Evaluation of the tip revealed a tear in the cuff and a portion missing. The nasopharynx and left nasal cavity were examined, and it was discovered that one of the K-wires had inadvertently pierced the left nasal cavity. The cuff may have been caught and torn by the K-wire during the process of removal. The remainder of the cuff was retrieved from the nasopharynx. The patient was extubated in the operating room without complications.

The primary concern in this case was in noticing and recovering the torn portion of the stethoscope cuff quickly prior to possible aspiration into the airway. Several recommendations can be made in regard to this problem: 1) surgeons should direct the K-wires away from the nasal airway; 2) if the monitoring device does meet resistance during removal, the surgeons should be notified to rule out the possibility of the K-wire piercing the nasal cavity; 3) at the termination of anesthesia, the esophageal stethoscope should be removed before extubation, and examined carefully, and any missing part should be recovered immediately; 4) placement of a radiopaque marker on the cuff could be useful in locating and retrieving a missing part.

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# Potential Effects of an Unknown Gas on Mass Spectrometer Readings

*To the Editor:*—In their Clinical Report "Misleading Mass Spectrometer Readings Caused by Aerosol Propellant,"[1] the authors demonstrate what happens when an unknown, unmeasured gas is introduced into a fixed collector mass spectrometer. I would like to comment further on this problem and offer some additional information.

As mentioned by the authors, an unknown, unmeasured gas introduced into a fixed collector mass spectrometer will cause erroneous readings if ionized fragments from that gas hit one or more of the standard collectors. In addition, the sum of the observed partial pressures can be driven greater than the local barometric pressure.

TABLE 1. True Gas Concentrations *vs* Percent of an Unknown Gas

| | True Concentrations | | |
|---|---|---|---|
| Percent Unknown | Percent $O_2$ | Percent $N_2O$ | Percent Isoflurane |
| 0 | 50 | 47.0 | 3.0 |
| 10 | 45 | 42.3 | 2.7 |
| 20 | 40 | 37.6 | 2.4 |
| 40 | 30 | 28.2 | 1.8 |
| 60 | 20 | 18.8 | 1.2 |

The Perkin-Elmer® mass spectrometer uses three separate collectors for the three anesthetic agents so that one can be differentiated from the other. As a result, the propellants, a combination of chlorofluoro-hydrocarbons, similar in chemical compositon to the anesthetic agents, were detected by the instrument.

A more important problem, however, is the fact that when an unknown, unmeasured gas is introduced into any fixed collector mass spectrometer that computes the percentage or partial pressure of each gas by referencing it to the sum of all gases measured, all the gas readings will be in error. They will be too high because the total volume of gas has not been considered. (The referenced Chemetron SARA® and Perkin-Elmer® mass spectrometers are both fixed collector instruments.)

It is not known what the absolute concentration of the propellant was when the author's readings were taken but we assume that the instantaneous value of the aerosol in the circuit could be quite high when first administered. Table 1 illustrates the actual concentrations that would

be present for 50% $O_2$, 47% $N_2O$, and 3% isoflurane when various amounts of an unknown gas are introduced into a mass spectrometer but are not detected. In other words, the instrument would read 50%, 47%, and 3% respectively, but the true concentrations would be as indicated.

In both of the above cases, the algorithm of the mass spectrometer cannot correct for the unknown gas unless a specific collector and the appropriate correction circuits are used.

I suggest it was fortuitous that the authors had an indication that the readings were erroneous but agree that the best way to avoid the problem altogether is either not to dispense the medication (or any other foreign gas) while the mass spectrometer is sampling or to not use the readings for 4–5 s after administration.

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63:725, 1985

# A Portable C-Pram® Circuit

*To the Editor:*—Ambu-bags have been universally used during transport of intubated patients after surgery and for short procedures, *e.g.*, ECTs and PDA ligations. A better system is to connect a C-Pram® circuit (Bain) to a portable oxygen cylinder (fig. 1). It has certain advantages, namely, a patient's chest compliance is better appreciated (a pressure manometer is part of the Bain arm), a disconnect is readily detected by observation of a collapsed rebreathing bag, positive-pressure ventilation is easily synchronized with the patient's spontaneous ventilation, and movement of the endotracheal tube is minimized by the light material construction of the circuit. In cases where the inspired oxygen fraction is deemed important, *e.g.*, PDA ligations, the fresh gas flow can be connected to an air mixer. An oxygen monitor should be added to this system when it is used for brief anesthetic procedures.

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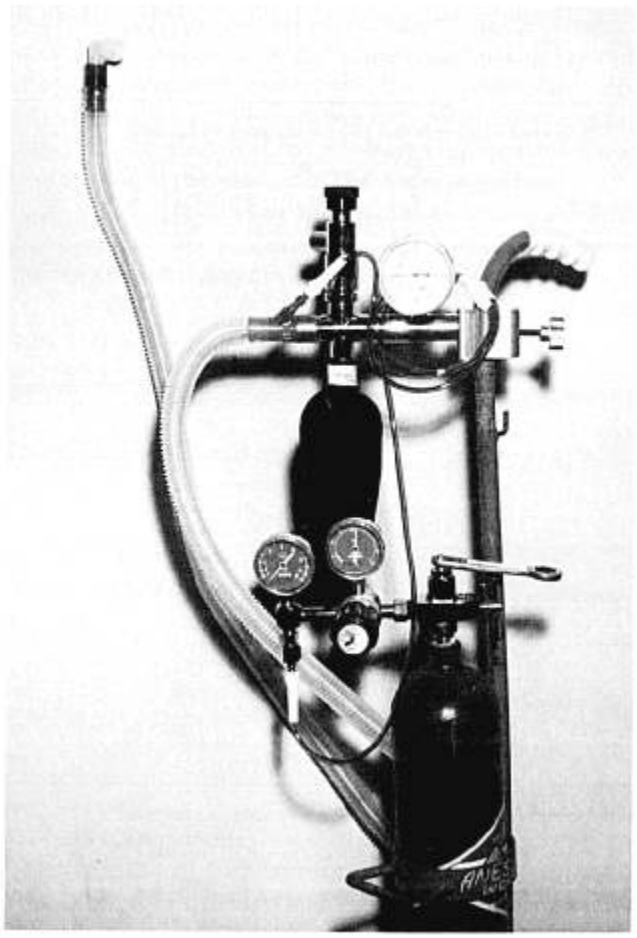

FIG. 1. The portable C-Pram circuit.