

OCCUPATIONAL HAZARDS TO ANESTHESIOLOGISTS

Samuel Wald, M.D.
 Clinical Professor
 Department of Anesthesiology
 David Geffen School of Medicine at UCLA

DISCLOSURES:

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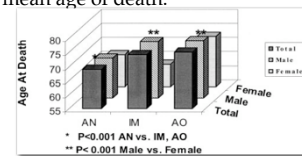
OCCUPATIONAL HAZARDS OF ANESTHESIA VESSEY AND NUNN BMJ 1980

- Halothane and N2O main focus
- Increased risk of abortion secondary to N2O
- Inconclusive evidence on B12 effects
- Suggest effective scavenging
- No consistent increase in cancer
- Increased risk of death from suicide

DO ANESTHESIOLOGISTS DIE YOUNGER?

PHYSICIAN MASTER FILE (AMA AND NON-AMA-2100 PRIMARY SOURCES)

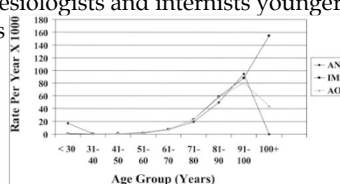
- 21,336 deaths in years 1989, '90, '95, 2000-1
- 3 Groups compared for mean age of death:
 - Anesthesia- 69
 - Internal Med- 74
 - All Others- 75
- All Physician- 75
- Women 72 younger than Men 75
- Same gender risk for all 3 groups



Katz A & A
 2004

AGE-SPECIFIC DEATH RATES

- No difference 31-80
- <30 Mortality ↑
- N=2
- Living anesthesiologists and internists younger than all others



ANESTHESIOLOGIST CAUSE-SPECIFIC MORTALITY

- Anesthesiologist vs. Internists-Physician Master File used
 - 40,000 vs. 40,000 (out of 136,000)
 - 66.5 years vs. 69.0 years
- Also compared to general population
- Physicians have better overall health EXCEPT
 - Accidental poisoning: male anesthesiologists
 - Probable related to substance abuse (per K. Domino)
 - Suicide: female anesthesiologists

Alexander Anes 2000

WHAT ARE THE RISKS TO ANESTHESIOLOGISTS?

- Suicide (50% excess risk)
 - Double for drug-related
 - Greatest difference in first 5 years post-grad
- HIV (80% increased risk)
- Hep B
 - HIV and Hep B both primarily in males which may indicate lifestyle
- Cerebrovascular Disease
- NOT CANCER OF ANY TYPE
- External Causes (boating, plane, falls)

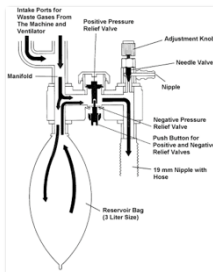
WHAT ARE THE HAZARDS?



- "Toxic" Exposure
- Infection
- Substance Abuse

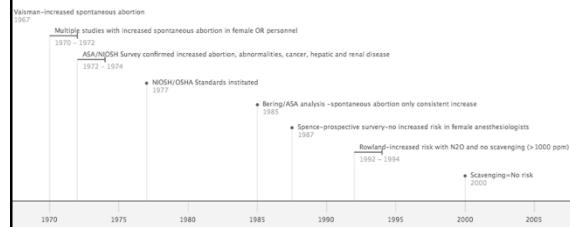


ANESTHESIA GAS EXPOSURE



- All Modern Inhalation Agents:
 - Not Mutagenic
 - Not Carcinogenic
 - Reproductive Effects
 - Nitrous Oxide ??!

History of Occupational N2O Exposure Research



<http://www.cdc.gov/niosh/noxidair.html>

Mcgregor Mayo Clin Proc 2000

RESPONSE BIAS: SURVEY AND COLLECTION OF INFORMATION ABOUT NON-RESPONDENTS IN A SWEDISH TOWN OF 50,000 USING HOSPITAL ARCHIVES ON OB WARD

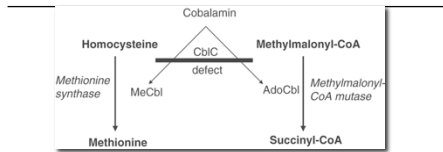
- Many previous studies did not take maternal age and smoking into consideration
 - Response rates may be too low
 - Women who had induced AB less likely to answer survey
 - Selection of pregnancies for anesthesia -exposed women
 - Under-reporting of miscarriage non-exposed women
 - No difference in miscarriage rate with anesthesia gas exposure
- Axelsson Int J Epid 1982

SHIFT WORK, N2O AND SPONTANEOUS ABORTION

- 4000 Swedish Midwives surveyed
 - N2O by mask during deliveries
- ONLY increased risk were pregnancies during STAFF SHORTAGES
 - Night work for first pregnancies only
- No Association with N2O

