Appendix

Detailed Description of Test Items

1 Carbon Dioxide Canister Leak

A leak was created in the carbon dioxide canister by placing a spacer between the canister assembly and the gasket on the canister top. The spacer was adjusted until at least a 3 l/min leak was obtained at an airway pressure at 20 cm H_2O. The leak was allowed to persist until 5 minutes after the initiation of mechanical ventilation with the ventilator on the anesthesia machine. If the leak had not been corrected by the subject at that time it was identified and corrected by the research assistant playing the role of the circulation nurse.

2 Inspiratory Valve

Before the start of the evaluation process the disk was removed from the inspiratory valve in the anesthesia circle circuit. The inspiratory valve was chosen because the expiratory valve disc is covered and partially hidden by a PEEP valve on the anesthesia machine used in the Simulation Centre (Ohmeda, Excel 210 SE). A minimum end tidal carbon dioxide concentration of 60 mm Hg and a minimum inspired carbon dioxide of 3 mm Hg was obtained in all cases. The problem of the missing inspiratory valve was allowed to persist until 5 minutes after the initiation of mechanical ventilation with the ventilator on the anesthesia machine. If the problem had not been corrected by the subject at that time it was identified and corrected by the research assistant playing the role of the circulating nurse.

3 Hypotension During Mesenteric Traction

The surgeon informed the anesthesiologist that the abdomen was tight and surgical exposure was inadequate. The surgeon then asked if muscle relaxation was adequate. Two minutes later the surgeon repeated the statement with respect to surgical exposure. Two minutes after that the surgeon requested a

large retractor from the circulating nurse. The circulating nurse unwrapped the retractor and handed it on to the operating field. Hypotension was induced using the peripheral vascular resistance control in the advanced controls window. This method resulted in a compensatory tachycardia. A target of a systolic blood pressure of less than 80 mm Hg was achieved in all cases. The blood pressures was kept at the target level for 5 minutes unless the subject requested that the retractor be repositioned or removed. At the end of the 5 minutes the blood pressure was returned to normal.

4. Atelectasis

Atelectasis was induced using the atelectasis event in the events window. This event resulted in desaturation, a mild decrease in pulmonary compliance with no change in breath sounds. A target SpO2 of 89 was set. The SpO2 was kept at the target level for 5 minutes unless the subject performed a vital capacity maneuver defined as a single breath of greater than 800 ml or add positive end expiratory pressure to the breathing circuit. At the end of the 5 minutes the atelectasis event was terminated and the SpO2 was returned to normal.

5. Coronary Constriction

Coronary ischemia was induced using the coronary constriction event in the events window. This event results in a depression of the ST segments, ventricular ectopy and a mild reduction in blood pressure. A target ST segment depression of greater than 4 mm was achieved in all cases. ST segment depression was kept at the target level for 5 minutes unless the subject administered a nitrate or beta-blocker. At the end of the 5 minutes the coronary constriction event was terminated and the ST segments became isoelectric.

6. Pneumothorax

A pneumothorax was induced using the pneumothorax event in the events window. This event results in rapid profound desaturation, decreased pulmonary

compliance, absence of breath sounds over the right chest and diminished movement of the right hemithorax. SpO2 fell to less than 70% in all instances. The problem was allowed to continue for 5 minutes unless the subject indicated a plan to perform a needle or tube thoracostomy. At the end of the 5 minutes the pneumothorax event was terminated and the SpO2 returned to normal.

7. Anaphylaxis

The surgeon requested antibiotic coverage consisting of gentamycin, cefazolin and metronidazole for an inadvertent fecal soilage of the peritoneal cavity. Two minutes after injection of the cefazolin the anaphylaxis problem was started. Anaphylaxis was simulated using the bronchospasm event in the events window and using the peripheral vascular resistance and heart rate controls in the advanced controls window. We elected to use this method of simulating anaphylaxis to obtain more precise control over the hemodynamic parameters. This resulted in significant wheezing, decreased lung compliance, hypotension and tachycardia. A target systolic blood pressure of less than 70 mm Hg was achieved in all cases. The event was allowed to continue for 5 minutes unless the subject administered epinephrine. At the end of the 5 minutes the event was terminated and the blood pressure was returned to normal.

8 Hypothermia

Hypothermia was induced using the hypothermia event in the events window. This event results in a gradual decrease throughout the case so that at 1 hour into the case the patients temperature was 33°C. The hypothermia event was terminated when radiation or convection was used as a warming strategy or the simulated patient's temperature fell below 33°C.

9 Anuria

After anesthetic induction the surgeon asked the subject anesthesiologist whether a urinary catheter could be placed. Once permission for placement of

the urinary catheter had been received from the anesthesiologist, the circulating nurse handed to the anesthesiologist a urinary catheter collection bag containing 20 cc of amber colored “urine”. For the rest of the case no more urine came into the catheter collection bag unless the circulating nurse or the anesthesiologist investigated the catheter and collection tubing under the surgical drapes.