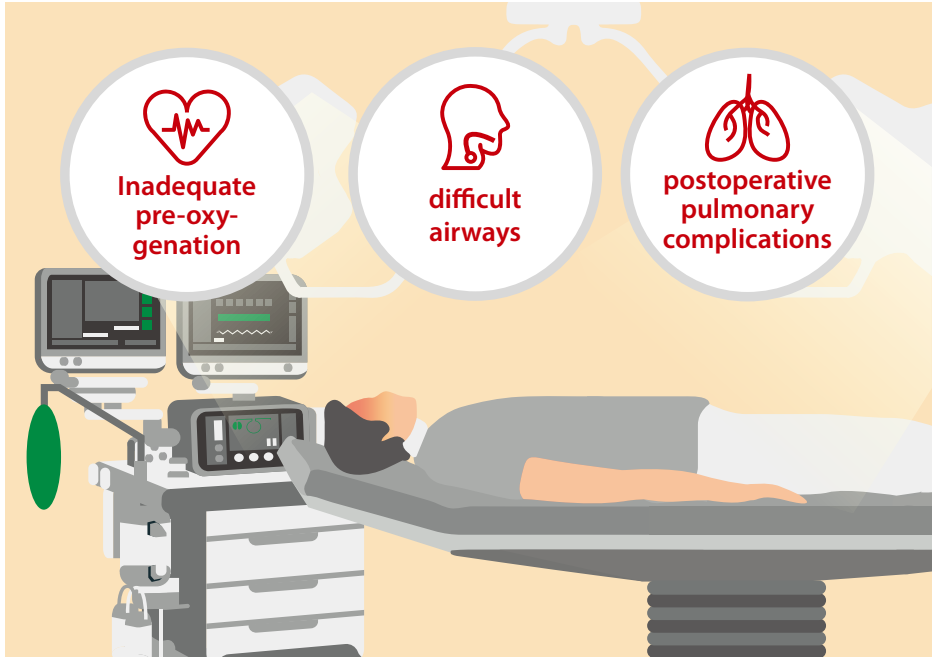


**mysafety** insight

# How do we create a safe operating room?

Clinical Information Leaflet

## How can we enhance patient safety through anesthesia in the operating room?



People generally think of surgery as a swift and, hopefully, seamless endeavor. However, to ensure the safety of the patient and effectiveness of the procedure, the tasks performed in the operating room (OR) require collaboration pre-, intra- and post-operatively across multiple teams.

The risk of perioperative severe complications is easy to overlook when balancing surgical pathways, resulting in increased morbidity and mortality. This is an opportunity for anaesthesiologist to play an integral part in the maintenance of patient safety.

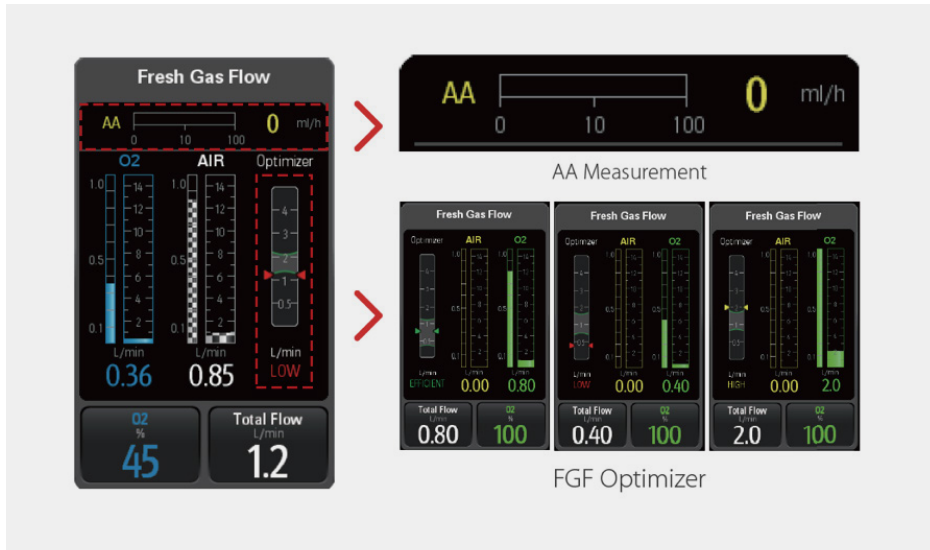
### ► Induction

Pre-oxygenation using a high fraction of inspired oxygen (FIO<sub>2</sub>) is a critical step before induction of anaesthesia and tracheal intubation, as it creates an oxygen reservoir in the lungs. This delays the onset of arterial hemoglobin desaturation during apnea. Despite the fact that pre-oxygenation is advised for intubation, inadequate pre-oxygenation was observed in approximately 56% of patients<sup>[1]</sup>.