Axelsson Occup Environ Med 1996

N2O EXPOSURE



- N2O oxidizes B12 (Cobalamin) to inactive form
- Metabolite is methionine synthetase cofactor
 - homocysteine-->methionine
- Increase in homocysteine indicates cobalamin deficiency/biomarker of N2O exposure

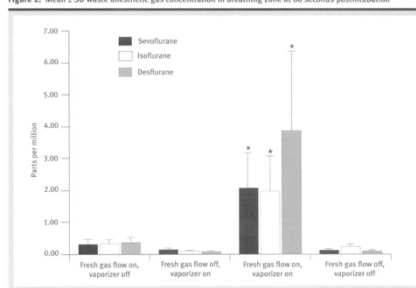
N2O EXPOSURE

- Surgical Nurses vs. Control (N=195)
- Lower B12 levels
- Increased Homocysteine levels
- No affect on CBC values
- Only effect in OR without modern ventilation
- Volatile agents all below NIOSH standards

Krajewski BJA 2007

POLLUTION AND ANESTHETIC TECHNIQUE AT INDUCTION

Figure 2. Mean ± SD waste anesthetic gas concentration in breathing zone at 60 seconds postintubation



* P < .005 compared with the other 3 techniques.

Barberio AANA Journal 2006

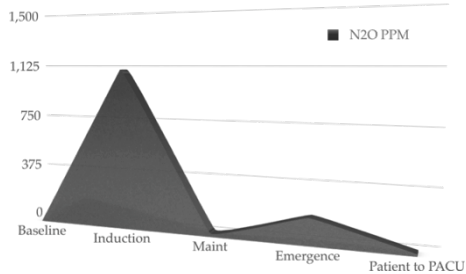
PEDIATRIC GAS EXPOSURE

- Evaluated Room, Breath, BLOOD, URINE Levels
 - Immediately after induction
 - Sevoflurane and Nitrous oxide
- N=5 is Heme/Onc, Dental, MRI, Day Surg
- No control for airway device or induction type
- No influence of airway device or induction
- Sevo always below limits
- Nitrous above limits but magnified by no scavenging and non-circle system (t-piece)



Raj Anaesthesia 2003

MORE PEDIATRIC ANESTHESIA EXPOSURE



Chang Industrial Health 1997

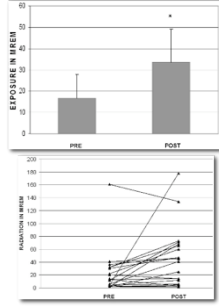
RADIATION EXPOSURE

- Minimal Exposure at > 36"
- Cellular injury in cumulative and permanent
- No defined lower threshold
- ALARA (as low as reasonably achievable)



RADIATION EXPOSURE

- Exposure 6 months v. 6 months after (212 cases) in 30 ACP-apron+screen
- Departmental Exposure DOUBLED with opening of EP lab
- Well below occupational limits of 5000 mrem/year



Katz A&A 2005

OR FLUOROSCOPY



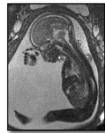
- Dosimetry badges placed at usual positions of operating room team
- 12-60 inches and 1-10 minutes of continuous radiation at Neck and Waist level
 - 3 brands in vertical/inverted position (at floor)
- "Anesthesiologist" at 60 inches Zero radiation
- Up to 10 minutes continuous fluoroscopy
- "Scrub Nurse:" at 36 inches Zero radiation
- "Surgeon" exposure at 24 inches

Mehlman Journal Orthopaedic Trauma 1997

MRI



- Baker 1994 3-year hearing follow-up
- Known congenital anomalies
 - 0.5T n=20 no increase in disability
 - no hearing loss
- Myers 1998 IUGR analysis
 - n=74 Normal pregnancies
 - 0.5 T lower birth-weight but shorter gestation
 - OB reviewed all scans → Increased Induction (17% vs. 11%)



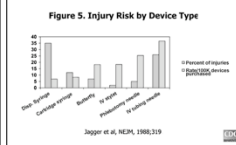
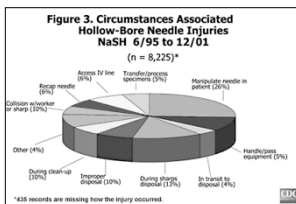
PERCUTANEOUS INJURIES: ANESTHESIA PERSONNEL

- 9 Hospitals and 58 percutaneous injuries
 - 14 attendings 42 residents 2 CRNAs
 - 39% contaminated
 - 86% hollow bore
 - 55% preventable
 - 100% NO SAFETY DEVICE

