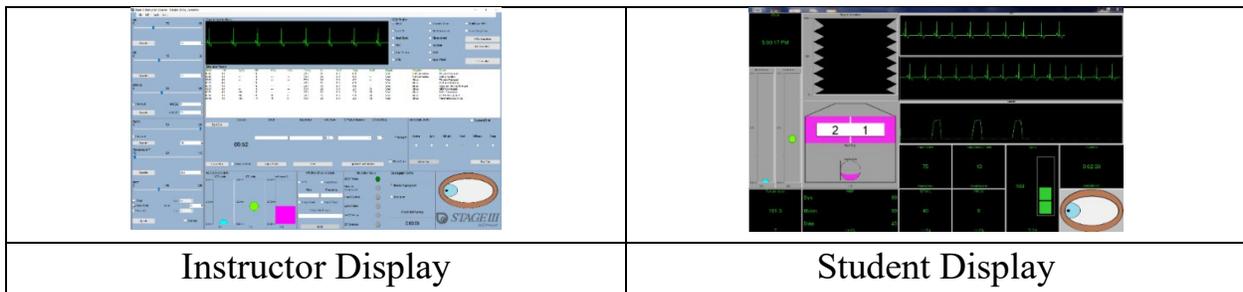




*Stage III*TM Anesthesia Simulation
 Stage III Release 2
 User Manual Version 2.0.0.0
 January 2023
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PC Setup: *Stage III* is designed to run on Windows[®] 10-11 computers having a video display card with outputs for two monitors. The simulation has been designed to show separate instructor and student screens on two different monitors using the extended desktop configuration of your system. To setup extended display on your Windows[®] PC press the Windows Key + P and select Extend. This setting effectively extends your display across your two monitors. Launch the program and drag the instructor display to the monitor you wish to use as a controlling display then drag the student display to the monitor you wish to use as the student simulation display. This arrangement allows you to control the simulation while the students see only the vital signs monitor display. For more details, please see the minimum requirements section at the end of this guide.



Mannequin: The simulation environment was designed to be mannequin independent and will work with any mannequin the user purchases or creates. The Stage III *Anastasia* mannequin contains an on board microprocessor that integrates with the Stage III software and automates much of the instructor control. The *Anastasia* mannequin is currently being beta tested and will be available in the near future.

Props: The simulation environment uses a variety of readily available props to enhance realism. A surgery table, instrument tray, IV pole, anesthesia machine, drug cart and vital signs monitor are helpful if it is desired to emulate a surgical environment. As the student connects vital signs monitors and adjusts the vaporizer and flowmeters the instructor effects the changes via the instructor control screen providing the illusion of a living patient.

Starting a Simulation: To start a simulation click the “Start Sim” button on the instructor display; the duration indicator begins counting upward and the ECG and Capnograph waveforms begin moving on the student vital signs display. To pause the simulation at any time, click the “Pause Sim” button; the duration counter and the waveforms stop moving. This feature allows you to incorporate a “time-out” into your simulation session to guide progress or emphasize a point. If you haven’t loaded a Simulation Scenario Setup (*.sss) file, default values for physiologic variables are used: HR=40; RR=10; SpO₂=100; Temp=70F; ETCO₂=40; IMCO₂=0; S/M/D NIBP = 90/70/50). Most vital signs parameters need to be “Connected” before they are displayed to the students. An example is the pulse oximeter, even though the default value of 100 is displayed on the instructor screen the student vital signs display will only show 3 dashes (---) until the student connects the pulse oximeter probe at which time the instructor can check the “Connect” tick box and have the SpO₂ value displayed to the student along with a stack of pulsing led bars corresponding to the pulse rate. Three vital signs parameters (HR, RR and Temperature) are always connected thus the HR will always be displayed on the student vital signs display but the ECG trace will display a flat line until the “Connect” box is ticked. The capnograph trace functions similarly; the RR is always displayed but the capnograph trace displays a flat line until “Connect” is ticked. The Temperature vital signs display is always connected and displays a default value of 70° F. When the student inserts the temperature probe into a manikin the instructor changes the displayed temperature value.

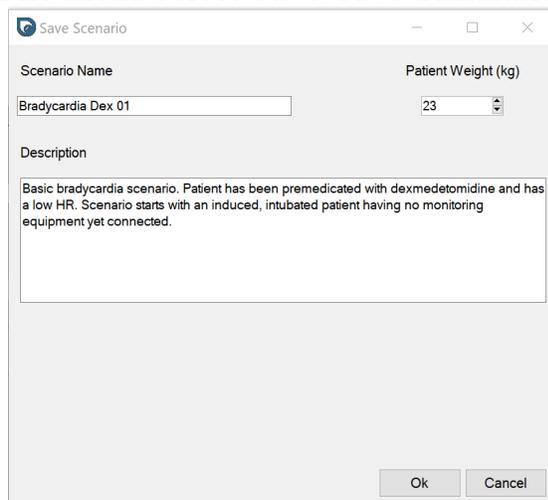
As the student connects the various monitors on the manikin, the instructor ticks the appropriate “Connect” box rewarding the student with the vital signs parameter. When connected, the NIBP vital signs monitor will display only 0 for S/M/D pressures until the student activates the “Start” or “Auto Cycle” button on the prop monitor. The instructor then clicks the “Update” button and the student vital signs monitor will turn grey to indicate that the NIBP monitor is taking a reading. After a short time, interval values for S/M/D pressure are displayed on the student vital signs monitor display.

The instructor can choose to change vital signs parameters & waveforms on the fly or run a preprogrammed scenario sketch with the ability to cancel the scenario at any time and take over control. A record of the simulation is displayed in the

Simulation Record Window. This record can be saved to a spreadsheet for subsequent review during a post-simulation debriefing session.

Loading a Simulation: A Simulation Scenario Startup file makes it easy to preset simulated patient values prior to running a simulation session. From the File menu select Open/Open Simulation Scenario, make a selection and click Ok. The current simulation parameters including patient weight will be updated to what was stored in the file.

Saving a Simulation: Simulation Scenario Startup files are easy to create. Using the instructor screen simply set the simulation parameters including depth of anesthesia, the connected status of a monitor and the ECG rhythm. Next from the File menu select Save/Save Simulation Scenario to bring up the Save Scenario



