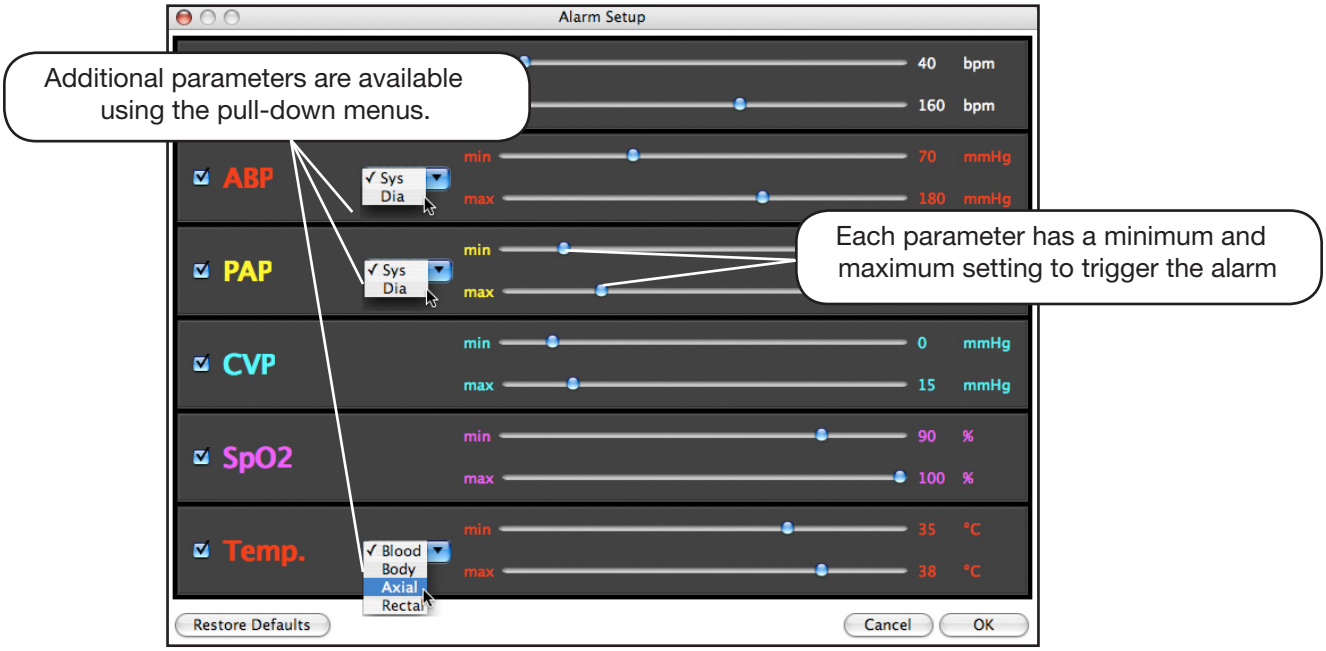
When alarms have been suspended, a diamond appears to the left of the option showing that **Suspend** has been selected.

The Alarm settings can also be modified. To change the settings for the alarms, select the **Alarm setup** option from the **Alarms** menu.



Selecting the Alarm Setup

The Alarm Setup screen appears, displaying six parameters, three of which have pull-down menus.



The Alarm Setup Screen

Including the pull-down settings, there are 11 parameters that may be associated with an alarm. However, only six alarm settings (one for each of the primary parameters displayed in the window) are possible at one time.

Alarm Settings					
Parameter	**Units**	**Minimum**	**Default Range**	**Maximum**	**Alarm Sound**
Heart Rate	BPM	30	40 to 160	250	Two-Tone/ High-Low
ABP (Sys)	mmHg	-40	70 to 180	300	Two-Tone/ High-Low
ABP (Dia)	mmHg	-40	20 to 110	300	Two-Tone/ High-Low
PAP (Sys)	mmHg	-40	10 to 40	300	Two-Tone/ High-Low
PAP (Dia)	mmHg	-40	5 to 20	300	Two-Tone/ High-Low
CVP	mmHg	-40	0 to 15	300	Two-Tone/ High-Low
SpO2	%	50	90 to 100	100	Two-Tone/ High-Low
Temp (Blood)	ºC	10	35 to 38	45	Two-Tone/ High-Low
Temp (Body)	ºC	10	35 to 38	45	Two-Tone/ High-Low
Temp (Axial)	ºC	10	35 to 38	45	Two-Tone/ High-Low
Temp (Rectal)	ºC	10	35 to 38	45	Two-Tone/ High-Low
ICP	mmHg	-50	0 to 10	300	Two-Tone/ High-Low
NIBP (Sys)	mmHg	-40	70 to 180	300	Two-Tone/ High-Low
NIBP (Dia)	mmHg	-40	20 to 110	300	Two-Tone/ High-Low

To set an alarm:

1. Check the box to the left of the parameter.
2. Choose an option from the pull-down menu, if available.
3. Use the slider bar to set the maximum and minimum levels.
4. Click the **OK** button.

To turn off a specific parameter's alarm, uncheck the box to left of that parameter and click **OK**.

To undo any changes, click the **Restore Defaults** button.

iStan Care and Maintenance

Maintaining iStan requires careful treatment of the electronic and mechanical components. Each time iStan is assembled or disassembled, make sure all components are properly handled and either removed from or placed into storage correctly.

iStan Warranty Programs

General Information

METI patient simulator products come with a one-year Manufacturer's Warranty (excluding batteries and consumables). All warranties begin at date of shipment or METI 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 (see **Time and Materials** section).

To place an out-of-warranty unit under a warranty contract, METI reserves the right to have the patient simulator inspected by a METI-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 Support

United States Office: Toll Free +1 (866) 462-7920 Direct +1 (941) 342-5605 Fax +1 (941) 342-5600 Internet Address: support@meti.com Web URL: www.meti.com	
European Office: Phone +49 (0) 6131 38075 20 Fax +49 (0) 6131 38075 49 Internet Address: international.support@meti.com	**Australian Office:** Toll Free +1 (800) 656 434 Fax +6173 34970 91 Internet Address: australia.support@meti.com
Canadian Office: Phone +1 (888) 516-9199 Internet Address: canada.support@meti.com	**United Kingdom:** Phone: +44 (0) 8009 171851 Internet Address: uk.support@meti.com

Service Hours

The principal period for performance of service is:

United States Office: Monday through Friday 7:00 A.M. to 6:00 P.M., Eastern Standard Time	**European Office:** Monday through Friday 8:00 A.M. to 5:00 P.M., Central European Time
Canadian Office: Monday through Friday 8:00 A.M. to 5:00 P.M., Mountain Standard Time	**Australian Office:** Monday through Friday 8:00 A.M. to 5:00 P.M., Australian Eastern Standard Time

Holiday and non-business days are excluded.

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.

METI may elect which remedy or combination of remedies to provide at its sole discretion. METI shall have a reasonable time after determining that a defective material exists to repair or replace defective material. METI's replacement material will be manufactured from new and/or serviceable parts. METI'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. METI warrants its LABOR for 30 days or the balance at the applicable period of the original warranty, whichever is greater.

METI 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 METI, will be repaired under the Time and Materials service plan (see **Time and Materials** section).

METI'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 METI without first contacting METI 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	METI'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 METI's fully burdened cost plus fee

Principal period of on-site support is:

- Monday through Friday, 7:00 AM to 7:00 PM (Eastern Standard Time)
- 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, iStan should be properly disassembled and stored in a secure place. To ensure that iStan remains in good working condition, follow the prescribed METI breakdown procedures below. These procedures are estimated to take less than 30 minutes.

	Breakdown Steps
1	Shut Down the Software
2	Power Off the Simulator
3	Clean the Simulator and the Fluid System

Step 1: Shut Down the Software

To shut down both the Waveform Display and HPS6 software:

1. In the HPS6 software, Click the **Disconnect** icon on the **Patient** window (*see page 3.14* for more information on the Connection Icons).
2. From the Waveform Display software, select **Quit Waveform Display** from the **Waveform Display** menu.
3. If desired, click **Save** to save the patient file (*see page 3.7* for information on the **Save** icon or *page 3.22* to learn about Saving Data).
4. From the HPS6 software, click the **Stop** icon in the Patient window or Patient Palette (*see page 3.7* for information on using the Stop icon). A warning box appears providing another opportunity to Save the patient file.
5. Select **Quit HPS**.

If using a Wireless Remote Control, quit the HPS6 application using the same steps described above for the Instructor Workstation.

Step 2: Power Off the Simulator

1. Carefully pull pack the skin on iStan's left hip and flip the power switch to the OFF position.
2. Carefully pull the skin back into place for storage.

Step 3: Clean the Simulator and the Fluid System

For detailed instructions on cleaning, *see page 5.12 below*.

Maintenance Advice

Simple care and maintenance helps to ensure that iStan 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.

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 (and 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 ABRASIVE soaps or pads.
- Prior to using moulage of any kind, METI 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 the trauma, genitourinary or IV features of the iStan system have been used, flush out the simulator as described in the following pages. Failure to flush the systems may cause problems for the system during attempts at future use.

Storage

When in regular use, iStan'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 lay flat.
- The simulator should NEVER be stored or shipped with fluids in the system.

METI also recommends storing the simulator with a cervical collar in place to protect the neck.

Care of Electronic Equipment

- Do NOT use any of the computer components associated with this system for any other use.
- Do NOT connect the computer components to any network of any kind.
- Install any METI software updates as soon as they become available.

Airway Inspection

iStan 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. While such damage may be readily apparent (manifested as a leak in the breathing circuit) during connection to a ventilator, it may not be obvious during spontaneous or bag and mask ventilation.

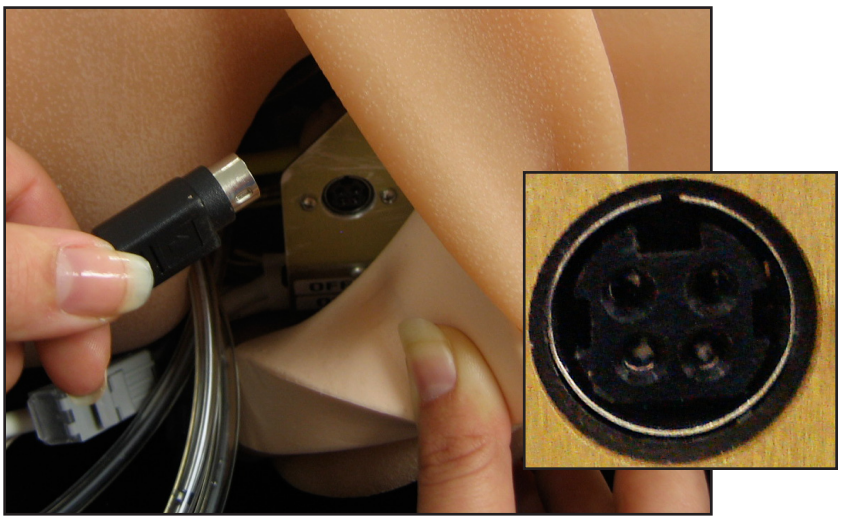
Because damage can occur, occasional visual inspection of the airway is recommended. Using the light of a laryngoscope blade or a flashlight, visually examine both the upper and lower airway. While tears in the upper airway resulting from intubation may be obvious, needle holes in the lower bronchus 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. However, for permanent repair of damaged simulators contact METI Customer Support.

Recharging the Battery

The battery should be recharged after approximately seven to eight hours. The iStan battery will NOT charge while the unit is in operation.

To recharge the battery, connect the power adapter to the receptacle inside the skin on iStan's left hip. Note that the power adapter connection is keyed. Care must be taken so that the adapter is properly oriented (the flat side of the connector is on top) when the connection is made.



Recharging should take approximately five hours.

Replacing the Battery

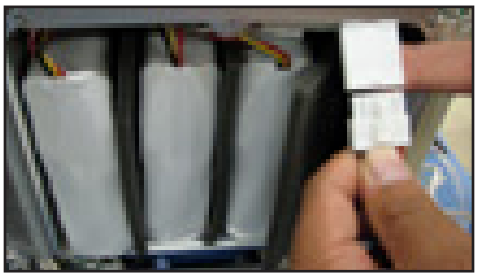
a. BE CERTAIN iStan's power ON/OFF switch located in iStan's left hip is in the OFF position.

b. Position iStan so that the battery compartment located in iStan's lower lumbar region is accessible.

c. Lift the top layer of skin from the waist up to mid-torso and remove the lower lumbar foam piece covering the compartment panel.

d. Remove the panel to the battery compartment by loosening the thumbscrew hardware by hand.

e. One by one, carefully lay in each battery pack, connecting each one to the nearest battery pack input cable. The color of the battery pack cable wires should match those of the input connector.



f. Refasten the battery compartment cover, tightening the thumbscrews.

g. Return the lumbar foam piece to its original location.

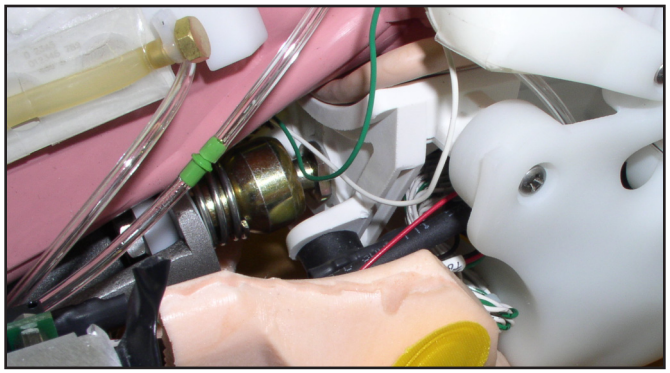
h. Carefully pull the top skin layer back into place.

i. Plug in the external 20VDC, 150W AC/DC power supply into the nearest AC outlet. The fast-charge process lasts four to six hours and can only be done while iStan is powered down and the external power supply is plugged in.

