New Guidelines Available for Pre-Anesthesia Checkout

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While chatting with a patient about to undergo a laparoscopic cholecystectomy, you administer an induction dose of propofol and an intubating dose of vecuronium. The patient loses consciousness and spontaneous respiration ceases. You adjust the mask on the patient's face to establish a secure fit and squeeze the reservoir bag, only to find that you are unable to deliver a positive pressure breath. A quick visual inspection of the breathing circuit does not reveal the cause of the problem. Can you reliably ventilate this patient before he becomes hypoxic? Is an alternative method of ventilation readily available and functioning? Is there a reliable source of oxygen? Furthermore, you are using a relatively new anesthesia machine that performs an automated checkout procedure. What functions of the anesthesia machine did the automated checkout actually evaluate? Did you perform a thorough check of the machine before use that could have detected the source of this problem?

Failure to check anesthesia equipment prior to use can lead to patient injury or "near misses."[1] Checking equipment has also been associated with a decreased risk of severe postoperative morbidity and mortality.[2] Indeed, a pre-use anesthesia apparatus checkout recommendation (AACR) was developed many years ago and widely accepted as an important step in the process of preparing to deliver anesthesia care.[3] Despite the accepted importance of the 1993 AACR, available evidence suggests that it is not well understood and not reliably utilized by anesthesia providers.[4,5] Furthermore, anesthesia delivery systems have evolved to the point that one checkout procedure is not broadly applicable to all anesthesia delivery systems currently on the market. For these reasons, a new approach to the pre-use AACR has been developed. The primary goals of this new approach are to have a procedure that is applicable to all anesthesia delivery systems, and one that will be reliably performed.

The effort to revise the AACR was initiated by the Committee on Equipment and Facilities at the 2003 annual ASA meeting after recognizing that the 1993 AACR did not apply to modern anesthesia delivery systems. A task force was established consisting of representatives from major anesthesia delivery system manufacturers, the American Association of Nurse Anesthetists (AANA), The American Society of Anesthesia Technicians and Technologists (ASATT), and the ASA. The task force met for the first time at the 2004 ASA meeting while working continuously via e-mail since 2003. The result of this process is a document entitled "Recommendations for Pre-Anesthesia Checkout Procedures (2008)" and a growing library of checklists for checking individual anesthesia delivery systems. This information is available on the ASA website in the Clinical Information section (http://www.asahq.org/clinical/fda.htm).

TABLE 1

Recommended Essential Steps in a Pre-Anesthesia Checkout Procedure

TO BE COMPLETED DAILY, OR AFTER A MACHINE IS MOVED OR VAPORIZERS CHANGED

ITEM TO BE COMPLETED		RESPONSIBLE PARTY
Item #1:	Verify Auxiliary Oxygen Cylinder and Manual Ventilation Device (Ambu Bag) are Available & Functioning.	Provider and Tech
Item #2:	Verify patient suction is adequate to clear the airway.	Provider and Tech
Item #3:	Turn on anesthesia delivery system and confirm that ac power is available.	Provider or Tech
Item #4:	Verify availability of required monitors, including alarms.	Provider or Tech
Item #5:	Verify that pressure is adequate on the spare oxygen cylinder mounted on the anesthesia machine.	Provider and Tech
Item #6:	Verify that the piped gas pressures are ≥ 50 psig.	Provider and Tech
Item #7:	Verify that vaporizers are adequately filled and, if applicable, that the filler ports are tightly closed.	Provider or Tech
Item #8:	Verify that there are no leaks in the gas supply lines between the flowmeters and the common gas outlet.	Provider or Tech
Item #9:	Test scavenging system function.	Provider or Tech
Item #10:	Calibrate, or verify calibration of, the oxygen monitor and check the low oxygen alarm.	Provider or Tech
Item #11:	Verify carbon dioxide absorbent is fresh and not exhausted.	Provider or Tech
Item #12:	Perform breathing system pressure and leak testing.	Provider and Tech
Item #13:	Verify that gas flows properly through the breathing circuit during both inspiration and exhalation.	Provider and Tech
Item #14:	Document completion of checkout procedures.	Provider and Tech
Item #15:	Confirm ventilator settings and evaluate readiness to deliver anesthesia care. (ANESTHESIA TIME OUT)	Provider

The 2008 AACR recommends that 15 separate items be checked or verified at the beginning of each day, or whenever a machine is moved, serviced, or the vaporizers changed (Table 1). Eight of these items should be checked prior to each procedure (Table 2). Some of these steps may be part of an automated checkout process on many machines. Following these checklists will typically require <5 minutes at the beginning of the day, and <2 minutes between cases, but will provide you with the confidence that the machine will be able to provide all essential life support functions before you begin a case.

