Winter 2025 edition

LÖWENSTEIN
medical

A magazine by people, for people

INSPIRATION

Hello CARO!

After the successful CMI, CARO is at the starting gate.

APPsolutely helpful.
Apps in sleep therapy.

Huge innovations.
The LEONI 4 project.

Sleep, little child, sleep.
Childhood sleep disorders.

In this edition.

Our topics.

Löwenstein takes a holistic approach to patient care. We, our service and our products are there for you, from diagnosis and hospitalization to the optimal settings for homecare.

The Löwenstein colors provide orientation. Dark blue stands for the company. Green stands for Hospital, magenta for Homecare and light blue indicates our Diagnostics.

Have fun reading!

Homecare

Hospital

Diagnostics

The company

Foreword

Dear Readers,

In today's world, it is essential to think holistically and on the long-term, while at the same time acting with speed and agility. A contradiction in itself. How can this be reconciled?

There should be no limits to thinking. What can be achieved in the short term and the paths that lead to the goal can vary.

It is crucial to regularly review long-term, holistic goals and not be distracted by short-term obstacles.

Those who do not think beyond today's boundaries will never achieve extraordinary results or surpass themselves. Therefore, it is important to continually question the status quo.

At Löwenstein, our strength lies not only in holistic thinking but also in long-term thinking. Our independence allows us to operate without obligations to banks or shareholders.

Our actions are guided solely by the needs of our patients, customers, and employees.

You can learn more about this unique philosophy in this magazine. It's about holistic therapy concepts for patients on long-term ventilation at home and patients on acute ventilation in clinical settings.

We report on research and development for a better future and aim to share knowledge and make it accessible. Commitment to our customers and employees is of the utmost importance to us.

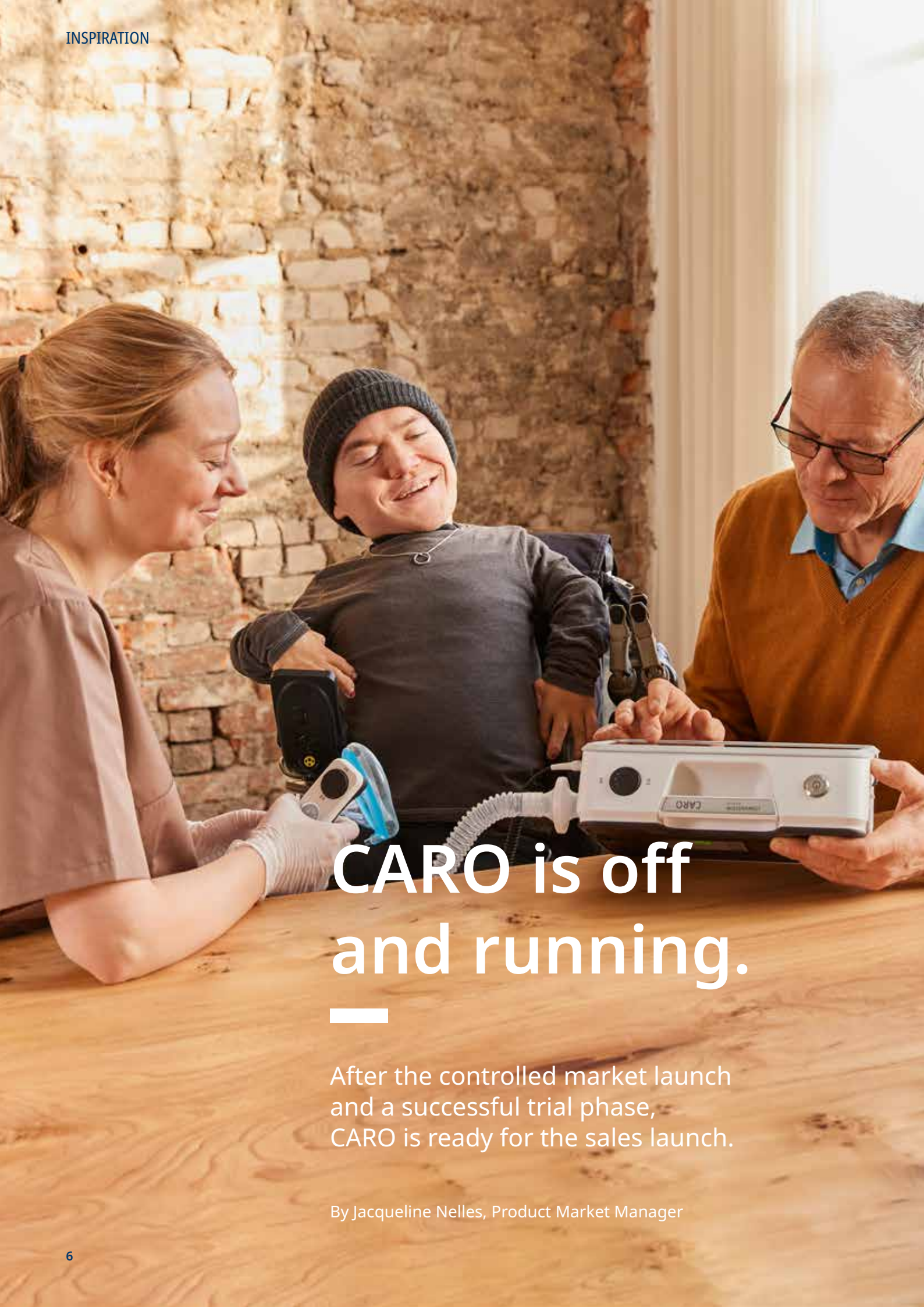
That's what our name stands for: Reliability. We will not disappoint you.

Yours sincerely, Benjamin Löwenstein

PS: We cordially invite you to share your ideas and comments on these topics with us.
Write to us at: inspiration@loewensteinmedical.com

LEONI 4 is our latest ventilator for preterm and neonates as well as children.

Page 24



CARO is off and running.

After the controlled market launch and a successful trial phase, CARO is ready for the sales launch.

By Jacqueline Nelles, Product Market Manager

"CARO is the effective alternative for secretion mobilization in neuromuscular diseases.

Thomas Gläser, Application Consultant

CARO is ready for the market. After the successful controlled market introduction (CMI), our new mechanical insufflator-exsufflator (MI-E) is about to enter the market. The response from practice has been very promising, the processes are in place, and the team is eagerly anticipating the sales launch in the fall.

CMI (controlled market introduction): The last big practical test.

CARO has long since cleared the regulatory hurdles. With the CE mark, the product has met all safety, quality, and efficacy requirements since April 2025 – and is therefore officially approved for application.

Nevertheless, we consciously and voluntarily opted for a controlled market launch to take the final step toward market readiness not only technically, but also in a practical, user-oriented way. This is our standard approach not only for our therapy devices, but also for masks and software releases – with the goal of consistently delivering true Löwenstein quality.

No matter how innovative a medical device may be, its true test is not in the lab, but in everyday clinical use: in application by healthcare professionals, in combination with patient needs, and integrated into existing workflows.

So the CMI is far more than just a product test. It is a structured method for testing under real-world conditions, allowing us to systematically gain insights – into handling, user experience, and potential areas for improvement. At the same time, it ensures a professional, coordinated, and practice-oriented market launch.

The CMI focused on four key aspects:

Technical handling:
How intuitive and reliable is CARO in everyday use?

Acceptance:
How do patients respond to therapy with CARO?

Result:
Strong performance – strong approval

Adaptability:
How flexibly can CARO be integrated into different care scenarios?

Service and training:
What information, formats, and support resources are needed?

Three months in use – three months of learning.

The launch kicked off in mid-June. From then on, CARO was used in practice in selected regions, accompanied by experienced application consultants.

Together with product management, sales, research & development, and the clinical team, a close feedback loop was established.

Feedback was collected and evaluated through standardized questionnaires, personal conversations, and regular group communication.

The feedback is clear: CARO delivers. Both in technical performance and practical application, the device generates satisfaction in the market.

Particularly highlighted were:

- the intuitive user interface,
- the quick, individualized adjustability of therapy parameters,
- the smooth and quiet operation of the device,
- as well as the thoughtful design with clear user guidance and a practical hand control.

Kick-off event for the controlled market launch of CARO with 25 application consultants and colleagues from SANIMED and IfM.

Dr. med. Geiseler, MD (l.) and Andreas Bosch, MD (r.). Both have played a key role in establishing MI-E as a standard component of secretion management therapy in Germany.

"With CARO and LUISA, Löwenstein Medical offers not only secretion management and life-supporting ventilation from a single source – the two devices can also be placed together on an expandable trolley.