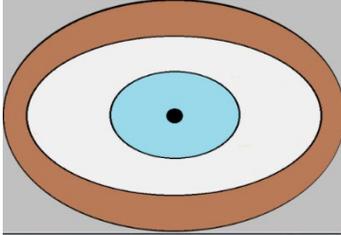
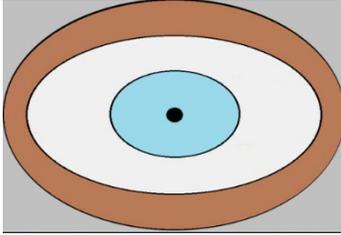
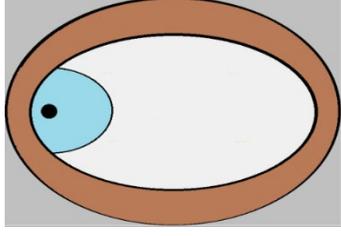
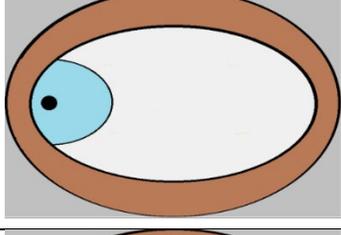
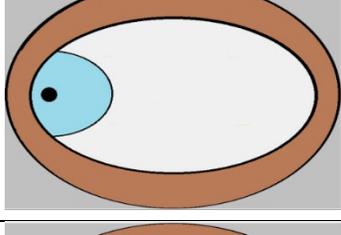
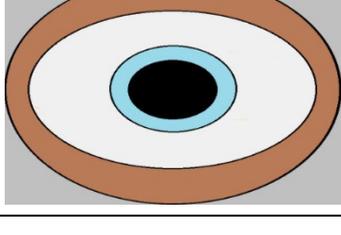
Dialog. The dialog allows you to name your scenario, provide a short description of the starting parameters and enter a simulated patient weight. Click Ok and you will be prompted for a file name so your scenario can be stored on disk and loaded at a later time. Please see the Current Simulation Scenario Startup Files table at the end of this manual. If your license permits, saved scenarios may be shared with other *Stage III* instructors.



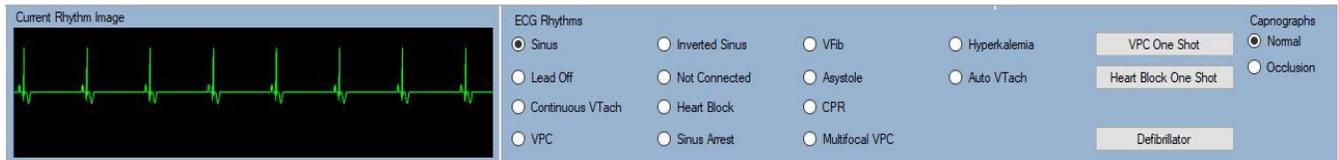
Simulation Parameters: *Stage III* displays all common patient parameters that are present on anesthetic vital signs monitors. In addition to displaying values for HR, SpO₂, Temperature and NIBP, the student display screen also shows N₂O and O₂ flowmeters, an anesthetic vaporizer (filled with either Isoflurane, Sevoflurane or Desflurane), a depth of anesthesia eye, two capnographs (normal and occluded) as well as different ECG rhythm selections.

Depth of Anesthesia: Depth of anesthesia is conveyed to the learner by means of a blinking and rotating anesthetic eye designed to mimic the characteristic eye signs exhibited by an anesthetized canine patient. The instructor is able to select any of six different depths of anesthesia which directly control the globe position, pupil diameter and blink response of the anesthetic eye shown on the student display. The Tap Eye button located on the instructor display will cause the anesthetic eye to blink at a speed dictated by the depth of anesthesia that is selected. If the Suspend Blink box is ticked the anesthetic eye will not blink in response to the Tap Eye button but will instead flash conveying that the eye was checked but did not blink. If the partial blink checkbox is ticked the anesthetic eye will display a partial or half blink in response to the Tap Eye button. The blink function may also be triggered by pressing the space bar.

Anesthetic Eye Characteristics

Anesthetic Depth	Anesthetic Eye	Blink Speed
Awake		Spontaneous
Light		Fast
Medium Light		Brisk
Medium		Moderate
Medium Deep		Sluggish
Deep		Absent

ECG Rhythms: Depending upon the Stage III version installed,[†] the instructor is able to display up to 14 different ECG rhythms on the student display by selecting the appropriate rhythm button.



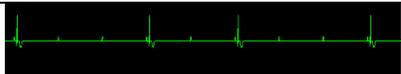
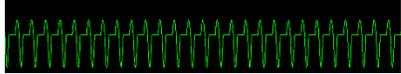
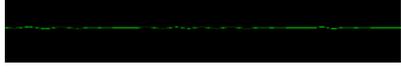
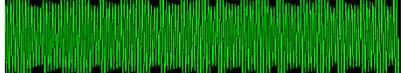
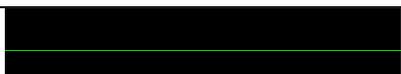
An image of the currently selected rhythm is displayed to the left of the rhythm selector buttons on the instructor display panel. The available rhythm selections are either simple rhythms meaning they contain only one rhythm or they are complex rhythms meaning they contain more than one rhythm. Examples of simple rhythms are Sinus and Inverted Sinus, Not Connected, Asystole and CPR. Simple rhythms display only one rhythm and do not return to a previous or predominant rhythm. In contrast complex rhythms display more than one rhythm and may return to a predominant rhythm when their rhythm completes. Examples of complex rhythms are Heart Block, VPC, Sinus Arrest, Automatic VTach and MultiFocal VPC[†].

Complex rhythms allow the instructor to set the frequency and/or duration of the rhythm. For example, the VPC rhythm may be set to occur randomly once per screen or randomly with different frequencies of occurrence (occasional, worrisome or critical). The Sinus Arrest and Automatic VTach complex rhythms allow the instructor to set the length of the respective arrhythmia (Arrhythmia Length) after which time the selected rhythm will automatically revert back to the previously selected sinus or inverted sinus simple rhythm. This feature enables the instructor to display a predetermined sinus arrest length or a burst of VTach without having to manually revert back to a sinus rhythm.

One Shot Rhythms: In addition to the Heart Block and VPC complex rhythm selections, *Stage III* allows for the insertion of single Heart Block and VPC complexes into Sinus and Inverted Sinus rhythms simply by clicking the Heart Block and VPC One Shot Buttons located in the ECG Rhythm panel. This handy feature permits the instructor to insert heart blocks and VPCs at strategic points during a simulation session without having to change from a sinus rhythm.

[†]Complex Rhythms are not available in Stage III Technician Educator Edition.

Stage III ECG Rhythms

ECG Rhythm	Type	Image
Sinus	Simple	
Inverted Sinus	Simple	
Heart Block†	Complex	
Sinus Arrest†	Complex	
VPC†	Complex	
Multifocal VPC†	Complex	
VTach	Simple	
AutoReset VTach†	Complex	
VFib	Simple	
Asystole	Simple	
CPR	Simple	
Lead Off	Simple	
Not Connected	Simple	

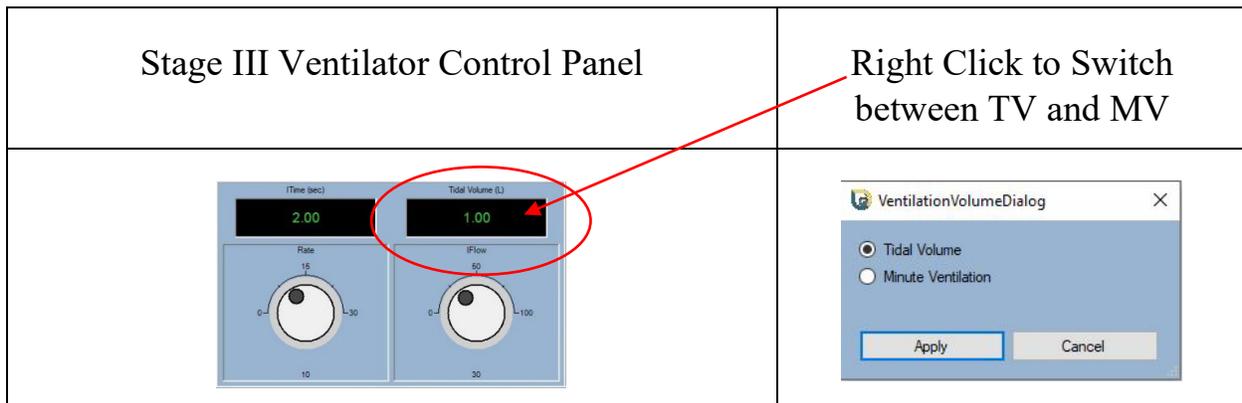
†Not available in Stage III Technician Educator Edition.

