# Technology Insights

## for transition to spontaneous breathing during recovery

Protective ventilation in the OR can pose major challenges for anesthesia workstations. Dräger works closely with clinicians and nursing staff around the world to understand the precise needs and requirements for protective ventilation in the OR.

Below we describe some of the latest ventilation technologies in our anesthesia workstations regarding protective ventilation strategies.

Technology for Life

Anesthesia care providers aim to allow patients to wake up at the desired time and with sufficient spontaneous breathing so that they can be transferred to the recovery room in a state of respiratory and hemodynamic stability.
If this is not achieved, the patient may need to be given short-term ventilation in the OR or the recovery room and more intensive monitoring may be necessary. To achieve this, the anesthetic agents must be either dosed as appropriately as possible, or else reversed wherever possible. Sometimes the latter harbors considerable risks. The washout of anesthetic agents by hyperventilation is one popular method if the effects of the anesthetic agents would extend for too long after the end of the operation. However this procedure is also problematic for pharmacokinetic reasons. You can find some background information about this here.

Certain special aspects have to be taken into consideration during the recovery of obese patients. During recovery, the ventilation successes before and during the operation have to be maintained. When the patient begins to breathe spontaneously again, and especially after extubation, there is a risk that obese patients in particular will develop repeated or additional atelectasis and may therefore be exposed to a greater risk of postoperative pulmonary complications.

During the recovery phase, precise management of the anesthetic agents and a successful transition to spontaneous breathing are helpful to prevent atelectasis.

Below we describe technologies that can assist anesthesia care providers in their work.

### TECHNOLOGY SUPPORTING THE MANAGEMENT OF ANESTHESIA IN OBESE PATIENTS

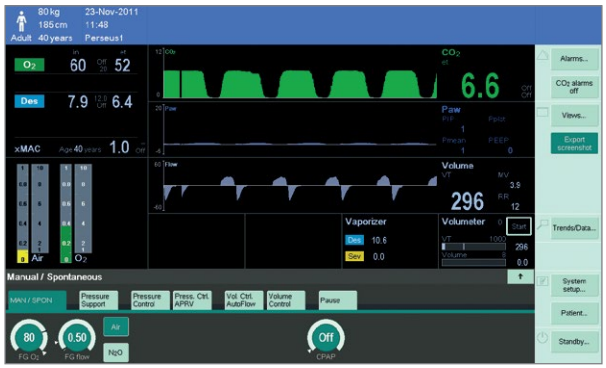
**Active CPAP**

In order to actively counteract the intrinsic PEEP in obese patients during recovery, CPAP could be used during induction. A real CPAP supports the patient with a continuous flow that actively counteracts the intrinsic PEEP and thus reduces the work of breathing. In the absence of a real CPAP, attempts are often made in Man./Spon. to simulate a CPAP by setting the APL valve to the desired pressure. However, the pressure set at the APL valve acts primarily as a resistance instead of providing active support. This means that the APL valve does not reduce the work of breathing but merely makes expiration more difficult. Furthermore, the pressure is not maintained at a constant level during spontaneous breathing.

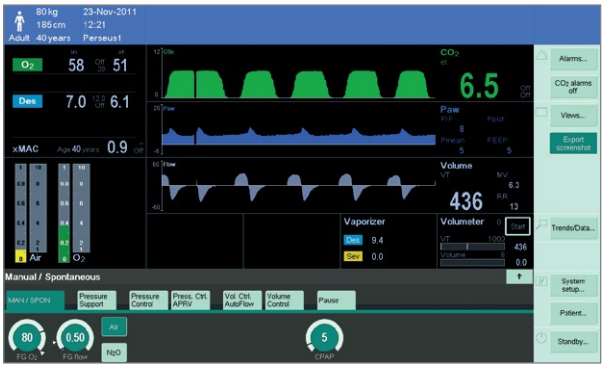
The Dräger ventilation units TurboVent 2 (installed in the Dräger anesthesia machine Perseus® A500) has a blower ventilator that can deliver an active CPAP without any interruptions. The blower delivers a continuous circulation, thus enabling the rapid mixing of gases in the breathing system and with it rapid gaseous exchange. The blower can adjust its speed extremely rapidly, thus reacting to pressure changes during spontaneous breathing and maintaining the a constant pressure at the level set. The E-Vent plus piston-based ventilator installed in the Apollo® is also capable of applying a real, active CPAP in Pressure Support mode. In Pressure Support mode the pressure support is reduced to 0 $cmH_2O$. If you would like to know more about ventilator technology please click here.

### Pressure support + CPAP

Pure CPAP may also be helpful for moderately obese patients during recovery, given that it can facilitate independent spontaneous breathing in the supine position. However in cases of advanced obesity this may not be sufficient, rendering it necessary to support breaths in order to achieve adequate tidal volumes. A very sensitive trigger which can be adjusted to the individual patient, coupled with the fast reactions of the electric ventilators E-Vent/E-Vent Plus, and in particular TurboVent 2, ensure rapid and synchronous pressure support for spontaneous breathing patients. The rate at which the pressure rises can be adapted using slope adjustment to take account of the individual lung mechanics.




Spontaneous breathing without CPAP




Spontaneous breathing with activated CPAP

During the expiration phases PEEP (CPAP) is maintained appropriately. This option is available with all Dräger anesthesia machines. Synchronization and the reaction times of modern ventilator technologies, especially the TurboVent 2 blower, correspond to the performance of intensive care ventilators.

### Resistances in the breathing system

In the blower-driven anesthesia machines, the circulation reduces the resistances arising due to the breathing system to facilitate spontaneous breathing at the PEEP (CPAP) level and thus to reduce the required work of breathing.
During expiration, the E-Vent plus piston-driven ventilators synchronize themselves with the expiration flow, and actively support the patient's expiration by means of controlled ventilator piston return.

### Mask fit in non-invasive support for spontaneous breathing

As in pre-oxygenation and induction in obese patients (click here for the white paper), after extubation the patient may also require support for spontaneous breathing using CPAP and possibly also Pressure Support in order to prevent repeated or increased formation of atelectasis. Here, too, the increased amount of adipose tissue in the face can make it difficult to get a good mask fit and, if the choice of mask is incorrect, can lead to leakages that reduce the efficacy of the measure. Both the size and type of the mask should therefore be selected with care.



**CORPORATE HEADQUARTERS**
Drägerwerk AG & Co. KGaA
Moislinger Allee 53–55
23558 Lübeck, Germany

www.draeger.com

**USA**
Draeger, Inc.
3135 Quarry Road
Telford, PA 18969-1042, USA
Tel +1 800 4DRAGER
(+1 800 437 2437)
Fax +1 215 723 5935
info.usa@draeger.com

**Manufacturer:**
Drägerwerk AG & Co. KGaA
Moislinger Allee 53–55
23542 Lübeck, Germany

**Locate your Regional Sales Representative at:**
**www.draeger.com/contact**

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