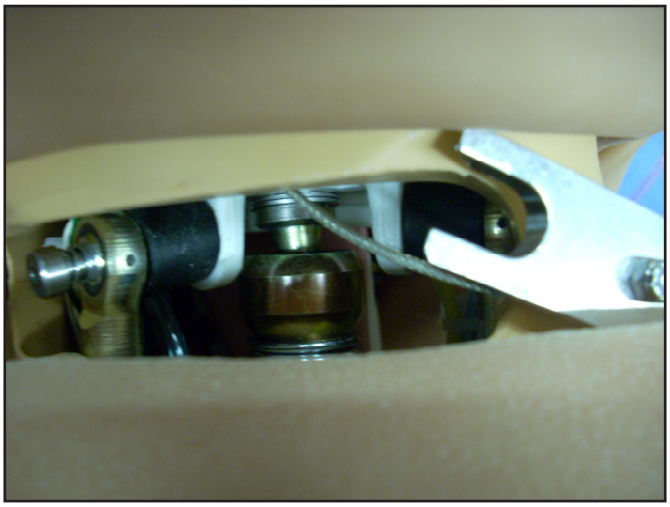
Reducing Cervical Motion

To reduce cervical motion:

1. Remove the neck skin and pull the skin at the back of the head toward the front to expose the neck from the rear.
2. Locate the neck joint at the base of the skull.



3. Locate the steel cable attached to the back of the skull.
4. Locate the U-shaped plate at the end of the cable.
5. Slide the U-shaped plate onto the neck joint.



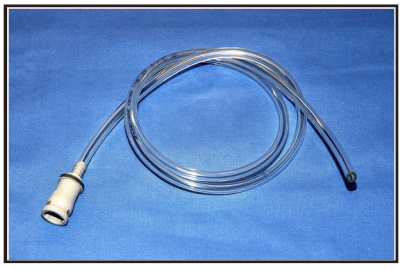
Draining Condensation from the Simulator

As part of a regular preventative 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 condsnsation:

1. Locate the Condensation Drain Hose included with the inventory kit.



2. Bring the hose and a small bucket to the simulator location.
3. Separate the skin on the left side of the simulator at the hip to reveal a hose with the appropriate gray connector mate. Bring to the outside for use in later steps.
4. With help from assistants, place iSTAN into a sitting position. (A 45-degree angle is fine.)
5. Turn iSTAN on, but do not start the application. Give enough time for the internal compressor to pressurize the system. (The pump will turn off automatically.)
6. Turn iSTAN off.
7. Place the tubing end of the Condensation Drain Hose into the small bucket and then connect the gray fitting onto the simulators drain connector with a push and twist motion. There will be a sudden release of pressure into the bucket. Any condensation within the system will drain with this exhaust.
8. Disconnect the Condensation Drain Hose from the simulator.

Connecting the Air Hose

The air hose can be connected to or disconnected from iStan at any time. When the external air pressure is sensed, the pump internal to iStan will turn off automatically. When you want to make iStan mobile again, simply disconnect the hose.

The optional External Air kit *(see page 1.12)* consists of a flexible 30ft (9m) 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 air kit to a METI compressor using the Quick Coupler attached to the regulator. (Other compressed air sources will have their own adapters. Locate the adapter for your compressed air source.)
2. Separate the skin on the left side of the simulator at the hip to reveal a hose with the appropriate gray connector mate. Bring this hose to the outside for connection to the air hose.
3. Mate the gray connectors with a push and twist motion.

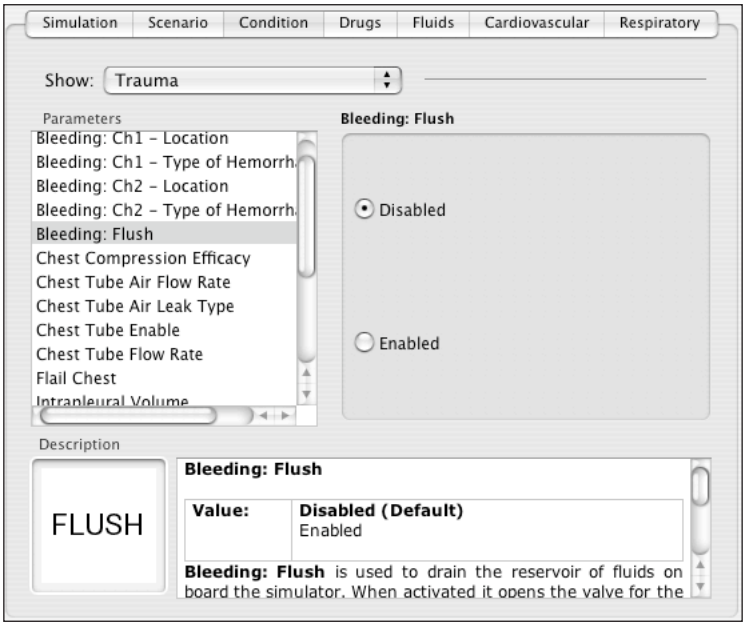
Cleaning the Simulator and the Fluid System

NOTE: A small bucket is recommended to collect wastewater during cleaning and flushing operations.

Cleaning and Flushing after Use of Hemorrhage

To clean simulated blood from the simulator and fluid system:

1. Remove any wound haptic(s) from the wound umbilical(s) and rinse with distilled water.
2. Wipe the simulator off immediately to remove red fluid. The food color will stain more readily if left on for an extended period.
3. Connect the blue and yellow connectors of an empty Trauma Fill Tank to the blue “fill” and yellow “vent” connectors on the right side of the simulator.
4. Disconnect the Overfill Bottle from the Trauma Fill Tank.
5. Using a haptic tube from the Inventory Kit, connect the haptic tube to the Overfill Bottle port on the Trauma Fill Tank.
6. Place the other end of the haptic tube into an empty bucket to collect the wastewater.
7. Select the **Bleeding: Flush** parameter under the Trauma menu of the Condition tab and click **Enabled**. This setting turns on all valves to maximize the flow of the remaining blood mixture into the Trauma Fill Tank.



Bleeding: Flush

8. Pressurize the Trauma Fill Tank by pumping no more than 20 times.
9. Connect the wound umbilical(s) to the bleeding site(s) that were used, keeping the ends in the wastewater bucket.
10. When fluid stops flowing, select the **Disabled** setting on the **Bleeding: Flush** parameter.
11. Disconnect the blue and yellow lines of the Trauma Fill Tank from the simulator.
12. Rinse the Trauma Fill Tank thoroughly with distilled water.
13. Using a Trauma Fill Tank with clear, distilled water, pump the distilled water into the simulator.
14. Repeat steps 1-13 until waters flows clear.
15. **Optional**: To clean lines to head, from the **Condition** Tab, under Assessment, select Secretion: **Ears** (**Nose** and **Mouth**) and click **Blood**.
16. **Optional**: To flush the chest tube lines, with a chest or priming tube in place and an empty bucket to catch fluid, from the **Condition** Tab, under **Trauma**, select **Chest Tube Enable** and click **Prime**.

Cleaning and Flushing after Blood Secretions

To clean simulated blood from the simulator and fluid system:

1. Wipe the simulator off immediately to remove red fluid. The food color will stain more readily if left on for an extended period.
2. Connect the Trauma Fill Tank containing the red fluid to the blue “fill” connector on the right side, but do not connect the yellow “vent” connection.
3. Turn the yellow pressure relief knob clockwise (open) on the Trauma Fill Tank. Alternatively, loosen the Trauma Fill Tank lid so that the tank is able to vent during the subsequent process.
4. Select the **Bleeding: Flush** parameter under the **Trauma** menu of the **Condition** tab and click **Enabled**. This setting turns on all valves to maximize the flow of the remaining blood mixture into the Trauma Fill Tank.
5. When fluid stops flowing, select the **Disabled** setting on the **Bleeding: Flush** parameter.
6. Disconnect the Trauma Fill Tank from the simulator.
7. Rinse the Trauma Fill Tank thoroughly.
8. Pour approximately 16 ounces (the size of the Overfill Bottle) of clean distilled water into the tank.

9. Pump the distilled water into the simulator.
10. If a chest tube was used, flush that system by selecting **Chest Tube Enable** from the **Trauma** menu on the **Condition** tab and click **Enable**.
11. Place a chest catheter in each side until the distilled water runs clear.
12. If red fluids were used as blood with head secretions, select the **Secretion: Ears** (**Mouth** and **Nose**) parameter from the **Trauma** menu on the **Condition** tab and click **Blood**.
13. Run until the distilled water runs clear.
14. If fluid remains in the system, reconnect the Trauma Fill Tank containing the red fluid to the blue "fill" connector on the right side, being sure not to connect the yellow "vent" connection.
15. Turn the yellow pressure relief knob clockwise (open) on the Trauma Fill Tank.
16. Select the **Bleeding: Flush** parameter under the **Trauma** menu of the **Condition** tab and click **Enabled**.

NOTE: Once a month, it is advised to flush the system with a 50/50 mix of distilled water and white vinegar to keep mineral and algae build up to a minimum. Always flush with distilled water to remove any trace amounts of vinegar.

Cleaning and Flushing after Clear Secretions

1. Dry off the simulator.
2. Connect the blue and yellow connectors of an empty Trauma Fill Tank to the blue "fill" and yellow "vent" connectors on the right side of the simulator.
3. Disconnect the Overfill Bottle from the Trauma Fill Tank.
4. Using a haptic tube from the Inventory Kit, connect the haptic tube to the Overfill Bottle port on the Trauma Fill Tank.
5. Place the other end of the haptic tube into an empty bucket to collect the wastewater.
6. Pressurize the Trauma Fill Tank by pumping no more than 20 times.
7. When the fluid stops flowing, disconnect the blue and yellow lines of the Trauma Fill Tank from the simulator.

NOTE: Once a month, it is advised to flush the system with a 50/50 mix of distilled water and white vinegar to keep mineral and algae build up to a minimum. Always flush with distilled water to remove any trace amounts of vinegar.

Flushing the Fluid System for Storage

When storing iStan for substantial periods of time, make certain that all moisture has been removed from the system.

After draining the reservoirs, flush the system with air using the following steps:

1. Connect a clean and dry Trauma Fill Tank to both the yellow and blue connectors on the right side.
2. Unlock the Trauma Fill Tank's handle and stroke up and down 25 to 35 times to pressurize the tank. This pressure air is transported to the on-board reservoir.
3. Lock the pump handle back into the pump assembly by turning clockwise.
4. After approximately one minute, disconnect the Trauma Fill Tank.
5. Connect a clean and dry Trauma Fill Tank to both the yellow and blue connectors on the left side.
6. Unlock the Trauma Fill Tank's handle and stroke up and down 25 to 35 times to pressurize the tank. This pressure air is transported to the on-board reservoir.
7. Lock the pump handle back into the pump assembly by turning clockwise.
8. After approximately one minute, disconnect the Trauma Fill Tank.
9. If a chest tube was used, flush that system by selecting **Chest Tube Enable** from the **Trauma** menu on the **Condition** tab and click **Prime**.
10. Place a chest catheter in each side until no distilled water runs out.
11. If red fluids were used as blood with head secretions, select the **Secretion: Ears** (**Mouth** and **Nose**) parameter from the **Trauma** menu on the **Condition** tab and click **Blood**.
12. Continue until no distilled water runs out.
13. If Hemorrhage bleeding was used, select the **Bleeding: Flush** parameter under the **Trauma** menu of the **Condition** tab and click **Enabled**, then connect the wound umbilical to each location until no distilled water runs out.

Flushing the ICP System

To flush all fluid from the ICP system:

1. Connect the ICP Fluid Adapter to the simulator's head.
2. Temporarily connect this hose to an empty IV bag line to capture fluid during this set-up stage.
3. Select **ICP Override** from the list of **Parameters** located under the **ICP** menu on the **Condition** tab.
4. Set the value to the maximum mmHg. Air bubbles and/or fluid will exit from ICP reservoir, through the tube and into the container.
5. When bubbles and/or fluid stops, select **ICP Override**.
6. Set the value to 0 mmHg.
7. Remove the ICP Fluid Adapter from iStan's head and shut down the system.

Flushing the IV/IO System

To purge fluid from the IV/IO system:

1. Connect an external empty 1.0L IV bag to the Drain Port.
2. Connect a 60cc syringe to IV Source Port and withdraw all fluid.
3. Slowly push 2 @ 60cc of air into the IV Source Port. Replace the cap.
4. Slowly push 60cc of air into Jugular IV Port. Replace the cap.
5. Slowly push 60cc of air into Sternum IO Prime Port. Replace the cap.
6. Slowly push 30cc of air into Femoral IV Port. Replace the cap.
7. Slowly push 30cc of air into Left Tibial IO Prime Port. Replace the cap.
8. Slowly push 30cc of air into Right Tibial IO Prime Port. Replace the cap.
9. Evacuate all remaining air from the IV Source Port. Replace the cap.
10. Disconnect the external IV Bag and evacuate all remaining air or fluids from the IV Drain Port using a 60cc syringe. Replace the cap.

IV Arm Kit

Over time, the IV arm will become worn and the skin or veins may need to be replaced using the contents of the IV Arm Kit included in the mannequin Replacement Kit.

To replace the skin:

1. Remove the used skin.
2. Sprinkle talcum powder from the packet enclosed with the IV Arm Kit into the interior of the new skin.
3. Shake out the excess powder and slide the new skin over the hand. Pull it into place over the arm.
4. Palpate the veins to make sure they are positioned in the channel on the arm and hand.

To replace the veins:

1. Pull down the skin of the arm.
2. Remove the section of tubing that needs to be replaced by cutting the tubing on each side of the affected area. Leave at least 1” (2.5 cm) of the vein extending from the molded arm to ensure enough material in which to install butt connectors.
3. Insert one of the supplied butt connectors into each of the ends of tubing.
4. Retrieve a new piece of tubing from the Replacement Kit, cutting it to the same length as the piece you are replacing.
5. Install the new section by lubricating the butt connectors and sliding the new vein all the way over the connectors. Be sure the tubing is applied all the way onto the connectors on both ends of the replacement section of tubing.
6. Replace the skin over the mannequin’s arm.