Capnograph Waveforms: Version 2.0.0.0 of Stage III Release 2 is capable of generating and displaying two capnograph waveforms, a normal capnograph and a capnograph that is associated with an airway obstruction (kinked ET tube or ET tube obstruction). Selection of the capnograph waveforms is identical to that of the ECG rhythms, clicking the respective button causes the corresponding capnograph to be displayed.

Stage III Capnograph Waveforms

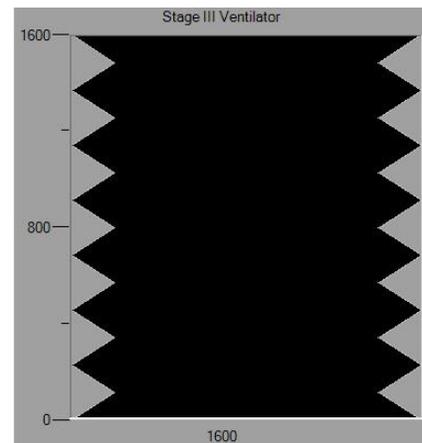
<p>Normal</p>	
<p>Obstructed</p>	

Stage III Anesthesia Ventilator: Version 2.0.0.0 of Stage III Release 2 contains an anesthesia ventilator that can be connected to the simulated patient†. Similar to many anesthesia ventilators the ventilator I:E ratio is fixed at 1:2 and the patients tidal volume and tidal volume/minute ventilation are controlled by the ventilator rate control and the inspiratory flow control. Changes to Inspiratory Time and Tidal Volume or Minute Ventilation as a result of changes in Rate and Flow are displayed above the dial controls. Right clicking with the mouse over the Volume display enables the instructor to display either tidal volume or minute ventilation.



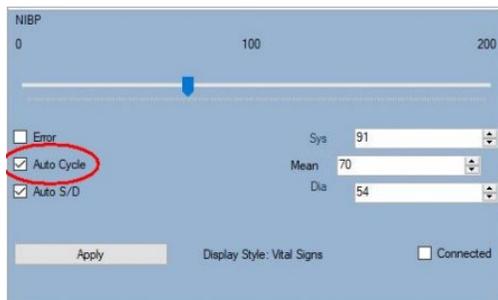
†Not available in Stage III Technician Educator Edition.

The ventilator is connected and switched on by accessing **Ventilator Active** from the **Tools Menu**. When the ventilator is active the ventilator control panel activates and the RR and CO₂ control panels become inactive. With the ventilator active the simulated patient's RR is controlled by the ventilator rate control while the ETCO₂ is generated by a physiologic model using the patients weight and minute ventilation as inputs. When the ventilator is switched off the simulated patient's RR and ETCO₂ are again controlled by the RR and CO₂ control panels. The standing ventilator bellows on the student display descend according to the tidal volume during inspiration and ascend during exhalation.

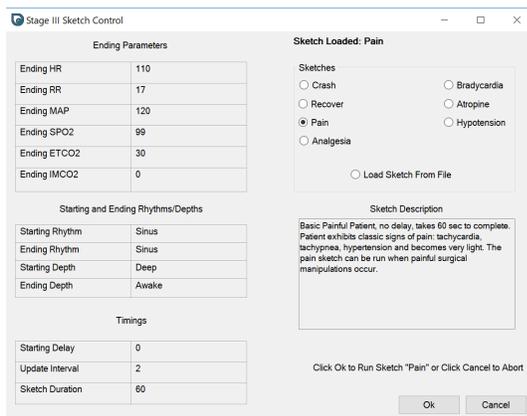


Changing Simulation Parameters: All vital signs parameters may be adjusted on the fly during a simulation session. In addition, the parameters can be pre-programmed to change at specific times during a simulation scenario by loading either a built in or user defined Simulation Sketch.

Physiologic Parameter Bouncing: When the NIBP's AutoCycle box is ticked all simulation parameters with the exception of temperature will bounce around the current values. This feature may be used to insert a measure of realism into a scenario as the simulated parameters will change at intervals. The NIBP control will automatically cycle and display a new reading every 30 sec when Auto Cycle is active. Manually changing any parameter except temperature will automatically cancel the Auto Cycle feature.

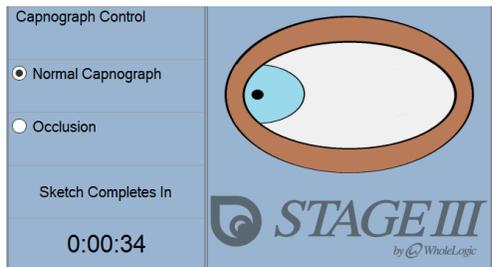


Simulation Sketches: A simulation sketch directs *Stage III* to follow a preprogrammed path through a scenario. *Stage III* contains seven preloaded sketches (crashing patient, recovering patient, pain, analgesia, bradycardia, atropine and hypotension) that we use frequently during our simulation sessions. The simulation sketch dialog is accessed from the File Menu under Open/Open Simulation Sketch. When a sketch is selected and run the simulated patients vital signs will change from the current values at a sketch determined rate and amount of time and will eventually reach sketch determined ending values.



The sketch description relays information about the sketch that the instructor can review before deciding to run the sketch. The left side of the control displays the sketch ending parameters for HR, RR, MAP, SpO₂, ETCO₂ and IMCO₂ as well as the rhythm and anesthetic depth the sketch will start and end with. The timings section indicates how long it will take for the sketch to run to completion (Sketch Duration) how frequently the parameters will change (Update Interval) and the amount of time to delay (if any) before the sketch is started. All of the timings are specified in seconds. In the example above the instructor has selected the preloaded Pain Sketch. This sketch starts immediately (0 sec delay), updates the vital signs every 2 seconds and will run for 60 seconds. When the sketch ends the HR will be 110, RR = 17 and MAP = 120. When the instructor clicks the Ok button the sketch will begin, clicking Cancel will abort the sketch.

When a sketch has been started a panel in the instructor display shows the status of the sketch as well as the amount of time before the sketch starts (Delay Time) and how long the sketch will take to complete (Sketch Completes In).



