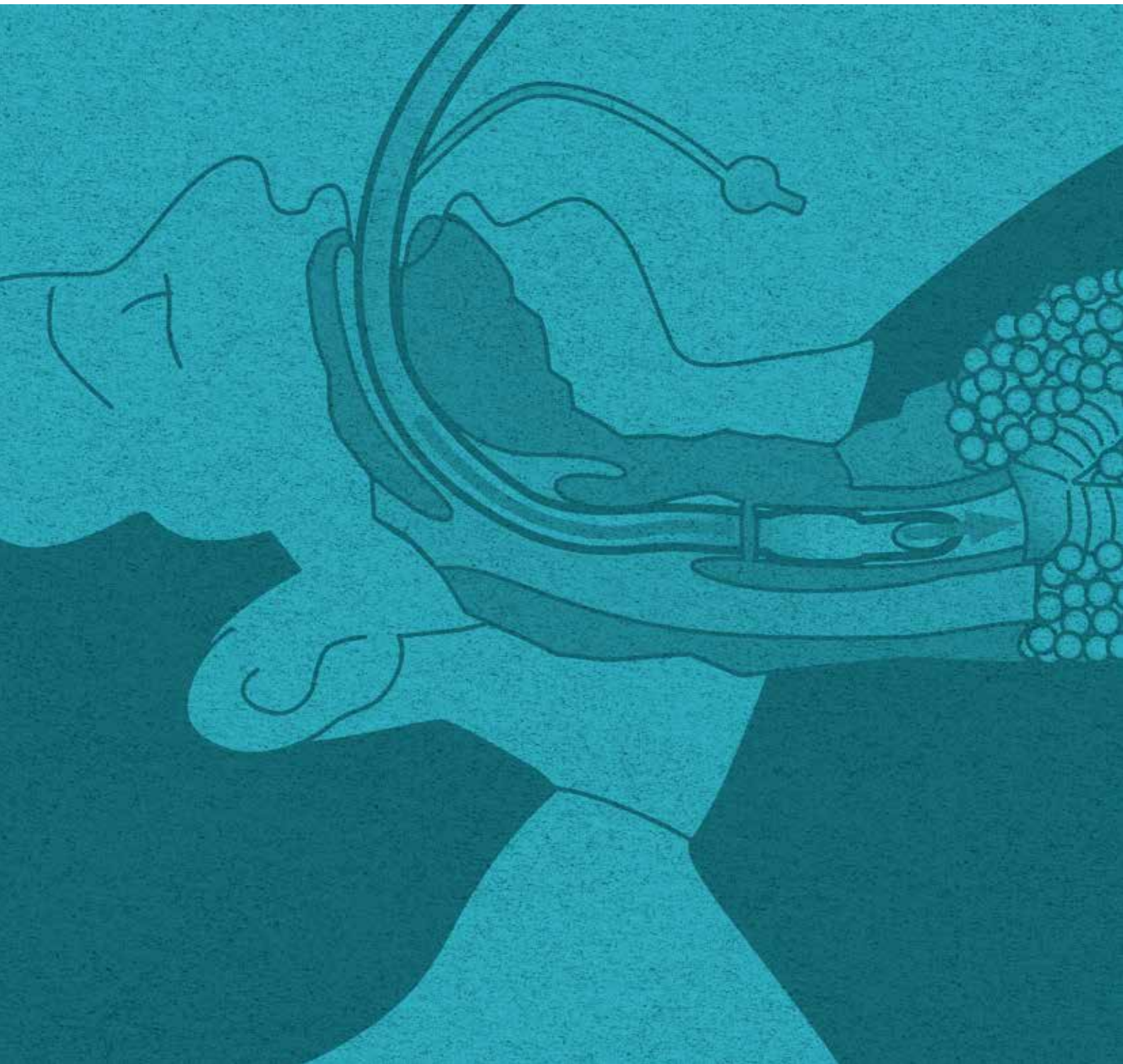


Safety. Less Stress. Efficiency.

Saving lives with ventilators



Rapid Assistance

Circulatory arrest, respiratory disease, poisoning and severe trauma – thanks to emergency ventilation from Emergency Medical Service professionals, every day thousands of people get a second chance at life. Rescue teams are often under a lot of time pressure. Stress and significant physical and psychological strain are part of their everyday working lives. After all, when it is a matter of life and death, every move must be spot on.