Cleaning the Trauma Fill Tank and the Umbilical

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 seals, filter and other components.

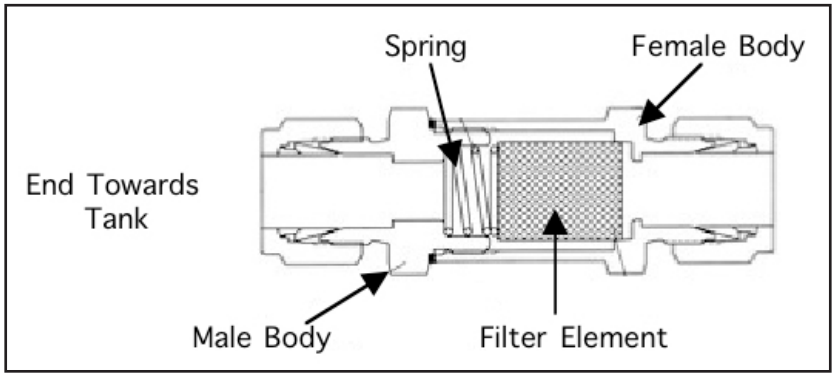
1. Remove and rinse the Overflow Bottle.
2. Remove and rinse the pump assembly.
3. Rinse the tank to remove all traces of the simulated blood.
4. Pour 480 ml (16 oz) of distilled water into the tank and reinstall the pump assembly. (The Overflow Bottle holds 16 ounces.)
5. Place the Overflow Bottle lid 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 METI Customer Support for details if the pump loses the ability to create pressure, squeaks loudly or is difficult to move.

Cleaning the In-Line Filter

To clean the In-line filter:

1. Disconnect the umbilical from the Overflow Bottle lid.
2. Using two 3/4” (or adjustable) wrenches, separate the halves of the filter by holding the top nut (end towards tank) stable and turning the bottom. Be sure to capture the spring as the halves are separated.



3. Remove the filter element from the female half by placing a screwdriver between the top edge of the filter element and the female housing and gently prying the filter. Once the filter breaks loose, do the same on the opposite side. This should allow you to turn the housing over and have the filter element fall out.
4. Once the filter element is out, rinse the outside of the element, and then the inside. Then, take a 60cc syringe filled with distilled water and shoot the water through the open end of the element, repeating this process five to six times. This will back-flush the filter element and dislodge any trapped particles.
5. Wipe down the filter spring with a soft, lint-free cloth.
6. Place a paper towel or soft cloth on a hard surface. Tap the open end of the long female filter housing on the hard surface to knock out any large debris.
7. While holding the female housing with the open end pointed downward, use the syringe to shoot distilled water in the housing and rinse any remaining debris out, then wipe down the inside of housing with a soft, lint free cloth.
8. Pour approximately 16 ounces of clean distilled water into the Trauma Fill Tank.
9. Aim the short hose with the male fitting toward a wastewater bucket and pump one time. This should flush the hose and the male fitting clear of any remaining debris. Stop the flow by turning the pressure relief valve.
10. Wipe down the inside of the male filter housing.

11. While holding the female housing with the open end up, place the filter element with the open end down into the housing, Using the tip of your finger, or a small, soft instrument (e.g. the eraser end of a pencil), to gently apply pressure to the filter element and push into place.
12. Place spring into housing.
13. Screw the two halves together hand tight, and then use the two wrenches to tighten the connection.
14. Pump ten times to verify that the filter assembly has no leaks.
15. Place the Overflow Bottle lid with umbilical attached into the wastewater bucket.
16. Attach the blue and yellow connectors together at the other end of the umbilical. This will flush the umbilical and wash any debris out.

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 buildup. No fluid is transported to simulator.	(1) Pump assembly not sealed tightly into tank or (2) Damaged pump cylinder gasket or o-ring. (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 METI for service. (3) Turn valve until it returns to a "sealed" position.
Simulator fill time takes 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 disconnected 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.

Handling CO_2 Canisters

Careful handling is required in the use of CO_2 canisters. Please read and follow all appropriate cautions and warnings.

For information on CO_2 canister insertion, *see page 2.11*.

Removing CO_2 Canisters from the Regulator

The following instructions will show you 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 frostbite 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 METI.

Punctured canisters are considered to be empty. No residue remains in the canister after use. The steel used is a low carbon type, which will turn to rust quickly 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 METI 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.

Index

Appendix A - Macintosh Fundamentals

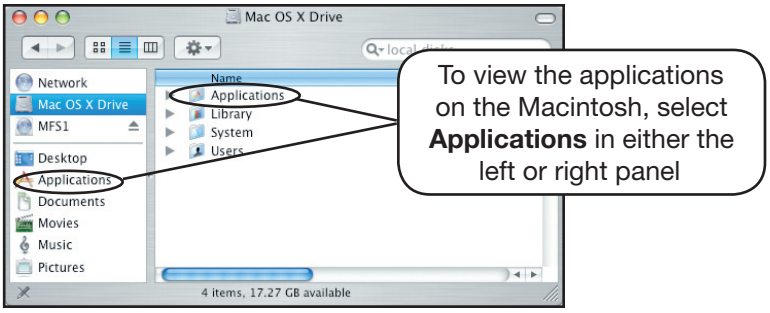
The Macintosh desktop configured for the Instructor Workstation displays all the functionality needed to operate the HPS6 software. Applications can be accessed either by opening the Mac OS X window or by using the shortcuts assigned to the Dock.

Opening the Mac OS X Window

The icon for the Mac OS X system hard drive is located initially in the upper right corner of the desktop.

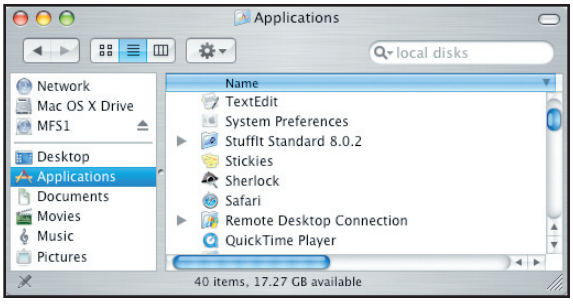
Mac OS X Icon

Clicking on this icon opens the window for the hard drive.



Mac OS X Window

Selecting **Applications** in either the left or right panel displays the applications available on the hard drive.

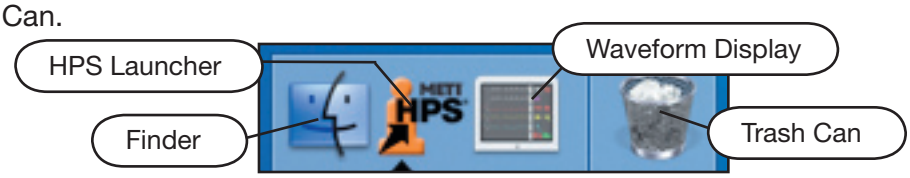


Available Applications

The applications on the Instructor Workstation include those programs, such as Text Edit, which contain standard features that may be useful when working with the HPS6 software.

Using the Dock

The Dock, initally located at the bottom of the desktop, displays shortcut icons to applications, open files that are currently minimized, and other items like the Finder and Trash Can.



The Dock

To open or activate an item in the Dock, click the icon for that item.

To add an application to the Dock, locate the application on the hard drive, select the application and drag it (see Dragging below) to the Dock.

To remove an icon, click on that icon and drag it off the Dock.

The Finder

The Finder is always active and the Finder window can be accessed by clicking anywhere on the desktop or on the Finder icon in the Dock.

The Finder Menu

The Finder menu provides the tools for locating and managing files.

The HPS6 Launcher

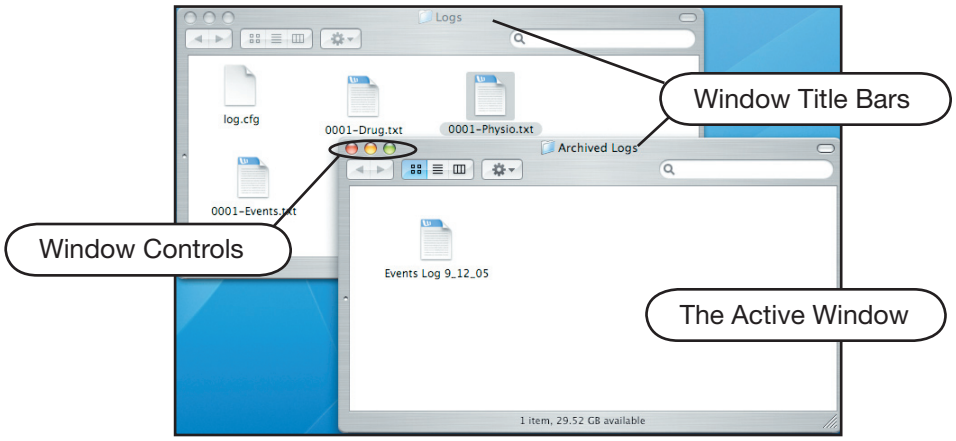
To launch the HPS6 application, click the HPS6 Launcher icon located in the Dock. Once the software is loaded, the HPS menu bar appears at the top of the window indicating that the HPS6 application is running.

The HPS Menu

The HPS menu provides the basic functionality needed for opening and running the Patient software. Many of the options found on the menu are also located on the Patient Palette and the Patient window.

Working with Windows

A window is the main, rectangular area in which application elements are displayed. The elements in a window vary from application to application. There is almost no limit to the number of windows that can be open on the desktop at one time, but only one window at a time is active. The active window appears at the uppermost level of the screen and the controls of the active window are enabled. The title bar displays the name of the file that the window represents.



An Inactive and Active Window

Moving a Window

To move a window, click the window's title bar and drag the window to the desired location (see Dragging below).

Using Window Controls

The Window Controls are comprised of three colored buttons located in the upper left corner of the window.

Click the green (+) Maximize button to enlarge the window.

Click the yellow (-) Minimize button to reduce the window and place it as an icon in the Dock. To return the window to the desktop in its original size, click on the icon.

Click the red (x) Close button to close the window.

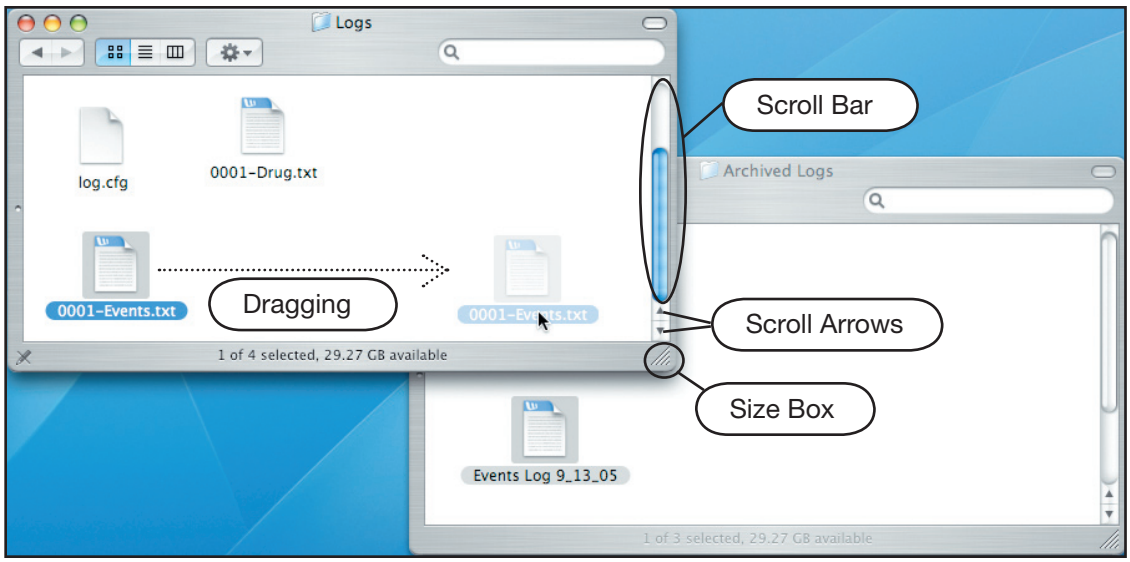
NOTE: Windows can also be closed and minimized by using the **Window** menu located on the application's menu bar.

Switching between Windows

To make a window active, click anywhere on an inactive window. The new active window moves to the foreground and title bar or the active window is highlighted. This action does not close any windows, but all other windows on the desktop remain inactive.

Dragging

To move an object on the screen, position the cursor over the object, press and hold the mouse button, move the object to the desired location and release the mouse button.



Window Features

Scrolling

Windows that contain additional information that is out-of-view display scroll bars either along the right side or the bottom of the window. Moving the scroll box inside the scroll bar adjusts the view of the window's contents. Clicking a scroll arrow moves the document one line while holding down the scroll arrow causes continuous scrolling.

Resizing

Windows can be sized to any available dimension on the screen by dragging the Size Box located on the bottom right corner of the window.

Appendix B - Shortcut Keys

The keyboard can be used to access the functionality of many of the menu options available with the HPS software.

HPS Graphical User Interface (GUI) Shortcut Keys

The shortcut keys appear on the HPS menu beside their corresponding option with the command key (⌘) and the shift key (⇧) displayed by their symbols along with the character assigned as a shortcut. The option (or alt) key (⌥) is also occasionally used. The table below summarizes the functionality available using these keys:

Command	Shortcut Keys	Functionality
Connect to Patient Model...	⌘ K	**HPS** Menu - Opens the Patient Models dialog that displays HPS models and their host identification numbers.
Hide HPS	⌘ H	**HPS** Menu - Hides the HPS GUI from the desktop.
Quit HPS	⌘ Q	**HPS** Menu - Quits the HPS software. (Patients should be stopped before quitting.)
New	⌘ N	**Patient Menu** - Opens a new patient.
Open...	⌘ O	**Patient Menu** - Activates the Open navigational dialog, providing the user with the means to locate and select a patient from the system.
Save	⌘ S	**Patient Menu** - Save the active patient file.
Save As...	⇧ ⌘ S	**Patient Menu** - Save the active patient file as a new filename.
Pause	⇧ ⌘ U	**Patient Menu** - Pauses the Patient Time, freezing the simulation in its current state.
Fast Forward	⇧ ⌘ F	**Patient Menu** - Advances the Patient Time, running the physiological model at approximately four times normal speed.
Print	⌘ P	**Patient Menu** - Prints (or creates a PDF file) for the active tab view.
Detach Tab	⇧ ⌘ T	**Window Menu** - Creates a separate window for the active tab.
Minimize Window	⌘ M	**Window Menu** - Creates a separate window for the active tab.
Close Window	⌘ W	**Window Menu** - Closes the active window, removing it from the desktop.
Show/Hide Logs Drawer	⌘ L	**Window Menu** - Opens or closes the Logs Drawer.

