STANDARD OPERATING PROCEDURES

DIVISION OF COMPARATIVE MEDICINE
UNIVERSITY OF SOUTH FLORIDA

TITLE:	**SurgiVet Advisor® Vital Signs Monitor**
SCOPE:	Research and Animal Care Personnel
RESPONSIBILITY:	Facility Manager, Technical Staff, Professional and Administrative Staff
PURPOSE:	To Outline the Proper Procedures for Use and Maintenance of the Advisor Vital Signs Monitor

I. PURPOSE

1. This procedure outlines the use and maintenance of a veterinary patient monitor to assess oxygen saturation levels, end-tidal ($ETCO_2$) and inspired ($INCO_2$) carbon dioxide levels, heart rate, respiration rate, body temperature, and blood pressure during anesthesia in a variety of species.

II. RESPONSIBILITY

1. The Facility Manager ensures that equipment is appropriately cleaned, maintained in good working order, and available for research personnel as requested.

2. The veterinary professional, administrative, and managerial staffs ensure that all research and technical staff using this equipment are adequately trained and experienced to perform veterinary capnograph determinations.

3. Veterinary and technical staff operating this equipment ensure this procedure and the manufacturer's operation manual are followed.

III. EQUIPMENT SET UP

1. Plug A/C power cord into power outlet.

2. Press the ON/OFF key to turn on monitor.

3. Select patient type and enter patient ID as needed.

4. Attach the patient and sensors.

5. Choose waveforms to be displayed.

6. Adjust settings in the parameter boxes.

7. Set high low alarm limits.

8. The data logger is capable of capturing real-time trend data from the monitor to an SD Flash card. Choose function (Record Real Time Trend, Capture (ECG only) or Capture Screen) and select intervals from menu selections.

9. The printer is capable of producing waveform snapshots, waveform strip charts, and tabular trend data. Set the print speed and duration and type (waveform or tabular trend data).

10. Attach SpO_2 connector to unit.

11. Insert moisture trap into gas port inlet of unit. (left side of unit, see above for similar comments).

12. Attach sample incoming line to moisture trap.

13. Insert CO_2 absorber to rear of unit.

14. Attach either lingual clip or rectal probe to patient sensor cable and place on patient.

15. Connect elbow adapter to CO2 sample line and place adaptor in between endotracheal tube and Wye piece/Bain circuit of anesthetic machine.

IV. EQUIPMENT USE

Electrocardiography (ECG)

1. Choose 3-lead or 5-lead ECG processing.

2. Ensure alligator clips and banana plugs are thoroughly cleaned and dried before attaching to patient.

3. Connect the ECG cable to the monitor.

4. Attach ECG leads to the patient.

5. Ensure leads are in the correct ECG cable position (i.e., color-coded leads and connector).

6. Use the ECG waveform menu options to choose the primary ECG lead and adjust the size and speed of the ECG waveform.

7. Adjust high and low alarm limits and volume for alarm and pulse beep tones as needed.

8. ECG calibration is not performed for patient monitoring. If there is reason to believe unit is not recording ECG accurately, unit is removed from service and returned to SurgiVet for service.

Oximetry (%SPO_2)

1. Choose the sensor type to be used to monitor oximetry.

2. Check sensor and patient cable to ensure they do not appear damaged.

3. Connect sensor/sensor cable to monitor.

4. Attach sensor to patient.

5. Use the SpO_2 waveform menu options to adjust the speed of the SpO2 waveform, or plethysmogram.

6. Adjust high and low alarm limits.

7. Choose to use the peripheral pulse rate and/or oximetry averaging options.

8. Pulse oximeters do not require calibration.

Invasive Blood Pressure (IBP)

1. Provision of new pressure transducers for acute non-survival procedures will occur as deemed necessary (e.g., when damaged, when excessively soiled, etc.), or prior to beginning a single or series of survival surgeries. If utilized during a series of survival surgeries, the unit should be replaced with a new set prior to beginning of the first case of the day.

2. Choose an invasive pressure transducer and appropriate interface cable.

3. Prepare transducer according to the manufacturer's instructions.

4. Connect the transducer to the monitor.

5. Choose waveform and parameter box settings for patient.

6. Attach transducer to patient catheter.

7. Choose scale and waveform speed from the waveform menu.

8. Pressure transducers must be calibrated or set to zero to ensure accurate pressure measurements. **Disposable transducers are pre-calibrated by the manufacturer and considered accurate at the time of use but must be zeroed prior to each use.** To zero transducer:
    a. Flush transducer and corresponding IV lines with IV solution.
    b. Open the transducer to air or ambient pressure.
    c. To zero both IBP transducers, press the IBP ZERO key on monitor.
    d. To zero a single IBP transducer, use the parameter or waveform menu.
    e. Close transducer(s).