If a patient stops breathing or there is a risk of the respiratory muscles becoming fatigued, breathing must be managed either manually with a resuscitator or mechanically with a ventilator. The goal: To ensure the gas exchange in the lungs and keep the airways free in order to supply the organs with the oxygen they need to survive and to expire CO₂.



Mechanical ventilation: a better alternative

Mechanical ventilation is a safe method not just for patients but also for you as the user. The ventilators from WEINMANN Emergency have been thought through down to the finest detail and offer maximum security for emergency ventilation. They can be used in all areas of emergency medicine: from the ventilation of narcotized patients at the scene of the emergency and patient transfers between hospitals through to cardiopulmonary resuscitation.



Advantages of ventilators

- Volume and pressure control: Constant ventilation rate, precise volume delivery and exact compliance with pressure limits
- Control function via monitoring of the ventilation parameters and visual and acoustic alarms
- The strain of mechanical work is reduced
- The mask can be positioned tightly using two hands
- Resources are freed up for other live-saving activities
- CPR mode facilitates guideline-compliant cardiopulmonary resuscitation
- More precise and convenient application of assisted forms of ventilation
- Simplified and safer ventilation of special patient groups
- Avoidance of hypoventilation and hyperventilation thanks to precise setting and monitoring options



Patient Safety

Risks of bag-valve-mask ventilation

Do you prefer to use a resuscitator and mask over a ventilator? Do you feel more confident when you are able to take the patient “into your own hands”?

Studies confirm that bag-valve-mask ventilation often poses more risks than benefits. This is because it is technically demanding and requires a lot of skill and training. Even experienced EMS professionals are not always able to ventilate patients exactly as prescribed by international guidelines¹. These demand constant ventilation volumes and the avoidance of pressure peaks in the airways. These often fluctuate greatly with manual ventilation². And if the ventilation parameters aren't correct, the resuscitator does not issue an alarm as is standard with ventilators.



Two EMS professionals are required

There is also the risk that it may not be possible to fit the mask tightly on the face with one hand. This can result in reductions in the ventilation volume, so-called leakage, which can be life-threatening for patients. This is why international guidelines recommend the two-worker technique³: The first team member positions the mask tightly on the patient's face whilst the second member operates the resuscitator. The disadvantage: Two people are tied up.



Where the risks lurk

- Hypoventilation as a result of the mask not being fitted tightly
- Risk of aspiration from stomach overinflation
- Barotrauma with pressure peaks from excessively fast volume delivery
- Hyperventilation from incorrect ventilation rate
- Differently sized respiratory volume



¹ Elling R, Politis J: An evaluation of emergency medical technicians' ability to use manual ventilation devices. *Ann Emerg Med* 1983 Dec;12(12):765-8

² Lee HM et al.: Can you deliver accurate tidal volume by manual resuscitator? *Emerg Med J* 2008;25:632-634

³ Deakin CD et al.: European Resuscitation Council Guidelines for Resuscitation 2010. Section 4. Adult advanced life support. *Resuscitation* 2010 Oct;81(10):1305-52

Risk: Overinflation of the Stomach

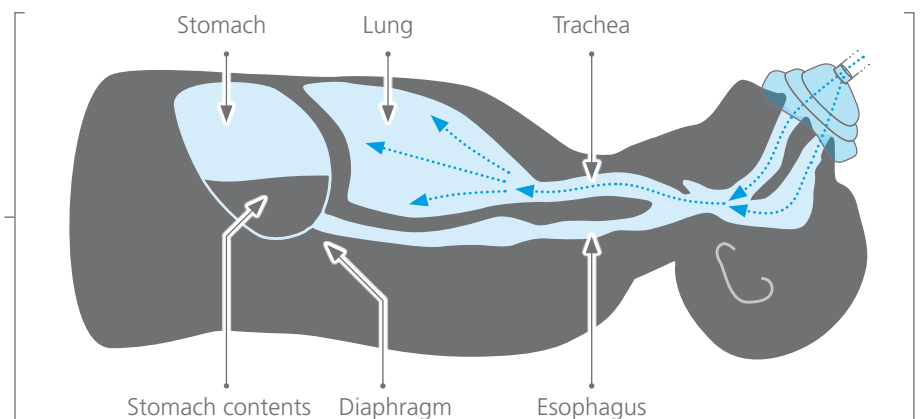
Preventing aspiration

Ventilation with a resuscitator and mask is not always sufficient. This is why too much volume is often delivered. This is not without its risks: Overpressure rapidly builds up and the risk of stomach overinflation increases. This can lead to regurgitation and aspiration of the stomach contents!

