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Vigilance and Checking of Anaesthesia Machine is a Must for Patient Safety in Anaesthesia

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Anaesthesia machine or modern anaesthesia workstation is required to deliver O_2, anaesthetic gases and volatile anaesthetic in desired concentrations to patients.The older anaesthesia machines were completely mechanical systems that have a number of limitations and drawbacks.There are multiple exposed connections which are subject to disconnection or misconnection, kinking, or obstruction. So that even a small leaks and its flow meters makes them unfit for low flow anaesthesia. Most old anaesthesia ventilators are 'bag in bottle' double circuit machines that consume oxygen for powering the ventilator with lack of internal positive end-expiratory pressure valve. And also there were no performance feedback mechanisms in old machines [1].

Anaesthesia machines had evolved from simple mechanical pneumatic devices to sophisticated, computer-based, fully integrated anaesthesia systems. Modern anaesthesia workstation had replaced the older anaesthesia machines even in developing countries also. The need of greater patient safety and the technological innovations made the development of these newer advanced anaesthesia gas delivery systems cum patient information systems.It had physiological and other optional monitoring of the patients which provides detailed information on not only the cardiorespiratory status of the patient but also have in built high end ventilators to meet the requirement in operation theatres.

The limitations and hazards of modern workstation are continued movement of a descending bellows despite a leak or disconnection in the machine. In the ascending bellows system a small amount of PEEP transmitted to the patient during ventilation .Augmentation of tidal volume when the oxygen flush is activated in the inspiratory phase of ventilator delivered breath in machines without fresh gas delivery. Although workstation had battery backup butfunctioning depends on the electricity. Inability to detect the carbon monoxideproduction. Besidesall this, human error due to ignorance or lack of understanding or training of newer modern anaesthesia workstation and systems are always challenging [2].

For the patient safety maintenance and checking each component of anaesthesia machine and workstation daily prior to use is a must. A detailedanaesthesia machine/workstation checking involves the proper functioning of the pneumatic, electrical, electronic and other components of the machine in a systematic manner. An approach may involve checking the integrity of the high pressure, intermediate pressure and low pressure system with checking of electrical/electronic components of anaesthesia machine and its breathing circuits system. There are several international guidelines are available for anaesthesia machine check [3-5].

Manual inspection and checking the machine for leaks/malfunction is not done frequently or incompletely done. Leak test was carried out almost perfectly but other tests were not performed routinely by anaesthesiologists. Therefore an idea to putanesthesiologists under an obligation to use the check sheet before anaesthesia and file the sheet in the medical may be useful [5]. Most modern anaesthesia delivery systems perform the self-test or automatic machine check and have ability to detect and report the faults.The modern machines being more sophisticated and increasingly complex, many conventional tests of machine check cannot be applied and it is difficult for anaesthetist to determine a problem.

With the development of new workstation most of the hazards and drawbacks of older anaesthesia machines had been improved but still some are

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remaining as water vapour condensation inside the machine components, bobbins of the flow meters may get stuck to the inner wall of the flow meter (due to dirt and static electricity), possibility of leak from the selectatec system of vaporisers in the event of accidental removal of O-ring during the process of mounting or dismounting of the vaporisers [1,2].

Also new problems are also coming day to day practise such as leak or obstruction attributable to newer mechanical, electronic and electric components and gadgets. Besides human error and other factors a lot of incidents had been reported in literature regarding malfunctioning of workstations in last decades.Leakage from the vaporizer of the anesthetic machine despite the normalities on performing the initial leak test. The vaporizer of the anesthetic machine was found compressed by computer keyboard of Electronic Medical Records which caused a leak from vaporizer [6]. Complete internal fresh gas flow disconnect within a DrägerFabius GS anesthesia machine without any alarms being triggered. Despite the advent of highly automated machines, manual checkout procedures remain crucial to minimizing undiagnosed failures [7]. Broken transverse pin on the back of a Drager D-Vapordesflurane vaporiser caused significant anaesthetic machine (Datex-OhmedaAestiva 15) leak during a routine anaesthetic machine check in the morning before commencement of the day list [8]. Interruptions in the supply of breathing gas during general anesthesia caused by malposition of the DragerVapor 2000® vaporizer, which was accidentally tilted and lifted off the Selectatec manifold of the anesthesia machine. The gas-sampling tubing had become lodged in the gap between the adjustable pressure-limiting valve dial and its housing causing leak into the high end Dragger Primus anaesthetic machine, which took place despite a full machine check as per guidelines. but the leak in the catheter mount was not detected by any of these tests [9]. Adverse events are known to have occurred due to problems with tracheal tube connectors so routine testing for both integrity and leakage of catheter mounts be carried out along.During an anaesthetic machine check, yellow discolouration of liquid desflurane was seen in the D-Vapor (Draeger Medical UK Ltd.) vaporiser window due to contamination [10].

Sophisticated and advance technology demands up gradation not only of anaesthesia machines but also of doctors using it and of those who are caring them. There should be proper training before using new workstation whichstarts from self-routine test before first use. Also emphasis should be onthe manual inspection to rule out any possible malfunction before using on the patients. There should be strict institute protocols for machine check as per any of the existing guidelines and label this in medical records to see proper functioning because safety is always first.

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