Beware! defects in pipeline supplies can occur: Be aware of this possibility after engineering work in related areas of the hospital

Sir,

Fatal accidents caused by piped gases are an ever present danger to patients in the operating room. I present details of accidental hypoxia caused by pipeline misconnection.

A child with no comorbid conditions had induction of anaesthesia using 100% oxygen and sevoflurane while an intravenous line was being secured. Cyanosis and bradycardia developed, followed by cardiac arrest. He responded to cardiopulmonary resuscitation only after the anaesthesia machine was connected to an alternative oxygen outlet in the same room. A stable circulation was achieved and spontaneous breathing resumed. He was later transferred to the nearest tertiary hospital for further care. Unfortunately, serious hypoxic brain damage became evident and the patient died after 10 days, from a respiratory infection.

The anaesthetic machine had been checked before anaesthesia started and an oxygen cylinder was provided on the machine. Although the machine was equipped with an analyser for the oxygen mixture, this was not functional. When the complications occurred, rather than switching on the oxygen cylinder, the anaesthetist involved decided to connect the oxygen pipeline to an alternative supply.

An enquiry revealed that the operating rooms had been closed for renovation before the incident. The pipeline engineers had noticed that this particular operating room (in a suite of four rooms) had the sequence of the gas outlets N\textsubscript{2}O – O\textsubscript{2} – vacuum and not the usual sequence of O\textsubscript{2} – N\textsubscript{2}O – vacuum as in the other operating rooms in the theatre suite. The room had been used previously as a recovery room and had later been converted into an operating room, when the N\textsubscript{2}O pipe-line was added. The engineers changed the sequence of the outlets to O\textsubscript{2} – N\textsubscript{2}O – vacuum and the colour coding to white – blue – yellow. However, the pipe-lines from the manifold room were not reconnected to correspond to the changed outlets and the gas composition delivered from the outlets were not checked by analysis after the renovations. The operating room management team were not informed about this change in gas outlets. In an unfortunate coincidence of errors, the O\textsubscript{2} analyser on the anaesthesia machine was not working.

After this incident, the pipeline engineers realigned the outlets with the gas pipes from the manifold room. The department arranged to have oxygen analysers with all anaesthesia machines in the operating rooms. Technical staff made sure that a full oxygen cylinder was attached to every machine.

A pipeline error caused two deaths in a teaching hospital in Japan in 1987.[1] A mistake in the labelling and identification of medical gases resulted in cross-connection of oxygen and air and caused perioperative hypoxia in Belgium in 2010.[2] In India, these incidents are rarely reported, except by the press, but are probably relatively frequent. In Lucknow, 11 neonatal incubator deaths were reported in 2001 and other neonatal incubator deaths were reported from Kurnool, AP in September 2011. Both events were alleged to be caused by misconnection of oxygen pipelines. A case of brain damage due to alleged administration of N\textsubscript{2}O instead of O\textsubscript{2} was reported in February of 2012, in a hospital in South India.
Anaesthesiologists should be aware that renovation or construction work in hospital premises or related areas may affect piped supplies of gases. Constant vigilance is required and this should be heightened when resuming work in an operating room after engineering works. An alternate source of oxygen (cylinders/O₂ concentrators) should be available in operating rooms and intensive care units. Gas supplies should be analysed at handover and the results recorded before a clinical area is accepted back into use. A working oxygen analyser should be present on all anaesthesia machines.

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**REFERENCES**