In combination with the WILAmed AIRcon Gen2 respiratory gas humidifier and the ASSKEA Allegra M30 suction device, they form the perfect complete solution for clinical titration and patient care – made in Germany.

Andreas Bosch, Authorized Officer/Vice President

Prepared together: Kick-off event as a source of inspiration.

An important foundation for successful implementation was the three-day kick-off event in Hamburg. Around 25 application consultants were intensively trained there on the product, its application, and the CMI processes.

The program was complemented by technical insights, hands-on workshops, and professional exchange with colleagues from development and clinical research. Representatives from our subsidiaries IfM and SANIMED were also involved.

CARO before the market launch.

With the successful completion of the CMI, CARO is now optimally prepared for the sales launch. Training materials were adjusted based on feedback, service processes were refined, and the sales team is closely involved as well. The knowledge gathered from the CMI forms a solid foundation – not only for sales, but also for the long-term establishment of CARO in the market.

The official sales launch was scheduled for mid-September, and early customers are already showing strong interest – not least thanks to the high recognition of the MI-E concept and CARO's strong positioning in everyday clinical use.

Summary: Strong product, strong start.

The decision to go for a controlled market launch has stood the test of time. CARO is technically mature, user-tested, clinically validated, and optimally prepared.

The close collaboration among all parties – from development to user consulting – has been essential in bringing a high-quality, reliable, and patient-focused product to market.

We look forward to the sales launch in the fall, and to establishing CARO as the new standard in MI-E therapy

More about CARO

Flowing towards a better quality of life.

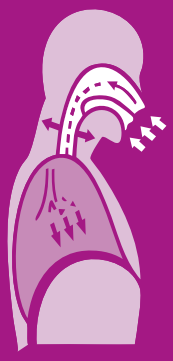
Which secretion management methods really help in neuromuscular diseases (NMD).

Dr. med. Jens Geiseler, Chief Physician for Pulmonology, Sleep, and Ventilation Medicine, Knappschaft Clinics, Paracelsus Marl

Secretions in the airways.

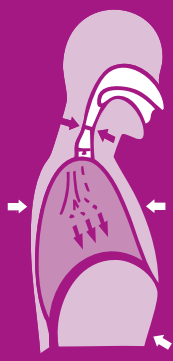
Secretions in the airways are continuously produced by the goblet cells and the glands located beneath the mucosa – approximately 10 mL per day. An increase in airway secretions, for example during lower respiratory tract infections or recurrent aspirations, is particularly problematic for patients with neuromuscular diseases who have a weakened cough reflex.

Inspiration



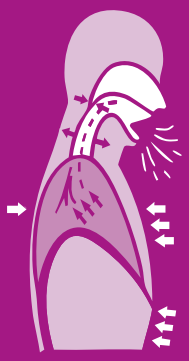
Deep inspiration; with intact respiratory muscles, volume at least 1-1.5 liters

Compression



Glottic closure (0.2 sec) followed by subsequent opening; requirement: intact bulbar musculature

Expiration



Contraction of expiratory muscles; requirement: intact expiratory musculature, MEP > 60 cmH_2O

Coughing.

Coughing consists of several phases:

- Deep inspiration (usually up to 80% of vital capacity; a minimum of 1.5 liters is required)
- Intrathoracic pressure build-up through contraction of the expiratory muscles during glottis closure
- Opening of the glottis and expulsion of air, and with it, secretions

Possible consequences of retained secretions in the airways.

Consequences of a weak cough may include:

- Airway obstruction resulting in decreased oxygen saturation
- Increased breathing work
- Increased risk of lower respiratory tract infections
- Failure of non-invasive ventilation
- Need for a tracheotomy with invasive home ventilation

Secretion management methods.

In addition to pharmacological secretion clearance (especially highly concentrated saline solutions for inhalation), there are five principles for secretion management (according to Schönhofer et al., Leitlinie Prolongiertes Weaning [Guideline on Prolonged Weaning], 2019):

- Increasing intrathoracic volume before the cough effort
- Increasing the maximum expiratory airflow from the airways
- Oscillatory therapy to liquefy secretions
- Increasing expiratory volume
- Mechanical suctioning (blind endotracheal or via bronchoscopy)

Specialized secretion management in neuromuscular diseases (NMD).

In neuromuscular patients, the principles mainly applied in the outpatient setting are increasing intrathoracic volume, accelerating maximum expiratory flow, and increasing expiratory volume.

When should non-invasive secretion management be initiated in neuromuscular patients?

- Regular measurement of peak cough flow (lung function testing or peak flow meter)
- Value < 270 L/min initiation of non-invasive secretion management
- Value < 160 L/min that does not respond to non-invasive secretion management; discussion of either tracheotomy or palliative care

CARO, in combination with the LUISA ventilator, the WILAmed AIRcon Gen2 humidifier, the ASSKEA Allegra M30 suction device, and the mask portfolio, completes Löwenstein's system solution for patients with chronic respiratory diseases.

History of the MI-E.

Developed by Dr. A. Barach in 1953 in the USA as the Cof-flator™, it was occasionally used by neuromuscular patients until its importance declined in the late 1960s with the replacement of the iron lung by tracheotomy and invasive ventilation.

In the late 1970s, J. Emerson further developed the Cof-flator™ into the MI-E, providing sufficiently high inspiratory and expiratory pressures. In Germany, its use has been promoted since the turn of the millennium through extensive training programs, including those offered by the company Heinen + Löwenstein (such as the "Cough-Help-Ventilate" symposia). It was included in the list of medical aids in 2009.

Measures to improve cough capacity in neuromuscular disease patients.

a) Air stacking.

Increasing intrathoracic volume before a cough effort, suitable for patients with neuromuscular disease who primarily have inspiratory muscle weakness with reduced vital capacity.

Methods for this include using a breathing bag for air insufflation, alternatively increasing therapy pressure under NIV (LIAM function: Lung Insufflation Assist Maneuver), and, in rare cases, glossopharyngeal ("frog") breathing, if the patient is able to perform it.

b) Manually assisted coughing.

Manually assisted coughing is a physiotherapeutic technique in which, following a deep inspiration or an air-stacking maneuver, compression applied either to the epigastrium or the lateral ribcage at the start of the cough increases peak cough flow by several liters per minute. Precise coordination between the deep inhalation and the execution of the maneuver at the onset of the cough is essential.

c) Machine-assisted coughing (Mechanical Insufflator-Exsufflator, MI-E).

MI-E most closely simulates a normal cough by combining a mechanical inflation maneuver with positive pressure, delivered via a non-invasive or invasive interface, followed by an abrupt switch to negative pressure, actively extracting air and secretions from the deep airways.

Application of the MI-E.

According to current recommendations, sufficiently high inspiratory and expiratory pressures are necessary when using the MI-E – pressures of 45-50 mbar for both inspiration and expiration are recommended. If the patient is intolerant but the method is effective, lower pressure settings can also be used.

You can also find the full article at loewensteinmedical.com/magazin.

Are all MI-E devices comparable in their performance?

The various MI-E devices available on the market differ in the performance of their turbines, as well as when using tubing systems of different lengths and internal diameters. Studies have been published by A. Schütz (Pneumologie, 2017) and N. Terzi (Respiratory Care, 2023), among others.

The consequence of this is that switching from one MI-E device to another, as is sometimes required by health insurance providers, is not possible without re-evaluating effectiveness and individual settings.

Do oscillations provide any benefits when applying the MI-E?

High-frequency oscillations (10-15 Hz) are frequently used successfully in physiotherapy for secretion clearance; however, they require a duration of at least 10 minutes, which is not achieved when using the MI-E.

The current body of evidence does not yet allow a general recommendation for the use of oscillations.

To the full article

Is the MI-E equally suitable for all patients with neuromuscular disease?

Clear answer: No. Problems in the upper airway, in particular, can be responsible for MI-E ineffectiveness:

- Paradoxical adduction of the vocal cords with (sub)total glottic closure
- Epiglottis folding down with (partial) closure of the laryngeal inlet during inspiration
- (Near) collapse of the hypopharynx during the expiratory phase

Oximetry feedback protocol.

All measures to improve secretion management in neuromuscular patients should be guided by the oximetry feedback protocol developed by J. Bach:

Blood oxygen saturation in (young) patients with neuromuscular disease and healthy lungs is usually above 95 %. If a drop in SO_2 is observed during regular spot measurements, a common cause is retained secretions in the airways. The consequence is to perform the prescribed secretion management, which usually leads to normalization of the SO_2.

Summary.

