DEPARTMENT OF THE NAVY
BUREAU OF MEDICINE AND SURGERY
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IN REPLY REFER TO
BUMEDNOTE 1520
BUMED-M3
7 Jun 2007

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 Lecture (Powerpoint Didactic Presentation)
(3) Drawover Vaporizer Competencies and Training Checklist
(4) Drawover Anesthesia Test
(5) 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 within the medical center environment.

2. 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 scrub carbon dioxide.

3. Responsibilities. Enclosures (1) through (5) will be implemented at all facilities to ensure uniform execution of clinical drawover anesthesia training as follows:

a. Commander, Naval Medical Centers (NAVMEDCEN). NAVMEDCEN commanders will ensure clinical drawover anesthesia training is incorporated into the local clinical course curricula for all credentialed anesthesia providers and anesthesia residents.

b. Commanding Officer, Navy Medicine Manpower, Personnel, Training and Education Command (NAVMED MPT&E) will ensure clinical drawover anesthesia training is incorporated into the local clinical course curricula at the NAVMEDCENs for all nurse anesthesia students.

c. Navy Medicine Specialty Leader for Anesthesiology will coordinate with the Navy Nurse Anesthesia Specialty Leader to ensure uniform implementation and compliance with the training standards in enclosures (1) through (5) at each of the NAVMEDCENs.

4. Action

a. Each NAVMEDCEN 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 NAVMEDCENs is indicated. The findings of this panel will be provided to BUMED-M3B6 for review and follow-on action.

5. Cancellation Contingency. Retain until further BUMED guidance is issued. My point of contact for questions is CDR Ivan Lesnik, Navy Anesthesia Specialty Leader, at commercial (619) 532-9913 or via e-mail: ilesnik@usuhs.mil.

D. C. ARTHUR

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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 complete and documented in individual's training jacket to attain Clinical Competency in use of the Ohmeda PAC Drawover Anesthesia Device for field administration of general inhalational anesthesia.

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

2. Completing required reading list as indicated in 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 general inhalational anesthesia while supervised 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 OR
- Unit within Operational Anesthesia Training Module

Resources

- WRAMC Drawover Training Guidelines
- Ohmeda Portable Anesthesia Complete (PAC) O&M Manual
- Required Reading
- Additional Presentations
  - Capt Baker

Drawover History

- Simple Origins (Morton and Jackson)
  - Patent no. 4,848 dtd 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 wt/cube, portable, efficient, accurate, nonspillable
  - Sturdy, simple
  - Supplemental O2 use when available
  - Nonrebreathing
  - PPV available
  - Adaptable to various agents, although ISO best
  - 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.*

Modern History

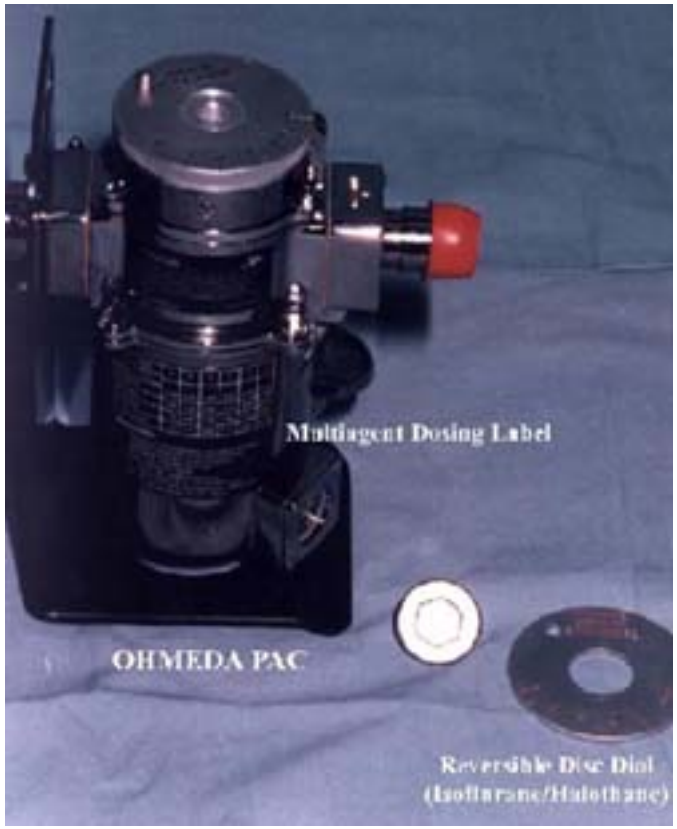
- Falklands
  - Surgical Support Team
  - Rudimentary Monitoring
  - Ventilation (Mechanical vs. “The Band”)
  - Intangible Force Multiplier
  - Triservice Device
  - Brit definition of Battle Anesthesia
  - Time to Presentation
  - Primary Agents: Ketamine/Volatile
  - Supp O2

O&M Manual

- Device Description
- Operating Characteristics
- Preop Checklist
- Performance Data

General Description

- Multiagent
- Variable bypss
- Nonrebreathing
- 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 CO2 Absorbent required
- O2 Supplementation available but inefficient (concentrator vs. compressed)

O2 Supplementation

- No compressed gas required
- Reservoir Tube (42” or 60” optimal)
- FIO2 Determination
  - O2 Flow rate
  - Minute ventilation
  - Reservoir Volume

O2 Conservation

- Not required with Concentrator
- Can be accomplished if close attention paid to flow rates, respiratory rates and O2 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 (Iso only for USN)

Vaporizer Performance

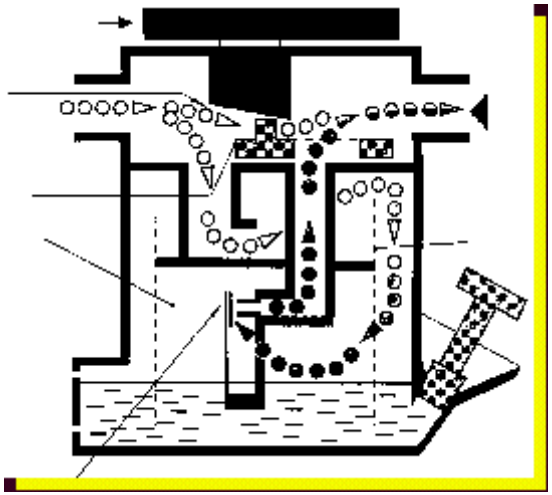
- Flat Performance Curve @ 3-12 L/min
- No clinically significant differences in spontaneous v assisted ventilation
- Performance consistent to 35 C, then potentially hazardous excessive delivery possible
- Outlet check valve – prevents pumping effect by any source of back pressure

Vapor Consumption

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

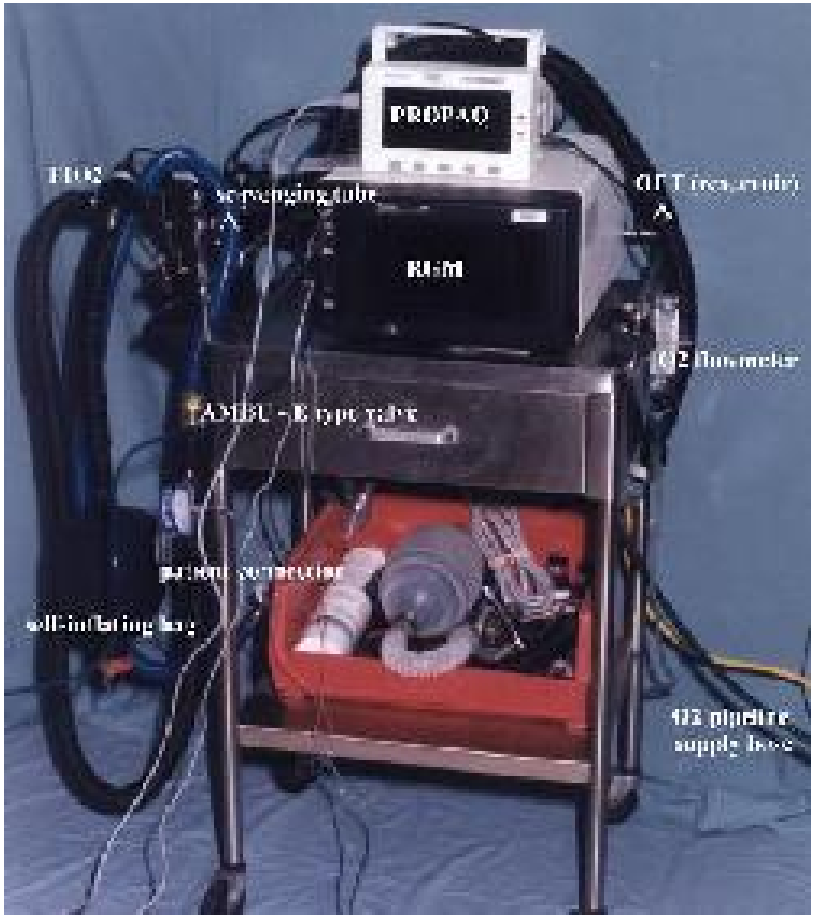
Spill Proof

- 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 O2
- Scavenging



Monitoring

- ASA Standards
  - Blood Pressure
  - EKG
  - Thermometer
  - Capnography
  - Pulse Oximetry
  - Oxygen Analyzer
  - Stethoscope

Drawover Disadvantages

- Lack of O2 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 (pre-op checks, filling, setup, cleaning, packing)
- Required supplemental reading
- Simulated patients
- OR Competency

Required Reading List

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

Journal Articles

- Drawover Anaesthetic Systems. Factors Determining Inspired Oxygen Concentration. Mackie, AM, Anaesthesia, 1987 Mar; 42(3):299-304
- Experience in Third World Anesthesia: Peacetime Training for Operational Deployment. Whitten, CE, Military Medicine, 1988 Dec; 153:629-632
- Historical Perspective on the Evolution of Today's Military Field Anesthesia Machine. Petty C, Military Medicine, 1990 Feb; 155:66-71

Journal Articles (cont.)

- Drawover Anesthesia. Olson, KW et al, Anesthesiology Review, 1990 Jul/Aug, 17(4):19-29
- 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
- Clinical Evaluation of Pushover Mechanical Ventilation with Ohmeda Universal Portable Anesthesia Complete Vaporizer. Hawkins JK, Ciresi SA, Military Medicine, 1998 Mar; 163:164-8

Journal Articles (cont.)

- Sevoflurane Concentration Available from the Universal Drawover Vaporizer, Pylman ML, Teiken PJ, Military Medicine, 1997 Jun, 162:405-6
- Airway Pressure Effects on the Performance of the Ohmeda Universal Portable Anesthesia Complete Vaporizer with Push-Over Mechanical Ventilation. Hawkins, JK, Ciresi, SA, Military Medicine, 1998 Aug; 163:540-3
- 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 VAPORIZER COMPETENCIES AND TRAINING CHECKLIST

The below must be completed prior to using Drawover in the operating room setting.

	Initials	Date
1. Trainee has received the lecture material and video on drawover vaporization.	_____	_____
2. Trainee has demonstrated 100 percent competency in the standard field setup of the drawover vaporizer as per instructional video and didactic materials.	_____	_____
3. Trainee has demonstrated 100 percent competency in the operating room (OR) setup of the drawover vaporizer per the UPAC manual's prescribed setup and departmental standard operating procedures (SOP).	_____	_____
4. Trainee has completed the drawover vaporizer written test with 80 percent or greater of the questions correct.	_____	_____

Note: Once all the above competencies and training have been met and signed off by qualified staff, that individual is determined to be competent to perform cases in the MOR under direct supervision.

Trainee has completed 10 OR cases under direct supervision.	_____	_____

Note: After 10 cases have been completed under direct supervision without any evidence of the need for training remediation the individual will be determined to be competent to perform general anesthetics utilizing a drawover vaporizer per departmental SOP.

Check One

____ Trainee is a Resident or SRNA and is qualified in the use of the drawover anesthesia machine.

____ Trainee is a Staff Anesthesiologist or CRNA and is qualified in the use and training of the drawover anesthesia machine.

_____
Date
Head, Anesthesiology

* copy to be retained in training record

DRAWOVER ANESTHESIA TEST

1. The spillproof 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.

5. Approved sterilization of the rubber portions of the device includes all of the following except: (Continued)

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

NAVMEDCEN STANDARD OPERATING PROCEDURES (SOP)

Policy: The following outlines the clinical guidelines and operating procedure for the drawover anesthesia machine in the Main Operating Room at Naval Medical Center Portsmouth, National Naval Medical Center, and Naval Medical Center San Diego.

1. Training will be conducted for all appropriate staff and trainees on the UPAC drawover prior to it's 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 shown in enclosure (3).

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. FIO2 monitor, ETCO2 monitor, ET agent monitor, pulse oximeter, NIBP, ECG.

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 is in accordance with the manufacturer's operation and maintenance manual:

a. Assemble machine in accordance with 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.