The oxygen reserve diminishes particularly in high-risk patients, so various strategies such as continuous positive airway pressure (CPAP) and high flow nasal cannula (HFNC) may be used to increase its effectiveness<sup>[1,2]</sup>. In addition to integrated monitoring of SpO<sub>2</sub>, new clinical applications like CPAP and HFNC can be very helpful to achieve maximum pre-oxygenation for obese patients, critically ill patients, or patients with a difficult airway.

### ► Maintenance

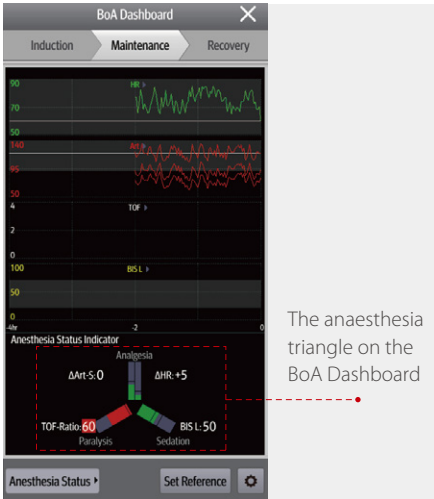
During general anaesthesia inhalation, real-time guidance on fresh gas flow is offered by a fresh gas flow visualization tool – the Optimizer – on Mindray’s anaesthesia machines, resulting in reduced anesthetic consumption and a safe low fresh gas flow. Another visualization feature, AA Prediction, allows anaesthesiologist to predict anesthetic status (including FiAA and EtAA) and oxygen concentration (including FiO<sub>2</sub> and EtO<sub>2</sub>) for the next 20 minutes.



As medical technologies advance, an automatic controlled anaesthesia tool that can automatically adjust the fresh gas and vaporizer output is strongly recommended to enhance the stability and safety of anaesthesia while relieving the work of anaesthesiologists.

It is also necessary to check on the balance of

anaesthesia in real time. A graphic 'anaesthesia triangle' that indicates patient's status of sedation, paralysis, and analgesia is enabled on the BoA Dashboard in Mindray's advanced BeneVision N Series patient monitors. There are many more features that can be used to ensure patient safety during the entire peri-operation.



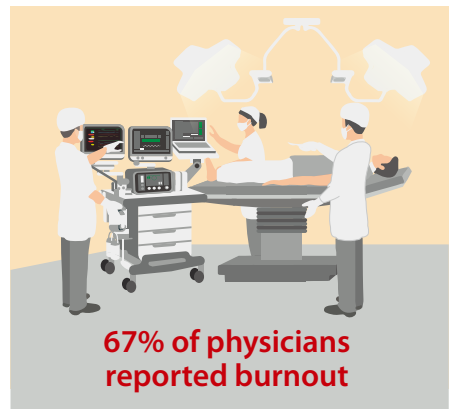
### ► Recovery

After surgery, patients are at risk of developing postoperative pulmonary complications (PPCs) that are strongly related to surgery and anesthesia. This can lead to serious side effects and longer hospital stays<sup>[3]</sup>. Approximately 5% of patients who undergo general surgery develop PPCs. This figure increases to almost 30% among obese patients or patients who undergo cardiac or thoracic surgeries<sup>[4]</sup>. Luckily, in recent studies, research has shown that the following criteria help to reduce the rate of PPCs<sup>[5,6,7]</sup>:

- Ventilation with lower tidal volume or lower driving pressure
- Appropriate levels of positive end-expiratory pressure (PEEP) that prevent alveolar collapse at end-expiration
- Lung recruitment maneuvers that re-expand the collapsed lung alveoli

With Mindray's perioperative lung-protective ventilation solution, a suitable PEEP level along with secure consistent tidal volume work to meet individual patient's needs and minimize the incidence of PPCs. Lung recruitment outcomes can be evaluated through respiratory mechanics using anesthesia machines and tracking oxygenation (SpO<sub>2</sub> or PaCO<sub>2</sub>) via patient monitors.