Peak cough flow should be measured regularly in all patients with neuromuscular disease who may have involvement of the inspiratory or expiratory muscles, in addition to monitoring of lung function and blood gases. If the value falls below 270 L/min, initiation of specific secretion management is indicated to prevent hospitalizations and often subsequent invasive ventilation, and to improve the patients' survival prognosis.

"Sleep apnea therapy restored my energy to cope with both my professional routine and family life.

Everything's in the clear.

A retrospective on a fulfilling life with a diagnosis of sleep apnea.

Martina Ecke, Marketing Manager, and
Nathalie Romeyo-Yoarsh, Marketing Intern

Arno Zillig has been a CPAP patient with Löwenstein Medical since 1988. He has been living with the diagnosis of sleep apnea for nearly four decades and has an active and fulfilling professional and personal life to look back on.

Mr. Zillig is an educated, friendly, and open-minded individual with a wide range of interests. He celebrated his 88th birthday in July 2025. He actively shares his extensive knowledge of sleep apnea therapy in lectures to self-help groups totaling 1,200 members. In addition, Arno Zillig is politically active at the district and state levels, as well as in the Bensheim Business Association.

Originally from Zwingenberg a. d. B., he completed training as an industrial clerk and as a concrete engineer at technician level. For many years, he worked as Managing Director for Dyckerhoff & Heidelberger Zement, where he played a key role in numerous major construction projects, such as bridges and high-rise buildings. During his career, this job involved long driving times to oversee the seven plants under his responsibility.

In his private life, Mr. Zillig was married to Ursula, a woman from Heidelberg, who passed away six years ago. The marriage produced three children: Ralf, Dagmar, and Bettina.

We visited Mr. Zillig at his home in Bensheim, the largest city in the Bergstraße district, nestled between the Odenwald and the Hessisches Ried. There, we spoke with him about good sleep, sleep apnea, his experiences, tips and recommendations for sleep apnea therapy, and his long-standing loyalty to Löwenstein. Currently, Mr. Zillig uses the Joyce sleep breathing mask and a white Prisma device.

prisma SOFT plus & max

Mr. Zillig, what does good sleep mean for your quality of life?

A structured daily routine is very important to me. After workdays lasting up to 16 hours, I placed special importance on restful sleep to start the next morning refreshed and ready to perform. A well-functioning balance between work, rest, and recovery was a fundamental requirement for my physical well-being and my professional resilience.

In the background, the first CPAP therapy device from the French company SEFAM. The device was the size of a refrigerator and could be moved on castors. Over the years, CPAP therapy devices have become increasingly compact (Photo: Wilfried Gladisch).

How has your life changed since you started CPAP therapy?

On April 6, 1989, after being diagnosed with severe sleep apnea, I received the prescription for my first CPAP device. The therapy led to a significant improvement in my quality of life: For the first time, I was able to sleep continuously without nighttime breathing interruptions.

At that time, the devices were very large, loud, and had limited comfort – comparable to a vacuum cleaner. The mask material was very rigid compared to the material they use today. Out of consideration for my wife, we slept in separate bedrooms. For me, wearing the mask was indispensable despite all the discomfort, as I would not have been able to work otherwise.

Before starting therapy, my condition was so critical that I regularly had to pull over on the right during car trips to take short rest breaks.

It was only through CPAP therapy that I was able to fully resume my work as a concrete engineer. Within nine months, I was able to resume my work with up to 16 hours per day, as I was accustomed to. At that time, I was 51 years old.

What were the biggest challenges when starting the therapy?

At one point, I found myself in a state of health in which I could no longer help myself. Neither my general practitioner nor the specialists I consulted were familiar with the condition of sleep apnea, which made finding a suitable treatment significantly more difficult. It was only with medical advancements and the increasing establishment of sleep medicine research in Germany – especially by the clinic in Marburg – that new prospects emerged for me.

In this context, I met Dr. med. Ulrich Brandenburg (Medical Director Diagnostics & Home-

To the detailed interview

Arno Zillig enjoys his lovingly tended garden around his home in Bensheim every day.

care), who was able to provide me for the first time with comprehensive information and further support in managing my condition. This contact marked a decisive turning point in my medical care and contributed significantly to stabilizing my health.

How did you get used to the device? Was there a moment when you thought, "Now it really works"?

For me, there was no typical adjustment period to CPAP therapy. Due to the severity of my sleep apnea and the associated limitations in daily life, I immediately adopted the solution offered. I used the device without hesitation – not as an option, but as a necessary measure to combat my condition. Immediate application led to a noticeable improvement in my sleep and overall endurance.

As a patient, what do you hope for in future devices – comfort, design, functionality?

I am very satisfied with the current state of CPAP technology. In my opinion, the devices are fully equipped, comfortable to use, and technically mature. I even find them nice to look at and especially appreciate the low noise level and high user-friendliness. For me, there's nothing better at the moment. Improvements are only possible in the details at most.

I am also very satisfied with the various masks and humidifiers, including JOYCE and LENA.

Is there a personal story or a special moment that you associate with your therapy?

A pivotal moment for me back then was a chance encounter: A man from Lampertheim told me that he urgently needed a CPAP machine – and we received the device at the same time. For me, this was an important motivation to seriously begin the therapy. Also, the first meeting with Dr. Brandenburg was a guiding influence for me at that time.

Without CPAP therapy, I would have had to give up my profession. The treatment was not only medically necessary for me but also crucial for my professional and personal quality of life.

Thank you very much, Mr. Zillig, for the interview.

JOYCEone

LENA

News from the world of science.

Recommended reading in the fields of ventilation, respiratory therapy, and related diagnostics.

Matthias Schwaibold, Chief Product Officer Homecare

Sleep disorders and sleep apnea therapy.

Increased risk of accidents due to sleep apnea confirmed.

All individuals in the Danish health database who received an OSA diagnosis between 1995 and 2015 were identified – almost 50,000. It was then queried whether they were involved in at least one traffic accident more frequently than the general population.

Result: The risk of a car accident approximately 30% higher, and there is a tendency for the accidents to be more severe. The risk of being involved in an accident as a pedestrian or cyclist did not increase.

Udholm, N., Rex, C. E., Fuglsang, M., Lundbye-Christensen, S., Bille, J. & Udholm, S. (2022): Obstructive sleep apnea and road traffic accidents: a Danish nationwide cohort study. Sleep medicine, 96, 64-69.

Global warming and sleep apnea – is there a connection?

In a worldwide study, the occurrence of obstructive sleep apnea was monitored using a sensor mat placed under the participants' mattresses. To do so, data from over 116,000 subjects was analyzed, with their breathing monitored nightly for an average of 3.5 years. At the same time, the temperature in the bedroom was recorded. Result: Sleep apnea is more likely to occur at night at higher temperatures – at 27 °C, the likelihood increased by 45% compared to a temperature of 6 °C.

At first, that may seem manageable. However, extrapolated across 29 industrialized countries in 2023, the climate-related increase in obstructive sleep apnea is estimated to result in a loss of 800,000 healthy life years and a productivity loss of 30 billion dollars if it remains undiagnosed and untreated. At least this little-known consequence of climate change can be mitigated, among other ways, with products from Löwenstein Medical.

Lechat, B., Manners, J., Pinilla, L., Reynolds, A.C., Scott, H., Vena, D., Bailly, S., Fitton, J., Toson, B., Kaambwa, B., Adams, R.J., Pépin, J.L., Escourrou, P., Catcheside, P.G. & Eckert, D.J. (2025): Global warming may increase the burden of obstructive sleep apnea. Nature Communications, 16.

Blood pressure reduction through CPAP therapy.

For years, the question has been studied of which patients and under what conditions CPAP therapy can lower blood pressure. We have also reported on this in the past. Several new publications on this topic have now been released.

It is confirmed that a higher severity of untreated apnea is a condition for a significant reduction in blood pressure through CPAP.

Zhao, X., Zhang, C., Zeng, P., Zhou, J., Li, X. & Zhang, X. (2025): The effect of continuous positive airway pressure on nocturnal blood pressure among obstructive sleep apnea-hypopnea syndrome patients. Sleep & breathing, 29 4, 240.

A study impressively shows that CPAP therapy can reduce the risk of hypertensive crises (i.e., emergency events caused by a sharp increase in blood pressure).

Oscullo, G., Beaperthui, T., Gómez-Olivas, J.D., Anglés, M., Mompeán, S., Martínez, R., Sánchez de la Torre, M., Gozal, D. & Martínez-García, M.Á. (2025): Prognostic Value Of Obstructive Sleep Apnea And Role Of Cpap Treatment In The Incidence Of Hypertensive Crisis. Sleep.

Does CPAP therapy generally improve cardiovascular health?

