Carbon dioxide sampling error due to leaking O-ring?

To the Editor:

We wish to report an equipment problem that led to misinterpretation of ETCO_2 measurements.

During uneventful low-flow anaesthesia, the Ohmeda 5200 carbon dioxide monitor alarmed, reporting a blocked sampling line. Investigation traced the blockage to the water filter, and this was replaced. Shortly after this replacement, it was noted that the monitor reported both an ETCO_2 concentration of 22 mmHg (instead of the previous 35 mmHg), and a nitrous oxide concentration varying between 29% and 35% (instead of 65%). Gently lifting or twisting the water filter brought the reported nitrous oxide concentration up to 65% and the ETCO_2 up to 40 mmHg (the minute volume had been reduced unnecessarily). This manoeuvre suggested that the O-rings sealing the water filter to the machine sampling pipes were at fault, allowing entrainment of air to dilute the sampled gas. Visual inspection of the joint did not reveal any obvious abnormality. As replacement parts were not available, the presence of expired CO_2 was monitored qualitatively, with intermittent quantitative measurements made by adjusting the water filter until the nitrous oxide read 65%. After an hour the gas dilution spontaneously ceased. Whether this was because the rubber O-rings had expanded sufficiently to seal the leak, or because moisture had collected in the gap is not clear.

The air entrainment led to a measurement of ETCO_2 concentration which under more exacting clinical circumstances, such as during neurosurgery, could lead to patient harm. Our observation has been reported to Ohmeda.

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Erratum

Lerman J. Study design in clinical research: sample size estimation and power analysis. *Can J Anaesth* 1996; 43: 184–91.

The calculation of ϕ for each proportion in equation 2 is based on the expression: $\phi = 2 \times \arcsin \sqrt{P}$. The factor, 2, was inadvertently omitted from the description of ϕ on page 186.