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Taskforce Recognizes Complexity of Checkout

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Early in the process of developing the new recommendations, the task force recognized that a single checkout recommendation could not be applicable to all modern anesthesia delivery systems. Not only does equipment design differ, but the automated checkout procedures built into many modern systems do not check all of the items that require attention, and vary from machine to machine. As a result, the task force has developed a guideline which describes the items that should be checked prior to use, rather than how each item should be checked. Actual checklists for everyday use will be based upon the guideline, but tailored to the equipment and resources available at a specific anesthetizing location. As a complement to the guideline, reference checklists are being developed for use by practitioners and departments interested in revising their checkout procedures. As new anesthesia delivery systems are adopted, revised checkout procedures will be required as the traditional AACR does not apply to modern equipment.

The task force also recognized that complexity is an obstacle to completing the checkout procedure. Therefore, the group worked hard to differentiate the items that must be checked by a clinician, from those items that could be checked by appropriately trained anesthesia technicians or clinical engineers. Departments that have skilled technician and engineering support may be able to develop checkout procedures that utilize these individuals, thereby reducing the time required from clinicians and increasing compliance with checkout procedures. The guidelines indicate which items could be checked by a technician alone or in conjunction with the anesthesia provider. Notwithstanding the role of the technician, the guidelines emphasize, however, that the ultimate responsibility for insuring that equipment functions properly lies with the anesthesia provider.

The Task Force further realized a need to emphasize requirements for safe delivery of anesthesia care, and listed these at the beginning of the recommendations. These requirements are the underlying rationale for the guideline, which specifies what should be checked prior to administering anesthesia. The requirements are

- Reliable delivery of oxygen at any appropriate concentration up to 100%.
- Reliable means of positive pressure ventilation.
- Backup ventilation equipment available and functioning.
- Controlled release of positive pressure in the breathing circuit.
- Anesthesia vapor delivery (if intended as part of the anesthetic plan).
- Adequate suction.
- Means to conform to standards for patient monitoring.

The new guidelines for Pre-Anesthesia Checkout were approved in the Spring of 2007 by the ASA leadership as a work product of the Committee on Equipment and Facilities. Since that time, the ASATT, the AANA, and The American Academy of Anesthesia Assistants (AAAA) have endorsed the document. The FDA had endorsed the 1993 recommendations that have been removed from their website, but the FDA has agreed to provide a link on their website to the ASA website where the new information will reside. The FDA has also endorsed the new guidelines as educational information.

Now that guidelines for checkout procedures have been developed, it is essential that clinicians be trained to utilize these procedures effectively. This is especially true when a new anesthesia delivery system design is put into service. New designs have significant differences from legacy systems. The APSF has spearheaded the "Technology Training Initiative," described on their website at http://www.apsf.org/initiatives/technology_training.mspx, to promote critical training on new, sophisticated, or unfamiliar devices that can directly affect patient safety. The results and recommendations of their October 2007 "Workshop on Formal Training and Assessment before Using Advanced Medical Devices in the Operating Room" are published in the previous issue of the *APSF Newsletter*.

It remains to be proven if the goals of this effort will be realized. All anesthesia providers are encouraged to review the new guidelines and develop checkout procedures for use in their own practices. The library of checklists on the ASA website is intended to facilitate the process of developing local checkout procedures. We will continue to add to the library of sample checklists under the direction of Adam Striker from the University of Missouri, Kansas City. The ASA is urging the FDA to consider the recommendations in the guideline when evaluating automated self-tests as part of the 510K approval process of new anesthesia delivery systems. Our Task Force believes that providers who adopt this new approach will have taken all possible steps to eliminate the risk of patient injury due to anesthesia equipment malfunction.

TABLE 2

Recommended Essential Steps in a Pre-Anesthesia Checkout Procedure

TO BE COMPLETED PRIOR TO EACH PROCEDURE

SUBSET OF ITEMS IN THE DAILY CHECKLIST TO BE COMPLETED BETWEEN CASES	RESPONSIBLE PARTY
Item #2: Verify patient suction is adequate to clear the airway.	Provider and Tech
Item #4: Verify availability of required monitors, including alarms.	Provider or Tech
Item #7: Verify that vaporizers are adequately filled and if applicable that the filler ports are tightly closed.	Provider
Item #11: Verify carbon dioxide absorbent is not exhausted.	Provider or Tech
Item #12: Breathing system pressure and leak testing.	Provider and Tech
Item #13: Verify that gas flows properly through the breathing circuit during both inspiration and exhalation.	Provider and Tech
Item #14: Document completion of checkout procedures.	Provider and Tech
Item #15: Confirm ventilator settings and evaluate readiness to deliver anesthesia care. (ANESTHESIA TIME OUT)	Provider

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