Using Equipment Safely
The Pre-Anesthesia Checklist

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SUMMARY

1. Studies of the old (1993) FDA checklist showed
   a. The vast majority of equipment failures are human error, or unfamiliarity with equipment. Outright equipment failures are rare. Users report that they often do not perform the FDA checklist; many do not feel competent in their ability to perform it correctly.
   b. When a checklist is performed, 30% of the gas machines in one study had serious faults discovered (confirmed over last 30 yr). Users perform poorly when using checklists to detect intentionally-created faults (confirmed in many studies).

2. New checklist (2008) because the 1997 FDA Checklist was not user friendly; not used consistently; and often not used effectively. New anesthesia workstation designs mean that no one procedural checklist can address all gas machines.

3. Pre-Anesthesia Checklist (PAC 2008)
   a. Basic Principles
      i. Anesthesia care provider is ultimately responsible for ensuring that equipment is safe and ready
      ii. Emergencies? The PAC is essential to safe care, but should not delay initiation of care when patient needs are so urgent that time taken for PAC could worsen outcome.
      iii. Recheck if moved- Whenever an anesthesia machine is moved to a new location, PAC must be repeated

   1. Verify backup ventilation equipment is available and functioning (Manual resuscitation bag, Auxiliary source of oxygen)
   2. Verify patient suction adequate to clear the airway
   3. Turn on anesthesia machine and verify AC power available
   4. Verify required monitors available, check alarms and limits
   5. Verify oxygen cylinder pressure is adequate
   6. Verify pipeline pressures ≥ 50 psi
   7. Verify vaporizers filled and filling ports tightly closed
   8. Verify no internal leaks in gas lines (between flowmeters and common gas outlet)
   9. Test scavenger system function
   10. Calibrate inspired oxygen monitor and check the low oxygen alarm
   11. Verify CO2 absorbent not exhausted
   12. Breathing system pressure and leak
   13. Verify that gas flows properly through the breathing circuit during both inspiration and expiration
   14. Document completion of PAC
iv. **Guideline for oxygen pipeline supply failure (Step 10)**

b. **Be Prepared.** Always check for a full E cylinder and an Ambu bag before using an anesthesia machine.

c. If pipeline pressure fails, or fraction of inspired oxygen drops:
   i. Do not attempt to fix the oxygen analyzer—it must be trusted until it can be proved wrong.
   ii. Turn on backup oxygen cylinder on machine fully, and disconnect pipeline.
      i. Ensure measured fraction of inspired oxygen begins to rise. If the fraction of inspired O2 does not increase (with fresh gas flow adequate to wash in the O2 quickly), ventilate the patient by Ambu bag with room air.
      ii. Use low flows of oxygen. Maintain anesthesia with a volatile agent. Ensure FIO2 and agent concentration are appropriate.
      i. Turn off the ventilator and ventilate manually through the circle system.
      ii. If unable to use the circle, ventilate with an oxygen source (freestanding cylinder) or with room air, via a bag-valve-mask device, and institute TIVA.
   iv. Call for help if needed; calculate the time remaining for the current cylinder; call for additional oxygen cylinders, and install them on the machine if needed.
   v. Find out how long the problem is expected to last; participate in the hospital disaster plan, which may require prioritizing oxygen for those patients who need it most. Do not reconnect patient to pipeline gas until the gas supply is tested.

4. **Test for occlusions in the breathing circuit (step 13)**

   a. Severe outcomes continue to occur from breathing circuit or ventilator mishaps (Mehta 2013). Provider error in 85%; preventable with proper equipment check 35%.
   
   b. Associated with inadequate alarms, improvised oxygen delivery systems (Zambricki, AANA J Feb 2014), and misdiagnosis or treatment of breathing circuit events.

3. **Last, essential steps when checking any gas machine**

   a. **Is there Oxygen in the oxygen line?** Ensure that inspired oxygen reads 21%, with sensor open to air. Ensure that FIO2 increases when reassembled circuit is flushed w/ O2.
   
   b. **Can they take a breath, and exhale it?** Unidirectional valves working? No mold flash or plastic emboli obstructing the circuit? Use second bag, or breathe through the circuit.
   
   c. **Can I give a breath?** Are there leaks in the reassembled circuit? Remember to do high pressure check after everything reassembled and checkout finished. If gas analysis tubing falls off—Leak.

**REFERENCES**