HIV 0.3% HBV 37% HCV 2%

Greene A&A 1996

CDC DATA ON PI



<http://www.cdc.gov/sharpssafety>

NEEDLE-STICK MANAGEMENT

- Report all exposures to Occupational Health
- Know your HBV, HCV and HIV Status
- 90 day wait option-HIV
- Exposure events: Employment plus 30 years
- <http://www.mednet.ucla.edu/Policies/policies.asp>



NEEDLE-STICK PROCEDURE AT UCLA

- Wash with soap and water
- No evidence that antiseptics or expression fluid reduces risk of blood-borne viral transmission
- Report to Occupational Health with Industrial Injury Referral form from Supervisor
 - M-F 0730-1630 or Emergency Department
- Post-exposure prophylaxis within 1-2 Hours
- Consent and Lab Testing of Source
- ED - No baseline testing for HCW
- Follow-up evaluation NEXT WEEKDAY

HEPATITIS B AND HIV PROCEDURE

- If not vaccinated-vaccine is given
- HBsAg Positive source and unvaccinated HCW, HBIG is given
- Vaccinated HCW given anti-HBsAB testing
- Evaluation of incidence to transmit pathogens
- Evaluation of source for risk factors
- High risk s
- ource for HIV = Post-exposure prophylaxis
 - 2-drug or 3-drug regimen

HIV PROPHYLAXIS

- Truvada (tenofovir plus emtricitabine)
- Combivir [Pregnancy] (zidovudine plus lamivudine)
- Expanded Kaletra Added (lopinavir/ritonavir)
- Post-exposure prophylaxis d/c if source is HIV antibody negative
 - rapid HIV test is <2 hours
 - Re-test at 6 wks, 12 wks, 6 months

PREVENTION

Many needlesticks and other cuts can be prevented by using safer techniques (for example, not recapping needles by hand), disposing of used needles in appropriate sharps disposal containers, and using medical devices with safety features designed to prevent injuries. Using appropriate barriers such as gloves, eye and face protection, or gowns when contact with blood is expected can prevent many exposures to the eyes, nose, mouth, or skin.


Information from the
Centers for Disease Control and Prevention
National Center for Infectious Diseases
Division of Healthcare Quality Promotion and
Division of Field Epidemiology


For additional brochures contact:
The Public Health Foundation
877-668-2282 (toll free)
or <http://bookstore.cdc.gov>

Updated July 2003

Exposure to Blood

What Healthcare
Personnel Need to
Know





[http://
www.healthsystem.virginia.edu/internet/epinet/
safetydevice.cfm](http://www.healthsystem.virginia.edu/internet/epinet/safetydevice.cfm)

[http://www.cdc.gov/ncidod/
dhqp/wrkrProtect_bp.html](http://www.cdc.gov/ncidod/dhqp/wrkrProtect_bp.html)

SUBSTANCE ABUSE



PHYSICIAN SUBSTANCE ABUSE

- Anesthesiology has the highest incidence of substance misuse
- Immediate access to Potent Drugs
- Small amount required for effect so easy to divert at first
- Possibly higher reporting because of vigilance of specialty to address the problem
- Occupational Stress
- Self-prescription/Self Treatment
 - “Sign of Weakness” to ask for help

ADDICTION IN ANESTHESIOLOGISTS

- 1988-Anesthesiologists 12% physicians in treatment for chemical dependence, but represented 4% all US physicians
- 1999-represent 6.1% treated physicians vs. 3.5% physician population

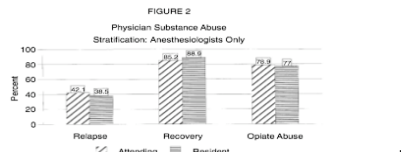
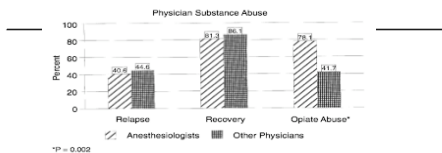
Gallegos QRB 1988 Paris J Add Dis 1999

ADDICTION IN ANESTHESIOLOGISTS

- Impaired Anesthesiologists are more likely:



SUBSTANCE ABUSE: ANESTHESIOLOGISTS V. OTHER PHYSICIANS



32 anes v 36 controls

Paris J Add Dis 1999

(13 residents)

ABUSE LIABILITY ANESTHETIC DRUGS

	Animals	Drug-Abusing	No Abuse
Mu Agonist	++	++	+
Mixed Agonist	++	+	-
Benzodiazepine	++	++	±
Barbiturate	++	++	-
Propofol	?	NT	+
Ketamine	++	NT	-
Inhaled	++	NT	±
Cocaine	++	++	NT
Lidocaine	-	-	NT
Alpha-2	++	+	NT
Anti-ACH	?	NT	-
Anti-Histamine	++	?	-
Ephedrine	?	++	-
Ondansetron	-	NT	NT

