Management of planned shutdown of medical oxygen pipeline system - A practical experience

Sir,

Cryogenic liquid oxygen tanks and centralised medical gas pipeline systems (MGPS) are essential components of modern-day healthcare facilities. Anaesthesiologists as ‘small engineers’ in the operation theatre, ought to possess knowledge about the MGPS existing in their facility,[1-3] and their role is often sought during maintenance work or mishaps in the MGPS.

We share our experience of successful management of planned shutdown of medical oxygen pipeline system (MOPS), undertaken to replace the existing liquid oxygen tank with a new one of increased storage capacity.

Our main concern was the inadequate support from the backup cylinder manifold system, established long before the days of the liquid oxygen plant. Previous planners had disproportionately increased the number of oxygen outlets in the system, after the installation of a liquid oxygen source, without considering the limited capacity of the backup system. With no space available now to increase the number of cylinders in the existing manifold, we had to look for alternate backup methods. The other challenge was the presence of busy critical care areas in the zones affected by the shutdown.

We formed teams with anaesthesia professionals, technicians and biomedical engineers. The roles and responsibilities of team members were clearly defined. As the plan drawing of the MGPS was not available, we traced the path of the MOPS from the source to the outlets. The source valve, main shutoff valve, floor valves and zone valves in the system were identified.

On the day of the shutdown, the teams were stationed at designated areas. The team leaders used mobile phones to ensure clear communication throughout the shutdown process.

We employed a five-pronged strategy to manage the process. Individual Intensive/Emergency Care Units were isolated by closing down the zone valves supplying that area. Back-feeding of the MOPS was done by connecting a bulk oxygen cylinder (D type) to one of the oxygen outlets in that zone. Adequate bulk oxygen cylinders were stocked in each area to meet out oxygen requirements during the shutdown period. A secondary backup measure was planned for each mechanically ventilated patient, with Bain’s circuit connected to bulk oxygen cylinders through a pressure regulator. Elective surgical procedures were postponed, and emergency surgeries were conducted with continuous replenishment of cylinders attached to the anaesthesia machines.

Adequate fire safety and mishap management measures were put in force. The shutdown process was managed in a stage-wise manner. After instituting the above backup measures, the existing liquid oxygen tank was dismantled. A new tank was installed, and an oxygen supply was initiated. The process was completed in around 6 hours.

The shutdown of the medical oxygen pipeline system is a rare event, not often reported in the literature. The crucial step in a planned shutdown is the management of uninterrupted oxygen supply to vital patient areas. Back-feeding sections of the medical gas pipeline after isolating them by closing valves either at the branch lines or zones is an accepted method. Usually, gases are back-fed through inlets placed downstream of the closed valves. In our set-up, we did not have such separate inlets. Hence, we had to use the outlet ports to back-feed each zone. Having relatively smaller internal diameter, these outlets are flow-limited and hence are generally not chosen for back-feeding. We pilot tested our strategy to ensure its effectiveness before the shutdown.

In the hindsight, we rued our failure to preserve an up-to-date plan of the MGPS. Moreover, regular mock drills of liquid oxygen shut down[4] and maintaining records of the activities, would have unearthed the deficiency in backup support cylinder manifold, beforehand. A recent article on medico-legal issues in anaesthesia practice stresses the need for the maintenance of written records.[5]

Following the successful exercise, we have now strengthened the backup manifold system. We have divided the oxygen supply system into two zones and two separate manifold systems including a newly built one, to support each zone. We are also conducting regular mock drills to train our teams to manage oxygen supply failures.
Electronic pre-anaesthetic checkups (E-PAC) and digital informed consent before elective procedures: Is it time to break the cliche?

Sir,

Informed consent is a collaborative decision-making process and the patient's voluntary agreement to accept medical and surgical treatment. Preoperative checkups and informed consent necessitate that the routine checkup is done thoroughly and techniques are fully explained to the patients to comprehend the anesthesia management, their untoward effects, and acceptance to undergo them willingly. During the global pandemic, the type of consultations with doctors, including anaesthesiologists, has changed. New ways to get in touch with the patient such as pre-anaesthetic assessment via telephone and online via digital media were implemented.

[1,2] This invites the question as to why, if conducting electronic (digital) pre-anaesthetic checkups (E-PAC) appears to be trivial and saves time, this was not done earlier. What are the flaws, and are there any legal ramifications? What are the standards for providing appropriate digital anaesthesia informed consent to increase patient safety? Can this be an alternative to personal face-to-face meetings?

Human cognition processes are changing the implementation of novel communication and information technology. Humans have become interdependent with modern artificial intelligence technologies, evolving into networked systems that recall less by knowing information and more by knowing where to find it. The smartphone has become a part of our routine lives, and it is readily available and handy.

[3] Online/telephone interviews can be beneficial for patients who live in remote locations, as no travel or transportation is necessary. Minimising traveling expenses will reduce overall cost, and patients can be more relaxed in their homes. Time is not wasted waiting...