HPS Text Shortcut Keys

Several shortcut keys have been provided for quick access to the functionality involved in the editing of the text used to create the patient's history.

Command	Shortcut Keys	Functionality
Undo	⌘ Z	**Edit Menu** - Undo the last keystroke.
Redo	⇧ ⌘ Z	**Edit Menu** - Redo the last keystroke that was undone.
Cut	⌘ X	**Edit Menu** - Remove the selected (highlighted) text.
Copy	⌘ C	**Edit Menu** - Copy the selected (highlighted) text to the clipboard.
Paste	⌘ V	**Edit Menu** - Paste the clipboard's contents to the area selected by the cursor.
Select All	⌘ A	**Edit Menu** - Select all the textual elements in the window.
Spelling	⌘ ;	**Edit Menu** - Locate the next text entry with questionable spelling.
Check Spelling	⇧ ⌘ ;	**Edit Menu** - Open the spell check dialog.
Special Characters	⌥ ⌘ F	**Edit Menu** - Open the Character Palette for mathematical and other symbols.
Show Fonts	⌘ T	**Format Menu** - Open the Font dialog with the list of available fonts and sizes.
Bold	⌘ B	**Format Menu** - Make the selected text bold.
Italic	⌘ I	**Format Menu** - Italicize the selected text.
Underline	⌘ U	**Format Menu** - Underline the selected text.

Scenario Shortcut Keys

Additional shortcut keys are provided for quick access to the functionality involved in creating and editing scenarios. All these options are located on the Scenario menu available under the Scenario tab.

Command	Shortcut Keys	Functionality
New	⇧ ⌘ N	**Scenario Editor** - Create a new scenario.
Open	⇧ ⌘ O	**Scenario Editor and Player** - Open an existing scenario.
Close	⇧ ⌘ W	**Scenario Editor and Player** - Close the current scenario.
Save	⇧ ⌘ V	**Scenario Editor** - Save the edited scenario.
New State	⌥ ⌘ N	**Scenario Editor** - Create a new state in the edited scenario.
New “Set” Event	⌥ ⇧ ⌘ S	**Scenario Editor** - Create a new Set event within a state of the edited scenario.
New “Bolus” Event	⌥ ⇧ ⌘ B	**Scenario Editor** - Create a new Bolus event within a state of the edited scenario.
New “Call” Event	⌥ ⇧ ⌘ C	**Scenario Editor** - Create a new Call event within a state of the edited scenario.
New “Go To” Event	⌥ ⇧ ⌘ G	**Scenario Editor**- Create a new Go To event within a state of the edited scenario.
New “Infustion” Event	⌥ ⇧ ⌘ U	**Scenario Editor** - Create a new Infusion event within a state of the edited scenario.
New “Multiply” Event	⌥ ⇧ ⌘ M	**Scenario Editor** - Create a new Multiply event within a state of the edited scenario.
New Transition	⌥ ⇧ ⌘ T	**Scenario Editor** - Create a new transition in the edited scenario.

Useful Macintosh Windows Controls

Macintosh systems with Expose' provide users with the means of opening and navigating between windows by using shortcut keys.

To see all open windows, hold down the **F9** key.

To see all the windows open in the current application, hold down the **F10** key.

To hide all the open windows to see the desktop, hold down the **F11** key.

Point to a window to see its name, then click the window or press the Space bar to bring it to the front. Also use the arrow keys to highlight windows, or press **Tab** to cycle through open applications, displaying each application's windows together.

If the function key (i.e. **F9**) does not open or hide the windows, hold down the **Fn** key and the function key

Appendix C - Drug Integration

The drug responses created or modified with the Pharmacology Editor are integrated into the HPS software through the options available in the **HPS** menu located on the HPS menu bar.

From the **HPS** menu select the **HPS Drug Responses** command to open a pull-down menu with three options that provide the functionality for:

Modifying drug responses for all the patients in the HPS system

Modifying drug responses for a specific patient

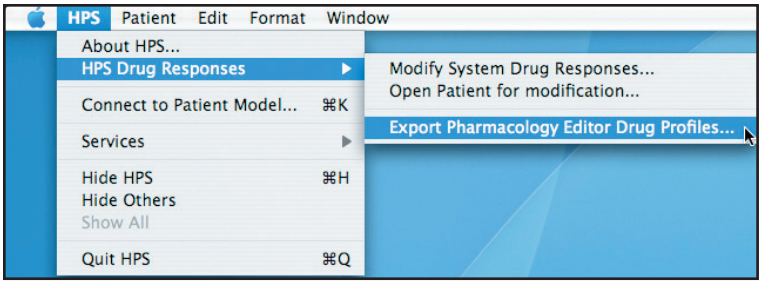
Export a drug profile to the Pharmacology Editor for modification

When a new drug list is imported into the HPS software for either one patient or the whole system, the existing default drug file for the patient or the system is overwritten. Importing a new drug list for a specific patient, however, overwrites only any previously specified drug responses for that particular patient and not for the entire system.

Exporting Drug Profiles

Drug profiles can only be exported (saved) on the Instructor Workstation to a location on the HPS system by selecting the **Export Pharmacology Editor Drug Profiles** option from the **HPS Drug Responses** command menu.

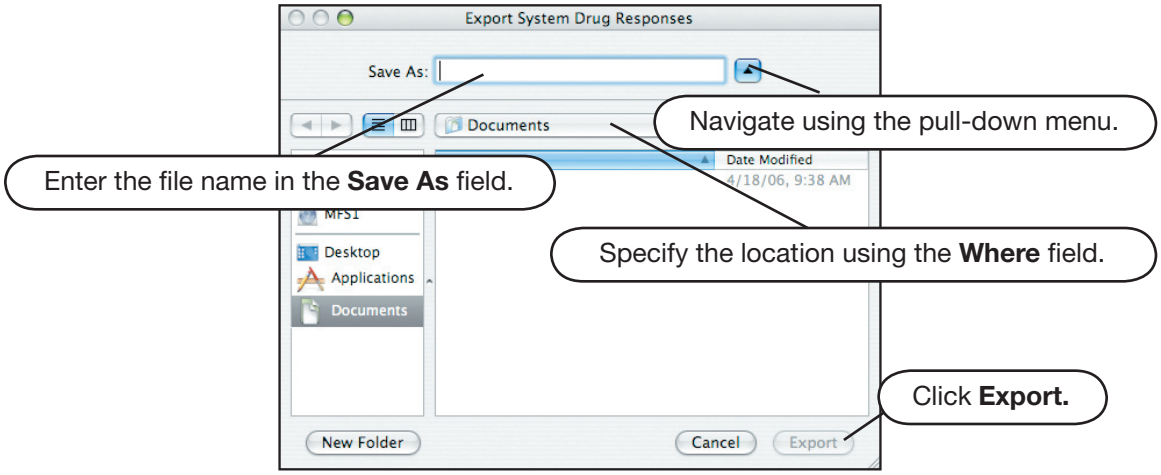
A drug file must be exported from the HPS and used assigned as a default drug profile for the Pharmacology Editor to have a drug list when opened.



Selecting the Export Option

The Export System Drug Responses dialog opens with a field for naming the file to be exported (saved) and a navigational pull-down menu for finding the location where the file will be stored.

Enter a name for the file in the **Save As** field and established a location in the **Where** field of the Export System Drug Responses dialog box.



The Export System Drug Responses Dialog Box

Click the **Export** button.

METI suggests that files stored on the Instructor Workstation be saved to the Documents folder. METI-created drug files have the following filenames:

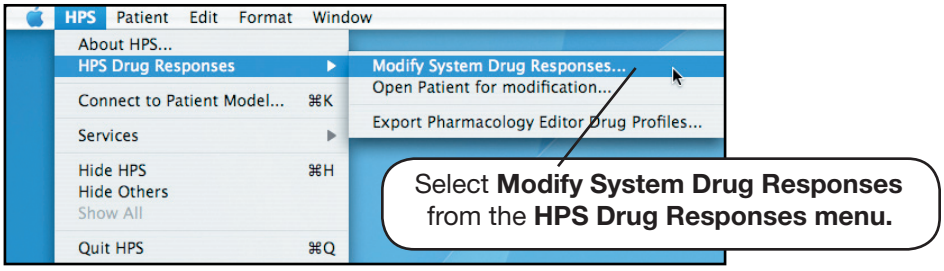
Adult patients:	DRUG.MST
Pediatric patients:	DRUGY.MST
Infant patients:	DRUGI.MST

Note: The images above apply to a Mac OS 10.4 system. The navigational dialogs for previous systems may have small visual differences.

Modifying System Drug Responses

No patient file should be running when the system drug responses are being modified.

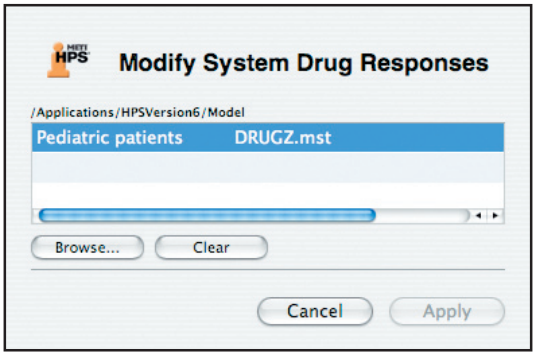
To integrate a modified drug list into the HPS software system-wide, select the **Modify System Drug Responses** option from the **HPS Drug Responses** command menu.



Selecting Modify System Drug Responses

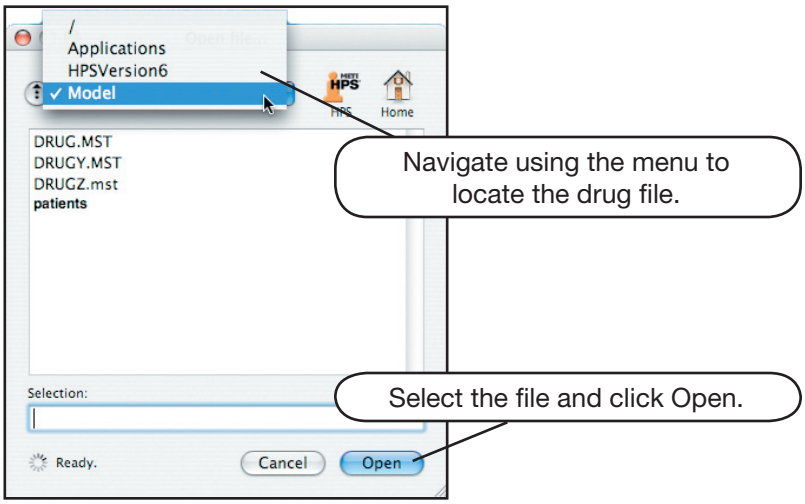
The Modify System Drug Responses dialog box appears.

The Modify System Drug Responses dialog box displays the path and file information for the HPS system's existing drug file.



The Modify System Drug Responses Dialog Box

To locate the new drug file, click the Browse button to activate the Open navigational dialog box.

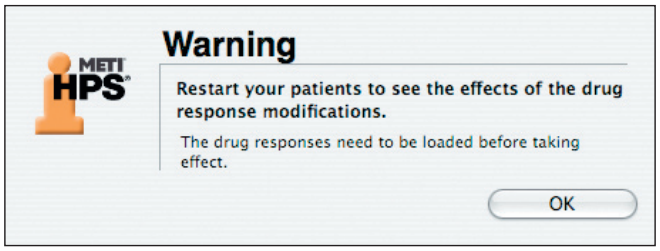


Navigating Using the Open Dialog Box

Use the Open dialog box to navigate to the directory where the new drug file is stored. Select the drug file and click the **Open** button to replace the drug file in the Modify System Drug Responses dialog box with the selected drug file.

In the Modify System Drug Responses dialog box, click **Apply**.

If a patient file is running, a warning box appears advising that the patient must be restarted for the new drug file's settings to be active.



The Modify System Drug Responses Warning Box

Click **OK** to close the box.

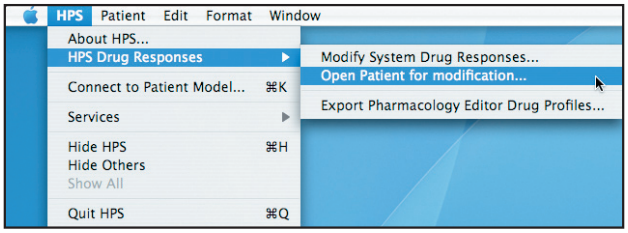
The modified drug file will be applied ONLY when the patient is restarted.

Opening a Patient File to Modify the Drug Response

The specific patient file should not be running when that patient's drug responses are being modified.

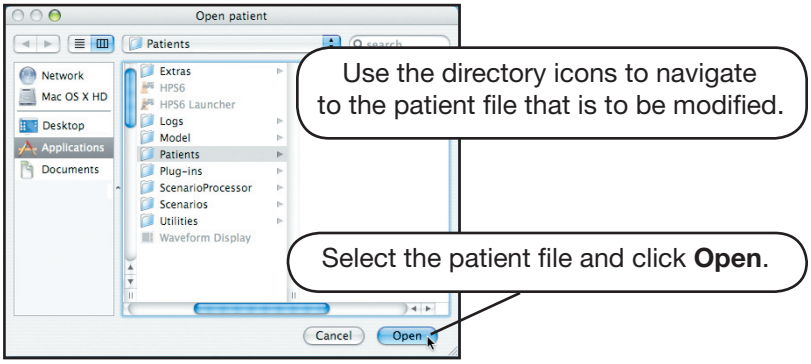
Note: This option is only available on the Instructor Workstation.