Zacny Anesthesiology 1999

•SUBSTANCE ABUSE IN ACADEMIC ANESTHESIOLOGY PROGRAMS

Survey 133 US training programs (Chairs) with 93% response for 1990-1997

- 167 anesthesiologists identified
- 133 residents and 34 faculty
- 1% of all faculty 1.6% of all residents
- same rate as earlier study by Ward in 1980 (0.9% / 1.3%) and Menk (2%) but included ETOH
- 18% required resuscitation or died prior to identification
- 69% had mandatory education - No difference in incidence
- Increase in regulation, control and accounting procedures per Chairs

Booth A&A 2002

Table 1. Operating Room Drugs Reported as Abused by Residents and Faculty (Raw Numbers)

Drug	No. Residents	No. Faculty
Fentanyl	73	16
Sufentanil	12	4
Cocaine	7	2
Nitrous oxide	5	0
Meperidine	3	0
Midazolam	3	0
Diazepam	2	1
Ketamine	2	1
Halothane	2	0
Propofol	1	1
Others	23	9

Others indicate either drugs not listed or drugs reported by class, e.g., opioids, narcotics, or benzodiazepines.

Booth A&A 2002

PROPOFOL: A "NEW" PROBLEM?

- 100% Response of 126 US Departments in 2006
- 18% departments (23): 1 or more in past 10 years
- 7 deaths (6 residents, 1 technician)
- Overall Mortality 28%, Resident Mortality 38%
- 0.10% incidence for all personnel for 10 years
- 12% returned to anesthesia (14% physician return)
- 71% no regulation and correlates with abuse

Wischmeyer A&A 2007

SUBSTANCE ABUSE, SUICIDE AND MORTALITY

- 10 year incidence of suicide is 0.15%
- Similar to Propofol abuse
- Incidence of successful suicide increases with age
- Drug-related deaths decrease with age
- Regulation may not decrease abuse
- Increased and strict federal laws against abuse of opioids and benzodiazepines, incidence is relatively unchanged

REENTRY INTO ANESTHESIOLOGY

- 159 Training programs with 71% response in 1988
- Opioid (73%) -5 presenting with death
- 34% reentry of residents
- 66% relapse within 2 years
 - 16% mortality
- 15% relapse after training
- Non-opioid (21%) -4 presenting with death
- 70% reentry (p<0.01)
- 30% relapse
 - same mortality
- ETOH 100% success with reentry

Menk JAMA 1990

RELAPSE RISK FACTORS

11 years of data from Washington PHP
1991-2001 All Physicians

- N=300 (entry after relapse excluded)
- 22 of 27 Anesthesiologists -Fentanyl
- 85% same drug used in relapse
- Risk of relapse decreases with increased time in treatment (>5 years=100% in medicine)
- Only 5 of 22 Anesthesiologists (Fentanyl) returned without relapse
 - increased risk of relapse with return to anesthesiology
 - psychiatric illness and family history are also significant predictors of relapse
 - opioid without psychiatric illness-->NO INCREASED RISK

Domino JAMA 2005

RELAPSE RISK FACTORS : NOT JUST THE SUBSTANCE

Table 5. Multivariate Model of Relapse

	Hazard Ratio (95% CI)*	P Value
Family history of substance use disorder	2.29 (1.44-3.64)	<.001
Major opioid and dual diagnosis		<.001
No major opioid and no dual diagnosis	Reference	
Major opioid with dual diagnosis	5.79 (2.89-11.42)	<.001
Major opioid without dual diagnosis	0.85 (0.33-2.17)	.73
Dual diagnosis without major opioid	1.71 (1.01-2.90)	.05

*Hazard ratios (H-Rs) and 95% confidence intervals (CIs) for combinations of risk factors not noted in the table include family history plus major opioid plus dual diagnosis (H-R, 13.25; 95% CI, 5.22-33.59), family history plus major opioid (H-R, 1.95; 95% CI, 0.65-5.83), and family history plus dual diagnosis (H-R, 3.94; 95% CI, 1.74-8.95).

Domino JAMA 2005

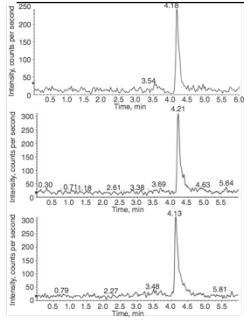
AN INTERESTING THEORY

- Second Hand Exposure
- Propofol and Fentanyl Aerosolized
- Environmental Exposure and Sensitization Theory
- Does this affect first use and relapse rate?



Gold J Add Dis 2006

AEROSOLIZED FENTANYL



Cardiac OR

Expiratory Circuit

Sharps Box

CONCLUSIONS: SOME OLD ADVICE



- "An ounce of prevention is worth a pound of cure" -Henry de Bracton