9. Choose site/vessel monitored label.

10. Choose alarm detection capability as necessary for each of the IBP values (i.e., SYS, DIA, and MN).

11. Turn arterial heart rate on/off.

12. Record transducer zero or calibration on the anesthesia monitoring tower maintenance hang-tag.

Non-Invasive Blood Pressure (NIBP)

1. Choose a blood pressure cuff appropriate for the patient and the limb size.
2. Attach cuff to patient.
3. Connect the cuff to monitor via the NIBP supply hose.
4. Ensure patient type (e.g., cat, dog or horse) is appropriate for the patient.
5. Choose NIBP mode (i.e., Auto, manual, or STAT).
6. Adjust alarm high low limits.
7. Choose inflation pressure.
8. Cuff can be cleaned in regular laundry load or hand-washed.
9. NIBP is not cannot be serviced/calibrated by user.

Temperature

1. Choose a temperature sensor.
2. Apply temperature sensor to patient.
3. Connect temperature sensor to monitor via interface cable.
4. Choose temperature alarm on/off and/or high low limits.
5. Choose unit of measurement (i.e., ^{0}C or ^{0}F).

Capnography

1. Ensure a capnography module is attached to the monitor.
2. Connect sample line to moisture trap.
3. Turn on capnography by turning rotary knob and selecting SETUP, PARAMETER OPTIONS, CO2 MONITOR, ON. Turn rotary log to select MAIN or PREVIOUS.
4. Check for leaks by pinching the sample line tubing near the moisture trap. If OCCLUSION is displayed in the CO2 parameter box the capnography module is functioning properly.
5. Ensure CO_2 exhaust kit is connected to capnography module for waste anesthesia gas scavenging.
6. Choose waveform scale, units of measurement, waveform speed from the waveform menu.

7. Choose alarm detection capability and alarm limits for each measured value (i.e., $ETCO_2$, $INCO_2$, RR).

8. Monthly, the capnography module is calibrated to ensure that the end-tidal CO2 and inspired CO2 measurements are accurate.

V. MAINTENANCE

1. Inspect condition of unit and electrical cord/plug to ensure safe operation. Equipment determined to be unsafe or not functioning properly will be removed from service immediately.

2. Clean unit and sensors prior to each use by wiping with a mild soap solution (e.g., dilute chlorhexidine 1 oz./gal water) and soft cloth. Disinfect surfaces **(but not the screen)** prior to survival procedures by wiping with isopropyl alcohol.

3. Maintain battery charge by connecting external charge to rear of unit

4. Moisture trap should be replaced when full and occludes.

5. Check pneumatic system for leaks periodically and after replacing moisture trap.

6. Replace CO_2 absorber when the majority of pellets turn blue.

7. Consult Operation Manual for maintenance details and troubleshooting.

8. Any additional maintenance/service should be performed by authorized personnel.

VI. CALIBRATION

1. Calibration ensures that the $ETCO_2$ and inspired CO_2 measurements are accurate and is **performed once a month**.

2. LOW CAL procedure resets the baseline measurement for CO_2 to zero. This procedure can be performed while a patient is attached to the monitor. Perform LOW CAL as describes below:
    a. Highlight capnograph on device display.
    b. Highlight “LOW CAL” and select
    c. Select “YES”
    d. “LO CAL in progress” will display in the CO_2 parameter box
    e. When calibration procedure is finished, CAL DONE will appear in CO_2 parameter box.

3. The Low/High procedure should be performed only after the capnograph parameter has been on for at least 15 minutes. Remove patient from device before proceeding. **Perform a Low/High Cal** as described below:
    a. Turn on the device.
    b. Attach the calibration gas canister to the moisture trap gas inlet via the “T” connector.

c. Turn rotary knob and highlight the CO_2 parameter box and push knob to select.
d. Highlight HILO CAL and select.
e. Turn rotary knob to highlight YES and select. After a low calibration the message "**TURN GAS ON**" will be displayed.
f. Quickly open the flow control valve on the calibration gas canister. The valve must be fully opened in less than 30 seconds.
g. When the message **"TURN GAS OFF"** appears, close the flow control valve of the calibration gas canister.
h. Calibration is finished when "**CAL DONE"** is displayed.
i. Change the units of measurement for CO2 to % from the main menu select SETUP, PARAMETER OPTIONS, CO2 UNITS
j. Verify calibration by opening and closing the flow control valve on the calibration gas canister at the rate of on for two seconds, off for two seconds for 4-8 on/off cycles.
k. Verify the $ETCO_2$ reading in the CO_2 parameter box reads 10.0% CO_2 $\pm$ 0.4 (9.6-10.4%)
l. Disconnect the calibration test fixture.

4. Refer to manufacturer's operation manual for additional information.

5. Calibration is documented by labeling the unit with the date of calibration and date the next calibration is due.

6. Facility Managers are responsible for maintaining current records of Division-owned equipment inspections, calibrations, maintenance, non-routine repairs, and current inventory for their facility on the Division's ***Equipment Maintenance Log*** **(CMDC#192)**.

VII. REFERENCES

1. The ***Advisor Vital Signs Monitor Operation Manual*** provides additional information and is intended to supplement this standard operating procedure.

Approved: **Date:**