To change the drug response for a specific patient, select the **Open Patient for modification** option from the **HPS Drug Responses** menu.



Selecting Open Patient For Modification

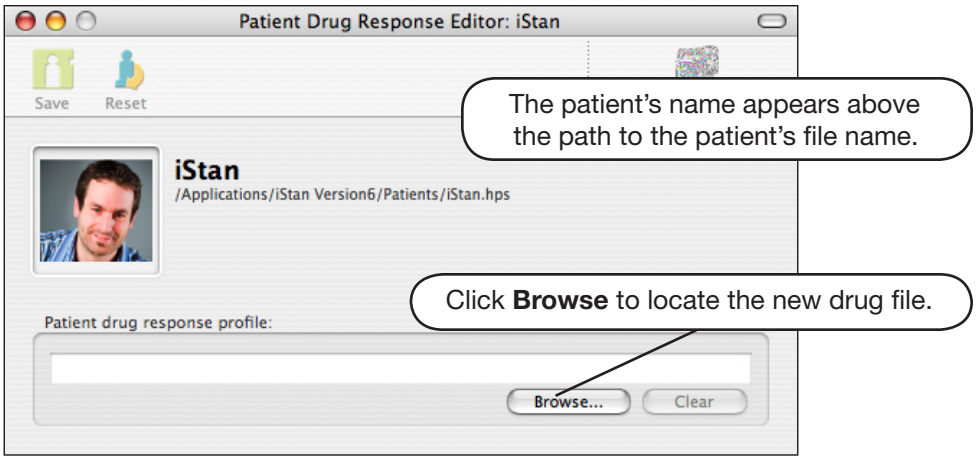
The Open patient navigational directory appears.



Locating the Patient File

Locate the patient file by navigating the directory. Select the file and click the Open button.

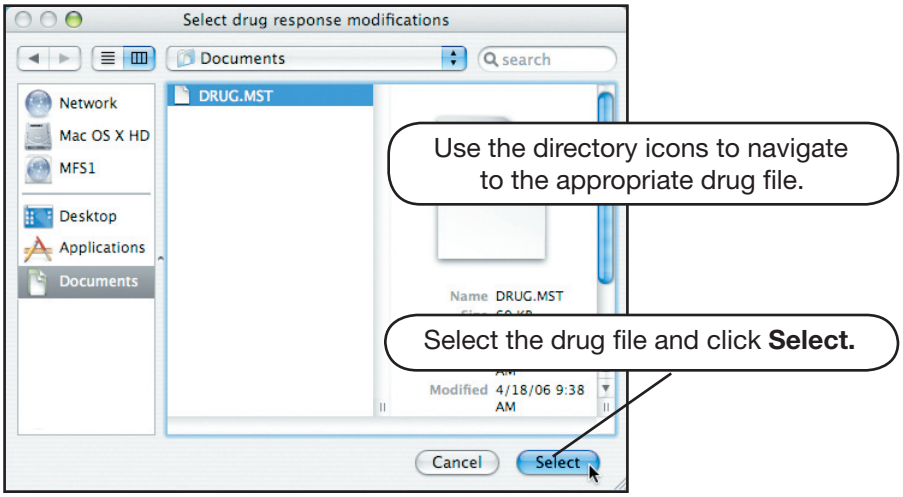
The Patient Drug Response Editor appears, displaying the name of the patient, the patient file path and a field for the new drug response profile.



The Patient Drug Response Editor

To establish or change the patient's specific drug responses, locate and enter the appropriate drug file into the **Patient drug response profile** field by clicking the **Browse** button.

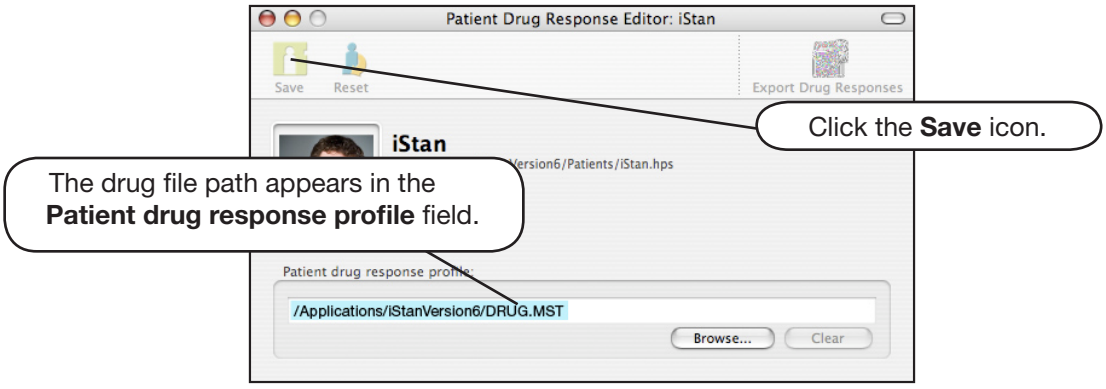
The Select drug response modifications dialog appears, displaying the navigational windows needed to locate and select the desired drug file.



Locating the Drug File

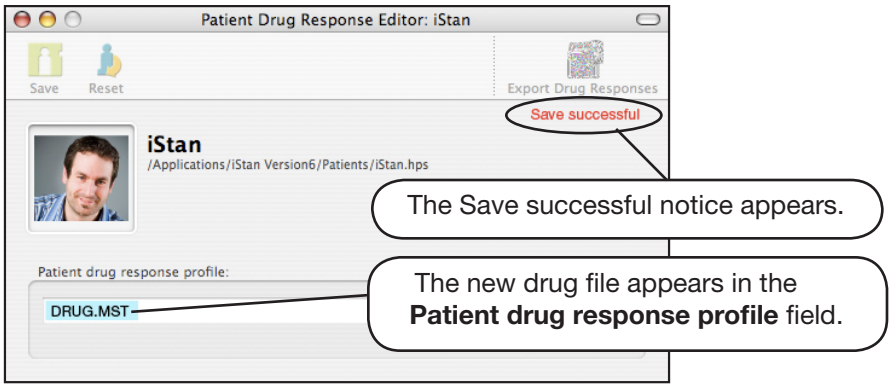
Select the drug file and double-click or click the **Select** button.

The Patient Drug Response Editor now displays the drug file and its path.



Path to New Drug File

Click the Save icon to set the drug response profile to the selected drug file.



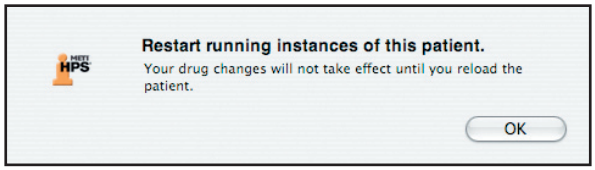
Patient Drug Response Profile Saved

The **Save successful** notice appears on the Editor and the new drug file name replaces the file path in the **Patient drug response profile** field.

The Patient drug response profile can be cleared by clicking the **Clear** button. To return a cleared file name, click the **Reset** icon.

Close the Patient Drug Response Editor by clicking the red close button in the upper-lefthand corner.

If the patient whose drug response is being modified is running, a warning box appears reminding that drug changes cannot take effect until that patient is restarted.

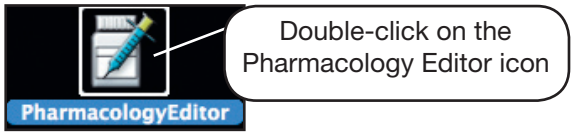


Patient Drug Response Profile Saved

Click OK to close the warning box. Stop and restart all instances of the patient to use the newly selected drug profile.

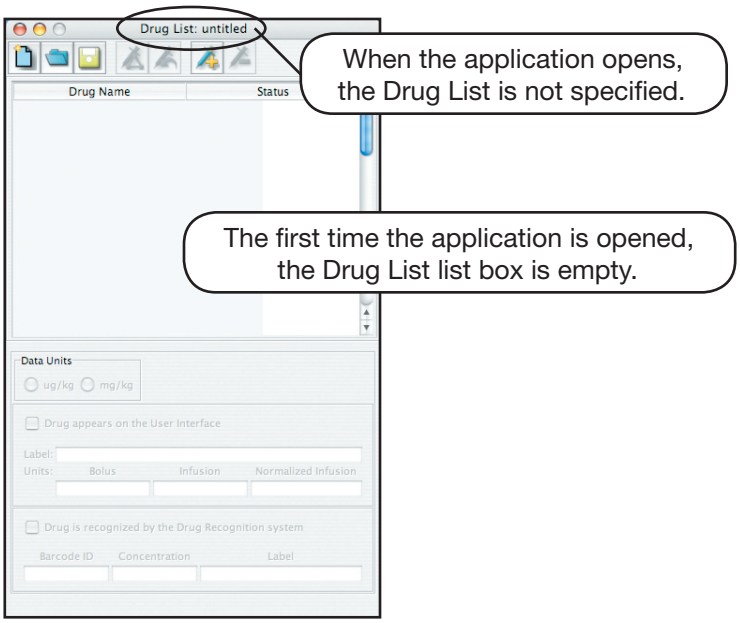
Using the Pharmacology Editor

To launch the Pharmacology Editor, double-click on the Pharmacology Editor icon. The icon may initially (for Mac installations) be located in the HPS folder. If desired, drag the icon to the desktop or to the dock for future access.



The Pharmacology Editor Icon

The application opens, initially displaying the Drug List dialog box with an unspecified drug list.



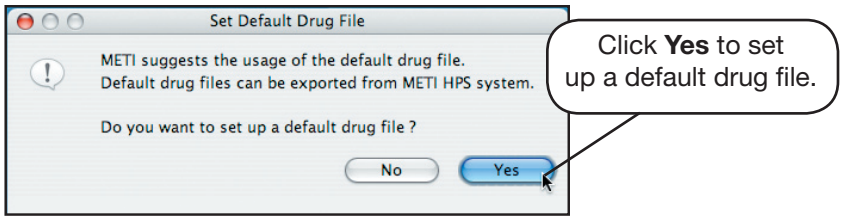
The Drug List (Prior to File Selection)

Unless a default drug file has been established, the “untitled” drug list is empty. Once a default drug file is set up, that list will be shown when the Drug List appears.

METI recommends that the HPS system drug MST file (profile) be used as the default drug file. Before using the system drug profile, the MST file must be exported to a location on the hard drive where the Pharmacology Editor can access the profile. METI suggests using the Documents folder on the Mac or the My Documents folder on a PC to store the default drug MST file.

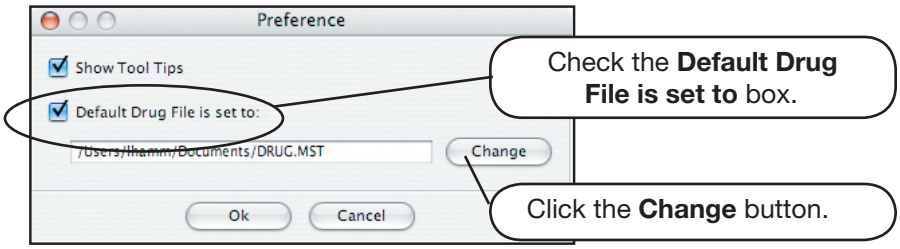
Setting a Default Drug File

When the Pharmacology Editor is initially launched, no default drug file has been established. A Set Default Drug File dialog box automatically appears.



Setting the Default Drug File

Click Yes on the Set Default Drug File dialog to activate the Preference dialog.

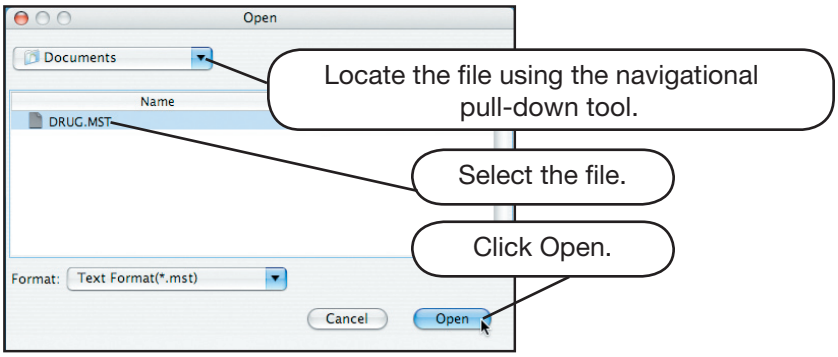


The Preference Dialog Box

Select the **Default Drug File is set to** box to activate the field below and the **Change** button.

Select the **Show Tool Tips** box to have ToolTips displayed when the cursor is over an icon.

The Open dialog appears, displaying the navigational tools needed to locate the drug file.