The instructor can abort a running sketch by either right clicking on the sketch time display or by selecting Cancel Sketch from the File/Open menu. When the sketch is aborted the sketch ending parameters are never reached and the simulated vital signs remain at the values displayed when the sketch was cancelled.

User Defined Sketches:

Interval (sec)	HR	RR	MAP	SPO2	ETCO2	IMCO2	Temp	Rhythm	Depth
6								Sinus	Med_Light
12								InvertedSinus	Med_Light
18								InvertedSinus	Med
24								Sinus	Med
30								Sinus	Med
36								VPC	Light
42								VPC	Light
48								VPC	Med_Deep
54								MultiFocalVPC	Med_Deep
60								MultiFocalVPC	Med_Deep
66								AutoVTach	Med
72								AutoVTach	Med
78								SinusArrest	Med
84								SinusArrest	Deep
Ending Values	20	5	42	95	58	0	101.0	SinusArrest	Deep
Sketch Delay	Sketch Duration	Change Mechanism		Enter a Short Description of Your Sketch					
10	90	<input type="radio"/> Absolute <input checked="" type="radio"/> Percentage		<input type="text"/>					

In addition to the seven built in sketches, versions of the *Stage III* Simulation allow the instructor to create their own sketches and store them on disk. Creation of user defined sketches is facilitated by the Sketch Studio which is accessed from the Tools/Sketch Studio menu. The Sketch Studio displays a grid that allows the instructor to create a sketch entering the sketch ending values, duration†, delay† and anesthetic depths and rhythms†. After entering a short description of what your sketch does and is used for you will be prompted to save the sketch. Saved sketches may be loaded during a future simulation session and if your license permits, they may be shared with other *Stage III* instructors. Please see the table of preloaded and user defined simulation sketch files at the end of this manual.

†Not available or limited in Stage III Technician Educator Edition.

Current Simulation Scenario Startup Files

Scenario Name	Scenario Description
Monitoring Barney	Scenario file for the 35 kg Barney Monitoring scenario. Acepromazine, Hydromorphone premeds. HR = 80;RR = 10;ETCO ₂ = 40;SpO ₂ = 100; Temp = 70; MAP = 75, Inhalant = Isoflurane
Monitoring Blue	Scenario file for the 17 kg Blue Monitoring scenario. Midazolam, Methadone premeds. HR = 80;RR = 10;ETCO ₂ = 40;SpO ₂ = 100; Temp = 70; MAP = 75, Inhalant = Isoflurane
Bradycardia Mandy	Scenario file for the 28 kg Mandy scenario. Dexmedetomidine, Hydromorphone premeds. HR = 50;RR = 10;ETCO ₂ = 40;SpO ₂ = 100; Temp = 70; MAP = 78, Inhalant = Sevoflurane
Lucy Hypotension	Scenario file for the 24 kg Lucy Hypotension Scenario. Acepromazine, Hydromorphone premeds. HR = 50;RR = 10;ETCO ₂ = 40;SpO ₂ = 100; Temp = 70; MAP = 69, Inhalant = Sevoflurane
Pepper The Painful Poodle	Scenario file for the 15 kg Pepper pain scenario. Midazolam, Hydromorphone premeds. HR = 83;RR = 10;ETCO ₂ = 39;SpO ₂ = 100; Temp = 70; MAP = 75; Inhalant = Sevo; Depth = MDeep
CPR Max	Scenario file for the 28kg Max CPR scenario. Dexmedetomidine, Hydromorphone premeds. HR = 50;RR = 10;ETCO ₂ = 40;SpO ₂ = 98; Temp = 100.2; MAP = 78. Maintained on 1.5% Sevo, Sinus Rhythm.
Mocha Esophageal Intubation	Scenario file for the 34 kg Mocha Esophageal Intubation Scenario. Ace, Hydromorphone premeds. HR = 75; RR = 10;ETCO ₂ = 0;IMCO ₂ = 0; SpO ₂ = 98; Temp = 70; MAP = 71; Sevoflurane = 0, O ₂ = 0; Depth = Med Rhythm = Not Connected
Lexi Stuck Dome Valve	Scenario file for the 34 kg Lexi Dome Valve Scenario. Dex, Hydromorphone premeds. HR = 75;RR = 10;ETCO ₂ = 60;IMCO ₂ = 8; SpO ₂ = 100; Temp = 70; MAP = 75; Isoflurane = 0, O ₂ = 0; Depth = MDeep Rhythm = Not Connected
Wally Bleeding/Hypotension	Scenario file for the 28 kg Wally Abdominal Bleeding. Hydromorphone premed. HR = 86;RR = 10;ETCO ₂ = 40;IMCO ₂ = 0; SpO ₂ = 100; Temp = 70; MAP = 68; Isoflurane = 0, O ₂ = 0; Depth = MDeep Rhythm = Not Connected
Martha Bleeding/Hypotension	File for the 28 kg Martha Hypotension Scenario. Hydromorphone premed. HR = 84;RR = 11;ETCO ₂ = 44;IMCO ₂ = 0; SpO ₂ = 96; Temp = 70; MAP = 68; Sevoflurane = 0, O ₂ = 0; Depth = MDeep Rhythm = Not Connected

Current Simulation Sketch Files

Preloaded Sketch Name	Sketch Description
Crash	Basic Crashing Patient, no delay, death within 30 sec.
Recover	Basic Recovering from Crash Patient, no delay, awake within 30 sec.
Pain	Basic Painful Patient, no delay, takes 60 sec to complete. Patient exhibits classic signs of pain: tachycardia, tachypnea, hypertension and becomes very light. The pain sketch can be run when painful surgical manipulations occur.
Analgesic	Basic administration of analgesic to patient, 5 sec delay, takes 45 sec to complete. This sketch is linked to the injection of hydromorphone and fentanyl and can be configured to run automatically when these analgesics are administered.
Bradycardia	Bradycardic patient sketch, 0 sec delay, takes 30 sec to complete. Patient becomes hypotensive as a result of the bradycardia and displays Heart Block by the end of the sketch.
Atropine	Atropine administration sketch, 15 sec delay, takes 30 sec to complete. Patient becomes tachycardic and BP increases as a result of the atropine induced tachycardia. This sketch is linked to the injection of atropine and can be configured to run automatically when anticholinergics are administered.
Hypotension	Hypotension sketch, 0 sec delay, takes 45 sec to complete. Patient becomes hypotensive other parameters remain in normal range.



Simulation Documentation: The simulation record window keeps a running ledger of the events that happen during a simulation scenario. Every time an event is logged or a vital signs parameter is changed the current state of the simulation is timestamped and added to the simulation record. The simulation record enables the instructor to scroll through and review the events of the scenario. The record may be saved to a spreadsheet as a csv file by accessing the File/Save/Save Documentation menu. Once saved the record may be opened with a spreadsheet (Excel, Libre Calc), printed and referred to in the post simulation debrief.