## Are anesthesiologists at risk too?



While patient safety is of utmost importance, the safety of medical staff may be at risk too. With ever-growing workloads, health care professionals are particularly at risk of burnout. In a recent systematic review, 67% of physicians reported burnout<sup>[8]</sup>. Another systematic review showed the highest percentage of burnouts occurred in critical care and emergency medicine physicians (55%), closely followed by anaesthesiologist (50%)<sup>[9]</sup>. Although burnout is multifactorial, it develops in response to long working hours in high-risk and complex work settings involving

multidisciplinary teams.

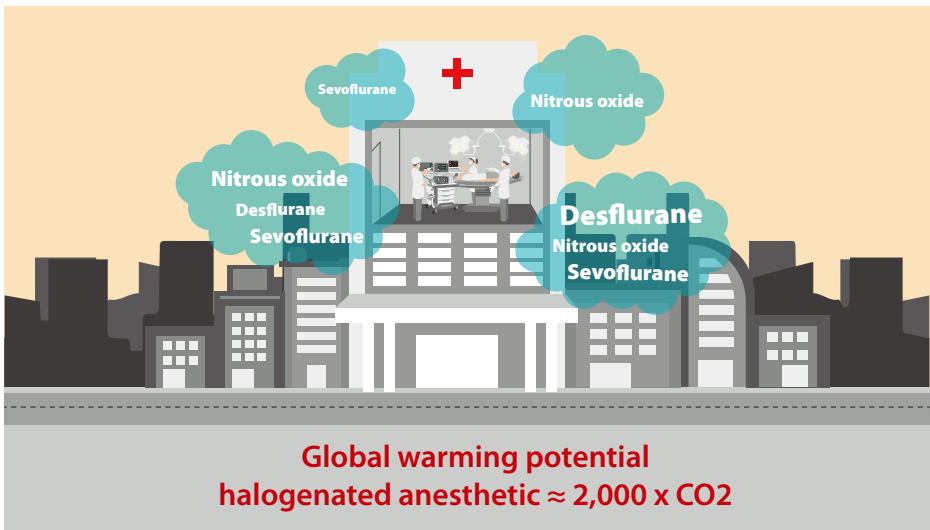
Better patient outcomes with less physician time and effort may be achieved with an informed and streamlined workflow utilized in intraoperative care. User-friendly interfaces, easy-to-read screens and a set of visualization tools can be helpful. Mindray anesthesia machines, especially the A7, have constantly been recognized for providing a good user experience. The A7 received a 'Good' rating in workflow, interoperability, and user experience by the ECRI evaluation<sup>[10]</sup>.

In addition to these, Mindray offers a comprehensive data integration system that stan-

dardizes patient data monitoring for effective decision-making. Seamless data transfer from patient admission to discharge is now possible to automatically upload data to the central monitoring system and the hospital's multiple IT systems to simplify time-consuming activities.

Anesthesia machines can be interfaced with patient monitors. A series of clinical assistive applications are integrated into Mindray's patient monitoring system to visualize multiple clinical parameters, allowing clinicians to read, diagnose, and intervene easily, enabling a less stressful work environment.

## What is a "green" operating room?



Healthcare practitioners can be exposed to anesthetic gases released during medical procedures. These gases are known as waste anesthetic gases (WAGs). Not only do WAGs

risk surgical staff and patient safety, they also contribute to anthropogenic climate changes. As only 5% of anesthetics are metabolized by patients, the rest is routinely vented to the

atmosphere through the OR scavenging system. It has been shown that the global warming potential of a halogenated anesthetic is up to 2,000 times greater than CO<sub>2</sub><sup>[11,12]</sup>.

Exposure to chronic halogenated anesthetics is linked with adverse reproductive effects and cancer. Exposure to nitrous oxide can cause light-headedness, shortness of breath, reduced fertility, and spontaneous abortion, as well as renal, liver, and neurogenic diseases<sup>[13]</sup>.

Mindray attempts to prevent OR staff from being exposed to unnecessary anesthesia leaks through the flow pause function in anesthesia machines, designed to temporarily

discontinue the fresh gas flow. In a safety advancement, Mindray's anaesthesia machines offer the option to reuse sample gases taken from the anesthetic gas monitoring module by making them return to the circuit. Exposure is further reduced by optimizing an efficient anesthetic gas scavenging system (AGSS) designed to vent WAGs out of the surgical environment.



**Keeping safety as the primary goal, Mindray adopts a path of technological advancement with a multifaceted approach towards achieving all-round safety. We seek to fulfill safe breakthroughs in a cost-effective manner for hospitals to achieve a healthier perioperative environment for patients, medical staff, and the environment.**

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P/N: ENG-How do we create a safe operating room?-210285X7P-202001112  
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