Locating the Open Button

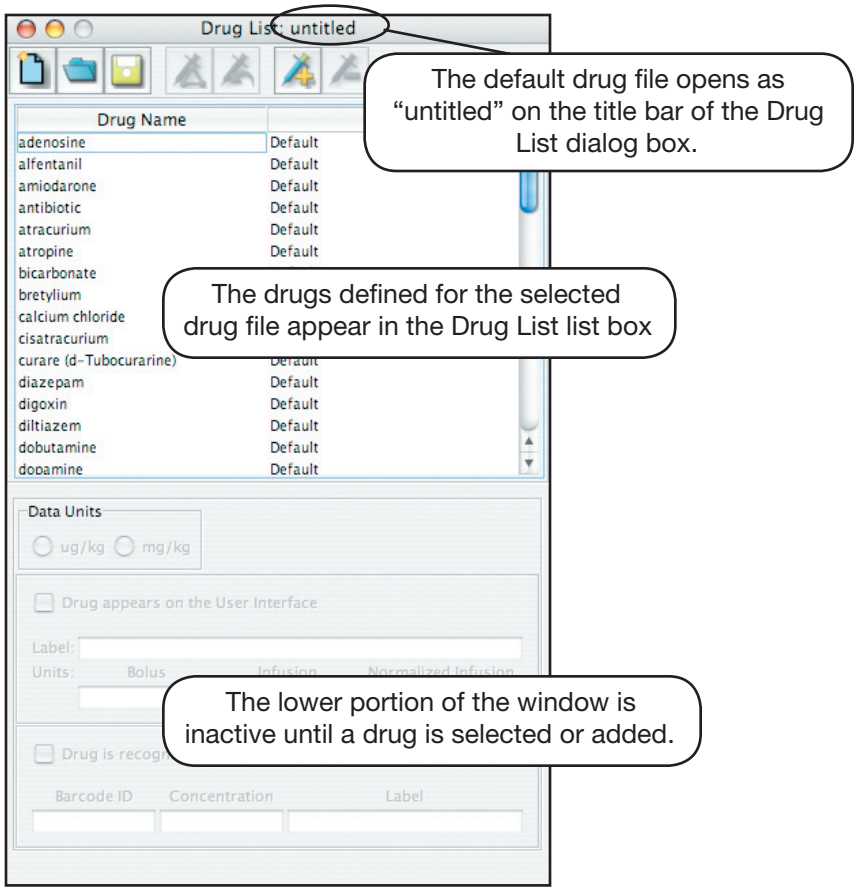
Locate the drug file using the navigational pull-down, then double-click on the filename or select the file and click the **Open** button. Note that the drug file has a suffix of MST.

The path to the drug file appears in the **Default Drug File** is set to field in the Preference dialog box. Click **Ok** to accept the file as the default.

This drug file populates the Drug List list box and is now set as the default file

Understanding the Drug List

When the default drug file opens, the Drug List appears containing the drugs defined in that file.



The Drug List

When the Pharmacology Editor opens, the default drug file loads with "untitled" as the name of the default drug list appearing on the title bar. This "untitled" file can then be saved under a new filename after the drug list has been modified.

A drug file saved from the Drug List window overwrites any other file of that name and location. It is recommended, therefore, that changes be made only to the "untitled" default file or to other user-created files. Modifying drug files supplied with the HPS6 software may remove default information and make the information in the drug file unreliable.

The lower portion of the Drug List window is inactive until a drug is selected from the list or added using the Add Drug command.

The Drug List Toolbar

The Drug List Toolbar is located beneath the title bar at the top of window.

The Drug List Toolbar

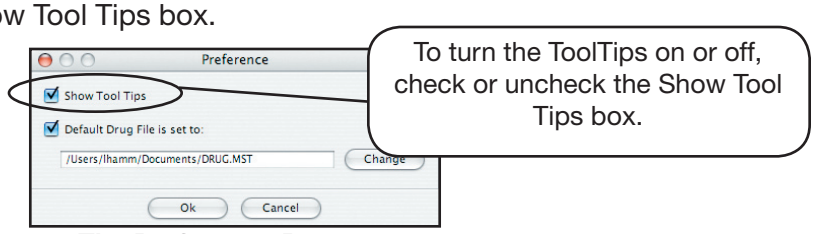
The toolbar contains icons that provide the functionality needed to create, edit and remove drugs from the list. Most of this functionality can also be found in the Pharmacology Editor's menu bar.

Icon	Command	Menu Command	Function
	New	**File>New**	Replace the existing drug list with the default list
	Open	**File > Open**	Access the Open dialog to be able to locate and open a drug file
	Save	**File > Save**	Save the existing file (for a specific filename) or save and rename (an untitled file) using the Save Drug File As dialog
	Edit Drug		Open the Drug to edit the selected drug
	Drug to Default	**Drug > To Default**	Return the selected **Modified** drug to the original default settings
	Add Drug	**Drug > Add**	Add a new drug to the list
	Delete Drug	**Drug > Delete**	Delete a **Generated** drug

Clicking on a icon (or selecting the menu command) accesses the functionality. However, not all icons are active for each drug. For example, only Generated drugs (newly created drugs) can be deleted and only Modified drugs (default drugs that have been changed) can be returned to their Default settings.

When Save is selected, an "untitled" file (loaded based upon the default drug file) must be renamed and saved to a user-assigned location. Saving an existing file overwrites that file's data with the new drug configuration.

ToolTips are available for the toolbar icons. To be able to view the tooltips, activate the Preference box by choosing the Preferences command from the PharmacologyEditor menu, then check the Show Tool Tips box.



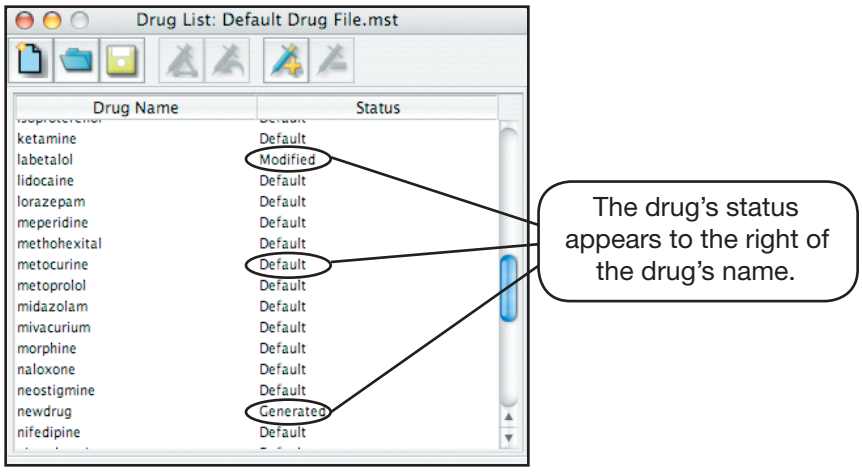
The Preference Box

Drug Name

The **Drug Name** column on the left-hand side of the Drug List lists all the drugs available in the selected drug file.

Drug Status

The **Status** column on the right-hand side of the Drug List displays a category that describes whether the drug has been newly created (**Generated**), created but not validated (**Generated [invalid]**), created from an original default drug (**Modified**) or remains in its default state (**Default**).



Drug Status

When a drug is selected, the status of that drug determines the tools that can be used with that drug.

Default - Default drugs can be modified but cannot be deleted.

Modified - Modified drugs are default drugs that have been changed. Further changes can be made to modified drugs, and they can be returned to their default settings by selecting them and using the Drug to Default icon. Modified drugs cannot be deleted.

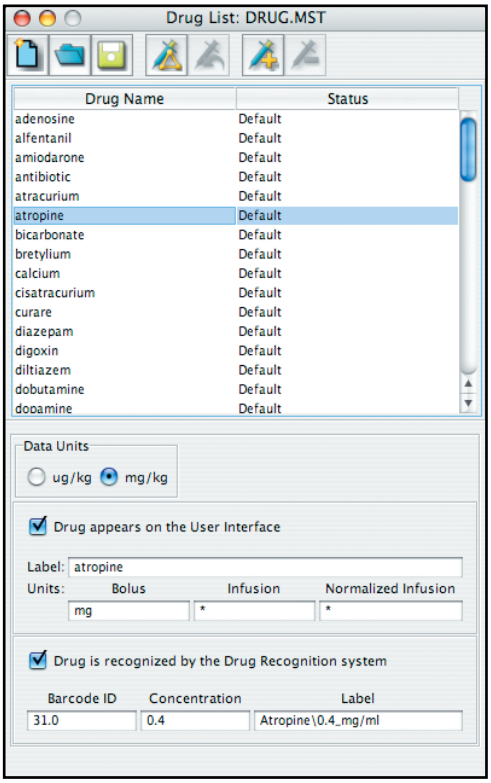
Generated - User-created drugs have a **Generated** status. Generated drugs can be changed and deleted.

Generated [invalid] - User-created drugs that are newly created and have not had valid PharmacoKinetic and PharmacoDynamic profiles defined.

All drugs can have their identification, units and physiological effects changed.

Drug Administration Method, Labeling and Barcode Information

The lower portion of the Drug List window becomes active when a drug is selected.



Selecting a Drug

The settings help to define the selected drug within the software.

Data Units - The option buttons in this box allow the user to set the drug measurement to either **ug/kg** (micrograms per kilogram) or **mg/kg** (milligrams per kilogram). This information is also used when editing the drug's PharmacoKinetics.

Drug appears on the User Interface - Checking this box activates the fields for the **Label** and the **Units** of measure that will be available on the HPS6 software's user interface whenever the select drug appears. If this box is not checked, the drug will not appear on the user interface.

Label identifies the name the user assigns to the drug. (Note: this field can be used to overwrite the generic drug name with a user-specific name.)

Units determines drug's administration methods and the respective units of measure that appear within the HPS system. At least one method must be assigned to each drug in order for the drug to be available for administration. An asterisk (*) or a blank entry in one of these fields disables this drug in that specific administration method.

METI recommends the following unit labels:

Bolus can be set in mcg or mg.

Infusion can be set in mcg or mg per min or hr.

Normalized Infusion is normalized to patient weight in kg.

Drug is recognized by the Drug Recognition system - Checking this box activates the fields that control the data provided by the barcoded syringe.

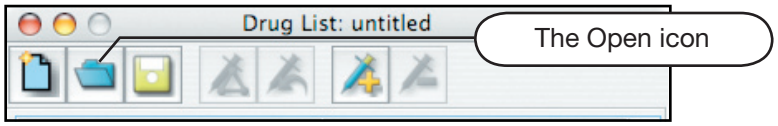
Barcode ID - This is the unique identifier for the barcoded drug. Duplicating an ID number overwrites the existing information for that number.

Concentration - This value identifies for the software the concentration of the drug in units of the dose per milliliter.

Label - This information includes the drug name and the concentration with its unit of measurement per milliliter and should match the label displayed with the barcode on the syringe. Barcodes have a specific labeling format.

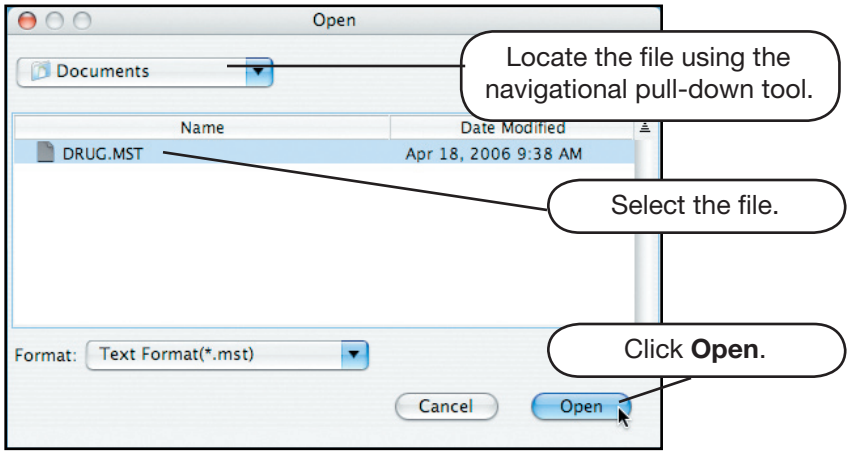
Loading a Drug File

To load a drug file, click the Open icon on the Drug List toolbar or select the **Open** command from the **File** menu.



Locating the Open Icon

Once the **Open** command or the **Open** icon is selected, the Open dialog box appears, displaying the navigational tools needed to locate the drug file.



Locating the Open Button

When the drug file is located, double-click on the filename or select the file and click the **Open** button. Note that the drug file has a suffix of MST.

With the release of the Pharmacology Editor, the filenames assigned to the various profiles are as follows:

Adult patients:	DRUG.MST
Pediatric patients:	DRUGY.MST
Infant patients:	DRUGI.MST

Creating User-Defined Drugs

Because drugs can induce severe physiological effects, the introduction of modified or new drugs should be carefully considered.

Modifying an Existing Drug

Drug modification takes place on three different interrelated screens:

The Drug List window - where the identification of the drug's administration method and associated units are established.

The PharmacoKinetics tab - where the time profile of the blood plasma and effector site concentrations following drug administration is determined.

The PharmacoDynamics tab - where the physiological effects of the drug are set, determining the patient's reaction to the drug.

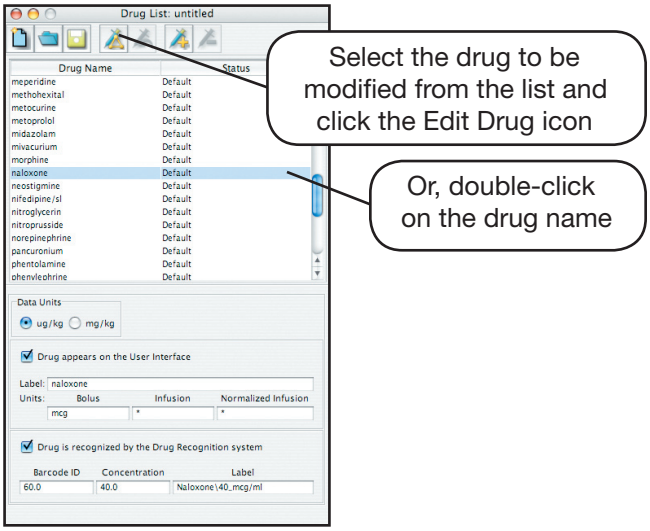
Once these screens are configured and verified, the modified drug becomes part of a newly defined set of drugs that can then be saved as a new drug file (with an MST extension). This drug file can then be used in the HPS software to modify specific drug responses.

Setting the HPS User Interface Information

Once a drug is selected in the Drug List window, the lower portion of the window is enabled. The information provided for the type of Data Units, the manner in which the Drug appears on the User Interface and the way in which the Drug is recognized by the Drug Recognition system sets the way in which these controls are identified in the HPS software.