Another meta-analysis compared CPAP users with CPAP refusers or those using other forms of therapy among sleep apnea patients. It

You are cordially invited to give us feedback on this selection or to tell us about your own personal literary highlights. We look forward to your email at: inspiration@loewensteinmedical.com

showed that CPAP therapy significantly reduces the risk of serious and fatal cardiovascular events. For less severe cardiovascular diseases and hospitalizations, no significant correlation has yet been demonstrated.

Javaid, S.S., Obaid, M.A., Noor, T., Kaleem, M., Shakil, A., Ul Haque, S., Abbasi, N., Saeed, E., Manan, S., Alam, K., Gul, O. & Anwer, F. (2025): Impact of Continuous Positive Airway Pressure on Cardiovascular Health in Patients With Obstructive Sleep Apnea: A Systematic Review and Meta-Analysis. Cardiology in review.

Ventilation.

Home ventilation in COPD: Optimizing effectiveness.

Several publications focus on further improving the effectiveness of home ventilation for COPD patients.

An American study showed that initiating home ventilation as quickly as possible after the diagnosis of hypercapnic (elevated CO_2 in the blood) respiratory failure due to COPD both extends survival and reduces follow-up costs for the healthcare system within one year.

Frazier, W.D., DaVanzo, J.E., Dobson, A., Heath, S. & Mati, K. (2022): Early Initiation of non-invasive ventilation at home improves survival and reduces healthcare costs in COPD patients with chronic hypercapnic respiratory failure: A retrospective cohort study. Respiratory medicine, 200, 106920.

A large study from France with nearly 50,000 patients also confirmed the reduction in mortality through non-invasive ventilation.

Pépin, J.L., Herquelot, E., Denis, H., Josseran, A., Lavergne, F., Benjafield, A.V., Malhotra, A., Raphelson, J.R., Cistulli, P., Schmidt, A., Bailly, S., Palot, A. & Prigent, A. (2025): Impact of long-term non-invasive ventilation on severe exacerbations and survival in COPD: a French nationwide cohort study using multistate models. Thorax.

Ventilator and patient are often not synchronized in pediatric ventilation.

A review article notes that in recent years, multiple publications have reported a variety of "asynchronies" in pediatric ventilation, meaning that the ventilator does not provide synchronous respiratory support.

The detection and classification of different types of asynchronies are now well described. However, there is still a lack of statements regarding the clinical relevance and the risk-benefit ratio of targeted ventilator adjustments to reduce asynchronies.

Yoon, B., Blokpoel, R.G., Ibn Hadj Hassine, C., Ito, Y., Albert, K., Aczon, M.D., Kneyber, M.C., Emeriaud, G. & Khemani, R.G. (2025): An overview of patient-ventilator asynchrony in children. Expert Review of Respiratory Medicine, 19, 435-447.

ASV therapy – Adaptive servoventilation.

ASV therapy still indicated for central sleep apnea and failed CPAP attempt.

An expert group from the ERS and ESRS reviewed the current evidence on ASV therapy and confirmed its positive effect on breathing and quality of life in central sleep apnea, especially when it persists despite optimal treatment of the underlying condition and a CPAP attempt. With special caution and in specialized centers, it is now even recommended again for heart failure with a reduced ejection fraction in the range of 30-45%.

Randerath, W.J., Schiza, S., Arzt, M., Rosaria Bonsignore, M., Heinzer, R., Lombardi, C., Lyssens, R., Parati, G., Penzel, T., Louis Pepin, J., Pevernagie, D.A., Ryan, S., Vignatelli, L. & Schwarz, E.I. (2025): European Respiratory Society and European Sleep Research Society Statement on the treatment of central sleep apnoea with adaptive servo-ventilation. The European Respiratory Journal.

Mechanical Insufflation/ Exsufflation (MI-E = Cough Assistance).

How do patients perceive the therapy?

In a German observational study, the use of MI-E was examined in over 500 ALS patients. Most patients used the therapy daily and reported a significant improvement in their symptoms.

The relevance of this therapy for improving the quality of life of severely ill patients led us at Löwenstein to develop our own MI-E solution, thereby enabling access to therapy for as many affected individuals with rare neuromuscular diseases as possible.

Maier, A., Kettemann, D., Weyen, U., Grehl, T., Schulte, P.C., Steinbach, R., Rödiger, A., Weydt, P., Petri, S., Wolf, J., Grosskreutz, J., Koch, J.C., Weishaupt, J.H., Rosseau, S., Norden, J., Körtvélyessy, P., Koch, B., Holm, T., Hildebrandt, B., Schumann, P., Walter, B., Riitano, A., Münch, C., Meyer, T. & Spittel, S. (2025): Provision, cough efficacy and treatment satisfaction of mechanical insufflation-exsufflation in a large multicenter cohort of patients with amyotrophic lateral sclerosis. Scientific Reports, 15.

APPsolutely helpful.

Smart applications like the prisma APP as digital companions for successful sleep apnea therapy.

Anke Hille, Product Market Manager Software

Sleep-disordered breathing, such as obstructive sleep apnea, affects nearly one billion people worldwide.[1)] While treatment with a CPAP or APAP device is considered the gold standard, for many patients it initially represents a real challenge in daily life: the mask, the device, the new bedtime routine – how easily can all of this be accepted permanently beyond the critical initial phase?

In fact, studies show that there is a particularly high risk of therapy discontinuation, especially during the first few months of treatment.[2)]

This is exactly where modern applications like the prisma APP from Löwenstein Medical come into play: They provide digital support, enhance understanding of one's own therapy, and can thus contribute significantly to therapy success.

Those who can immediately see their progress stay motivated – and this is exactly where the prisma APP comes in: It is a simple, practical companion in daily life that provides tangible support to patients and sustainably promotes therapy success.

The prisma APP helps users track their own progress and actively shape the success of their treatment. Isn't it much easier to maintain a new habit when you have access to your own data at any time?

The white devices prisma SOFT/SMART plus and prisma SOFT/SMART max can be easily connected directly to the app via Bluetooth. This allows users not only to gain insight into their personal therapy data but also to independently adjust comfort settings. This means more independence, more motivation – and consequently a significantly higher chance of long-term therapy success.

The installation of apps can be done easily and effortlessly by the patient.

Of course, there are sometimes doubts or uncertainties at the beginning – especially if one is not yet very familiar with using apps. Is the effort really worth it? Does the application provide noticeable support – or is it just a technical gimmick?

The answer is clear: It's worth it! A recent survey conducted within the prisma APP clearly shows that the app is much more than just a digital add-on.* It provides real added value, makes the therapy more understandable, and strengthens confidence in one's own treatment journey.

Those who can immediately see their progress stay motivated – and this is exactly where the prisma APP comes in: It is a simple, practical companion in daily life that provides tangible support to patients and sustainably promotes therapy success.

An **overwhelming majority (84%)** participates more **actively in therapy** thanks to the app.

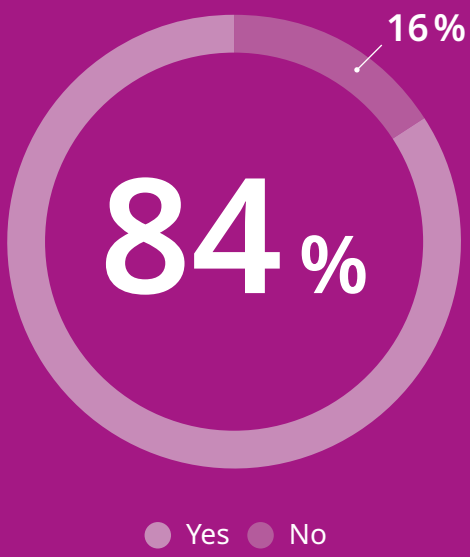
For 77% of app users, the focus is on understanding their own therapy.

Potential to improve adherence and reduce the burden on healthcare professionals.

