BUMED NOTICE 1520

From: Chief, Bureau of Medicine and Surgery

Subj: CLINICAL TRAINING REQUIREMENTS FOR THE DRAWOVER ANESTHESIA VAPORIZER

Encl: (1) Training Requirements for Clinical Competency in the Use of the Ohmeda Portable Anesthesia Complete (PAC) Drawover Anesthesia Device
     (2) Drawover Anesthesia
     (3) Drawover Anesthesia Test
     (4) Drawover Anesthesia Machine (Ohmeda Universal PAC) use in the Main Operating Room

1. **Purpose.** To establish policy for clinical training of Navy anesthesiologists, certified registered nurse anesthetists (CRNAs), and their residents and students on the drawover anesthesia vaporizer.

2. **Cancellation.** BUMEDNOTE 1520 of 7 Jun 2007.

3. **Scope.** This notice applies to commands providing anesthesia residency programs and training, as well as all anesthesiologists, certified registered nurse anesthetists, anesthesia residents, and nurse anesthesia students.

4. **Background.** Drawover vaporizer capability for anesthesia continues to be a requirement for operational settings. These vaporizers permit the delivery of inhaled anesthetics in battlefield and austere shipboard conditions with minimal logistic support, no requirement for compressed gases or electricity, and their use avoids the need to remove carbon dioxide.

5. **Responsibilities.** Enclosures (1) through (4) will be implemented at all current and future Navy anesthesia training facilities to ensure uniform execution of clinical drawover anesthesia training. Current training sites include Naval Medical Center San Diego, Naval Medical Center Portsmouth, and Naval Hospital Jacksonville. The responsibilities for these locations are:

   a. **Commanding officers.** Commanding officers will ensure clinical drawover anesthesia training is incorporated into the current and future local clinical course curricula for all credentialed anesthesia providers, anesthesia residents, and nurse anesthesia students. The following activities are currently using the drawover anesthesia vaporizer:

      (1) Naval Medical Center San Diego

      (2) Naval Medical Center Portsmouth
(3) Naval Hospital Jacksonville

(4) Navy Medicine Professional Development Center

b. Navy Medicine Specialty Leader for Anesthesiology. Specialty Leader will coordinate with the Navy Nurse Anesthesia Specialty Leader to ensure uniform implementation and compliance with the training standards in enclosures (1) through (4) at Naval Medical Center San Diego, Naval Medical Center Portsmouth, and Naval Hospital Jacksonville.

6. Action

a. Each current and future anesthesia training facility will acquire vaporizer units for training from Navy inventory and then follow manufacturer's operation and maintenance manuals to certify units by utilizing local biomedical engineering departments. Additional reconditioning or refurbishment will be performed as indicated.

b. Evaluation of the training will be completed at the conclusion of the first year and annually thereafter via a panel of subject matter experts made up of anesthesiologists and CRNAs to review the progress of the training and determine if training beyond the local facility is indicated. The findings of this panel will be provided to local commanding officer for review and follow-on action.

7. Point of Contact. CDR Richard Serianni, MC, USN, Navy Anesthesiology Specialty Leader, at (757) 953-3236 or via e-mail at Richard.Serianni@med.navy.mil.

8. Records. Records created as a result of this instruction, regardless of media and format, shall be managed per SECNAV M-5210.1 of January 2012.


10. Reports. The reports required in paragraphs 6b are exempt from reports control per SECNAV M-5214.1 of December 2005, Part IV, paragraph 7p.

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TRAINING REQUIREMENTS FOR CLINICAL COMPETENCY IN USE OF THE
OHMEDA PORTABLE ANESTHESIA COMPLETE (PAC)
DRAWOVER ANESTHESIA DEVICE

The following items must be completed and documented in individual’s training file to attain clinical competency in use of the Ohmeda PAC Drawover Anesthesia Device for field administration of general inhalational anesthesia.

1. View Drawover Anesthesia Lecture and accompanying videos on the use of the device with ventilator and oxygen concentrator.

2. Complete required reading list as indicated in the lecture to include familiarity with the manufacturer’s operations and maintenance manual.

3. One hundred percent competency demonstrated in preoperative checks, assembly and maintenance, operation and postoperative draining, cleaning, and packing.

4. Eighty percent correct or greater on the drawover written competency exam.

5. Conduct supervised general inhalational anesthesia for a minimum of 10 cases in the main operating room.
Drawover Anesthesia
Objectives

- Provide initial didactic training on Drawover Anesthesia for field use
- Provide first hands on training on Drawover Anesthesia
- First step towards practical competency and qualifying for use in Operating Room
- Unit within Operational Anesthesia Training Module
Resources

• Army Drawover Training Guidelines
• Ohmeda Portable Anesthesia Complete (PAC) Operation and Maintenance Manual
• Required Reading
• Additional Presentations
Drawover History