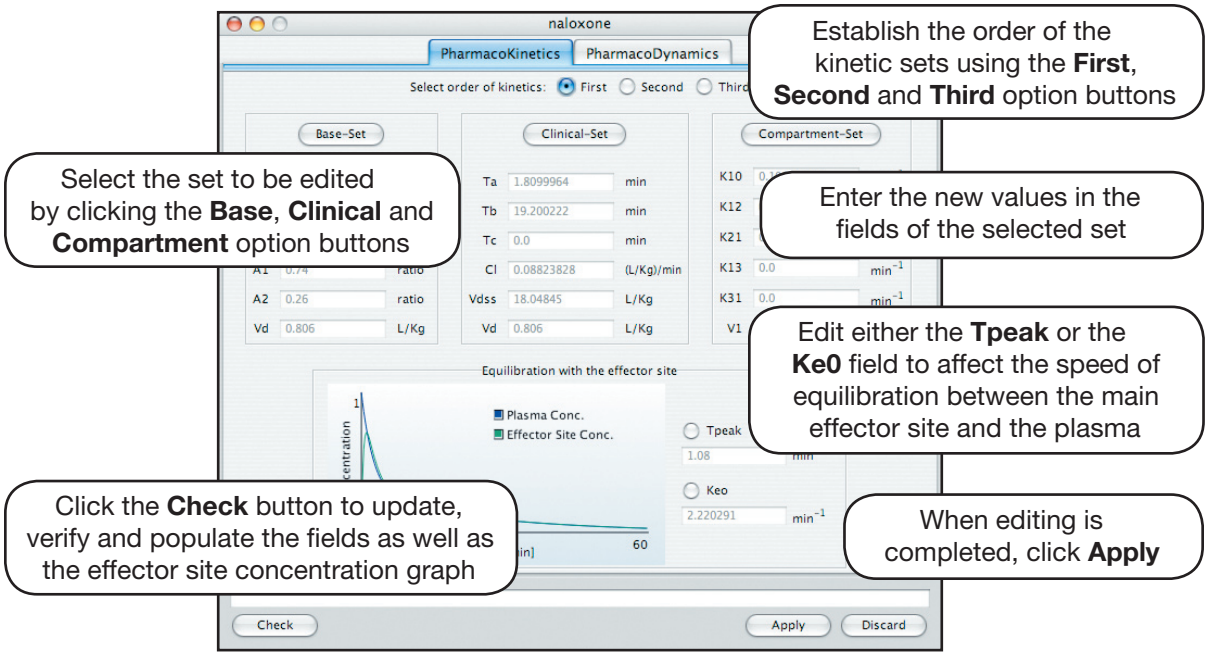
Editing a Drug's PharmacoKinetics

Double-click on the drug name in the Drug List window or select the drug name and click the Edit Drug icon on the toolbar.



Selecting a Drug to Edit

The Drug Profile screen opens, displaying the **PharmacoKinetics** tab.



The PharmacoKinetics Tab

ToolTips can be activated for the Drug Profile Screen by checking the **Show Tool Tips** box of the Preference box.

The **PharmacoKinetics** tab allows for the user to specify the order of the kinetic data as **First**, **Second** or **Third**. Once the order of the kinetics has been selected, data can be entered in any of these three sets:

Base-Set - these parameters reflect the inverse time constants and amplitudes of exponentials that can be fitted to plasma concentration data following a bolus dose, as well as the initial volume of distribution.

Clinical-Set - these parameters can be derived from the plasma concentration decay curve by inspection, rather than by curve fitting methods.

Compartment-Set - these parameters are used in a compartment model of pharmacokinetics.

The parameter fields available for each set are activated by clicking on the corresponding button. Changing the values in these fields causes relevant corresponding changes to the values in the other sets when the **Check** or **Apply** buttons are selected.

Note: the pharmacokinetic order (first, second or third) affects the applicability and, therefore, the availability of the field.

The Base Set		
Parameter	**Units of Measure**	**Description**
a	1/min	*Inverse time constant* of the *fastest exponential*, usually reflecting distribution
b	1/min	*Inverse time constant* of the *slower exponential*, usually reflecting distribution
c	1/min	*Inverse time constant* of the *slowest exponential*, reflecting slow elimination for third order pharmacokinetics
A1	--	*Relative amplitude* of the *fastest exponential*
A2	--	*Relative amplitude* of the *slower exponential*
Vd	L/kg	Initial volume of distribution (bolus dose divided by initial concentration)

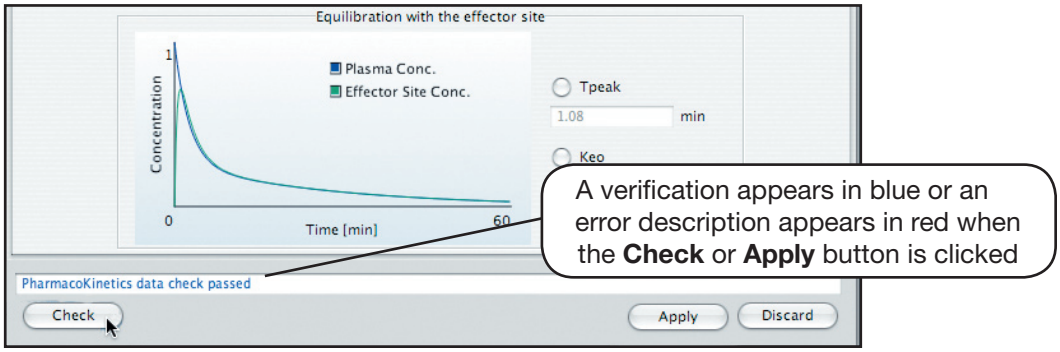
The Clinical Set		
Parameter	**Units of Measure**	**Description**
Ta	min	*Half time* of the *fastest decaying phase*, usually reflecting distribution
Tb	min	*Half time* of the *slower decaying phase*, usually reflecting distribution
Tc	min	*Half time* of the *slowest decaying phase*, reflecting slow elimination for third order pharmacokinetics
Cl	(L/kg)/min	Clearance from the plasma
Vdss	L/kg	Steady state volume of distribution
Vd	L/kg	Initial volume of distribution (bolus dose divided by initial concentration)

The Compartment Set		
Parameter	**Units of Measure**	**Description**
k10	1/min	Elimination rate constant
k12	1/min	*Rate constant* for the distribution from the *central compartment* to the (first) *peripheral compartment*
k21	1/min	*Rate constant* for the distribution from the (first) *peripheral compartment* to the *central compartment*
k13	1/min	*Rate constant* for the distribution from the *central compartment* to the *second peripheral compartment*
k31	1/min	*Rate constant* for the distribution from the *second peripheral compartment* to the *central compartment*
V1	L/kg	Volume of distribution of the central compartment (identical to the initial volume of distribution

The PharmacoKinetics screen also allows for changes to the parameter k_{e0} (**Ke0**), the inverse time constant that determines the speed of equilibration between the main effector site and the plasma. This data can be entered specifically into the **Ke0** field, or it can be entered as the time of peak effect, **Tpeak**. Checking the data (by clicking the **Check** button), automatically computes the corresponding field (i.e. if a new value is entered into the **Tpeak** field, clicking **Check** updates the **Ke0** field and vice-versa).

Clicking **Check** also updates the graph depicting effector site concentration.

When the **Check** button is clicked, a verification appears in blue in the field above the button.



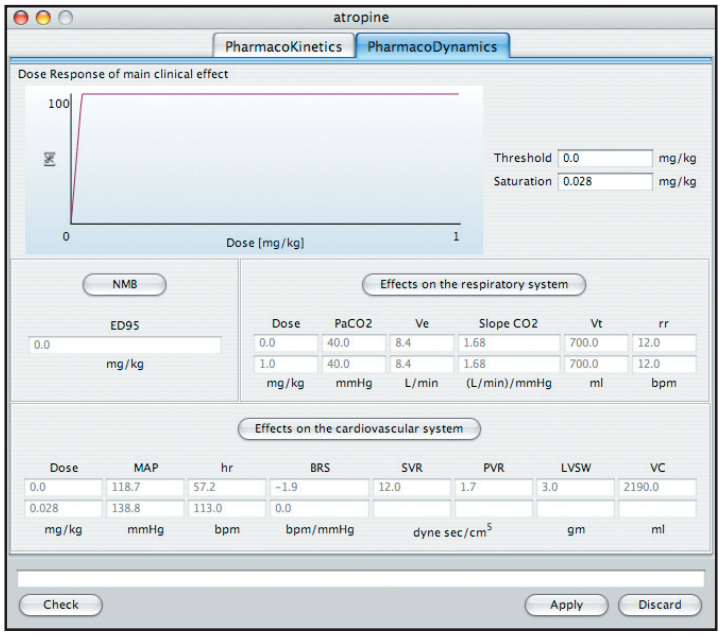
The PharmacoKinetics Data Check

If an error in data entry has occurred, the field displays a description of the computation error in red.

Once the application of pharmacokinetics data is successful, click **Apply** to apply all changes.

Editing a Drug's PharmacoDynamics

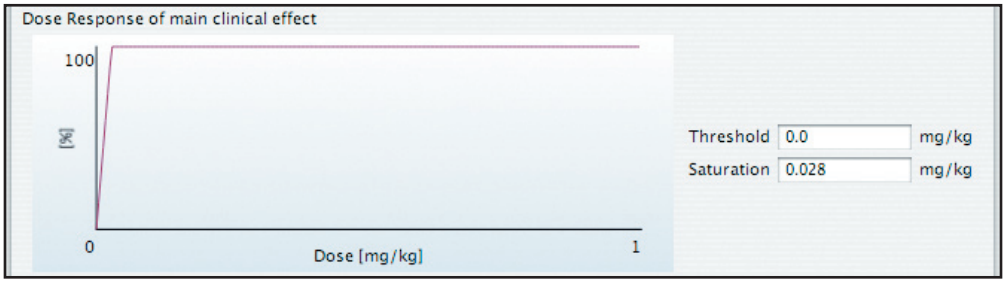
From the Drug Profile screen, select the **PharmacoDynamics** tab.



The PharmacoDynamics Tab

The **PharmacoDynamics** tab allows for the specification of the non-linearities associated to a drug response and to the independent specification of the magnitude of the response for neuromuscular blockade, respiratory and cardio-vascular responses.

Threshold and saturation doses are established by completing the fields to the right of the graphical display of the dose response curve.



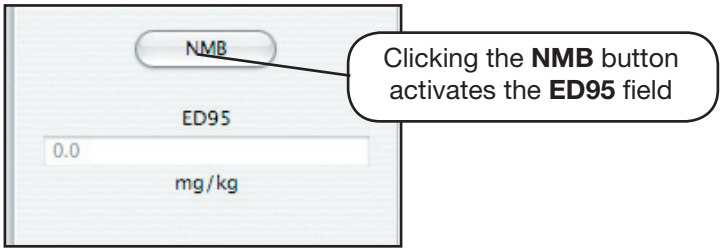
Dose Response Grraph with Threshold and Saturation Fields

The **Threshold** dose is the maximum bolus dose for which no noticeable effect occurs.

The **Saturation** dose sets a limit on bolus dosage after which no further effect occurs. Some effect categories have “natural saturations,” such as, for example, a neuromuscular blocking drug when twitch height reaches 100%.

Threshold and saturation doses apply to all three effect categories.

Clicking on **NMB** button activates the **ED95** field.

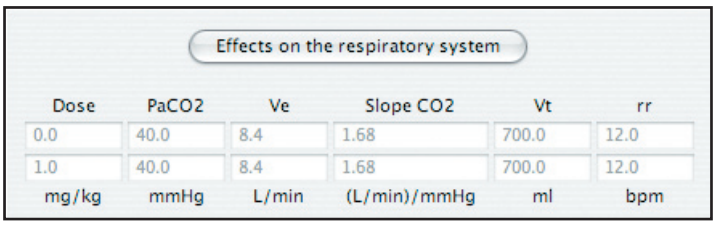


Setting ED95

The magnitude of the effect on neuromuscular blockade (**NMB**) is specified by entering the dose that results in 95% (single) twitch height depression at the adductor pollicis (**ED95**). ED95 has to be bigger than the threshold dose. In METI patient simulators, neuromuscular blockade automatically reduces the force of the respiratory muscles, so no separate respiratory effect has to be entered.

After the **Threshold** and **Saturation** values have been entered, clicking the **Check** button at the bottom of the screen updates the graphical display of the dose response curve.

Clicking the Effects on the respiratory system button activates fields for variables that determine the drug effects on breathing and ventilation.



Setting the Respiratory Effects

This data has to be specified for the baseline patient (dose equal to 0.0 by default) and for the maximum effect following a typical bolus dose. This dose has to be greater than the **Threshold** dose.

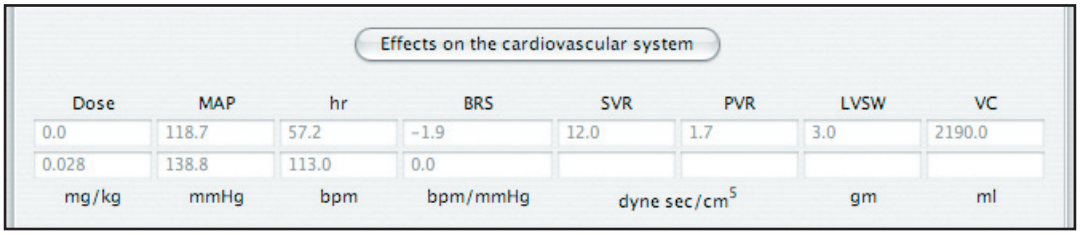
The Respiratory Variables		
Variable	**Units of Measure**	**Description**
Dose	mg/kg	Administered bolus dose
$PaCO_2$	mg/kg	Partial pressure of carbon dioxide (CO_2) in the arterial blood. If this value is not available, the end-tidal CO_2 is an alternative variable
Ve	L/min	Respiratory rate in breaths per minute
Slope CO_2	(L/min)/ mmHg	Respiratory rate in breaths per minute
Vt	ml	Respiratory rate in breaths per minute
rr	bpm	Respiratory rate in breaths per minute

The tidal volume and respiratory rate data are used to determine the drug influence on the VT/rr ratio. There is no consistency check between this data and minute ventilation. These fields can also be left blank, resulting in no drug effect on the VT/rr ratio.