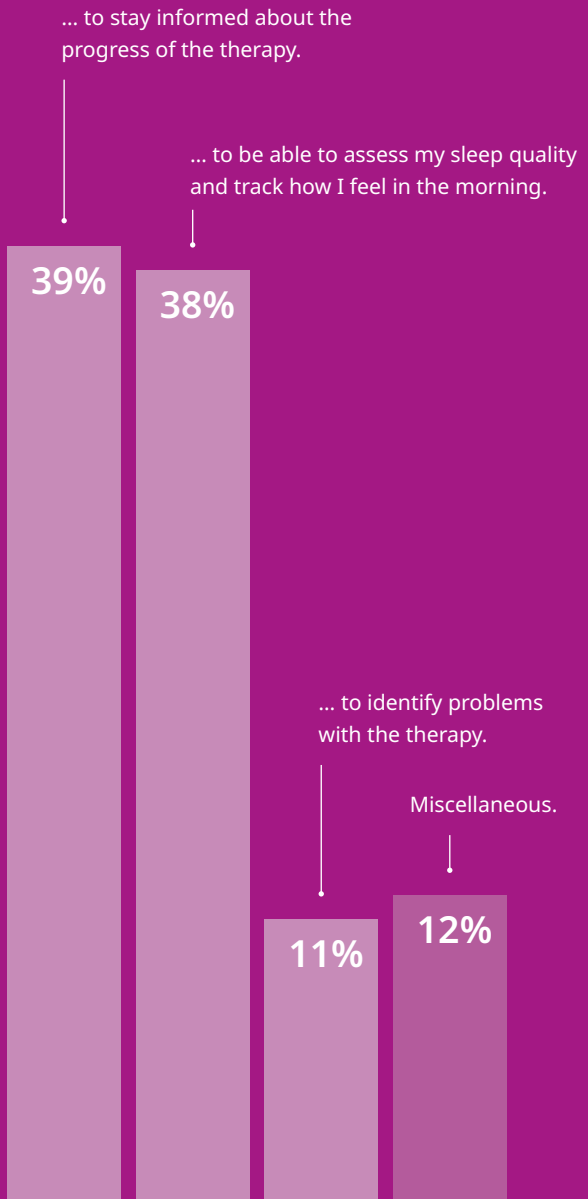
Patients in therapy want transparency and wish to actively track their treatment. With the **prisma APP**, they can independently access their therapy data and enter additional information about sleep quality. This personal responsibility can have a positive effect not only on the motivation of those affected but also on collaboration with healthcare professionals.

If support from a provider or medical professional is required, the patient can make their data available to the healthcare professional for intervention. This ensures that the time required by healthcare professionals is used as efficiently as possible. Especially in view of the increasingly limited resources in healthcare, the prisma APP offers great potential: It supports patients in their therapy, relieves healthcare professionals at the same time, and thus contributes to a sustainable improvement in adherence and therapy success – as our 2023 study [3] already impressively demonstrates.

Does the app help you use the therapy device more regularly and participate more actively in the therapy?



Why do you primarily use the prisma APP?



Summary: Digital companion with a positive impact on PAP therapy.

The prisma APP clearly demonstrates how digital applications can support sleep apnea therapy: They enhance understanding of the therapy, increase patients' active participation, and simultaneously relieve healthcare providers. With easy installation, direct access to relevant therapy data, and the possibility of targeted support from healthcare professionals, the app demonstrably contributes to improved adherence and effectiveness of PAP therapy – a benefit for both patients and providers alike.

Download the prisma APP and connect it to your therapy device:

Download on the App Store

GET IT ON Google Play

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* Voluntary survey in the prisma APP: Conducted between May 26, 2025 and June 3, 2025 in France, Germany, England, and the Netherlands; 11,040 completed questionnaires

[1)] Adam V Benjafield, et al. (2019): Estimation of the global prevalence and burden of obstructive sleep apnea: a literature-based analysis

[2)] Matsusato Tsuyumu, et al. (2020): Ten-year adherence to continuous positive airway pressure treatment in patients with moderate-to-severe obstructive sleep apnea; https://link.springer.com/article/10.1007/s11325-020-02033-0

[3)] Christian Franke, Franziska Piezonna, Regina Schäfer, Alexander Grimm, Lisa-Marie Loris & Matthias Schwaibold (2023): Effect of a digital patient motivation and support tool on CPAP/APAP adherence and daytime sleepiness: a randomized controlled trial, https://doi.org/10.1007/s41105-023-00479-9

Big innovations for the little ones.

LEONI 4 is our latest ventilator for preterm and neonates as well as children.

Britta Smoes, Development, and Marco Meeß,
Global Product Manager Neonatology
Hospital Division

The ventilation of preterm and neonates is an especially challenging discipline within intensive care medicine. The lungs of preterm babies are not yet fully developed. The alveoli (air sacs) are smaller and fewer in number, resulting in increased airway resistance and reduced lung compliance (lung elasticity).

The immature lungs are extremely sensitive to volutrauma (damage caused by excessive tidal volumes), barotrauma (damage caused by excessive airway pressures) and atelectrauma (damage caused by the repeated collapse and reinflation of the alveoli). This can lead to the development of a chronic lung disease, bronchopulmonary dysplasia (BPD), and to associated long-term damage.

Preterm babies also often have an irregular respiratory pattern with central or mixed apneas (pauses in breathing), which are caused by the immaturity of the central nervous system. This makes synchronous ventilation more difficult and requires ventilation modes that can respond to these irregularities.

More about LEONI 4

Caring for our tiniest patients has always been and continues to be especially close to our hearts.

We ventilate preterm babies with tiny lung volumes, weighing only 300 to 400 grams. For this, we need highly precise technology, as provided by Löwenstein. We can rely on these devices – they give us the confidence to provide optimal care for these extremely fragile children.

Dr. med. Ulrich Rochwalsky,
Head of Neonatology, University Hospital Frankfurt, Department of Pediatrics and Adolescent Medicine

In focus: Neonatology.

Since the founding of Heinen + Löwenstein in 1986, the roots and focus have been in the field of neonatology.

From the very beginning, we have focused on the development and production of medical ventilation technologies and thermal therapy systems for preterm and neonates.

Over decades, Löwenstein Medical has set standards in neonatal ventilation with the Leoni family, particularly Leoni plus.

Building on our expertise, the goal was to develop an innovative successor to the Leoni plus that integrates current scientific findings, technological advances, and practical requirements of neonatology.

The LEONI 4 project.

At the start of such a project, the requirements for a neonatal ventilator must be formulated not only with technical rigor but also with high medical sensitivity and regulatory compliance.

The quality of the formulated requirements forms the foundation for the design, development, testing, and approval of the device.

To this end, starting in February 2019, Marco Meeß (Global Product Manager Neonatology) and Britta Smoes (Project Lead for Development) analyzed existing systems from both our own company and competitors. Worldwide tenders and customer requirements were examined, and the needs of various stakeholders were captured through workshops, brainstorming sessions, and interviews.

From all this data, supplemented by long-standing in-house expertise – from colleagues in the R&D department, quality management, production and service, sales, marketing, and product management – the requirements specification for the R&D department is created.

"I have a long-standing, trusting relationship with Löwenstein Medical – from joint workshops to the introduction of the LEONI at the UKE. To me, Löwenstein is a sound, dependable partner and an entrepreneurial life's work that deserves the utmost respect.

Professor Emeritus Dr. med. Dominique Singer, Neonatology and Pediatric Intensive Care, Center for Obstetrics, Pediatrics and Adolescent Medicine, University Medical Center Hamburg-Eppendorf (UKE)

"LEONI 4 is doubly new: Each device change presents the team with new challenges. At the same time, LEONI 4, as a newly introduced product, is uncharted territory for everyone involved. All the more important is having a competent, easily reachable contact at the manufacturer – and such a contact exists.

Prof. Dr. med. Guthmann, MD, MME, Chief Physician, General Pediatrics and Neonatology, AUF DER BULT, Children's and Youth Hospital Hannover

On the test bench in record time.

In February 2020, following the presentation of preliminary work to management, the starting signal was given for the LEONI 4 project.

At the start of the project, seven developers worked on the extensive areas of design, construction, software, electronics, user interface, circuit boards, documentation, and more. It quickly became clear that additional staff needed to be recruited and some areas outsourced to external service providers. From mid-2021, 16 internal and external employees were working on the project.

In record time, the team managed in April 2022 to submit the first prototype of the LEONI 4 for initial testing at the TÜV Rheinland laboratory.

In November 2023, we then received the final report from the testing laboratories confirming that all necessary tests and inspections had been successfully completed. This ensured that the LEONI 4 meets the rigorous requirements.

Only after this could our Notified Body (an organization designated by an EU country to assess the conformity of certain products before they are placed on the market) begin reviewing the technical documentation.

After just two rounds of questions and answers, our notified body was able to forward its report to the Device Expert Panel (a group of independent scientific experts operating within the framework of EU regulations for medical devices and in vitro diagnostics [IVDs]).

As a user, I would like to highlight the stability, safety, service, support, assistance in emergencies, long-term collaboration, and recognition of nursing in patient care.

Karin Schnabel, Head of Nursing Group, Department of Pediatrics and Adolescent Medicine, Focus on Neonatal Intensive Care, Pediatric Intensive Care, University Hospital Frankfurt

Our neo-specialists: Dr. Cathrin Niedeggen, Marco Meeß, Ralf Wendt, Stefan Ruhwedel, Carolin Valte, Torsten Zeugner (l. to r.)

