

Loss of Pipeline Oxygen Supply

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Citation

J Johner, G Rise. *Loss of Pipeline Oxygen Supply*. The Internet Journal of Anesthesiology. 2007 Volume 16 Number 2.

Abstract

A planned loss of pipeline oxygen supply in an operating room at our institution was the stimulus for our department reviewing the effect that an unplanned loss of pipeline oxygen would cause.

CASE

In October 2007, a planned loss of hospital gas pipeline supply to the University of Kentucky eye room occurred because of new construction. Therefore, wall supply of oxygen, nitrous oxide and air was unavailable. Two H-cylinder tanks, approximately 6900 L of oxygen capacity, were set up by our biomedical technicians as the primary oxygen source with a pressure regulator set at 55 P.S.I.G. between the H-cylinders and the anesthesia machine. E-tanks, approximately 2000 L capacity, already in place on the back of the anesthesia machine served as the emergency reserve. An emergency ophthalmology case was posted requiring general anesthesia. Patient details were noncontributory, and the case was completed without complication using the above set-up.

DISCUSSION

There are multiple reasons for loss of pipeline oxygen supply. Some are planned (as in this case), while others are unexpected and sometimes catastrophic. Unanticipated causes include environmental damage like fires, incidental damage from construction, obstruction from debris, depletion, deliberate tampering, and shutoff from human error.

Safety devices like the oxygen fail safe device and the oxygen supply failure alarm alert the anesthesia provider of such loss. The oxygen fail safe device shuts off or decreases supply of non-oxygen gases if oxygen supply decreases. The oxygen supply failure alarm is activated once oxygen pressure falls below a predetermined level.

Although this case report illustrates a planned supply failure, a sudden loss of liquid oxygen supply occurred at the University of Alabama in 2003. A mechanical failure of one joint on a primary tank caused the release of approximately

8,000L of liquid oxygen into the atmosphere, producing a massive cloud of water vapor and ice. This was immediately recognized and supply was restored with the back-up tank one block away without any interruption in on-going anesthetics or patient harm.

These episodes serve as a reminder for anesthesia providers to have a plan of action should a sudden loss of wall supply occur. Close attention to the anesthesia pressure gauges and alarms (particularly the fail safe valve and failure supply alarm) should promptly alert one of a sudden problem. The first plan of action is to open the emergency oxygen supply. Next, the wall supply should be disconnected in case of accidental crossover or contamination with impurities. Then, depending on the type of anesthesia machine, it may be beneficial to change to low flow anesthesia. For machines in which the ventilator is a bellows type, oxygen (Datex-Ohmeda) or an oxygen-air mix (Drager) is the driving gas. By decreasing to low flow rates and changing to manual bag ventilation, one can lengthen the duration of the existing supply of cylinder oxygen. It is also recommended to obtain an additional oxygen supply as soon as possible.

Due to safety concerns, it is obvious why training programs are using simulators to test preparedness for this type of disaster. In 2006, Lorraway et al tested twenty residents at the University of Toronto who participated in a simulated loss of pipeline oxygen supply during carotid endarterectomy. The reserve tank was empty and no help was available. This ten minute scenario was taped and reviewed by two experienced staff Anesthesiologists. Second year residents were compared with fourth-year residents on their expected key actions (n =20). Forty percent recognized the oxygen supply failure alarm; fifty percent opened the oxygen cylinder on the machine; and forty percent were able to change oxygen cylinders. The data

suggests that anesthesiology residents need more training in anesthesia machine troubleshooting.

CONCLUSIONS

Although loss of pipeline oxygen supply is a rare event, whether planned or unexpected, there may be a specialty-wide weakness in training programs on how to respond to such an emergency. Focusing on experiences from three different institutions, this review suggests that anesthesia residents need more training on how to troubleshoot anesthesia machine problems in order to ensure patient safety.

References

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