Ventilator malfunction

Sir,

In medical practice errors are common occurrence and they can lead to mortality and morbidity. They could be caused by human failure or machine malfunction. Human errors can be minimized by reporting, audit of all adverse events and feedback to the staff. However, continuous vigilance is needed, despite in-built alarms systems, to minimize machine-related errors. We present a case of ventilator malfunction in our intensive care unit (ICU), which could have caused a major catastrophe but for timely action by the staff.

A 34-weeks-gestation primigravida with eclampsia and uncontrolled seizures was shifted to our ICU. At time of admission, she was disoriented, restless, and violent. Her heart rate was 180/min and blood pressure 170/110 mm Hg. She had received therapy with magnesium sulphate, nifedipine, and phenytoin. Since the seizures could not be controlled, she was placed on mechanical ventilation using an Advent Ventilator (Erkadi systems, Bengaluru, Karnataka, India). In view of the ongoing seizures, an infusion of vecuronium was started for muscle relaxation and it was maintained for 12 h. She delivered a stillborn after induction of labor with three doses of misoprostol. Thereafter, her neurological and hemodynamic status improved.

Twelve hours after initiation of mechanical ventilation, there was sudden drop in oxygen saturation and heart rate. The patient developed sinus bradycardia and impending cardiac arrest. It was noticed that the ventilator was switched off, though all the electrical connections were intact. Ventilator was disconnected and manual ventilation started along with cardiopulmonary resuscitation. The malfunctioning ventilator was replaced as the cause of sudden ventilator malfunction could not be immediately ascertained. Patient had no neurological deficits. She was shifted from ICU on the fifth day and discharged on the eighth day.

Modern day ventilators are equipped with a variety of alarms for low oxygen pressure, inadequate volume delivery, disconnections, etc. These alarms are functional only if the ventilator is switched on. Possible reasons for ventilator failure could be inadvertent disconnection of power supply leading to drainage of battery, poor battery backup, central undetected UPS failure, and failure of the electronic components due to power surge. In the case reported, the ventilator switched off by itself although the electrical connections/supply was intact and all the above causes were ruled out.

The service engineer was called to check the ventilator and the ventilator was found to be functioning. The switching off was ascribed to a defective cooling system. Defective cooling system leads to overheating and inactivation of the thermistor, cutting off the power supply to ventilator. Activation of switch mode power supply due to voltage fluctuations may cause the ventilator to switch to internal power and in case the battery backup is poor during that time, it may switch off. Battery failure was thought to be the cause in this case and the battery was replaced.

Although the patient was not being ventilated and was in apnea, it was not recognised that the ventilator had switched off, as the ventilator did not raise an alarm. Use of end-tidal carbon dioxide monitoring may perhaps have led to early detection of the failure to ventilate and prevented the resultant morbidity. In addition to ventilator disconnection or accidental extubation, it can provide information on the cardiopulmonary status of the patient including complications such as pulmonary embolism.[1,2] The Fourth National Audit conducted in UK, found that failure to use capnography contributed to 74% of cases of death or persistent neurological injury.[3]

We recommend routine use of capnography in the ICU to help detect and prevent airway and ventilator related accident. Intense vigilance is recommended while using the above ventilator and any adverse functional feature of the ventilator should be brought to the notice of the readers.

BR Krishna Kumar, M Ravi, K Dinesh, A Nanda

Department of Anaesthesiology, Sri Devaraj Urs Medical College, Tamaka, Kolar, Karnataka, India

Address for correspondence: Dr. BR Krishna Kumar, 24/1, 6th Main, 6th Cross, Sanjaynagar, Bangalore - 560 094, India.
E-mail: krkr13@rediffmail.com

References

1. Dorsch JA, Dorsch SE. Understanding anesthesia equipment. 5th ed. Philadelphia: Williams and Wilkins; 2008. p. 708.
2. Levine RL. End-tidal CO_2; Physiology in pursuit of clinical applications. Intensive Care Med 2000;26:1595-7.
3. Cook TM, Woodall N, Harper J, Benger J. On behalf of the Fourth National Audit Project. Major complications of airway management in the UK: Results of the Fourth National Audit Project of the Royal College of Anaesthetists and the Difficult Airway Society. Part 2: Intensive care and Emergency departments. Br J Anaesth 2011;106:632-42.

Access this article online	
Quick Response Code:	Website: www.joacp.org
	DOI: 10.4103/0970-9185.86623