Stage III Simulation Record

Simulation Record													
00:00	81	100	10	40	0	100.5	1.0	2.0	1.5	74	Awake	Sinus	Start Simulation
00:03	81	100	10	40	0	100.5	1.0	2.0	1.5	74	Med_Deep	Sinus	Depth Changed
00:09	84	100	11	42	0	100.5	1.0	2.0	1.5	78	Med_Deep	Sinus	Parameters Bouncing
00:14	84	100	11	42	0	100.5	1.0	2.0	1.5	78	Med_Deep	Sinus	Rhythm Changed
00:15	84	100	11	42	0	100.5	1.0	2.0	1.5	78	Med_Deep	Sinus	VPC One Shot
00:19	82	100	11	41	0	100.5	1.0	2.0	1.5	76	Med_Deep	Sinus	Parameters Bouncing
00:27	82	91	11	41	0	100.5	1.0	2.0	1.5	76	Med_Deep	Sinus	SpO2 Changed
00:33	82	91	11	41	0	100.5	1.0	2.0	1.5	79	Med_Deep	Sinus	NIBP Changed
00:37	79	91	11	41	0	100.5	1.0	2.0	1.5	79	Med_Deep	Sinus	Heart Rate Changed
00:39	79	91	13	41	0	100.5	1.0	2.0	1.5	79	Med_Deep	Sinus	Breath Administered
00:42	79	91	10	41	0	100.5	1.0	2.0	1.5	79	Med_Deep	Sinus	Respiratory Rate Changed
00:45	79	91	8	40	0	100.5	1.0	2.0	1.5	79	Med_Deep	Sinus	Capnograph Changed
00:52	79	91	8	40	0	100.5	2.0	2.0	1.5	79	Med_Deep	Sinus	O2 L/min Changed
00:56	79	100	8	40	0	100.5	2.0	2.0	1.5	79	Med_Deep	Sinus	SpO2 Changed
01:00	79	100	8	40	0	100.5	2.0	2.0	1.5	79	Med_Deep	Sinus	Palpebral Reflex Tested-Blink
01:06	79	100	8	40	0	100.5	2.0	2.0	1.8	79	Med_Deep	Sinus	Vaporizer Setting Changed
01:19	79	100	8	40	0	100.5	2.0	2.0	1.8	77	Med_Deep	Sinus	NIBP Changed
01:26	79	100	8	40	0	100.3	2.0	2.0	1.8	77	Med_Deep	Sinus	Temperature Changed
01:30	79	100	8	40	0	100.3	2.0	2.0	1.8	77	Med_Deep	Sinus	Pause Simulation

Stage III Simulation Record csv file displayed in Excel

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	Stage III Simulation Record -12/23/2022 - 5:50 AM															
2																
3	Time	HR	SpO2	RR	CO2	IC02	Temp	O2	N2O	Vap	MAP	Depth	Rhythm	Event		
4	0:00	81	100	10	40	0	100.5	1	2	1.5	74	Awake	Sinus	Demo Mode Active		
5	0:00	81	100	10	40	0	100.5	1	2	1.5	74	Awake	Sinus	Start Simulation		
6	0:03	81	100	10	40	0	100.5	1	2	1.5	74	Med_Deep	Sinus	Depth Changed		
7	0:09	84	100	11	42	0	100.5	1	2	1.5	78	Med_Deep	Sinus	Parameters Bouncing		
8	0:14	84	100	11	42	0	100.5	1	2	1.5	78	Med_Deep	Sinus	VPC One Shot		
9	0:15	84	100	11	42	0	100.5	1	2	1.5	78	Med_Deep	Sinus	Rhythm Changed		
10	0:19	82	100	11	41	0	100.5	1	2	1.5	76	Med_Deep	Sinus	Parameters Bouncing		
11	0:27	82	91	11	41	0	100.5	1	2	1.5	76	Med_Deep	Sinus	SpO2 Changed		
12	0:33	82	91	11	41	0	100.5	1	2	1.5	79	Med_Deep	Sinus	NIBP Changed		
13	0:37	79	91	11	41	0	100.5	1	2	1.5	79	Med_Deep	Sinus	Heart Rate Changed		
14	0:39	79	91	13	41	0	100.5	1	2	1.5	79	Med_Deep	Sinus	Breath Administered		
15	0:42	79	91	10	41	0	100.5	1	2	1.5	79	Med_Deep	Sinus	Respiratory Rate Changed		
16	0:45	79	91	8	40	0	100.5	1	2	1.5	79	Med_Deep	Sinus	Capnograph Changed		
17	0:52	79	91	8	40	0	100.5	2	2	1.5	79	Med_Deep	Sinus	O2 L/min Changed		
18	0:56	79	100	8	40	0	100.5	2	2	1.5	79	Med_Deep	Sinus	SpO2 Changed		
19	1:00	79	100	8	40	0	100.5	2	2	1.5	79	Med_Deep	Sinus	Palpebral Reflex Tested-Blink		
20	1:06	79	100	8	40	0	100.5	2	2	1.8	79	Med_Deep	Sinus	Vaporizer Setting Changed		
21	1:19	79	100	8	40	0	100.5	2	2	1.8	77	Med_Deep	Sinus	NIBP Changed		
22	1:26	79	100	8	40	0	100.3	2	2	1.8	77	Med_Deep	Sinus	Temperature Changed		
23	1:30	79	100	8	40	0	100.3	2	2	1.8	77	Med_Deep	Sinus	Pause Simulation		
24																

Parameter Control Panels: The instructor display contains an array of parameter control panels each having a specific function. The individual panels and their functionality are listed below.

- **HR Panel** – Sets the HR of the simulated patient and this is reflected in the HR digital display in BPM, in the pulse oximeter display and in the ECG waveform display where the QRS complexes occur with increased or decreased frequency. The HR may be changed by sliding the trackbar, by entering a value directly or by using the up/down arrows. The simulated HR will not change until the Apply button is clicked. A value for the simulated patient's HR is always available to the students and as such a monitor need not be connected for this value to be shown.
- **RR Panel** - Sets the RR of the simulated patient and this is reflected in both the RR digital display in BPM and in the capnograph waveform display where the capnograph complexes occur with increased or decreased frequency. The RR may be changed by sliding the trackbar, by entering a value directly or by using the up/down arrows. The simulated RR will not change until the Apply button is clicked.
 - The RR panel also contains a **Breath Button** which administers an additional breath to the simulated patient. The breath button may be used when the students administer a sigh breath by compressing the reservoir bag on the anesthesia machine prop. A value for the simulated patient's RR is always available to the students and as such a monitor need not be connected for this value to be shown.
- **CO₂ Panel** – Sets the exhaled and inspired CO₂ values for the simulated patient. The exhaled CO₂ may be changed by sliding the trackbar, by entering a value directly or by using the up and down arrows. The inspired CO₂ is set using the separate numeric box either entering the value directly or by the up/down arrows. The capnograph sampling line on the prop vital signs monitor should be connected before a capnograph waveform and CO₂ values are displayed. When the students connect the sampling line the instructor ticks the **Connected** box and the students are rewarded with a capnograph trace and CO₂ values.