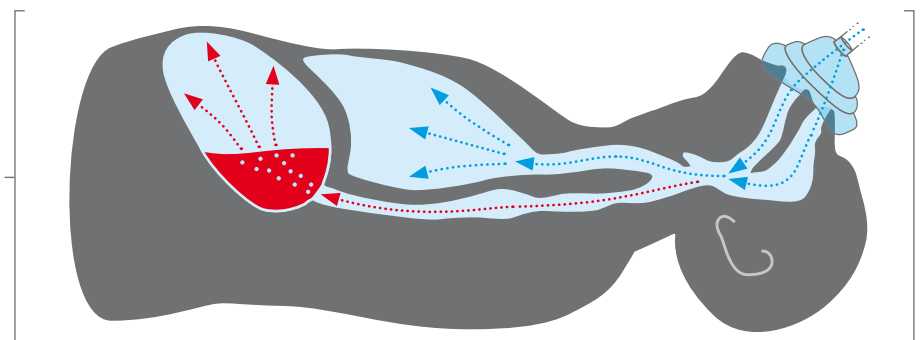
With mechanical ventilation this risk is reduced. This was confirmed by a study on a manikin with simulated circulatory arrest⁴: Whilst the lung tidal volume was comparable, the stomach tidal volume with mechanical ventilation was considerably less than with manual ventilation.

Caution, aspiration!

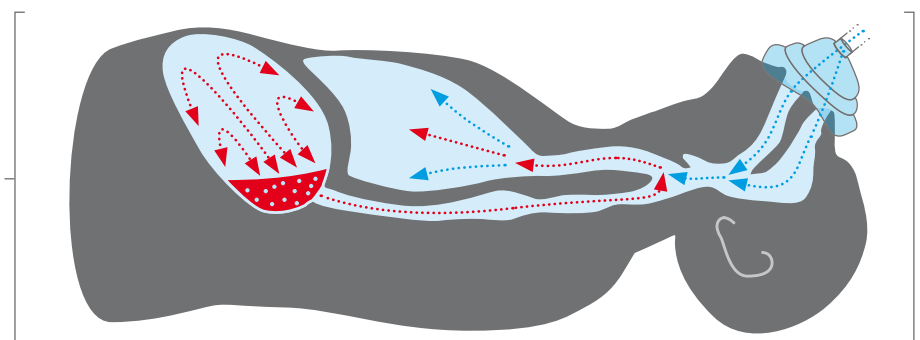
With a ventilation pressure < approx. 20 mbar (depending on the case) air is guided directly into the airways.



With a ventilation pressure > approx. 20 mbar (depending on the case) overpressure builds up and the stomach is overinflated!



As a consequence of stomach overinflation, the contents of the stomach are regurgitated which could cause the airways to become blocked. There is a risk of suffocation as well as the often fatal delayed effect, aspiration pneumonia.



⁴ Stallinger A et al.: Effects of decreasing inspiratory flow rate during simulated basic life support ventilation of a cardiac arrest patient on lung and stomach tidal volumes. Resuscitation 2002 Aug;54(2):167-73

