INTRODUCTION
Anaesthetists and anaesthesia nurses face special challenges when managing obese patients. These challenges will become more frequent in the future because the number of obese patients is rising steadily all over the world. In order to provide the best care for obese patients, it is important that the technology used supports the recommended clinical procedures and approaches in the best possible way. Below we describe some relevant special characteristics of obese patients and explain the general technical conditions that an anaesthetist’s workplace should fulfil to ensure the best patient care.

RELEVANT CHARACTERISTICS OF OBESE PATIENTS DURING INDUCTION OF GENERAL ANAESTHESIA
The special characteristics of obese patients described below are set out in detail, with references, in our clinical white paper [click here].

DIFFICULT INTUBATION
Obesity, and in particular morbid obesity, is often associated with difficult intubation. Sufficient time should therefore be allowed for the intubation of these patients, and the patient’s oxygen reserves should be filled up in advance to prevent the oxygen saturation from decreasing.

INCREASED WORK OF BREATHING
Some obese patients have markedly increased work of breathing. The main factors responsible for this are the abdominal mass, which presses against the diaphragm in the cranial direction in particular when the patient is supine, thus restricting the diaphragms movement, and the restricted extension of the thorax owing to the greatly increased amount of fatty tissue. Both of these factors exert adverse effects in particular when the patient is supine and make inspiration more difficult for obese patients. Anaesthesia workstations must assist spontaneously breathing obese patients as early as during pre-oxygenation in order to ensure sufficient oxygen reserves for intubation and the associated apnoea phase.

ATELECTASIS
The risk of atelectasis also rises with increasing obesity. Morbidly obese patients may exhibit clinically relevant atelectases even when upright. This can aggravate when the patient is supine. The commonly applied mechanical ventilation encourages the further spread of atelectatic areas of the lungs if it is not adjusted to the needs of obese patients. Already during induction of general anaesthesia, the course can be set for the intraoperative and even for the postoperative phase, in order to reduce the risk of complications.
TECHNOLOGY INSIGHT

The Dräger ventilation units TurboVent 2 (installed in the Dräger anaesthesia machines Zeus® IE and Perseus® A500) have a blower ventilator that can deliver an active CPAP without any interruptions. The blower delivers a continuous circle flow, thus enabling the rapid mixing of gases in the breathing circuit and with it rapid changes in gas concentrations. The blower can adjust its speed extremely rapidly, thus reacting to pressure changes during spontaneous breathing and maintaining a constant pressure at the level set. The E-Vent plus piston-based ventilator installed in the Primus® family is capable of applying a real, active CPAP via the Pressure Support mode. In Pressure Support mode the pressure support is reduced to 0 mbar. If you would like to know more about ventilator technology please click here.

Pressure Support + CPAP

Pure CPAP may be a great help for moderately obese patients, 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 near normal tidal volumes. The very high trigger sensitivity, which can be adjusted to the individual patient, coupled with the fast reactions of the electronic ventilators E-Vent/ E-Vent plus and especially TurboVent 2, ensure rapid and synchronous pressure support for spontaneous breathing. The rate at which the pressure rises can be adapted using slope adjustment to take account of the individual lung mechanics. During the expiration phases the PEEP (CPAP) is maintained appropriately. This option is available with all Dräger anaesthesia machines. Synchronisation and reaction times of Dräger’s current ventilator technologies, especially the TurboVent 2 blower, correspond to the performance of intensive care ventilators.

Reducing the resistance in the breathing circuit.

In the blower-driven anaesthesia machines, the circular flow reduces the resistances arising due to the breathing system in order to additionally 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 synchronise themselves with the expiration flow and actively support the patient’s expiration by means of controlled ventilator piston return.

**TECHNOLOGY SUPPORTING ANAESTHETIC MANAGEMENT OF OBESE PATIENTS**

**Active CPAP**

In order to actively counteract the intrinsic PEEP of obese patients during pre-oxygenation, the anaesthesia machine should be capable of applying an active CPAP 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 an APL valve to the desired pressure. However, the pressure set for 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.

**Intrinsic PEEP (PEEPi)**

Intrinsic PEEP is frequently a direct consequence of obesity. The constrictions in the airways often found in obese patients increase airway resistance. Coupled with a possibly shortened expiration time, this results in incomplete expiration and thus in a residual pressure in the lung. This residual pressure represents a resistance that initially has to be overcome at the onset of inspiration before an inspiratory flow can be achieved. This should be taken into account during pre-oxygenation, to ensure adequate oxygen saturation in the lung.

Below we some technical solutions that can support you during pre-oxygenation, in particular when treating obese patients.

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**Spontaneous breathing without CPAP**

**Spontaneous breathing with activated CPAP**
Mask fit
During pre-oxygenation and the induction of anaesthesia in obese patients, it is important that the CPAP and the pressure for Pressure Support should arrive at the patient with as little leakage as possible despite non-invasive application. It is therefore essential to select the correct mask size. Some obese patients also have a greatly increased amount of fatty tissue in the facial region, which can make it more difficult to achieve a good fit with the ventilation mask. In addition to selecting the correct size, it may be necessary to adjust the pressure of the mask cushion in order to get a good seal. Obese men should preferably be shaved so that beard hair does not affect the fit of the mask.