Note that a blank or empty field (one with no data) indicates no effects while a field with a value input of 0 (zero) indicates that the dosage brings the value of the effect to zero.

Clicking the **Check** button at the bottom of the screen computes the direct drug effect on ventilation as well as the indirect effect on the control of breathing and transforms the data into the parameters used by the HPS software.

Clicking the **Effects on the cardiovascular system** button activates activates fields for variables that determine the drug effects on the cardiovascular system.



Setting the Cardiovascular Effects

This data has to be specified for the baseline patient (dose equal to 0.0 by default) and for the maximum effect following a typical bolus dose. This dose has to be greater than the **Threshold** dose.

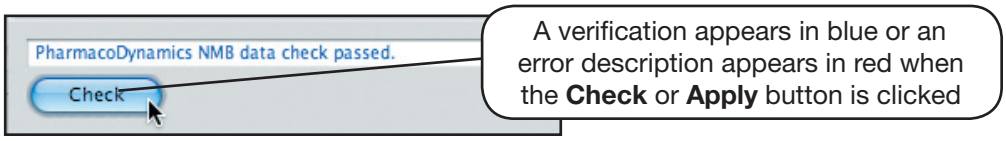
The Cardiovascular Variables		
Variable	**Units of Measure**	**Description**
Dose	mg/kg or ug/kg	Administered bolus dose
MAP	mmHg	Mean arterial pressure
hr	bpm	Heart rate
BRS	bpm/mmHg	Baroreflex sensitivity, expressed in change in heart rate over change in mean arterial pressure
SVR	dyne sec/cm^5	Systematic vascular resistance
PVR	dyne sec/cm^5	Pulmonary vascular resistance
LVSW	gm	Left ventricular stroke work. If LVSW data is not available, another measure for cardiac contractility, for example, ejection fraction or stroke volume, can be entered here. Note that these variables are only approximations
VC	ml	Venous capacitance. Changes in the vvenous capacitance or unstressed volume of the venous circulation greatly influence preload

Data for four (**SVR**, **PVR**, **LVSW** and **VDC**) of the cardiovascular variables are analyzed as relative changes. A reported 20% drop in SVR, therefore, can be represented by entering 100 in the first and 80 in the second row of the SVR column. In this case, the units are ignored. No change can be indicated by entering 100 (%) in both rows of a particular variable column. Leaving a column blank (no data) indicates no direct drug effect on these variables. This does not exclude changes caused by indirect drug effects through an activation of the baroreflex.

Clicking the **Check** button at the bottom of the screen computes the direct drug effect on cardiovascular system and the indirect on the baroreflex control of blood pressure and transforms the data into the parameters used by the HPS software.

Clicking the **Check** button checks only the selected model (e.g. NMB, Respiratory). All three models must pass the check for the PharmacoDynamics check to be successful.

Whenever the **Check** button is clicked, a verification appears in blue in the field above the button.



The PharmacoDynamics Data Check

If an error in data entry has occurred, the field displays a description of the parameter error in red.

Once the data entry for pharmacokinetics information is complete, click **Apply** to apply all changes.

The pharmacodynamic part of the Pharmacology Editor derives drug response parameters from relative changes in the entered data: relative to the baseline patient data and normalized to patient weight. In the simulator, drug effects are computed (using these parameters) with respect to the simulated baseline, unmedicated patient. Resulting cardiovascular and respiratory drug responses may be different from the entered data for two reasons:

Differences between patients reported in the studies from which data are entered and the simulator patients, and

Differences in blood volume or ventilatory status.

Creating a New Drug

Creation of a new drug occurs using the same steps as modifying an existing drug. To create a new drug complete the necessary information on the three different interrelated screens:

The Drug List window - where the identification of the drug's administration method and associated units are established.

The **PharmacoKinetics** tab - where the time profile of the blood plasma and effector site concentrations following drug administration is determined.

The **PharmacoDynamics** tab - where the physiological effects of the drug are set, determining the patient's reaction to the drug.

Once these screens are configured and verified, the drug that has been created becomes part of a newly defined set of drugs that can then be saved as a new drug file (with an MST extension). This drug file can then be used in the HPS software to modify specific drug responses.

Note: When creating a new drug based on an existing drug, printing the Drug Profile Screen may be helpful.

Pharmacology Editor Saving and Printing Options

The manner in which saving and printing information from the Pharmacology Editor can be performed depends on system onto which the Pharmacology Editor has been installed.

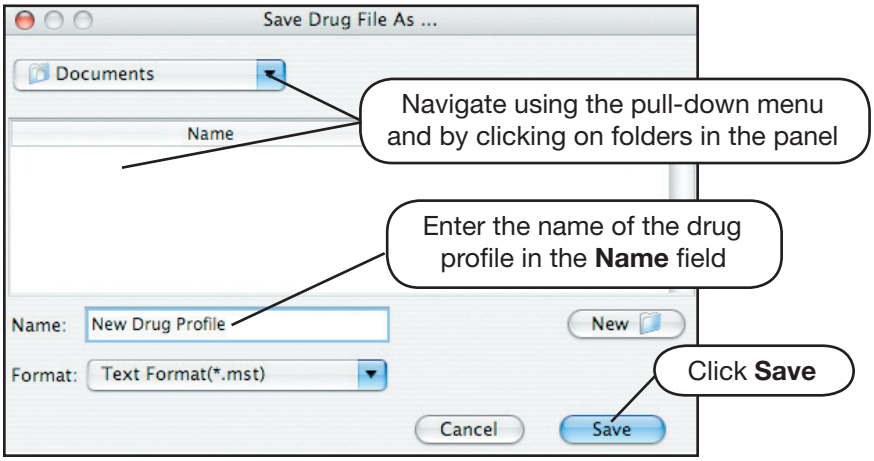
Users may install the Pharmacology Editor on any system, but since printers cannot be connected to HPS workstations to ensure proper functionality and performance of the HPS software, specific procedures apply to both HPS and non-HPS workstations.

Saving on Non-HPS Workstations

If the Pharmacology Editor has been installed on a system apart from the Instructor Workstation and the HPS software, the saving and printing functions operate according to that system's software and hardware capabilities.

To save the active drug list, click the Save icon on the Drug List Toolbar or select **Save** from the **File** menu.

The drug list can also be saved as a different name or at a different location by selecting the **Save As** option from the **File** menu, opening the Save Drug File As navigational dialog.



Saving the Active Drug List

The Save Drug File As dialog provides the ability to enter a **Name** and to navigate to the location where the new drug profile is to stored.

Click **Save** when the name and location have been specified.

Only valid user-generated and/or modified drugs can be saved.

Saving with the HPS System

If the Pharmacology Editor is installed on the Instructor Workstation, drug profiles can still be saved on the system in the same way that they are saved on an external system. However, if the user wishes to print or to store the files elsewhere, the files must be saved either to a CD or to a USB memory device.

Saving to a CD

To save to a CD-ROM:

1. Insert a blank CD in the CD drive of the Instructor Workstation. A dialog box appears with a field highlighted by default for labeling the CD.
2. Enter the new name in the **Name** field (overwriting the default name).
3. Click **OK**.
4. Locate the folder with the information you wish to save.
5. Select and drag the appropriate files from the drive to the CD.
6. Double-click on the CD icon to open the window for the CD and confirm the files have been copied.
7. Drag the CD file to the Trash icon on the Dock. When the CD file is over the Trash, the icon changes to a Burn CD icon.

A dialog box appears with the options to **Burn**, **Cancel** or **Eject**.

CDs can also be burned by selecting the **File** menu from the Finder and then selecting the **Burn Disc** option.

Click the **Burn** button on the dialog box. Once burning is complete, the CD reappears on the desktop.

To remove the CD from the CD-ROM drive, drag the CD file to the Trash icon in the Dock. The icon changes to an Eject icon, and the CD is ejected.

CDs can also be ejected by selecting the CD file and choosing the **Eject** option from the Finder's **File** menu or by pressing the **Eject** key (where available).

Saving to a USB Memory Device

To save to a USB memory device:

1. Insert the USB memory device into an available USB port on the Instructor Workstation. An icon appears on the desktop indicating that the memory device has been recognized.

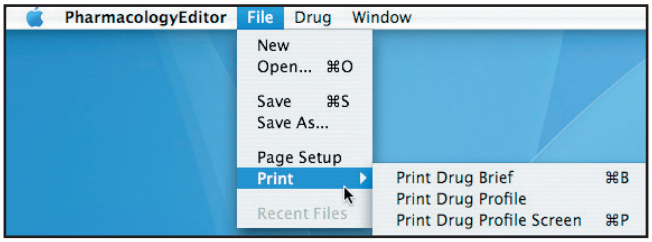
USB Memory Device Icon

2. Locate the appropriate folder on the hard drive under HPSVersion6 containing the file(s) to be saved.
3. Drag the file(s) from the folder on the hard drive to the memory device icon on the desktop. The files are copied automatically onto the device.
4. Drag the icon to the Trash to disconnect the memory device.
5. Remove the memory device from the USB port.

Printing

The Pharmacology Editor has three print options accessed by selecting the **Print** command from the **File** menu.

Note: The Instructor Workstation with the proprietary HPS system should NOT be connected to a printer. To print from the Instructor Workstation, save the file as a PDF (discussed below) and copy the PDF file to either a CD or a USB memory device (discussed above) and transfer the file to a printer-ready system.



The Print Options

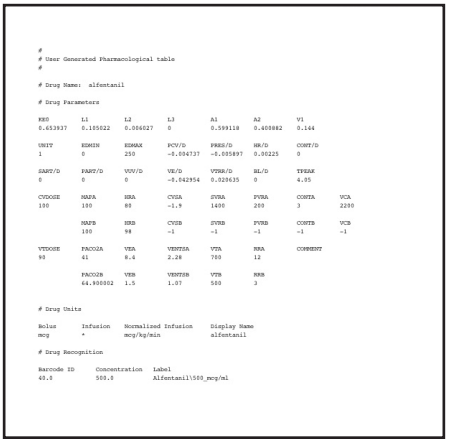
The three print options offer three different views of the drug's information:

Print Drug Brief - drug parameters, units and recognition in text (TXT) format

Print Drug Profile - drug units and label information, the PharmacoKinetics profile, the PharmacoDynamics profile and the corresponding graphs

Print Drug Profile Screen - screenshots of the PharmacoKinetics and PharmacoDynamics tabs

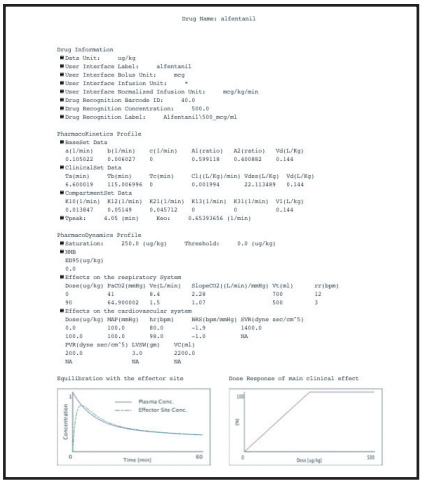
Examples of these views are shown below.



```
#
# User Generated Pharmacological table
#

# Drug Name:  alfentanil

# Drug Parameters

KE0         L1          L2          L3          A1          A2          V1
0.653937    0.105022    0.006627    0           0.599118    0.400882    0.144

UNIT        EDMIN       EDMAX       PCV/D       PRR/D       HR/D        CONT/D
1           0           250         -0.004737   -0.005897   0.00225     0

SAM7/D      PAM7/D      VUV/D       VE/D        VTRR/D      BL/D        TPEAK
0           0           0           -0.042954   0.020635    0           4.05

CVDOSE      MAPA        HRA         CVIA        SVRA        PVRA        CONTA       VCA
100         100         80          -1.9        1400        200         3           2200

            MAPB        HRB         CVIB        SVRB        PVRB        CONTB       VCB
            100         98          -1          -1          -1          -1          -1

VTDOSE      FACO2A      VEA         VENTSA      VTA         RRA         COMMENT
90          41          8.4         2.28        700         12

            FACO2B      VEB         VENTSB      VTB         RRB
            64.906802   1.5         1.07        500         3

# Drug Units

Bolus       Infusion    Normalized Infusion     Display Name
mcg         *           mcg/kg/min              alfentanil

# Drug Recognition

Barcode ID      Concentration   Label
40.0            500.0           Alfentanil\500_mcg/ml
```

A Sample Drug Brief

The Drug Brief may be printed from either the Drug List or from the Drug Profile screen.



A Sample Drug Profile

A Sample Drug Profile Screen

The Drug Profile and Drug Profile Screen options are available only when the Drug Profile screen is active.

Saving as a PDF for Printing (for Mac)

Printing should not be performed from the Instructor Workstation. Instead, transfer the needed files to a CD or USB memory device and insert the CD or memory device into a computer with printing capabilities.

If the Pharmacology Editor has been installed on a Mac, select the appropriate option from the Pharmacology Editor **Print** command menu. On the Print dialog, open the **PDF** pull-down menu on the lower left and select the **Save as PDF** option. The Save dialog appears, providing a **Save As** field for the file's name and a **Where** navigational field to locate the place where the file is to be saved. Click **Save** to save the selected print material as a PDF.

Order of Kinetics

The Pharmacokinetic information that must be provided for the drug profile to be valid is described in more detail earlier in this section, but the tables below show the fields that have to be completed for the first, second and third order of kinetics.

First Order		
Base-Set	**Clinical-Set**	**Compartment-Set**
a	Ta	K10
Vd	Vd	V1

Second Order		
Base-Set	**Clinical-Set**	**Compartment-Set**
a	Ta	K10
b	Tb	K12
A1	Cl	K21
Vd	Vd	V1

Third Order		
Base-Set	**Clinical-Set**	**Compartment-Set**
a	Ta	K10
b	Tb	K12
c	Tc	K21
A1	Cl	K13
A2	Vdss	K31
Vd	Vd	V1

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