Risk: Lung Damage

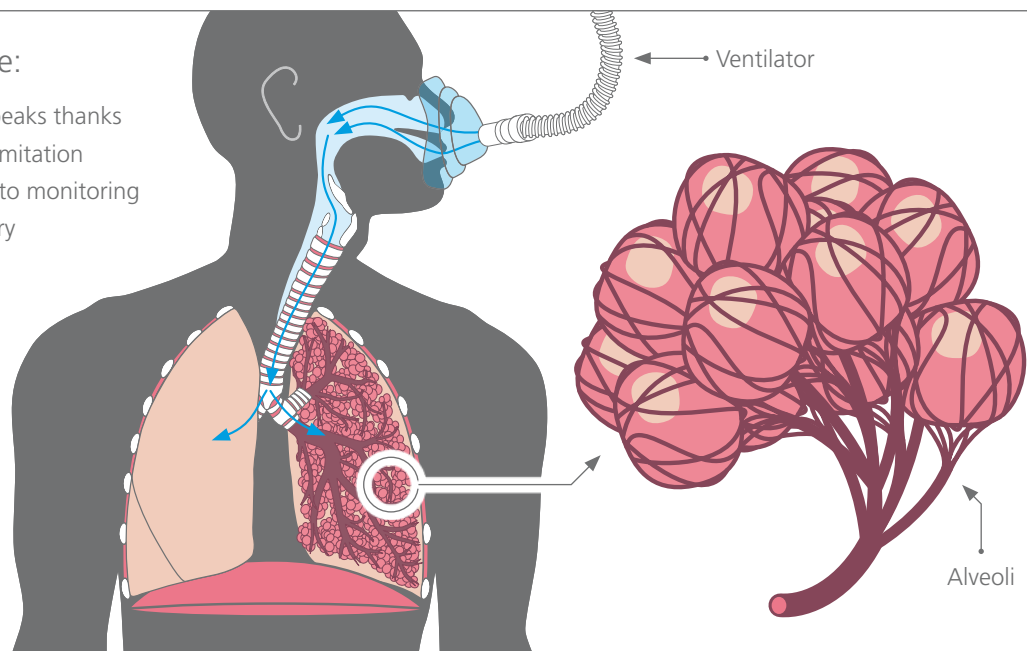
Avoiding pressure peaks

Excessively high ventilation pressures can lead to overinflation of the pulmonary alveoli and trigger barotrauma or volutrauma. Given the lack of monitoring, there is no pressure control with manual ventilation. Pressure is delivered by instinct. This results, in part, in considerably higher peak pressures than a ventilator

would generate⁵. Moreover, EMS professionals use different techniques – and thus apply more or less pressure to the bag. With ventilators, on the other hand, there is integrated pressure limitation to avoid pressure peaks.

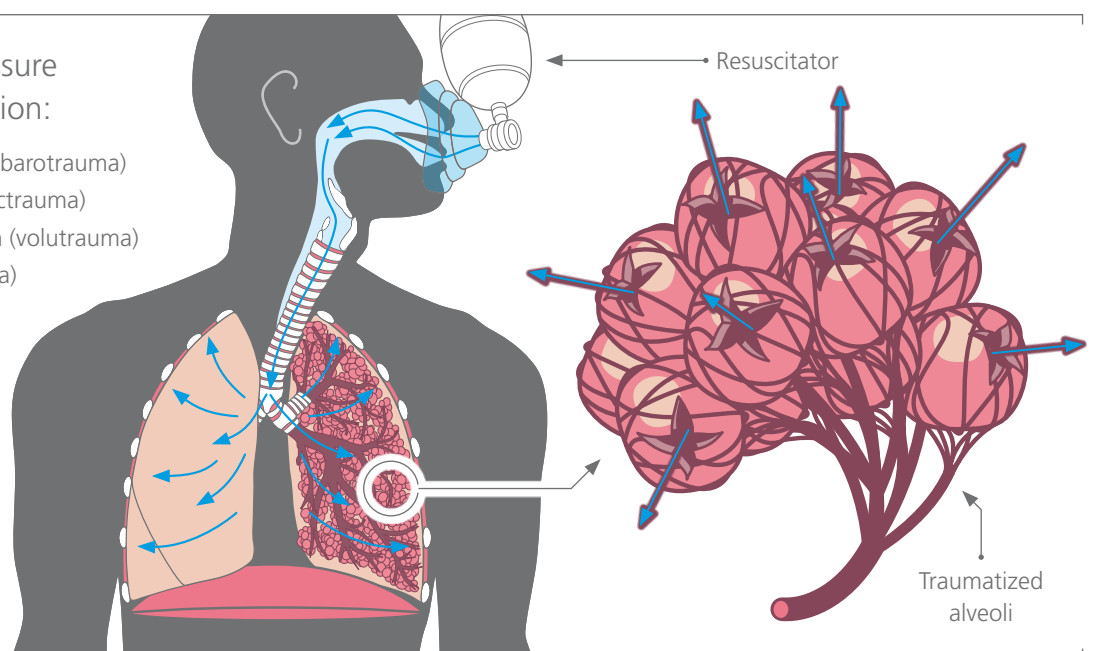
Ventilators guarantee:

- Avoidance of pressure peaks thanks to integrated pressure limitation
- Pressure control thanks to monitoring
- Uniform pressure delivery



High risk of overpressure with manual ventilation:

- High plateau pressures (barotrauma)
- High shear forces (atelectrauma)
- Progressive overinflation (volutrauma)
- Inflammation (biotrauma)



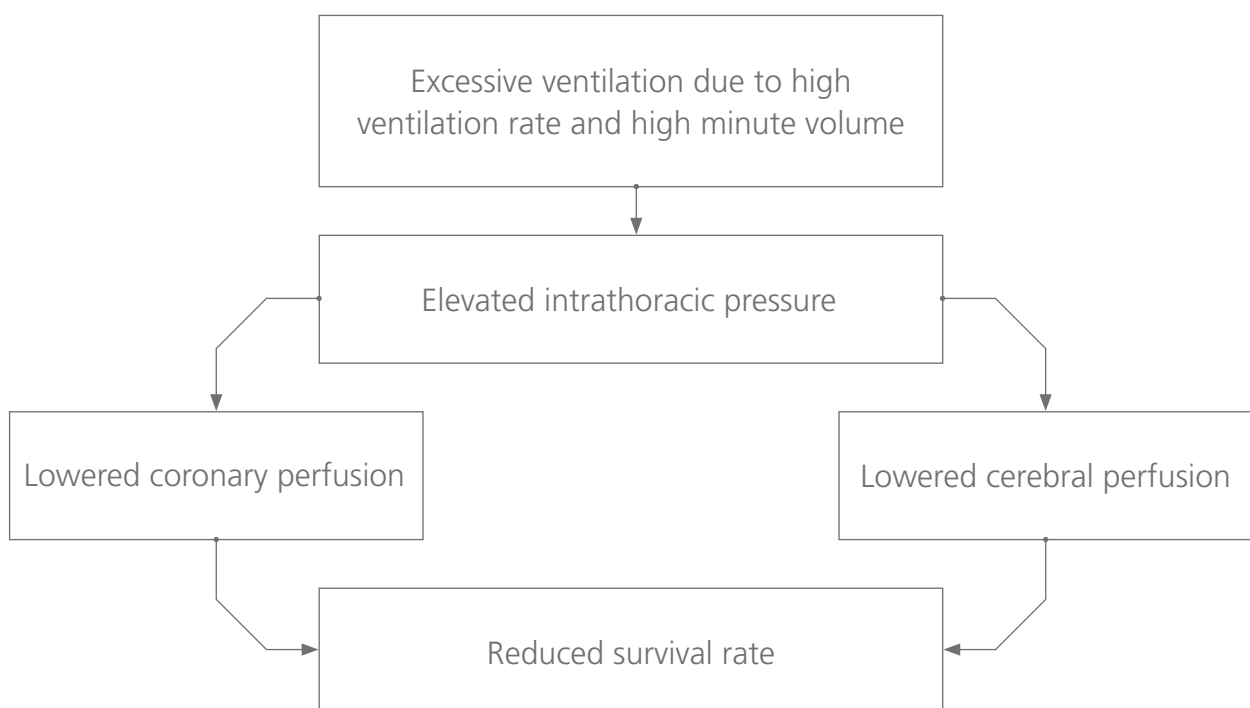
⁵ Turki M et al.: Peak pressures during manual ventilation. *Respir Care* 2005 Mar;50(3):340-4



Risk: Hyperventilation

Maintaining the right rate

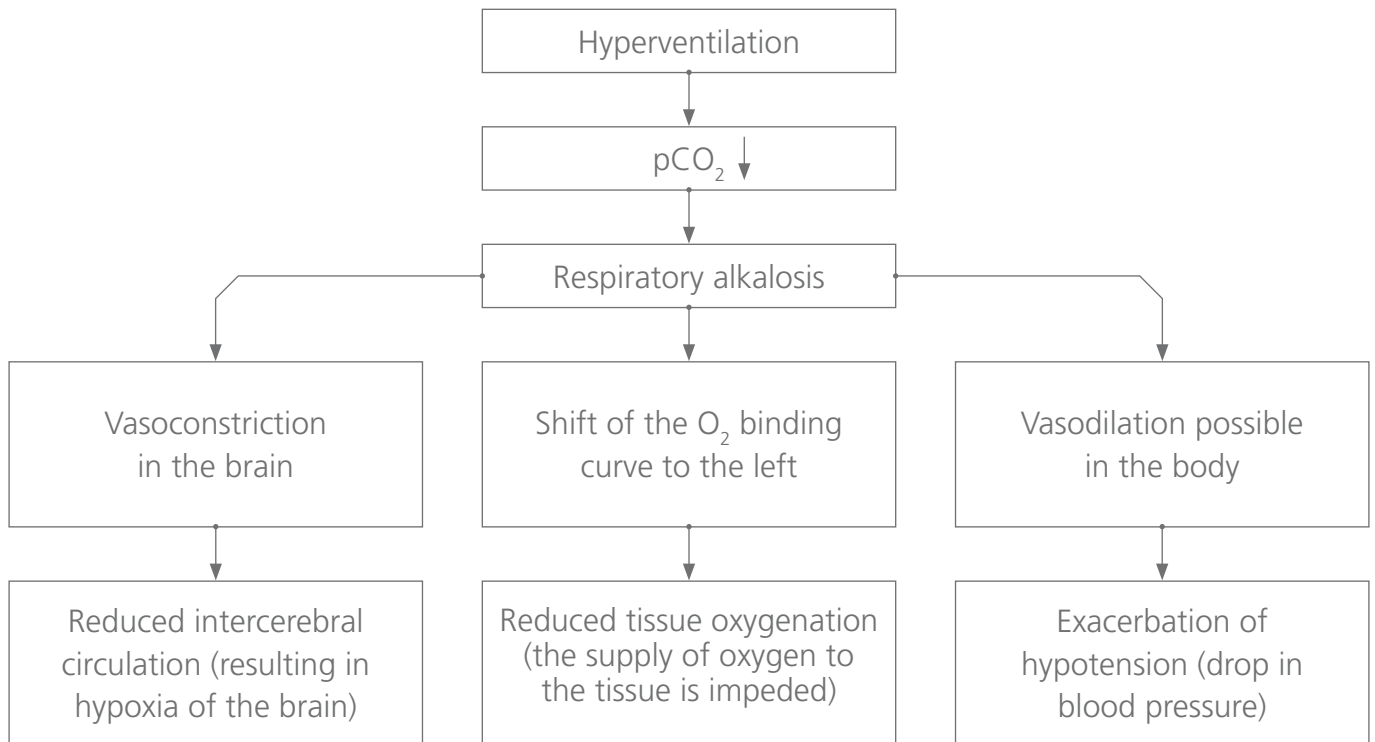
Hyperventilation is an everyday challenge for all EMS professionals. This is hardly surprising given that overly high ventilation rates reduce the likelihood of survival. This was confirmed by a study of out-of-hospital emergencies with cardiac arrest and manual bag ventilation conducted in the USA⁶. The EMS professionals hyperventilated almost all patients – with fatal consequences. On the back of this, scientists simulated this observation on pigs suffering from cardiovascular failure. The result: Almost all animals survived ventilation with 12 strokes per minute. In contrast, virtually all the pigs who were treated with 30 strokes per minute died. The higher the ventilation rate, the lower the coronary perfusion pressure.



⁶ Aufderheide TP, Lurie KG.: Death by hyperventilation: a common and life-threatening problem during cardiopulmonary resuscitation. Crit Care Med 2004 Sep;32(9 Suppl):S345-51

Blood gases “out of kilter”

During transportation in particular it is difficult to maintain the right ventilation rate. According to a study, this can be demonstrated with the blood gas values⁷: In the case of manually ventilated patients the CO₂ partial pressure fell, the pH value increased and patients experienced respiratory alkalosis, yet with mechanically ventilated patients, the acid-base balance essentially remained stable.



⁷ Hurst JM et al.: Comparison of blood gases during transport using two methods of ventilatory support. J Trauma 1989 Dec;29(12):1637-40

⚡ Risk: Airway Access

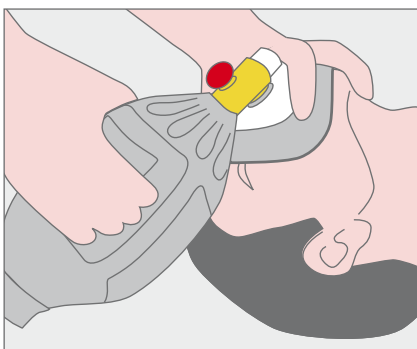
Intubation is not absolutely necessary

There is no doubt that intubation is the gold standard with mechanical ventilation as it protects against aspiration. However, safe intubation in preclinical treatment is associated with risks and failed attempts with extended hypoxia times are not the exception. This is why many EMS professionals continue to opt for alternatives. If you wish to avoid intubation, but still desire controlled ventilation, you can also use our ventilators with less invasive techniques such as a laryngeal mask, laryngeal tube or ventilation mask.

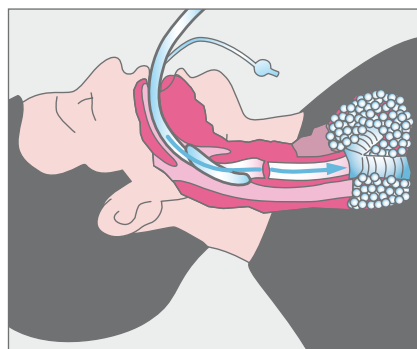


⚡ Possible Airway Access

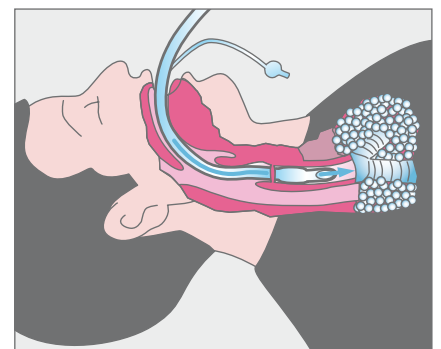
Whether a ventilation mask, supraglottic airway aids or an endotracheal tube, select the type of airway access which is best suited to your patient and the specific emergency. It goes without saying that the ventilators from WEINMANN Emergency are compatible with all three types of airway management.



Ventilation mask



e.g. laryngeal mask



Endotracheal tube

Patient Safety



On the safe side

In contrast to manual ventilation, mechanical ventilation offers key advantages, particularly with regard to patient safety⁸:

- If the patient is ventilated using a mask, the EMS professional can hold the head in a correct axial position with both hands
- The risk of overly intensive ventilation with hyperventilation is avoided as only the ventilator is able to guarantee constant and guideline-compliant ventilation
- As there are reduced peak pressures, the intrathoracic pressure is also lower. This improves the venous return and the cardiac output. Furthermore, overinflation of the stomach becomes less frequent – the risk of aspiration is reduced.

A safe arrival

In terms of patient transport, too, mechanical ventilation beats manual ventilation. This was confirmed by a comparative study: With manual ventilation the ventilation parameters of intubated patients during intra-clinic transportation fluctuated more significantly than with mechanical ventilation⁹. Moreover, with ventilators the interruptions associated with bag-valve-mask ventilation, for example during transportation in narrow staircases, are avoided.

⁸ Deakin CD et al.: European Resuscitation Council Guidelines for Resuscitation 2010. Section 4. Adult advanced life support. Resuscitation 2010 Oct;81(10):1305–52

⁹ Dockery WK et al.: A comparison of manual and mechanical ventilation during pediatric transport. Crit Care Med 1999 Apr;27(4):802–6



User Safety

Free your head and your hands

Not only patients but also you as an EMS professional benefit from mechanical ventilation. After all, ventilators offer enhanced safety: Visual and acoustic alarms, clearly visible measurement and setting parameters as well as constant ventilation parameters ensure the guideline-compliant and consistent ventilation of patients. Some of the devices from WEINMANN Emergency also feature special functions such as voice prompts, metronome and CPR* and RSI** modes. With the MEDUtrigger individual mechanical breaths can be triggered manually on the mask. This enables you to determine the timing of mechanical breaths very precisely.