- Simple Origins (Morton and Jackson)
  - Patent no. 4,848 of 12 November, 1846
- Schimmelbusch Mask for Aethernarkosen
- Flagg Can
- Epstein MacIntosh Oxford (EMO)
- AE Inhaler
- Oxford Miniature Vaporizer (OMV)
- Ohmeda Portable Anesthesia Complete (PAC)
Field Anesthesia

• Inhalational Anesthesia in Austere Conditions
  – General anesthesia quickly induced/terminated
  – No sterile equipment required
  – Less manual dexterity required (but not less skill!)
  – Small weight/cube
  – Modern volatile agents have low vapor concentrations
  – Ambient air for carrier gas
Field Anesthesia

- Advantages of Inhalational Anesthesia for Remote Areas or Major Disasters
  - Small with cube, portable, efficient, accurate, nonspillable
  - Sturdy, simple
  - Supplemental oxygen use when available
  - Non-rebreathing
  - PPV available
  - Adaptable to various agents
  - Minimal maintenance requirement, long shelf life
US Army Materials

- Drawover Familiarization Training Guideline
- Slide Presentation (basis for this presentation)
- Field Anesthesia Guidelines
- Drawover Supply List
- Corporate Knowledge
US Navy Curriculum Model

- Didactic Familiarization
- Practical Familiarization
- Supplemental Reading
- Supplemental Lectures
- OR usage and competency
- Real life field usage for fortunate few
Experience!

- "It cannot be over emphasized that in order to avoid repeating fatal mistakes, experience with these techniques needs to be acquired before their use in an emergency." de Sousa H, Equipment for Anesthesia in Difficult and Isolated Environments, Anesthesia Equipment Principles and Applications, Mosby 1993.
Supplement oxygen
Primary Agents: Ketamine/Volatile
Time to Presentation
Brit definition of Battle Anesthesia
Intragible Force Multiplier
Ventilation (Mechanical vs. "The Band"
Rudimentary Monitoring
Surgical Support Team
Falklands

Modern History
General Description

- Multiagent
- Variable bypass
- Non-rebreathing
- Temperature Compensated
- Ventilator not included
Basic Components

- Vaporizer
- Self Inflating Bag
- Tubing
- Dust Cap
- AMBU-E valve
- Mask

...Pretty Simple!
Non-rebreathing System

• Vaporizer in-line
• Anesthetic concentration changes quickly
• Increased agent consumption
• No Carbon Dioxide absorbent required
• Oxygen supplementation available but inefficient (concentrator vs. compressed)
Oxygen Supplementation

- No compressed gas required
- Reservoir Tube (42” or 60” optimal)
- Fraction of Inspired Oxygen Determination
  - Oxygen Flow rate
  - Minute ventilation
  - Reservoir Volume
Oxygen Conservation

- Not required with Concentrator
- Can be accomplished if close attention paid to flow rates, respiratory rates and Oxygen saturation
Vaporizer Specifications

- Vaporizer Capacity
- Vaporizer Performance and Effects of Flow and Temperature
- Vapor Consumption
- Spill Proof Feature
Vaporizer Capacity

- 85 ml to fully charge
- 50 ml between fill lines
- Drain prior to movement/shipping
- Clearly mark agent
Vaporizer Performance

- Flat Performance Curve @ 3-12 L/min
- No clinically significant differences in spontaneous v assisted ventilation
- Performance consistent to 35 C, then potentially hazardous excessive delivery possible
- Outlet check valve – prevents pumping effect by any source of back pressure
Vapor Consumption

- Dependent on:
  - Flow Rate
  - Output Concentration
- 1 ml liquid agent = 200 ml vapor
- Hourly Consumption (ml)
  - $3 \times \% \ F$ (% = vapor output setting on dial; $F =$ Flow through in L/min)
Spill Proof

- Vaporization Chamber
  - Inlet/Outlet Above
  - Liquid level in all positions
- Minimal increase in output when laid sideways
- See O&M Manual
Recommended Work Station

- Secure
- Supplemental Oxygen
- Scavenging
Monitoring

• ASA Standards
  – Blood Pressure
  – EKG
  – Thermometer
  – Capnography
  – Pulse Oximetry
  – Oxygen Analyzer
  – Stethoscope
Drawover Disadvantages

- Lack of Oxygen and agent conservation
- Variable inspired anesthetic concentration
- No integrated monitors
- Potential for hypoxic delivery
Drawover Ventilators

- Cape TC 50
- Ohio V5A
- PLV 100
- Impact Univent
Alternate Setup/Maintenance Hints

- Laerdal Self inflating v silicon bag
- Laerdal Nonrebreathing valve
- Multiple valves
- Multiple circuit filters
Continued Training

- Hands on training (preoperative checks, filling, setup, cleaning, packing)
- Required supplemental reading
- Simulated patients
- OR Competency
Required Reading List

- O&M Manual
- Army Field Anesthesia Training Guidelines
- Army Field Anesthesia Introduction
- Journal Articles (see list)
- NMCP Operating Room Drawover SOP.
Journal Articles


Journal Articles (cont.)