After a fortunately quick and positive response within a week, the reports could be forwarded to the certification body. The certification body conducted rounds of questions and answers with the notified body.

At the end of March 2025, we received positive feedback from the certification body, allowing us to issue the EU Declaration of Conformity under the current Medical Device Regulation (MDR) at the beginning of April 2025 – after less than five years of development.

LEONI 4 is being tested and challenged by users under real-world clinical conditions. So far, very successfully. We have succeeded in improving the worthy predecessor, Leoni plus, in many aspects.

LEONI 4 represents the pioneering platform for highly specialized neonatal ventilation from Löwenstein Medical and sets new standards.

"To me, the dialogue with engineers, technicians, and makers has always been very important – just as much as the exchange of knowledge between us users and the developers. Many of our requests, especially those regarding the ventilators, were seized upon and implemented wherever possible.

Professor Emeritus Dr. Rolf Schlößer former Head of Neonatology, University Hospital Frankfurt, Department of Pediatrics and Adolescent Medicine

LEONI 4 at the GNPI 2025.

In May of this year, the annual conference of the Society for Neonatology and Pediatric Intensive Care (GNPI) took place in Lübeck.

Firmly rooted in neonatology since its founding, Löwenstein Medical participated as usual – as already reported in the summer issue of Inspiration.

Particularly noteworthy: This year, Reinhard Löwenstein marks 50 years of continuous personal participation.

The latest generation of the LEONI 4 ventilator was presented at our exhibition stand and in practical workshops – a true highlight for professional visitors from neonatology.

The workshops in particular attracted great interest: Here, visitors could experience the new features of LEONI 4 live and engage directly with the developers.

We interviewed some of our customers to ask how they experience working with Löwenstein Medical. On the preceding pages, you can access the interview directly via the respective QR code.

We would like to sincerely thank all interview partners once again for their valuable feedback and look forward to continued successful collaboration.

The full interviews can also be found at loewensteinmedical.com/en/news/company-magazine/.

On the same wavelength.

Why we need new ventilation modes and how BiLevel-NRV (Near Relaxation Ventilation) preserves patient comfort and respiratory muscle function.

PD Dr. med. Hajo Reissmann, MBA

Mechanical ventilation is indispensable in modern intensive care medicine – it saves lives, but can also contribute to significant lung damage and loss of respiratory muscle function. In recent years, research has increasingly focused on how ventilation modes can be designed to ensure adequate ventilation while minimizing harmful effects.

A key aspect is the synchronization between a spontaneously breathing patient and the assisting ventilator. The better the two act in sync, the more comfortable the ventilation

"The patient can inhale at any time without the device having to first "decide" whether to provide support.

This reduces frustration and makes the ventilation feel more harmonious.

is for the patient, and the less the caregivers need to support acceptance, for example with sedatives. The challenge is to develop a method that maintains patient comfort, keeps the respiratory muscles active, and still enables effective ventilation – even under difficult pathophysiological conditions, such as dynamic hyperinflation or inadequate triggering.

This is where "Near Relaxation Ventilation" (NRV) comes in, an advancement of the classic BiLevel mode. Instead of switching abruptly between two pressure levels, both the rise and fall phases are designed as smooth pressure ramps. The goal is to keep the pressure-determined relaxation volume as close as possible to the current lung volume at all times, avoid inspiratory peak flows, and thus translate the patient's breathing efforts more effectively into ventilation.

In the following interview, Dr Hajo Reißmann, one of the pioneers of NRV, talks about the development of this form of ventilation, its physiological principles, and its potential clinical benefits – including its particular suitability as the "optimum of non-1:1-synchronous ventilation."

Dr Reißmann, let's go back to the beginning. What was the situation in ventilatory research in the early 1990s when you began working on Near Relaxation Ventilation?

At that time, two conditions were the primary focus: acute respiratory failure, i.e., ARDS or ALI, and chronic obstructive pulmonary disease (COPD). In COPD, dynamic hyperinflation was an ever-present issue – we knew it limited ventilation and caused trigger problems. At the same time, we observed that ventilators, thanks to digital controls and improved sensors, offered entirely new possibilities for assisted ventilation modes. What was largely unexplored, however, was the actual mechanical interaction between the patient and the ventilator.

And how did you come up with the idea to specifically investigate this aspect of interaction?

It was a mix of clinical observation and technical curiosity. In our research group at the University Medical Center Hamburg-Eppendorf starting in 1991, we asked ourselves: How does the patient's breathing mechanics influence the device's control – and vice versa? We recognized it early: When a patient wants to inhale while exspiration is not yet complete, they first have to overcome the intrinsic PEEP, also called auto-PEEP. This requires effort and can cause some breathing efforts to go completely "unnoticed" by the ventilator – the infamous missed triggers.

Why did you specifically choose BiLevel as the area of investigation?

BiLevel was – and still is – a method that does not operate in a 1:1 synchronization with spontaneous breathing, but rather alternates in phases between two pressure levels. The advantage: The patient can breathe spontaneously at any time, but the machine can also take over completely if needed. The disadvantage: The abrupt pressure changes mean that the new equilibrium volume determined by the pressure level suddenly deviates significantly from the current lung volume. After a jump from the high to the low pressure level, a significant dynamic overinflation occurs, which interferes with the patient's next inspiration. This is unphysiological and subjectively uncomfortable.

How did this lead to the development of NRV?

The basic idea was simple: We wanted to minimize dynamic overinflation. That meant: no sudden jumps in pressure, but smooth, linear pressure changes – both upward and downward. This way, the pressure difference between alveolar pressure and ventilator pressure remains only as large as necessary for the desired ventilation. This gives the patient the opportunity to effectively contribute to their breathing work, because they don't have to fight against abrupt pressure barriers.

From your perspective, what are the particular strengths of this approach?

On the one hand, comfort: Steady, even airflow feels less "forced" to the patient. On the other hand, there are

physiological benefits – more uniform gas flows tend to produce a more homogeneous distribution of ventilation and could improve gas exchange. And then there's another point that's important to me: BiLevel-NRV represents an optimum among the non-1:1-synchronized ventilation methods. This means that even if perfect synchrony cannot be achieved for pathophysiological reasons – such as when a patient is unstable or the triggering fails under difficult conditions – we can still preserve the patient's spontaneous breathing activity and, with it, the conditioning of the respiratory muscles. This is especially relevant in the context of non-invasive ventilation, as colleagues in Kiel have also emphasized.

You're referring to non-invasive ventilation. Where do you see the role of BiLevel-NRV here?

NRV is very well suited for this. Mask ventilation almost always involves variable leaks, which complicate triggering and make it unreliable. NRV is time-controlled and, consequently, leak-tolerant. The patient can inhale at any time without the device having to first "decide" whether to provide support. This reduces frustration and makes the ventilation feel more harmonious.

How did you approach the development from a |methodological perspective?

We initially used digital simulations – with models that variably represent compliance, resistance, and patient activity. Later, we conducted mechanical simulations using dual-chamber training lungs with endotracheal tubes to replicate realistic flow conditions. We used these experiments to directly compare NRV with classic BiLevel and intermediate modes, such as BiLevel with preset ramps.

What did these comparisons show?

That NRV allows the patient to convert their breathing work into ventilation more efficiently. With conventional BiLevel, early breathing efforts after a pressure change often go unrecognized – with NRV, however, they noticeably increase the minute ventilation. In addition, we measured significantly lower inspiratory peak flows, which is potentially gentler on the lungs.

Where do you see the next steps?

Clinical studies with patients to demonstrate the benefits in practice. We have learned a lot from simulations, but real-world practice is more complex – with variable patient activity, leaks, secretion management, and not least the interaction between patient, nursing staff, and device. I am very pleased that the University Hospital Kiel (UKSH) has examined this mode across different applications and is currently conducting a study regarding its use in non-invasive mask ventilation. I am convinced that NRV is a valuable option, especially in transitional situations – such as during emergence from anesthesia, in non-invasive ventilation, or in the early phase of weaning.

Dr. Reißmann, thank you very much for the interview.

More on the BiLevel-NRV

Reaching for new heights.

Five-day preparatory course for certification as a European somnologist.

Martina Ecke in an interview with
Prof. Dr. rer. physiol. Thomas Penzel

In July, around 55 international participants accepted Löwenstein Medical's invitation to attend a five-day preparatory course at various locations in Düsseldorf, aimed at certification as a European somnologist.

Certification as a European somnologist is becoming increasingly important, especially for (sleep) medical professionals outside of Germany. The internationally recognized certification raises the standards of sleep medicine and helps patients find reliable, qualified sleep specialists across Europe. The internationally recognized certification is an accredited proof of expertise in sleep medicine.

Accordingly, participant interest was very high, and the congress was characterized by an atmosphere of intensive learning. Each day, the professional audience was presented with a program featuring lectures by renowned experts in sleep medicine. The training and exam preparation, combined with intensive exchange, discussion, and networking, were the main focus of this event.

Thomas Domagala provides the participants with an insight into the preparations and procedure of a polysomnography measurement in the sleep laboratory. The presentation is moderated by Alexander Hubert and professionally supported by Dr. med. Martina Nedderman

Our goal is for patients in every European sleep laboratory to encounter the same high standard of knowledge and expertise – regardless of whether they are in Germany, Spain, or any other country.

Prof. Dr. rer. physiol. Thomas Penzel

Univ.-Prof. Dr. med. Christoph Schöbel in Rheinturm Düsseldorf

My presentation was about digitalization in sleep medicine. The technology is constantly evolving. While polysomnography in a sleep laboratory is still considered the diagnostic gold standard, its disadvantages are also well known: The unfamiliar environment, numerous cables attached to the body, and cameras in the room mean that sleep does not reflect the natural sleep at home.

New sensors now make it possible to measure sleep at home over several nights with much greater accuracy. This is especially important since both sleep and nighttime breathing pauses can change from one night to the next.

Many of these new technologies have already been validated as medical devices. In other words, we can trust that they truly measure what they are supposed to. These developments could play an important role in future diagnostics and treatment decisions.

Univ.-Prof. Dr. med. Christoph Schöbel

Organization team: Thomas Domagala, Chonlathit Kusumonkul, Prof. Dr. rer. physiol. Thomas Penzel; Jörg Lessau, Dr. med. Professor Martina Neddermann, Univ.-Prof. Dr. med. Christoph Schöbel, Benjamin Löwenstein (l. to r.)

Prof. Dr. rer. physiol. Thomas Penzel: in your view, what makes the ESRS certification as a European somnologist so special?

The ESRS certification as a European somnologist is internationally recognized. Although the focus is on Europe, the certification is by no means exclusive – it is also available to interested individuals from other countries that have not yet established their own certification in the field of sleep medicine. The current participants from Asia have deliberately chosen the European certification. I'm very pleased about that, because it shows that Europe is being seen as a reference point in this field.

A particular advantage of the ESRS certification is its interdisciplinary nature. In contrast to the global certification, it is aimed not only at physicians but also at sleep psychologists, scientists, and other professional groups working in sleep medicine. I find this openness and diversity particularly valuable – it makes the ESRS certification a strong and inclusive quality standard in sleep medicine.

It is particularly noteworthy that the European certification also includes medical-technical assistants (MTAs) and other professionals who work professionally in sleep laboratories. For example, this includes nurses with a bachelor's degree in nursing, as well as nurses who take on specialized roles in the sleep lab.

What role does the certification play in the internationalization of sleep medicine?

I see a key aspect of internationalizing sleep medicine as establishing a consistent standard of knowledge. That is why I am involved not only in the German certification but also at the European level and internationally with the World Sleep Society. My aim is for certifications to be globally equivalent, mutually recognized, and to create a unified international quality standard in sleep medicine. This is the only way to ensure reliable and consistent care across national boundaries.

To the detailed interview

How does the certification specifically contribute to improving patient care?

I firmly believe that the certification truly enhances patient care. Sleep medicine is an interdisciplinary specialty, encompassing fields such as otolaryngology, which treats sleep apnea, and psychology, which addresses insomnia. Professionals often remain within their respective disciplines. By contrast, the certification demands a comprehensive understanding of sleep medicine, covering all areas rather than just specific ones like insomnia, sleep apnea, or movement disorders.

That means: To become a somnologist, one must also familiarize oneself with adjacent disciplines. This broadening of one's knowledge beyond the boundaries of one's own specialty is a central part of the certification – and ultimately benefits patients.

How important is collaboration with companies like Löwenstein Medical for the advancement of sleep medicine?

Collaboration with companies like Löwenstein Medical is of central importance for the advancement of sleep medicine. I've been active in this field for many years and continually witness the importance of engaging with industry. As doctors and sleep researchers, we deliver patient care and offer practical input – but we don't create devices for either diagnosis or treatment. This is precisely where Löwenstein Medical plays a role: They implement our suggestions technically and drive innovation forward. Moreover, they play a key role in sharing knowledge, for instance through continuing education and international initiatives. While we usually work at institutions with a limited regional reach, companies like Löwenstein can disseminate knowledge on a regional and even global level. Such synergy is crucial for advancing sleep medicine.

Prof. Penzel, thank you very much for the interview.

A culinary and experiential highlight on the second-to-last day of the seminar was visiting Bar M 168 in the Rheinturm Düsseldorf, 168 meters up on a level with a full 360-degree view.

Sleep, little child, sleep.

Why sleep disorders should be taken seriously even in childhood.

Dr. Alfred Wiater, Pediatrician and Sleep Medicine Specialist, Online Pediatric Sleep Medicine Practice, Bad Wiessee

Sleeping well from the very beginning – for a healthy life.

In the first years of life, most neural networks (Fig. 1) are formed during sleep. This goes hand in hand with considerable learning capacity across all domains, including emotional skills. If sleep is disturbed during this sensitive developmental phase, the basic foundations on which all further development builds are lacking. But that's not all. If sleep disorders in childhood are not diagnosed and treated in time, they can become chronic and still have significant consequences in adulthood. After all, many sleep disorders in adults originate in childhood and adolescence. If they are treated during this period, many problems can be prevented for those affected.

The complex issue of sleep disorders.

Like adults, children's sleep disorders are closely linked to daytime behavior; however, non-restorative sleep in children more frequently results in restlessness and hyperactivity, while in adults, daytime sleepiness and fatigue are the main issues. You cannot properly evaluate sleep quality without understanding how the person functions during the day. But this is just one part of the broader complexity of sleep disorders.

Did you know

that, according to current studies,

13%

of children and adolescents have obstructive sleep apnea?

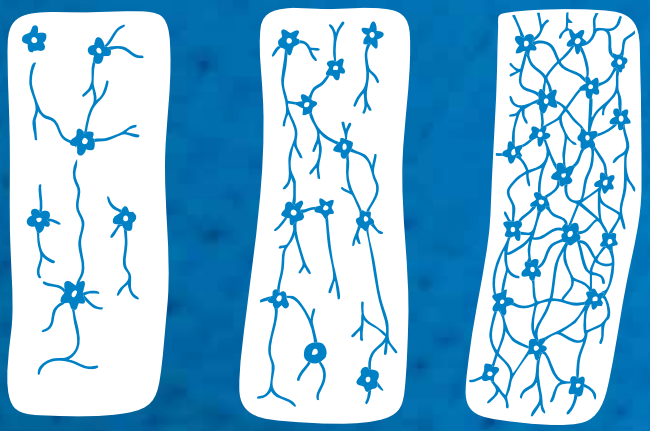
that as many as

25%

of children with restless legs syndrome show symptoms of ADHD?

that bruxism (teeth grinding) has an indirect connection to sleep apnea?

Fig. 1: Density of neural networks at various stages of life:



Neonates | 3 months old | 24 months old

Another important aspect is that various sleep disorders can affect one another, forming a bidirectional relationship. In the Summer 2025 issue of Inspiration, Dr. Weeß covered "COMISA: The Burdensome Dual Diagnosis," where OSA and insomnia co-occur and affect one another. A phenomenon that can also relate to sleep disorders and other conditions, and which likewise occurs in pediatric sleep medicine.

How restless legs syndrome (RLS) and ADHD are related.

A retrospective study of children with restless legs syndrome (RLS) showed that 64% had one or more concurrent psychiatric conditions, especially ADHD. The relationship between RLS and ADHD is complex and bidirectional. The co-occurrence of RLS and ADHD may be due to a dysfunction in the synthesis of the neurotransmitter dopamine.

Since iron is needed as a cofactor for dopamine production in the brain, this indicates that the pathogenesis of both disorders is closely associated with iron deficiency. Particularly because iron therapy may be beneficial for both disorders. This is only effective if the ferritin level, which reflects iron metabolism, is below a specific threshold.

