Policy #31: GUIDELINES FOR ANESTHETIC VAPORIZER CALIBRATION AND MACHINE MAINTENANCE

A. Purpose:
   - These guidelines are recommended for maintaining proper function of vaporizers used for administration of inhaled anesthetics, including isoflurane, sevoflurane, and desflurane. Users are advised to follow the manufacturer’s recommendations if they vary significantly from those in this document.

B. Background:
   - Anesthetic machines vaporize volatile liquid anesthetics in a precise and controlled fashion so that useful concentrations of these agents can be more safely administered. The inner mechanisms of vaporizers that regulate carrier gas flow and anesthetic output are subject to wear due to use or misuse and may result in extreme variation of anesthetic output compared to the output indicated by the vaporizer dial. These conditions may result in under- or over-anesthetized subjects. All personnel must be trained in the proper use of anesthetic machines and vaporizers prior to operation. Anesthetic equipment must be evaluated regularly to ensure its integrity and proper function.

C. Guidelines:
   1. **Vaporizer service**: Accuracy of anesthetic agent delivery must be verified annually, whenever inaccurate vapor output is suspected, or when placing a recently acquired used vaporizer into service. Variance of anesthetic delivery by more than 20% of calibrated values is not acceptable. Anesthetic vaporizers should be serviced by qualified personnel (such as an authorized service center) as recommended by the manufacturer.

   2. **Waste Anesthetic Gas Scavenging**: Anesthetic machines must have an effective system to scavenge waste anesthetics. Waste anesthetic contamination of the workplace may result in adverse health effects in personnel. In addition, halogenated anesthetic waste contributes to
atmospheric ozone depletion. Waste anesthetic production should be minimized when possible in order to help protect the environment.

a. Activated charcoal canisters are an inexpensive method for absorbing halogenated waste gases. This method is not effective for scavenging nitrous oxide. Canisters of activated charcoal generally remain active for around 12 hours of use. A log of the time the canister is used or the change in weight of the canister (see manufacturer’s guidelines) should be maintained. Spent canisters must be disposed of as dangerous chemical wastes.

b. Passive and active scavenging systems involving capture devices ("pop-off valves"), conducting tubing, scavenger interfaces, and vacuum systems offer more effective and extensive means for removing waste anesthetic gases from the work area.

c. Fume hoods should be utilized when conducting anesthetic procedures using the “open drop” method. Proper fume hood function should be tested and certified.

d. Carbon dioxide absorbers (Sodalime™, Baralyme™) should be changed on a regular basis. Dye indicators in the absorber granules will indicate a color change (usually from white to blue or purple) when the absorbers are no longer removing carbon dioxide. This color change will revert back to white overnight but does not replenish the function of the absorber. Absorber granules should be changed when the color change is first identified. Spent granules must be disposed of as dangerous chemical waste.

3. Documentation:
   - Vaporizers must have documentation of the date of testing and the initials of the person providing the test. A calibration date certificate should be affixed to the vaporizer after each service.

4. Services available:
   a. Anesthetic Equipment Supply, Inc., 24301 Roberts Dr., Black Diamond, WA 98010; phone:800-426-5007
   b. Highland Medical, 26111 Ynez Rd, C15, Temecula, CA 92591; phone: 800-826-5951 www.highlandmedical.net
   d. Smith's Medical/Surgivet: www.surgivet.com
e. DRE Veterinary Anesthesia Vaporizer Services: Ginny Philpot, 1800 Williamson Court, Louisville, KY 40223; phone: 877-321-8189.

5. Minimum STANDARD OPERATING PROCEDURE for ANESTHETIC Vaporizer use
   a. Check hoses, fittings and rebreathing bag and pressure check the breathing circuit to identify & then repair any leaks.
   b. If applicable, check color and consistency of the carbon dioxide absorber and replace if needed.
   c. Scavenge any waste anesthetic gas: waste anesthetic gas in the workplace is a human health hazard
      - Unless waste gas is scavenged through a working wall vacuum system or certified fume hood, then all anesthesia machines should be equipped with an activated charcoal canister (F/air).
      - Before use, the activated charcoal canister should be weighed. The weight should be recorded and dated on the side of the canister.
      - Following the use of an anesthesia machine, the number of hours the machine was in use should be recorded next to the dated weight information or on a record sheet.

      - The activated charcoal canister should be changed when (whichever occurs first):
        o The total number of hours used exceeds 12. OR
        o The weight of the canister increased by 50 grams over its initial weight.

      - Spent canisters must be disposed of as dangerous chemical waste & not in regular trash
   d. All vaporizers should be serviced by qualified personnel annually. Document any vaporizer maintenance or repair.

6. References: