



# Waste Anesthetic Gas Exposures in Mobile Surgery Units – NH Pensacola, Nov 2009 - Jan 2011

PDC 2012 Hampton, VA

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# WAGs in the MSUs

- MOR shut down NOV 09 – JAN 11
  - 5 operating rooms
- 2 mobile surgery units
  - Mobile Medical International Corporation (MMIC)
  - 2 operating rooms

# WAGs in the MSUs

The screenshot shows the MMIC website in a Windows Internet Explorer browser. The address bar displays the URL: <http://www.mmicglobal.com/interior.php?id=914&id=509&id=910>. The page features the MMIC logo, a navigation menu with links for Company, Products & Services, Partners, Customers, Blog, Media Center, and Contact Us, and a phone number: +1 802.748.2322. A search bar is located in the top right corner.

The main content area is divided into two columns. The left column, titled "Customers", lists various sectors: Military, Veterans Administration, Hospitals (with sub-links for Military hospitals, Private & Public Hospitals, Corrections, and International), and International. Below this list are social media sharing options (Tell a friend, Print this page, SHARE) and a "Corporate Video" section with the MMIC logo and a "Click Here to View" link.

The right column, titled "Military Hospitals", contains the following text:

MMIC's experience began in the private hospital market with the introduction of on-site Mobile Surgery Units™ for use during operating room renovations, to provide on-site surgical service during periods of operating room over capacity and to provide a surgical solution that can be used in rural outreach applications. As private hospitals utilized MMIC's units to meet their needs, military hospitals began to inquire about mobile units they could utilize to meet their needs as well.

**Pensacola Naval Hospital, Pensacola, Florida**  
During a full hospital renovation, including the surgical suites, officials at Pensacola Naval Hospital sought potential on-site solutions for U.S. code compliant surgery. Their search lead them to MMIC from whom they leased two Mobile Surgery Units™. Use of the Mobile Surgery Units™ allowed Pensacola Naval Hospital personnel to continue surgical procedures while the renovation project progressed seamlessly.

In addition to Mobile Surgery Units™ MMIC provided a climatized corridor connecting the two units to the hospital.

**Contact** MMIC to discuss your on-site healthcare delivery needs.

At the bottom of the page, there is a footer with links for Contact Us, Mission Statement, Website Use Terms & Conditions, Sitemap, and Home. The taskbar at the bottom shows several open applications, including MSU, IHPMS, and My Do...