- **SpO₂ Panel** – Sets the SpO₂ of the simulated patient which is reflected in the SpO₂ value viewed on the student display. The SpO₂ may be changed by sliding the trackbar, by entering a value directly or by using the up/down arrows. The simulated SpO₂ will not change until the Apply button is clicked. The pulse oximeter probe on the prop vital signs monitor should be connected before the SpO₂ values are displayed. When the students connect the pulse oximeter probe the instructor ticks the **Connected** box and the students are rewarded with a pulsing LED and SpO₂ values.
- **Temperature Panel** - Sets the temperature of the simulated patient and this is reflected in the temperature digital display in either C or F. The temperature may be changed by sliding the trackbar, by entering a value directly or by using the up/down arrows. The simulated temperature will not change until the Apply button is clicked. A value for the simulated patient's temperature is always available to the students and as such a monitor need not be connected for this value to be shown.
 - Right clicking on the temperature trackbar enables the instructor to choose units of C or F and both the temperature control panel and the student temperature display reflect the new units.
- **NIBP Panel** - Sets the mean, systolic and diastolic NIBP values for the simulated patient. The mean arterial pressure may be changed by sliding the trackbar, by entering a value directly or by using the up and down arrows. If the **Auto S/D** box is ticked the mean value will also control both the systolic and diastolic values with the systolic being around 20 mmHg higher and the diastolic being around 20 mmHg lower than the mean value. If the **Auto S/D** box is not ticked the systolic and diastolic pressures may be set independently of the mean by entering a value directly or by using the up and down arrows of the respective numeric boxes. Although the systolic and diastolic may be set independently, the systolic value may never be lower than the mean and the diastolic may never be higher than the mean.
 - When the students connect the NIBP line and cuff the instructor ticks the **Connected** box. Because the NIBP cycle must be started on an actual vital signs monitor before the inflation/deflation sequence takes a reading, the **Apply** button must be clicked before the simulated patient's NIBP values are displayed to the students. After the Apply button is clicked the student NIBP display turns gray for a short time simulating an inflation/deflation cycle before displaying the entered

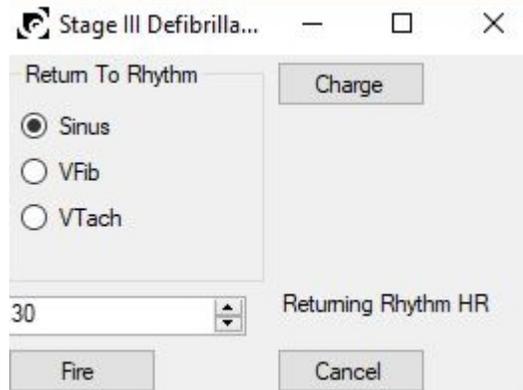
- values. The NIBP control panel will turn pink indicating to the instructor that the inflation/deflation sequence is running.
- When ticked the **Error Box** forces the NIBP student monitor to display an error message when **Apply** is clicked instead of the systolic, mean and diastolic values. Clearing the **Error Box** restores the NIBP values the next time **Apply** is clicked.
 - When ticked the **Auto Cycle Box** causes the parameters to bounce around the current values at periodic intervals. The **Auto Cycle** feature adds realism to the simulation enabling students to chart patients without the instructor needing to adjust vital signs. The **Auto Cycle Box** will automatically clear anytime a parameter other than the temperature is changed. To reinstitute the Auto Cycle feature re tick the **Auto Cycle Box**. Auto Cycle characteristics may be changed from the **Edit/Auto Cycle Parameters** menu.
 - Right clicking on the NIBP trackbar enables the instructor to choose between a classic display of NIBP values or a vital signs monitor type of NIBP display.

ECG Rhythms and Capnograph Control Panel: This panel enables the instructor to select a variety of rhythms and capnographs to be displayed on the student monitor.

- Unlike Parameter Control Panels, Rhythms and Capnographs do not require an Apply button; once the waveform is selected it is visible to the student.
- In addition to displaying a rhythm, **Complex Rhythms** (VPC, Heart Block, Sinus Arrest, Multifocal VPC and Auto Resetting VTach) also maintain a predominate or return to rhythm that they revert to after a specific frequency or duration.
 - Right clicking when the mouse is positioned over a **Complex Rhythm** allows the instructor to configure the frequency or duration of the **Complex Rhythm**.
- **The VPC and Heart Block One Shot Buttons** interrupt the currently selected rhythm and insert either a VPC or Heart Block. Upon completion of the one shot rhythm the selected rhythm resumes.

- **The Defibrillator Button** allows the instructor to configure the defibrillator controls.

Defibrillator Control Dialog



- From the Defibrillator Control Dialog the instructor can select the post defibrillation rhythm and heart rate in addition to charging and firing the defibrillator.
- The charge button charges the defibrillator and enables the fire button.
- The fire button discharges the defibrillator displaying a defibrillation voltage spike on the ECG display followed by a pause.
- Upon completion of defibrillator discharge the ECG rhythm switches to the selected return to rhythm and HR.

Simulation Start/Stop Panel: The Start/Stop Panel contains buttons for starting and pausing the simulation as well as a button for entering demo mode. In addition the panel contains a display of the elapsed simulation duration and the Show Duration Box.

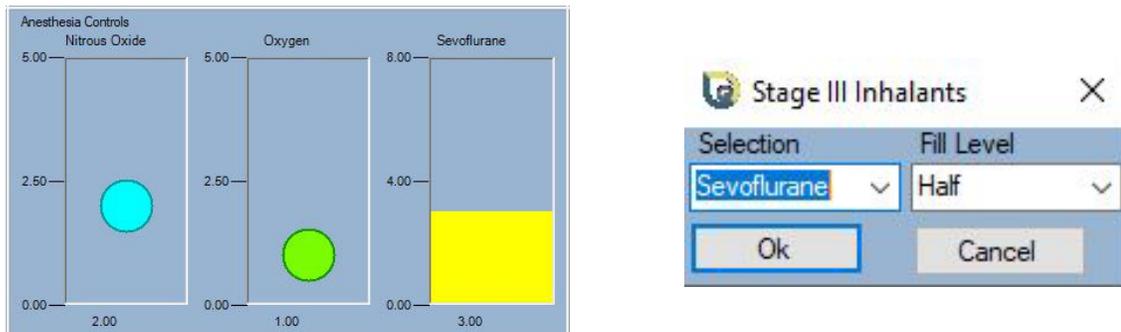
- **Start Simulation** – Starts the duration timer running as well as the ECG and Capnograph waveform displays.
- **Pause Simulation** – Pauses the duration timer as well as the ECG and Capnograph waveform displays.
- **Demo Mode** – Enters the Stage III demo mode starting the simulation with demo parameters.
- **Duration Display** – Displays the amount of time the current simulation has run.
- **Show Duration Box** – When ticked displays simulation duration on the student display.

Simulation Status Panel: The Simulation Status Panel contains button indicators for playing ECG tones and mannequin connections as well as an option to show or hide the time of day clock on the student display.

