Special Article

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Anesthetic Pollution in the Operating Room:

A Notice to Operating Room Personnel

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WITHIN THE PAST DECADE, epidemiologic studies in man and laboratory studies in animals have strongly suggested that chronic exposure to trace levels of anesthetic gases may constitute a health hazard for operating room personnel.[1–6] The data are by no means unequivocal, however, and several investigators have pointed out weaknesses in these studies, such as poor experimental design, inappropriate statistical analysis, and inability to establish cause–effect relationships. It has also been pointed out that other factors, such as the stress of the surgical environment, may contribute to some of the suspected disease entities.[7–9]

While controversy remains, the epidemiologic and animal data are sufficiently suggestive to cause concern. This issue has aroused the interest of a number of national agencies, in particular, The National Institute of Occupational Safety and Health (NIOSH), The Occupational Safety and Health Administration (OSHA), and the Joint Commission on Accreditation of Hospitals (JCAH).

At present a Criteria Document[10] compiled by NIOSH is being reviewed by OSHA in anticipation of promulgation into law. This document reviews the health hazard data and outlines means for the decrease in trace gas levels, which include scavenging of excess anesthetic gases, procedures for equipment maintenance, and trace gas monitoring. Current scavenging systems, coupled with an effective equipment anti-leak maintenance program, can decrease and maintain trace gas levels in the operating room at quite low levels.[11,12] Trace gas monitoring technology is also currently available to document adequate control.[13]

The Criteria Document also considers the care of operating room personnel. Exposed workers would receive notification of the potential health hazard by means of personal letters and posted notices. Preemployment and yearly physical examinations, laboratory tests, and questionnaires would also be requirements. Records would be kept for a 20-year period. These proposals, however, involve significant expense at a time when hospitals are already burdened with rising costs and marginal budgets. Additionally, yearly questionnaires and physical examinations may represent an invasion of privacy to some individuals.

We believed that a modification of the Criteria Document proposals would be appropriate. Our approach would not create undue expense at a time when the health hazard data remain equivocal, yet it would fulfill a moral obligation on our part to notify operating room personnel that a potential health hazard may exist consequent to trace anesthetic gas exposure. After consultation with hospital administrators and directors of the various departments involved, a letter (Appendix) was sent to members of the nursing, surgical, anesthesia and operating room housekeeping staff of The Hospital of the University of Pennsylvania. The purpose of the letter was to make personnel aware: that they might be exposed to a health hazard in the operating room; that every effort was being made to limit their exposure; of whom to contact or the literature to consult for further information; that they have the option of working in an area where they would not be exposed to trace levels of anesthetic gases, if they so desire. An acknowledgement sheet and a questionnaire form accompanied the letter.

Of 408 letters mailed, 400 elicited responses (98 per cent response rate) from persons currently actively practicing in or employed by the hospital. Nonrespondents consisted primarily of physicians who were courtesy members of the staff and seldom if ever used the operating rooms. Questionnaire responses are tabulated according to specialty (table

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Table 1. Percentages of Positive Responses (400 Responses = 98 Per Cent Response Rate)

	Work Specialty			
	Anesthesia	Surgery	Nursing	Housekeeping
1. Were you aware that a health hazard may exist secondary to working in the operating room?	100	93	85	38
2. If so, were you concerned about it?	76	38	45	30
3. Has this letter greatly alarmed you?	0	38	55	40
4. Do you plan further reading or discussion?	63	7	59	75
5. Would you consider changing your work area for health purposes?	6	3	23	14

1). Most of the literature on chronic exposure to anesthetic gases as a potential health hazard has appeared only in the past five years; however, problem awareness by personnel was quite high, with the exception of the housekeeping staff.

We wanted to determine the respondents' levels of concern prior to receiving the letter and whether the letter itself had generated undue worry. While a significant number of respondents expressed concern, few indicated that they would seek employment elsewhere; 90 per cent of those who considered work elsewhere sought it only for the duration of a pregnancy. In a comment section, 13 per cent of respondents expressed appreciation for being informed and for our interest.

In conclusion, in an institution where an active pollution control program has been in effect for several years, 85–100 per cent of personnel with the greatest exposure to trace gases were aware of the potential health hazards. The notice was well received and did not appear to generate undue alarm. However, institutions with a less visible anti-pollution program may have to deal with a lower awareness level and may encounter more anxiety in response to such a notice. In the absence of firm health-hazard data or specific governmental agency guidelines, this letter might serve as a model for other concerned institutions to use in informing operating room personnel of the potential health hazards resulting from chronic occupational exposure to anesthetic gases.

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Appendix

Personnel Notice

Department of Anesthesia
Hospital of the University of Pennsylvania

Notice to Employees on the Potential Health Hazards Associated with Occupational Exposure to Anesthetics

Our concern about your health and the quality of our environment requires that we periodically bring to your attention the suspected occupational hazards associated with working in anesthetizing locations such as the operating room.

Large epidemiologic survey studies suggest that women

who work in the operating room have a very slightly increased incidence of spontaneous abortion, birth defects in their children, and cancer; in addition, there appears to be a very slightly increased incidence of birth defects in children born to the wives of male anesthetists. Hepatic disease may occur more frequently in both men and women working in the operating room.

While chronic occupational exposure to trace concentrations of anesthetic gases is a suspected cause of these disease entities, the experimental evidence in animals is equivocal. Thus, conclusive proof of cause is not presently available. Indeed, other factors such as the stress of working in the operating room have also been proposed as causes of these health hazards. For those interested, a list of pertinent references is attached for further reading.

Fortunately, anesthetic exposure can be reduced substantially. A comprehensive protection program is in effect in all of our surgical and obstetric operating rooms: equipment maintenance has reduced leakage to a minimum; excess anesthetic circuit gases are captured and vented at a point where no personnel exposure occurs; and the operating room air is frequently monitored to document that the trace gas control program is effective and that low levels really are being maintained. The National Institute for Occupational Safety and Health (NIOSH) has proposed maximum target levels of 25 ppm for N_2O and 0.5 ppm for halothane or other halogenated agents. The average concentrations measured in our operating rooms are routinely well below these levels.

A question frequently raised is whether women who are pregnant or who are contemplating pregnancy should work in the operating room. A definite answer cannot be given, and the data are not strong enough to remove categorically all women who are at risk of obstetric mishap from the operating room. One would be most concerned, however, about women in a high-obstetric-risk category, such as those with a history of frequent abortions, or those who previously gave birth to children with birth defects. With the above factors in mind, we have attempted to make our operating suites as safe as possible by our concerted efforts to hold anesthetic exposure to a minimum. However, no "safe" exposure level below which we can be sure that adverse effects will not occur has yet been identified.

You must decide whether to accept the potential risks of working in anesthetizing areas. Should you have any questions or concerns, we urge that you consult Dr. Lecky, a member of the Anesthesia Department, who is especially interested in this matter.

If you strongly prefer not to have any exposure to trace gases, then you might request to work only in rooms where regional or local anesthetics are given, in the recovery room, or elsewhere in the hospital. The senior staff in the Anesthesia, Surgical, Nursing and Housekeeping Departments have made, and will continue to make, every effort to accommodate the wishes of concerned persons.

While the health hazards we alluded to, if they exist, occur rarely, we do anticipate that we will be required by law to notify all exposed personnel periodically and to maintain records that they have been notified. To show that you have received and understand this notice, then, please sign the last page and return it to us in the enclosed envelope as soon as possible.

Thank you for your cooperation.