# WAGs in the MSUs



# WAGs in the MSUs

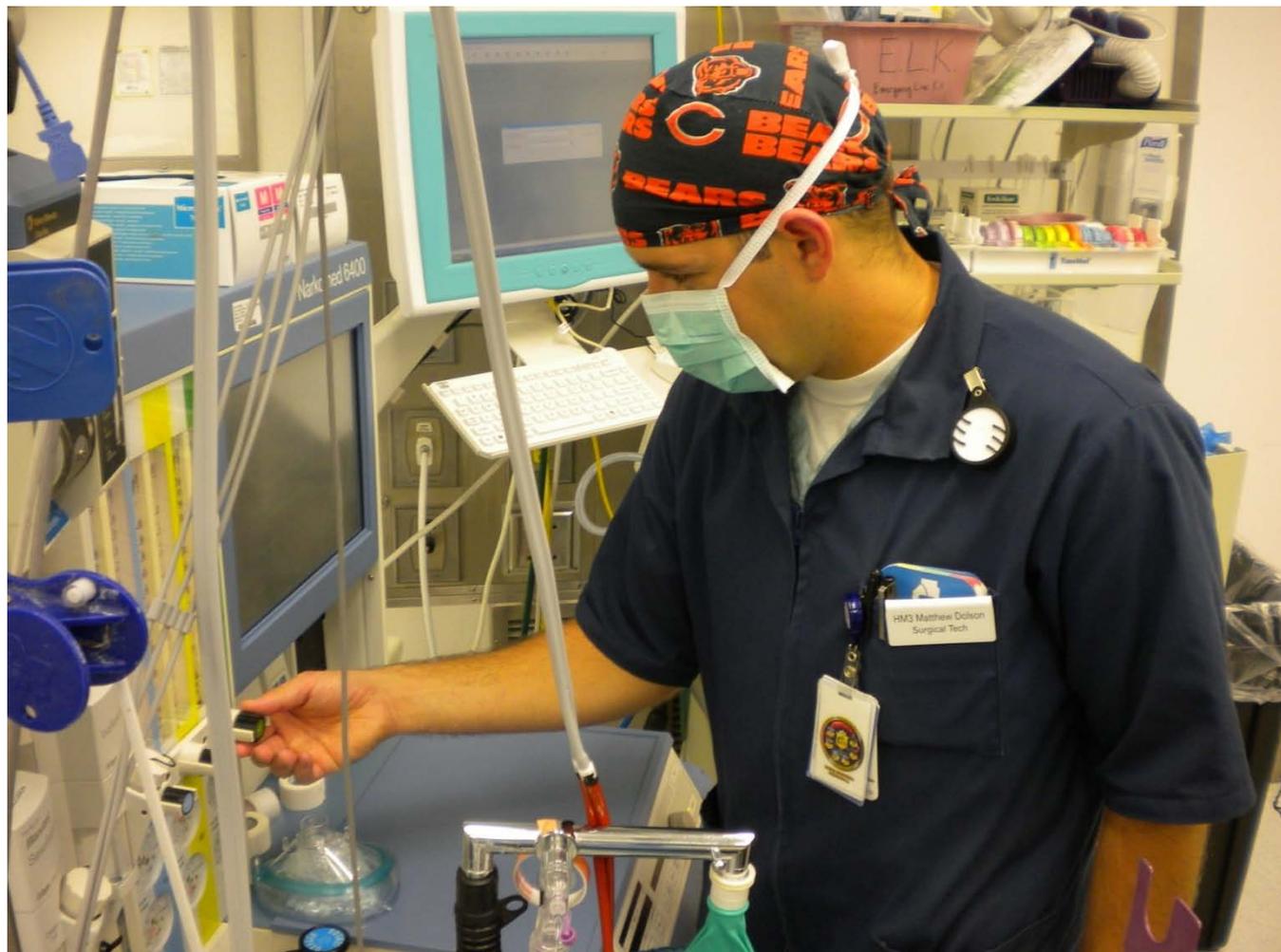


# WAGs in the MSUs

- Exposure Monitoring
  - Passive dosimeters by Sensors Safety Products
    - Nitrous oxide ( $N_2O$ )
    - Sevoflurane (Ulthrane)
    - Desflurane (Suprane)
    - Isoflurane (Forane)
- OELs
  - Nitrous oxide
    - 90 mg/m<sup>3</sup> as an 8-hr TWA



# WAGS in the MSUs



# WAGs in the MSUs

- OELs (cont'd)
  - Halogenated agents
    - 60-minute TWA
  - When used without nitrous oxide
    - Desflurane – 13.7 mg/m<sup>3</sup>
    - Sevoflurane – 16.4 mg/m<sup>3</sup>
  - When used with nitrous oxide
    - Desflurane - 3.4 mg/m<sup>3</sup>
    - Sevoflurane - 4.1 mg/m<sup>3</sup>

# WAGs in the MSUs

- Hazard Control
  - Active scavenging system
  - General ventilation
    - Exhausts without recirculation or return
    - 25 air changes/hour
    - Positive pressure

# WAGs in the MSUs

- Initial sampling DEC 2009
- Sevoflurane with nitrous oxide
  - OEL = 4.1 mg/m<sup>3</sup>
- 90 – 123 mg/m<sup>3</sup> as 8-hr TWA\*
  - Anesthesiologists, circulating nurse, surgeon
- 95<sup>th</sup>tile = 134 mg/m<sup>3</sup>

\*Yes, we usually sample halogenated agents as 60-minutes TWAs but on this day we didn't

# WAGs in the MSUs

- Nitrous oxide
  - OEL = 90 mg/m<sup>3</sup>
- Results were >180 mg/m<sup>3</sup>
  - 1 sample was 110 mg/m<sup>3</sup> on 5 JAN 10
- >180 mg/m<sup>3</sup> - >84.4 mg/m<sup>3</sup> as 8-hr TWA

# WAGs in the MSUs

- Sample data brought instant mayhem
  - Concern among OR staff for their safety
    - Shutdown the MSU?
  - OM did “town hall meeting”
  - Folks had known there was a problem since day one but didn’t communicate it

# WAGs and MSUs



# WAGs in the MSUs

- MMIC shocked at results
  - Joint investigation with NHP IH
- Scavenging systems not evacuating WAGs
  - Allowing backflow into MSUs
- Vacuum systems upgraded in JAN 2010
  - Lower static pressure losses

# WAGs in the MSUs

- Re-evaluation
  - 12 days of sampling in the MSUs
  - Halogenated agents used on 11 of 12 days
    - Collected at total of 60 samples
    - 59/60 samples < detectable
    - 14.4 mg/m<sup>3</sup> (desflurane w/ nitrous oxide on 25 AUG 2010 in MSU 2)
  - Nitrous oxide used on 11 of 12 days
    - 1 sample > 180 mg/m<sup>3</sup> (8 JUN 2010 in MSU 2)
    - All others below AL
      - 0.12 – 37 mg/m<sup>3</sup> as 8-hr TWA

# WAGs in the MSUs

- The unexplained
  - Seemingly random high values
  - Overall higher values of H<sub>2</sub>O
- Trust, but verify
- The deckplate