- **ECG Tones** – Click to turn the ECG and Defibrillator tones on or off. The ECG Tones are also accessible from the Tools/Options menu.
- **Show Clock** – When ticked (default) displays the Time of Day Clock on the student display.
- **Mannequin, Heart Sounds, Limb Motion, SpO₂ Probe, ET Sensors** indicate the status of the connection with the Stage III Anastasia mannequin.

Anesthesia Controls Panel: The Anesthesia controls panel sets values for N₂O, O₂ and Inhalant Anesthetic.

Anesthesia Controls



- Drag any of the indicators to set a new value for N₂O, O₂ or inhalant. The student display is updated with the new values.
 - Right clicking with the mouse over the inhalant drag bar brings up the inhalant dialog permitting the instructor to change the inhalant (isoflurane, sevoflurane or desflurane) and the vaporizer fill level.
 - The Inhalant Dialog is also accessible from the Edit/Inhalants menu.

Event, Injectables and Fluids Panel: This panel allows the instructor to record student actions during the simulation exercise and to enter this information into the Simulation Record.

Event, Injectables and Fluids



The figure shows the 'Event, Injectables and Fluids' panel. It has five main sections: 'Event' with a dropdown menu showing 'Check Jaw Tone' and an 'Apply Event' button; 'Injectables' with a dropdown menu showing 'Atropine' and an 'Inject' button; 'Vol Drawn' with a numeric input field showing '0.5'; 'IV Fluids/Infusion' with a dropdown menu showing 'LRS' and an 'Update Fluid/Infusion Rate' button; and 'Drops/10 sec' with a numeric input field showing '4' and a unit label '4.8 mL/kg/hr'.

- The **Event Box** contains several prepopulated items. Click on the dropdown to choose an item or type a custom item into the box. Clicking **Apply Event** adds the event to the Simulation Record.
- The **Injectables Box** enables the instructor to record student administration of anesthetic/support drugs. Click on the dropdown to choose an item and enter the volume of the drug that was drawn. Clicking the **Inject** button adds the drug and volume to the Simulation Record.

- **The IV Fluids/Infusion Box** enables the instructor to record student administration of IV fluids or drugs administered as an infusion. Click on the dropdown to choose an item and the fluid administration rate in drops/10 sec.
 - The corresponding fluid administration rate in mL/kg/hr is calculated from the patient weight and drop set size and displayed in the Event panel as well as on the Menu Bar just above the ECG Rhythms Panel.

Sketch Status Panel: This panel provides information about a currently running sketch. Clicking the **Cancel Sketch** button terminates the currently running sketch. Simulation parameters remain at the values when the sketch was cancelled until changed by the instructor.

- A running sketch may also be cancelled by accessing the Tools/Cancel Sketch menu item.

Ventilator Panel: This panel provides controls for the **Stage III Anesthesia Ventilator**. Please see the Ventilator section in this manual for specifics.

Anesthetic Depth Panel: This panel allows the instructor to change the appearance and response of the **Anesthetic Eye** which conveys information as to the anesthetic depth of the simulated patient. Please see the Anesthetic Depth and Anesthetic Eye sections in this manual for specifics.

Stage III Menu's

File Menu

- New Simulation – Loads a new simulation with default values of Weight = 20 kg, HR = 40, RR = 10, ETCO₂ = 40, SpO₂ = 100, Temperature = 70 F, NIBP = 90/70/50.
- Reload Simulation – Reloads the most currently loaded simulation. This is handy if you are running the same simulation with multiple learning sections. The last loaded simulation is reloaded.
- Open – Provides the option to Open a Simulation Scenario or a Simulation Sketch.
 - Open Simulation Scenario – Launches a menu from which it is possible to load a simulation scenario.
 - Open Simulation Sketch – Launches a menu from which it is possible to load a simulation sketch.
- Save – Provides the option to Save a Simulation Scenario or Save the Simulation Documentation..
 - Save Simulation Scenario – Saves the current simulation settings as a scenario.
 - Save Documentation – Saves the current simulation documentation window as a spreadsheet csv file that is readable by Excel and Libre Calc.
- Exit – Exits the Stage III Program.

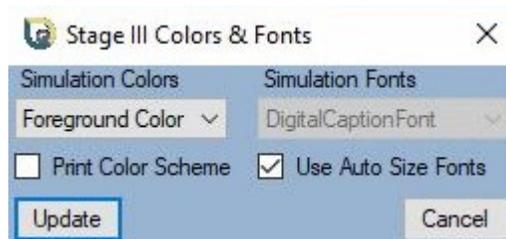
Edit Menu

- Patient Data – Allows the instructor to enter a weight (1-100 kg) for the simulated patient.
- Inhalants – Displays the **Inhalant Dialog** which allows the instructor to select an inhalant anesthetic and anesthetic vaporizer fill level.
- Auto Cycle Parameters – Displays the Auto Cycle Settings Dialog which allows the instructor to change the bounce values for HR, RR, SpO₂, ETCO₂ and MAP as well as the Auto Cycle Interval Time and the NIBP Cycle Multiple.

Tools Menu

- **Customize Sub Menu**

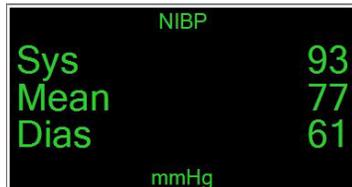
- Colors and Fonts – Allows the instructor to change the font size and color scheme of the vital signs displays, waveform displays and vaporizer.
 - Auto Font Size – If checked Stage III will auto size the fonts of the vital signs displays and the vaporizer making them as large as possible.
 - If unchecked the instructor is able to set the font sizes of the vital signs displays and vaporizer.
 - Print Color Scheme – If checked will change the colors of the waveform and vital signs displays making the background white and the foreground black. This setting is useful to capture waveforms using a screen shot program such as Windows Snipping Tool or Snip & Sketch. The captured images may then be inserted into a Word document.
 - Clearing the checkbox reverts from the print color scheme to the previous color scheme.



- Monitor Captions – Allows the instructor to create custom monitor captions for the vital signs displays.
 - Custom captions permit the vital signs displays to match the monitor labeling of your hospital's vital signs monitors.
 - Upon creation the captions are saved with the Stage III program data.

- NIBP Display Style – Switches between two styles of NIBP value display, Stage III Classic and Vital Signs. This menu may also be displayed by right clicking with the mouse cursor positioned over the NIBP trackbar.

Stage III Classic Display



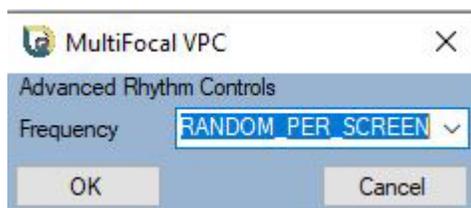
Vital Signs Display



- **Options Sub Menu**

- Temperature Units – Switches between F and C for the Temperature Parameter. This menu may also be displayed by right clicking with the mouse cursor positioned over the Temperature trackbar.
- ECG tones – Enables or disables the ECG Tone. The ECG Tones may also be controlled by left clicking on the ECG Tones Indicator light in the Simulation Status control panel.
- Advanced Rhythm Controls – Allows the instructor to set the frequency or duration of the advanced ECG rhythms (VPC, Heart Block, Sinus Arrest, Multifocal VPC and Auto Resetting VTach).
 - The individual menus may also be displayed by right clicking with the mouse cursor positioned over the appropriate rhythm button in the ECG Rhythms panel.

