Letters to the Editor

REDUCING CO_2 INHALATION IN CLINICAL PULMONARY INVESTIGATIONS

I would like to commend the authors from the Oak Ridge Associated Universities for the NMT Gadgetry article in the December 1977 issue entitled "Reducing CO_2 Inhalation in Clinical Pulmonary Investigations." It is extremely important to recognize that the tubing, face mask, and bacteriological filter between the patient and the main stream of Xe-133 is dead space and can cause breathing difficulties, particularly in patients suffering from pulmonary disease.

In addition, unduly long patient-to-mainstream tubing will not allow the patient the full advantage of the planned Xe-133 dose. For example, a patient with a tidal volume of 500 ml, breathing through a 200-ml dead space into a xenon mainstream of 5 mCi/l will not receive the expected 2.5 mCi in the lung (0.51×5 mCi/l) but rather 1.5 mCi. This could lead to statistical problems and produce images of poor quality.

Several items in the article concern me. Specifically, the 12-in. tubing has a volume of approximately 100 cc and not the 200 cc the authors indicated. There is an additional dead space in the head valve which is 37 cc during rebreathing and 138 cc during washout. Total dead space with the 12-in. tube is then 137 cc during rebreathing and 238 cc during washout.

Radx recognized several years ago that the latter figure was borderline for ill patients and began offering a 6-in. face mask hose. This reduces the dead space to 87 cc and 188 cc, respectively, which are acceptable. We have recently redesigned the head valve entirely, which reduces the dead space to less than 25 cc in both washout and rebreathing, bringing the total to either 75 cc or 125 cc depending on the face mask tube used; these values are extremely low and should be well tolerated.

A further concern is that the modification suggested by the authors would seem to negate the rebreathing mode of operation of the Ventil-Con, thus preventing the establishment of an equilibrium state between the patient and the stored Xe-133/air mixture. We feel that this is a critical part of a lung ventilation study and rather than sacrifice this aspect, we recommend the 6-in. tube.

Determination of a system's dead space is not always obvious. Single channel tubing, face masks, and mouthpieces are always dead space. Loops to bring the xenon from spirometers, bellows, and bags may or may not be dead depending on how they are constructed. Loops are only live spaces if they are provided with a mechanism to assure unidirectional air flow. Blowers and fans are not generally adequate for this purpose. An inline one-way check valve is absolutely necessary.

A second cause of CO_2 buildup can be due to inadequate or inadequately maintained CO_2 absorbers in rebreathing devices. The Ventil-Con employs a large capacity "Bell" jar which holds 2 lb of barium hydroxide. We prefer a product called Baralyme®, Barium Hydroxide Lime, U.S.P. mesh size 4 to 8 (Chemetron Medical Products, St. Louis, MO), as it has a color indicator and changes from pink to purple when exhausted. Even this is not entirely adequate, because in low use situations the purple color fades with time. Strict attention to maintenance of inline CO_2 absorbers, or adding such capabilities if not already present, is essential to good lung ventilation technique.

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REPLY

In response to Mr. Timpe's comments regarding our article entitled "Reducing CO_2 Inhalation in Clinical Pulmonary Investigations," which appeared as a gadgetry article in the *JNMT* December 1977 issue, we wish to make the following statements.

It is gratifying to know that Mr. Timpe and his staff at Radx Corporation have indeed recognized the importance of reducing the dead air space in their Ventil-Con system as is evidenced by their replacement of the 12-in. face mask hose with a 6-in. hose. This does reduce considerably the dead air space as noted in his comments. Mr. Timpe is also correct in stating that the previously used 12-in. face mask hose has a volume of approximately 100 cc. We regret that we did not clarify that our measurement of a 200-cc volume included the dead air space in both the disposable bacterial filter and the 12-in. face mask hose as shown in Figure 2 of the article. Mr. Timpe's second concern that our "modification seems to negate the rebreathing mode of operation" was a problem to us, too. We have since made a modification that reroutes the oxygen assist line and the line from the stored xenon/air mixture (spirometer) to connect with the external check valve on the mouthpiece. Of course, the ports within the arm of the Ventil-Con, where these lines were originally connected, have been plugged. This modification has solved that problem without any increase in the dead air space in the system. The external lines are wrapped in 3-mm lead for shielding.

While we think that the Radx Ventil-Con is basically a well designed instrument, we did find it necessary to make the previous modifications in order to make the machine function more specifically toward the needs of

our patients. We simply wanted to share these modifications with our colleagues and in no way intended to degrade the design or quality of the Ventil-Con.

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THE NEED TO IMPROVE PATIENT CARE

I enjoyed reading the article by Elaine Pritchard on patient care in the December *JNMT*. From my experiences in nuclear medicine, this is certainly the one area that nuclear medicine technologists most need to improve upon. I feel that nuclear medicine technologists have shown their interest in patient care by the rousing response to Karen Clark's lectures at the last two Society of Nuclear Medicine Annual Meetings. I hope that we see more articles of this sort and that patient care lectures continue to be a part of our annual meetings.

I would also like to see patient care emphasized more in the training of nuclear medicine technologists. The American Medical Association's *Essentials of an Accredited Educational Program for the Nuclear Medicine Technologist* state that the nuclear medicine technologist "must understand and relate to the patient's concerns and fears about their illnesses and pending diagnostic procedures . . . ." It also states that the content of an accredited program must include patient care. This requirement is usually taken care of by one or two lectures during the first week of a student's training. My training made me knowledgeable of the technology and science of nuclear medicine, but I'm still learning how to relate to sick and dying patients.

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