- Adapting the Ohmeda UPAC Draw-Over Vaporizer for Use in the Modern Operating Room. Casinelli, PE, Military Medicine, 1994 Sep, 159:600-601
- A Hazard of an Anesthesia Delivery System in a Developing Country... Shadrack N et al, Anesthesia and Analgesia, 1995, 80:424-6
Journal Articles (cont.)

- Sevoflurane Concentration Available from the Universal Drawover Vaporizer, Pylman ML, Teiken PJ, Military Medicine, 1997 Jun; 162:405-6
- Performance of the Universal Portable Anesthesia Complete Vaporizer with Mechanical Ventilation in Both Drawover and Pushover Configurations, Hawkins JK, Ciresi, SA, Military Medicine, 1998 Mar; 163:159-163
DRAWOVER ANESTHESIA TEST

1. The spill proof feature of the Ohmeda PAC allows an anesthesia provider to:
   a. Perform anesthesia in space.
   b. Hang the device from parachute cord upside down in the tent to improve dosing.
   c. Safely return the device to its upright position without interrupting the anesthetic procedure.
   d. Switch agents during an anesthetic by pouring out the current agent and refilling with a new agent.

2. Anesthetic agents for which the Ohmeda PAC is calibrated to use include:
   a. Isoflurane.
   b. Halothane.
   c. Diethylether.
   d. All of the above.

3. Servicing of the Ohmeda PAC is required ____ when it is used daily for several hours a day:
   a. Every 100 uses.
   b. Every other month.
   c. Yearly.
   d. Every 5 years.

4. The recommended length of tubing which functions as an oxygen reservoir is:
   a. 18 inches.
   b. 8 Feet.
   c. 42 inches or 60 inches.
   d. No recommendations exist.

5. Approved sterilization of the rubber portions of the device includes all of the following except:
   a. Washing with mild alkali detergent and cold germicidal solution intended for use with rubber.
   b. Steam sterilizing at 121 degrees C, or boiled for 15 minutes.
   c. High pressure steam sterilization.
   d. Exposing parts to 100 percent ethylene oxide for 12 hours.
6. When cleaning the device between uses ensure full saturation of the interior of the device with an alcohol based solvent or water:
   a. True.
   b. False.

7. Potentially hazardous excessive concentrations of anesthetic agent may occur at temperatures above 35 degrees C.
   a. True.
   b. False.

8. Hourly consumption of agent can be estimated using the following formula:
   a. 4 X flow (ML per min).
   b. ML agent in vaporizer X patient weight in KG.
   c. Running the anesthetic until patient wakes up then dividing initial volume by hours of use.
   d. 3 X % (vapor output setting) X F (flow in L/min).

9. The internal leak test during preop checks is satisfactory if the bag inflates when released:
   a. True.
   b. False.

10. Specifically if the Ohmeda PAC is used with a ventilator the operator must be attentive to the patient to observe for early evidence of which complication:
    a. Increased bleeding.
    b. Undischarged weapons.
    c. Subcutaneous emphysema.
    d. Dust in the circuit.
DRAWOVER ANESTHESIA MACHINE (OHMEDA UNIVERSAL PAC) USE IN THE MAIN OPERATING ROOM

STANDARD OPERATING PROCEDURES (SOP)

Policy: The following outlines the clinical guidelines and operating procedure for drawover anesthesia machine training at all Navy medical treatment facilities.

1. Training will be conducted for all appropriate staff and trainees on the Universal Portable Anesthesia Complete (UPAC) drawover prior to its use. Specific training requirements include the proper set-up and operation of the machine and outlined in enclosures (1) and (2) of this instruction with specific emphasis on patient monitoring and safety. All trainees will complete established training requirements and achieve required competencies using NAVMED 1520/30, Drawover Vaporizer Competencies and Training Checklist.

2. Standard clinical monitors as indicated for the use of general anesthesia will be used in conjunction with the drawover machine, to include at a minimum:

   a. Fraction of Inspired Oxygen (FiO2) monitor, End Tidal Carbon Dioxide (ETCO2) monitor, End Tidal (ET) agent monitor, plus oximeter, Noninvasive Blood Pressure Amplifier (NIBP).

   b. Waste gases must be scavenged as per manufacturer’s operation and maintenance manual.

   c. There must be a functioning standard anesthesia machine as backup in the operating room at all times.

3. Setup procedures for use of the drawover machine are per the manufacturer’s operation and maintenance manual:

   a. Assemble machine per manufacturer’s guidelines. The manufacturer’s manual will be in the operating room at all times during the use of the drawover. The set-up can be with or without the Impact 754 ventilator.

   b. Attach supplemental monitors and equipment to include fresh oxygen supply, gas scavenging, FiO2, ETCO2, ET agent monitoring, NIBP, ECG, and pulse oximetry.

   c. Perform recommended checks prior to using drawover machine.

   d. The volatile agent vaporizers will be filled by a credentialed provider and no other person. The vaporizer will be drained at the completion of each day’s cases. Only Isoflorane will be used in the vaporizer.