Making the best use of resources

Mechanical ventilation also relieves strain, and not just from an ergonomic perspective: Whilst manual ventilation ties up one or even two EMS professionals, with mechanical ventilation of intubated patients you have both hands free for other important tasks. Valuable personnel resources can be put to the best possible use – this improves the workflow decisively and frees up resources for other live-saving measures or documentation.

* cardiopulmonary resuscitation

**rapid sequence induction

The Facts at a Glance

Ventilator or bag-valve-mask ventilation?
Make the right decision!

Arguments against bag-valve-mask ventilation:

- Risk of hypoventilation or hyperventilation due to incorrect ventilation rate
- Danger of pressure peaks if volume is delivered too quickly
- Ventilation volumes can fluctuate
- No alarm function
- At least one hand is required for bag compression
- Mechanical operation is tiring on long transport routes
- It is only possible to use one hand to position the mask or a second rescue worker is necessary
- Ties up the resources of many highly-qualified personnel

Arguments in favor of mechanical ventilation:

- Compliance with international guidelines
- Constant ventilation rate
- Precise volume delivery
- Pressure limitation
- Comprehensive visual and acoustic alarm function
- Optimum tight positioning of the mask using two hands
- The strain of mechanical work is reduced
- Resources are freed up for other activities



Ventilators

Improved control with ventilators

Ventilators guarantee the right ventilation rate and keep this constant. Depending on the ventilation form, the ventilation pressure/volume are also constant or are measured and displayed. This means hyperventilation and hypoventilation are avoided. Hypoventilation is often a consequence of bag-valve-mask ventilation as the mask is not positioned tightly on the face with just one hand.

MEDUMAT Easy CPR

With MEDUMAT Easy CPR a device has been developed specifically for emergency ventilation during and after resuscitation. An example of this is the option of manually triggering mechanical breaths directly at the mask. The ventilator issues clear voice instructions to ensure maximum safety and guide the user through resuscitation.

MEDUMAT Easy CPR is intuitive to operate, small and therefore easy to transport.

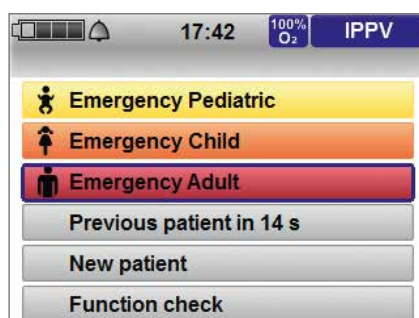


MEDUMAT Standard²

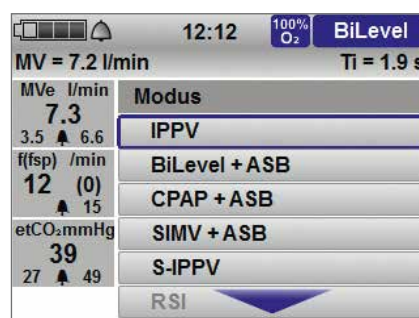
MEDUMAT Standard² offers a whole new take on modern ventilation. Its most striking feature: a monitor with a large color display. This shows all key respiratory values quickly and clearly.



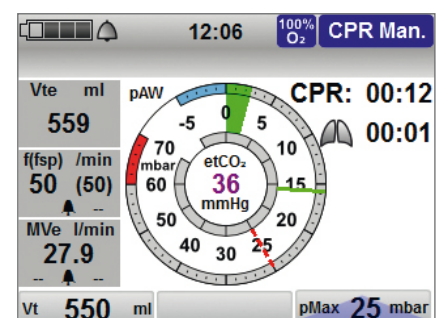
Intuitive start screen



Various differentiated ventilation forms



Innovative emergency mode



Simply Professional

WEINMANN Emergency is a family-owned, internationally active medical technology company. With our mobile system solutions for emergency, transport and disaster medicine, we set standards for saving human lives. In close collaboration with professional users in emergency medical services, hospitals and military medical corps, we develop innovative medical products for ventilation and defibrillation. For more than 100 years we have offered our customers a high degree of reliability, extensive experience and quality made in Germany.

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