Preface

The causes of acute respiratory failure are complex and often lead to structural lung impairments that make the use of ventilation therapy a life-saving necessity. Due to gravitational effects, regional surfactant defects, and the uneven distribution of atelectases, this results in the inhomogeneous distribution of regional ventilation.

Adjusting the ventilation to a patient's individual regional lung function is a highly complex task that must be regularly evaluated. Nevertheless, such an evaluation is essential because "lung-protective" ventilation reduces the mortality of patients with acute lung injury (ALI).

The individual adjustment of the positive end-expiratory pressure (PEEP) is key to optimised ventilation. It is quite a challenge to find the best PEEP level for patients with acute respiratory failure to avoid atelectases and alveolar over-distension. Furthermore, the optimally adjusted PEEP changes continuously with the lung function that is affected by disease and therapeutic measures. The PEEP level, therefore, has to be re-evaluated on a regular basis.

An optimally adjusted PEEP is a fundamental prerequisite for lung-protective ventilation. It reduces cyclic, tidal recruitment of lung regions and leads to a more homogeneous distribution of ventilation and perfusion in the lung. When PEEP values are too low, lung areas may be damaged by the formation of atelectasis, while excessive PEEP values can cause over-distension.

Various bedside methods can be used for optimising the PEEP setting. The most commonly used approaches include low-flow pressure volume curves, stress index, PEEP trial and the PEEP/FIO_2 table. They all

share the limitation that they cannot display the regionally inhomogeneous ventilation distribution. Radiological technologies such as chest X-rays, computed tomography, pulmonary ultrasound and less commonly, magnetic resonance tomography are also employed, but can only depict the pulmonary status at a specific point in time.

Chest X-rays performed bedside have the least significance among these methods. In some cases, they only show large pulmonary lesions. The effort associated with performing a CT or MRI examination of ventilated intensive-care patients is enormous and also represents a major risk for patients with unstable respiration. Furthermore, CT examinations create significant radiation exposure levels for patients. Despite all these limitations for use with ventilated intensive-care patients, CT is currently the only method that allows for optimising ventilation settings in relation to the regional lung function, which means that patients with severe respiratory failure must be subjected to CT examinations to optimise their ventilation settings.

Electrical impedance tomography (EIT) for the first time offers a bedside method for reliable non-invasive, continuous determination of the regional lung function without radiation exposure. In contrast to other medical imaging methods, EIT displays body functions instead of body structures. It provides real-time images, e.g. for monitoring ventilation, perfusion or gas exchange.

The current evidence base allows for transitioning to the next phase of the evaluation, in which EIT is used as an accompanying method to support therapy decisions. This booklet was written to support the clinical discussion on the way towards a reproducible interpretation of EIT images.

Our sincere appreciation goes to the intensive care teams of Mittelbaden Rastatt Hospital and Osnabrück Hospital as well as to Stephan Böhm.

Karlsruhe, January 2016
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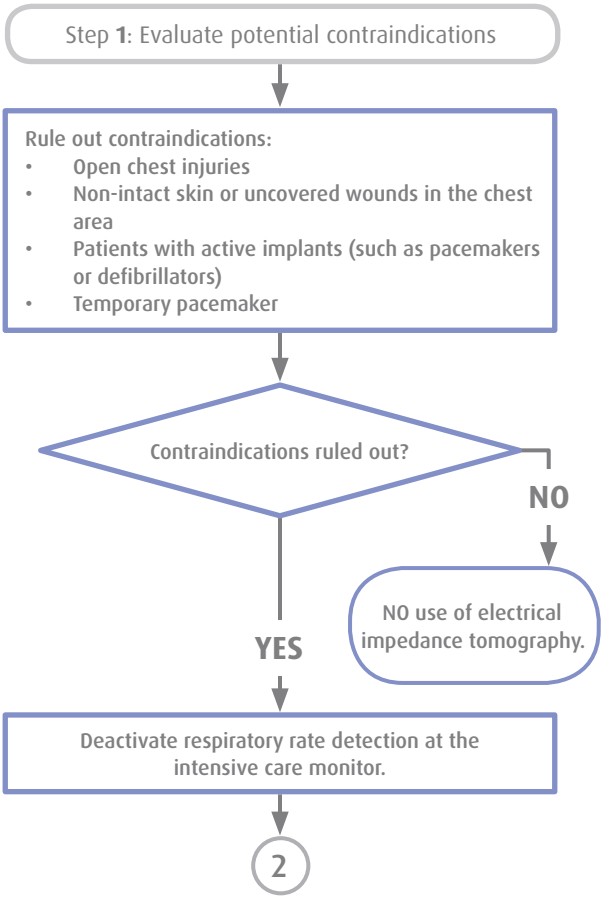
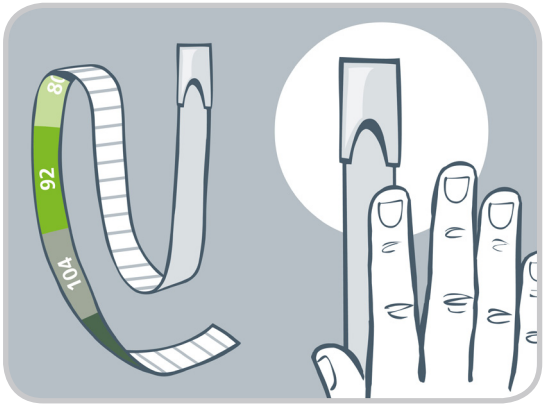
Evaluating potential contraindications



