Pre-anesthesia checkout procedure (including machine leak test)

A pre-anesthesia checkout procedure is considered an important step in the safe provision of anesthesia. Failure to properly check anesthesia equipment is associated with patient morbidity and mortality.[1,2]

^before the first case of the day
*before each use

1. ^Electrical supply: check anesthetic machine is connected to the electrical supply (if applicable) and switched on.
2. Oxygen
   a. ^Confirm secondary oxygen source (oxygen cylinder) is available and functioning
      i. Open cylinder valve, check adequate contents (usually at least 50% full, or 1000 psig) and close cylinder valve (unless cylinder will be primary oxygen source).
   b. ^Pipeline gas: confirm gas pressure is ≥ 50 psig (400 kPa)
      i. perform “tug test” - ensure correct and secure connection between pipeline (gas hose) and supply terminal (socket).
3. Vaporizer(s)
   a. *Check vaporizers are adequately filled and filling ports are closed.
   b. ^Check that vaporizers are properly seated on back bar and secured.
   c. ^Check vaporizer dial turns smoothly throughout range.
   d. *Turn off at end of testing and ensure off before use.
4. *Carbon dioxide absorbent
   a. Check absorbent is not exhausted (colour change may be lost if absorbent has not been used for some time - capnography during anesthesia recommended).
5. ^Flowmeter
   a. Confirm flow valve operates and that bobbin moves smoothly throughout full range.
6. Confirm function of emergency oxygen flush valve: gas flow is present when activated, without a decrease in pipeline pressure, and flow stops when control released.
7. Leak test
   a. ^Vaporizer leak test
      i. Turn on oxygen (approx. 3 l/min) and occlude common gas outlet with vaporizer dial in on and off position. Flowmeter bobbin should dip.
   b. *Breathing system leak testing
      i. Visually inspect system components to confirm correct assembly and free of obstruction.
      ii. Connect system securely to common gas outlet.
      iii. Circle leak test: occlude patient end (hand or plug), close APL valve and pressurize system via oxygen flowmeter to approx. 30 cmH_2O. Turn off oxygen flow and observe pressure gauge. Pressure should be maintained for 10 seconds. Open APL valve and confirm that reservoir bag deflates (pressure gauge should return to zero). Uncover/unplug patient end. A leak rate of ≤ 200 ml/min is considered acceptable.
         (1) Check unidirectional valve function (see “Two-bag test”, below).
         (2) If a co-axial Circle system is in use, confirm inner limb connection as described below for Bain system.
      iv. Bain leak test: occlude patient end (hand or plug), close APL valve and pressurize system via oxygen flowmeter to approx. 30 cmH_2O. Turn off oxygen flow and observe pressure gauge. Pressure should be maintained for 10 seconds. Open APL valve and confirm that reservoir bag deflates (pressure

gauge should return to zero). Uncover/unplug patient end. A leak rate of ≤ 200 ml/min is considered acceptable.
(1) Test inner limb of system: with oxygen flowing at approx. 3 L/min, occlude inner limb (plunger from 3 ml syringe) - flowmeter bobbin should dip.

v. Two-bag test: perform after checking vaporizer(s) and breathing system. Attach reservoir bag to patient end of breathing system, turn on oxygen (3 l/min) and manually ventilate.
(1) Confirm whole breathing system is patent.
(2) Circle system: observe unidirectional valve function during manual ventilation.
(3) APL valve: squeeze both reservoir bags to check APL valve.

8. ^Anesthetic gas scavenging system
   a. Check that active scavenging system is correctly connected to machine and breathing system.
   b. Confirm that reservoir bag deflates at conclusion of leak test.
   c. Occlude patient end of breathing system and activate emergency oxygen flush valve with APL valve open. Confirm that breathing system pressure gauge reading is below 10 cmH_2O.
   d. If using a charcoal cannister passive scavenging system, ensure that bottom holes are not occluded and confirm in records that charcoal is not exhausted (if in doubt, weigh and refer to manufacturer guidelines).
9. *Ensure required monitors are available, connected to the electrical supply and switched on.
   a. Confirm gas sampling lines are unobstructed and connected.
   b. Check appropriate frequency of NIBP measurement is selected.
   c. Check alarm limits are appropriate (where available).
10. *Check that ancillary equipment is available and working: this includes laryngoscope, ET tubes, tube tie, gauze.
11. *Log: document completion of checkout procedure (date, time, initial) in patient record.

NB: this checkout procedure was developed for the machines in current use at the UCVM (2019) and is not exhaustive. Users should be familiar with the specific requirements of their equipment.

Adapted from: AAGBI Safety Guideline (Anaesthesia 2012 67:660-668), Recommendations for Pre-Anesthesia Checkout Procedures (2008) Sub-Committee of ASA Committee on Equipment and Facilities, the BSAVA Manual of Small Animal Anaesthesia and Analgesia (chapters 4 and 5) and Ward's Anaesthetic Equipment (5th edition).

[1]Cooper JB, Newbower RS, Kitz RJ. An Analysis of Major Errors and Equipment Failures in Anesthesia Management: Considerations for Prevention and Detection. Anesthesiology 1984;60:34-42.
[2]Arbous MS, Meursing AE, van Kleef JW, de Lange JJ. Impact of Anesthesia Management Characteristics on Severe Morbidity and Mortality. Anesthesiology 2005; 102:257–68