Advanced VPC Control

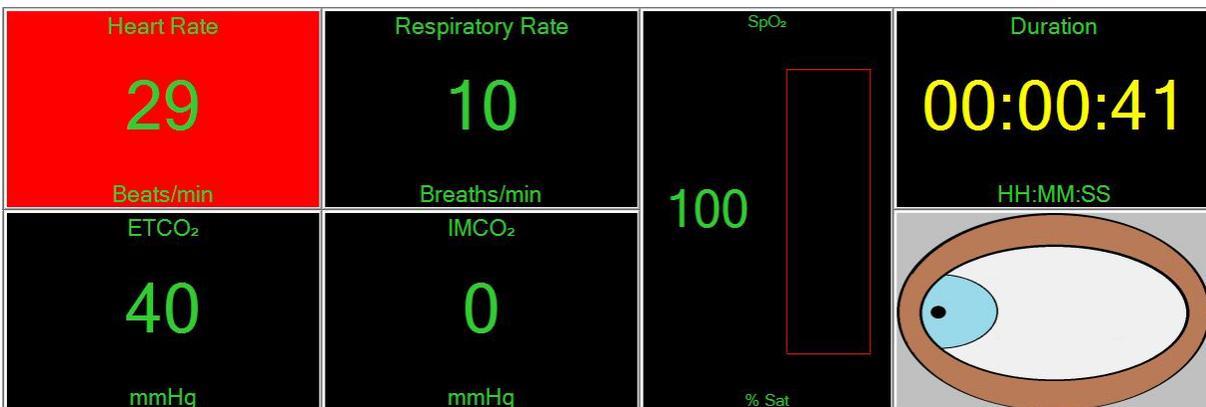


Advanced VTach Control



- Fluid Drip Sets – Allows the instructor to select a fluid drip set size (10, 15, 20 and 60 drops/mL) for the simulation.
 - The drip set size is used to calculate the # mL/Hr that the student has reported setting on the IV fluid bag set prop.
- **Alarms Sub Menu** – Allows the instructor to set parameter and duration alarms.
 - Both High and Low parameter alarms may be set on vital sign parameters (A Low alarm is not available for IMCO₂ and a High alarm is not available for SpO₂)
 - When the parameter falls outside the alarm range the parameter display turns red.
 - Parameter alarms may be used to draw attention to an out of acceptable range vital sign.
 - The duration alarm affects the duration display and has a user defined color. If the duration exceeds the alarm value the duration display changes to the user defined color.
 - The duration alarm may be used to alert a confederate that a period of time has elapsed.

Heart Rate Parameter Alarm set for 30 bpm and Duration Alarm set for 30 sec.



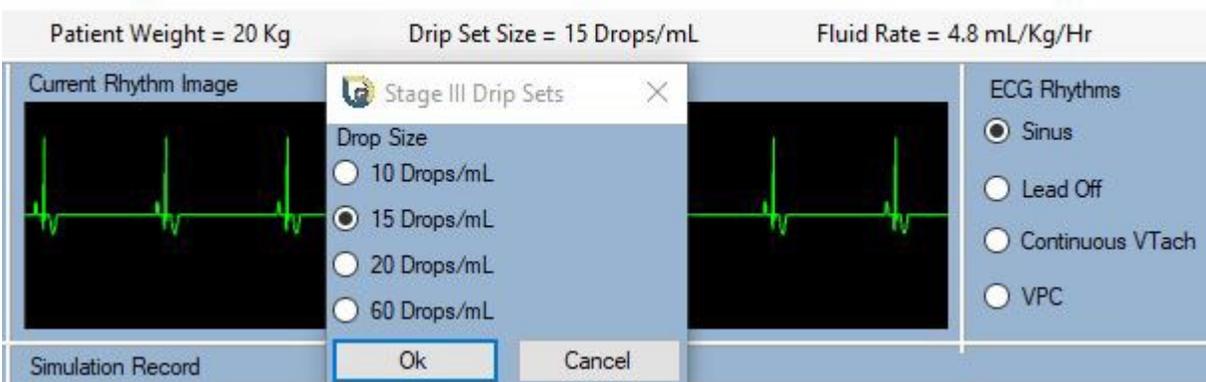
- **Sketch Studio Sub Menu** – Displays the Sketch Studio dialog allowing the instructor to create a user defined simulation sketch.
- **Cancel Sketch Sub Menu** – Allows the instructor to cancel a running sketch. A running sketch may also be cancelled by clicking the Cancel Sketch button in the Sketch Status control panel.
- **Ventilator Active Sub Menu[†]** – Allows the instructor to switch the anesthesia ventilator off or on.
 - The ventilator takes over control of both the RR and the ETCO₂. When the ventilator is ON the Ventilator control panel becomes active and both the RR and CO₂ control panels become inactivated. The RR and ETCO₂ are determined by the ventilator settings and may not be set directly when the ventilator is running.

Help Menu

- **About Sub Menu** – Displays Stage III Version and License Information
- **Release Notes Sub Menu** – Displays Features of the Installed Version

Menu Bar Items: Weight, Drip Set Size and Fluid Rate for the current simulated patient are displayed on the menu bar just above the Current Rhythm Image and ECG Rhythms panels.

- Left clicking with the mouse positioned over either the Patient Weight or Drip Set Size Displays allows the instructor to change these parameters.





Stage III Minimum Requirements: *Stage III* requires a PC running Windows® 10 or higher updated with the .NET framework version 4.7 or higher. Processor and memory requirements of the simulation are modest. Minimum requirements for a laptop installation are an Intel I3 processor running at 2.4 GHz with 8 GB RAM and a display screen larger than 13". Laptops having small display screens may need to use 100% display scale instead of the recommended 150% in order to display correctly. A USB, dual monitor docking station is useful to add additional USB ports and to facilitate extended displays. Requirements for desktop installations are similar and will include a graphics display adapter having two video outputs permitting extended displays. All installations require one display for the instructor controls (a laptop screen is fine) and a separate display for the simulation. Systems having fewer processor cores, less RAM and slower processor speeds may result in a slowly responding simulation.

Installation

Stage III requires an internet connection both for installation and anytime that the simulation is run. To install enter the download link into your browser and click the “Install” button. You are then prompted for a location to store the installer file. Double click on the installer file to install onto your PC. You will need to have administrative access to install and you may get a Windows Defender warning about the installer. If you get a Defender Smart Screen warning click more info at the top of the box and then run anyway in the new box that pops up.



The first time you run Stage III it will ask for your email address. Just enter your subscribed email and click “Submit EMail Address”. The validator will find your email in the database and will send a link to your Email inbox. Click on this link to validate the demo. Once you have done this, click the retrieve token button and you should be good to go. You only have to go through the validation process once.