Step **2**: Apply measurement tape



- Remove the special measurement tape from the ContactAgent package.
- Unroll the measurement tape and slip the loop at its end over your index finger.
- Use your other hand to keep light tension on the measurement tape.

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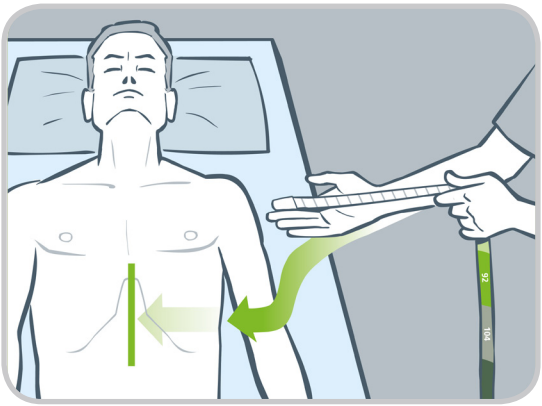
Step **3**: Measure patient



- Slide the hand holding the loop under the patient's back until you clearly feel the spine with your index finger.
- Measure one half of the thorax up to the centre of the sternum with the tape.

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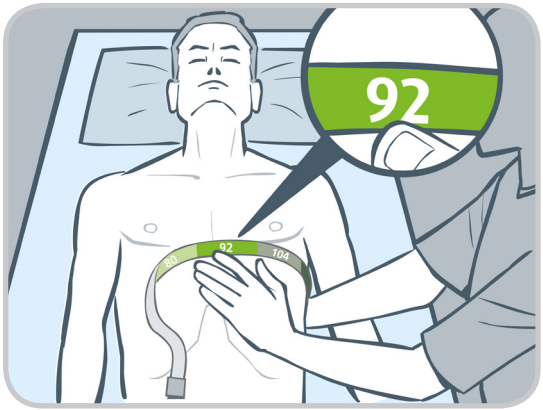
Step **4**: Determine SensorBelt size



- Read the measurement for half the chest circumference on the centimetre scale.
- Each cm value is associated with a SensorBelt size.

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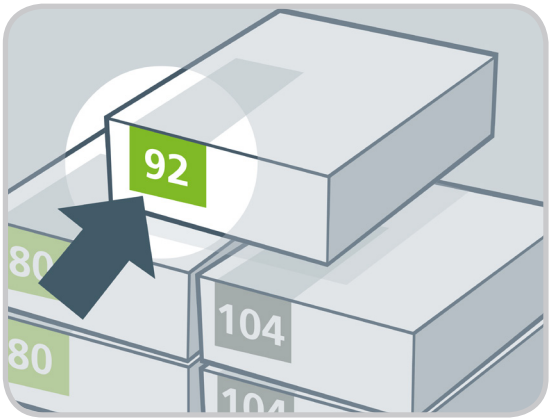
Step **5**: Choose the SensorBelt



- For easy recognition, each size is marked with a different colour. The corresponding colour of each SensorBelt size can also be found on every package label.
- Select a SensorBelt of the previously determined size and unpack it.

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