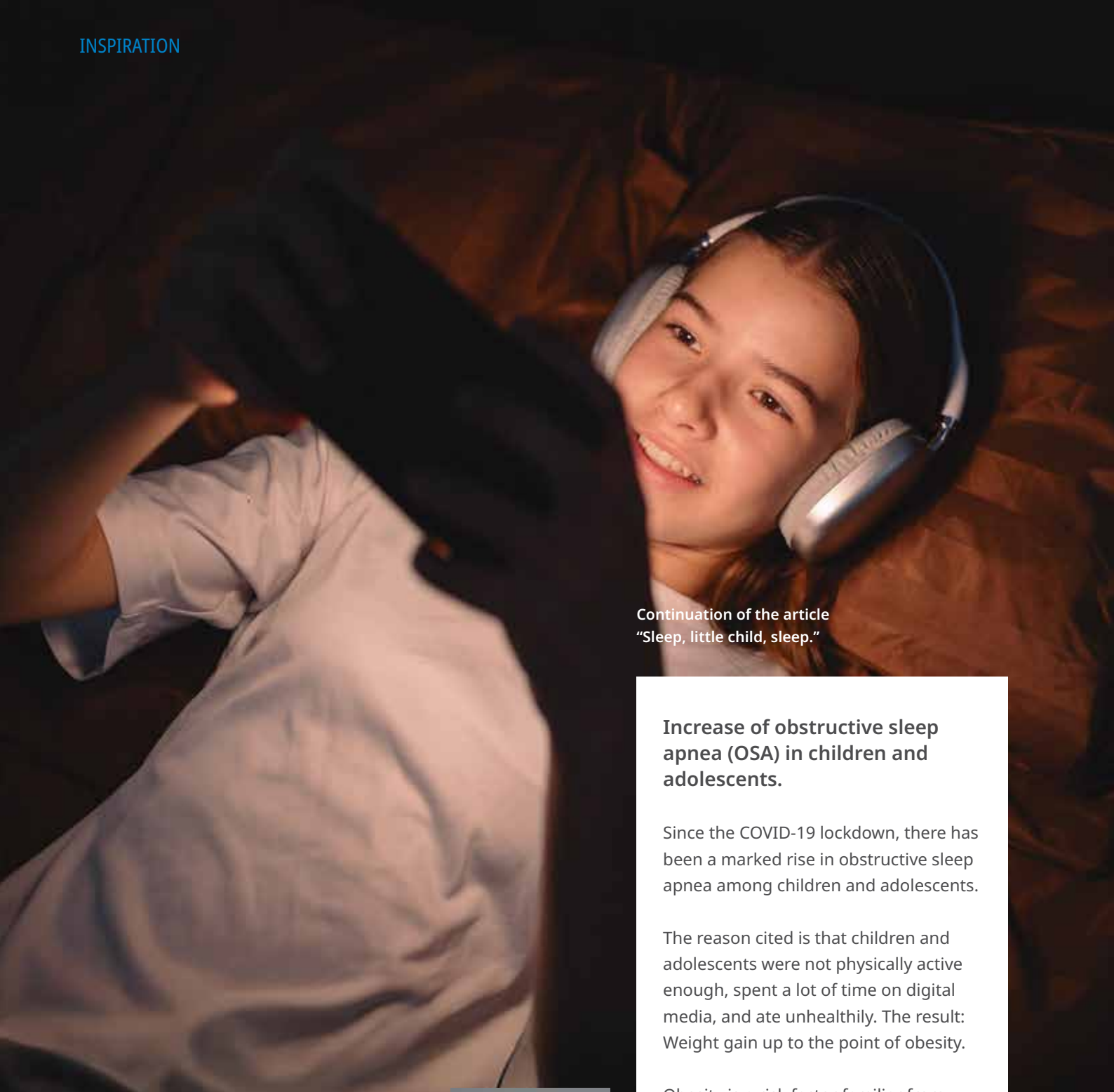
Physical and psychological consequences of sleep disorders.

Ultimately, sleep disorders can also be caused by organic or psychological conditions. For instance, depression may cause trouble falling or staying asleep, resulting in impaired daytime activity characteristic of insomnia. Conversely, insomnia is associated with an increased risk of developing depression.

The interrelationships between sleep and wakefulness, between different sleep disorders, and between sleep disorders and other conditions underlie the complexity of the issue.

Moreover, chronic sleep disorders can lead to physical issues in children as well. These include high blood pressure and cardiac strain as consequences of obstructive sleep apnea. In children, chronic sleep disorders can result in growth issues, since growth hormone is secreted during sleep. Psychologically, sleep disorders can lead not only to depression but also to anxiety.

6 years old



Continuation of the article
“Sleep, little child, sleep.”

Increase of obstructive sleep apnea (OSA) in children and adolescents.

Since the COVID-19 lockdown, there has been a marked rise in obstructive sleep apnea among children and adolescents.

The reason cited is that children and adolescents were not physically active enough, spent a lot of time on digital media, and ate unhealthily. The result: Weight gain up to the point of obesity.

Obesity is a risk factor familiar from adults with sleep apnea, yet in children and adolescents, it is just one of several contributing factors.

In this age group, the most frequent cause of obstructive sleep apnea is adenotonsillar hypertrophy – an enlargement of the throat and palatine tonsils. In such cases, the preferred treatment is ENT surgery.

Enlarged tonsils narrow the upper airways in children, leading them to

Dr. Alfred Wiater, Pediatrician and Sleep Medicine Specialist, Online Pediatric Sleep Medicine Practice, www.kinderschlaf.net

Information on sleep in infants, children, and adolescents, along with the references.

breathe through their mouths instead of their noses. As a result of this breathing behavior, the tongue sits in a middle position instead of resting against the palate, as it does with a closed mouth.

This deprives the facial skeleton, especially the jaw and midface, of an important growth stimulus. Both remain too narrow, the upper jaw protrudes beyond the lower jaw, creating a risk factor for OSA in adulthood – an issue that can be avoided with early diagnosis and intervention.

Bruxism associated with OSA.

Now let's talk about teeth grinding, or bruxism, which frequently accompanies OSA.

During obstructions of the upper airways, the genioglossus muscle is activated, which helps to widen the airways. In OSA, the respiratory signals that trigger the genioglossus muscle also engage the masseter muscles, which function in chewing.

This results in bruxism. The hypothesis has been proposed that activation of the masseter muscle serves to stabilize the lower jaw and allows the genioglossus muscle to keep the upper airways open more efficiently.

In practice, OSA treatment can also alleviate bruxism. Considering that about one in five adolescents in Germany show clear clinical signs of bruxism and that one in 20 already have enamel worn down to the dentin, early OSA treatment could have a positive effect on dental health – at least in children whose teeth grinding is related to OSA.

Finally, there are children and adolescents with facial and jaw anomalies from birth as a cause of OSA. In these cases, orthodontists should be involved in treatment early on, depending on the individual findings, even as early as toddler age.

This can help normalize jaw growth, thereby reducing the risk of OSA in adulthood. CPAP for children with OSA? Yes, but there is rarely an indication for this.

What conclusions can be drawn from this?

Children's sleep disorders need to be taken seriously, because their effects can extend all the way into adulthood.

Sleep should always be evaluated in the context of daytime behavior and symptoms. In children, issues like difficulty concentrating, attention problems, and hyperactive behavior may indicate a sleep disorder.

Different sleep disorders can appear at the same time and be connected, as illustrated by OSA and bruxism.

Psychological disorders such as depression can both result from and contribute to sleep disorders.

Beyond psychological disorders, sleep disorders in childhood can already contribute to organic conditions, such as cardiovascular disease.

Inspiring change.

Review of our symposium in France in April 2025.

Johanna Pardini, Communications Manager,
and Olivier Pasquier, Marketing Products Director,
Löwenstein Medical France

350
participants at the event

35
speakers from France and Switzerland

The Löwenstein Medical Symposium took place on April 3-4, 2025, at the prestigious Disney Newport Bay Club near Paris. Emerging from a partnership between Löwenstein Medical France and Switzerland, the third edition of the symposium was hosted in France for the first time, bringing the French-speaking medical community together for an outstanding event.

An unprecedented turnout for an outstanding edition, with almost 350 attendees across both days! This achievement underscores the increasing interest among professionals in an approach that unites scientific excellence, hands-on training, and networking opportunities.

A practice-oriented program.

Conceptualized and chaired by an exceptional scientific committee under the leadership of Dr. Claudia Llontop, Dr. Sandra Van Den Broecke, and Prof. Rémi Coudroy, the symposium was structured around three major topics: non-invasive home ventilation (NIV), the diagnosis and management of sleep disorders, and ventilation in intensive care medicine.

Each session was structured to integrate medical content, hands-on workshops, and opportunities for interaction, with the clear objective of equipping participants with practical knowledge for their everyday work.

As the scientific chair of this symposium, I am very pleased to be here. There are interesting lectures by experts on truly exciting topics. I am very proud to be a part of it.

Dr. Sandra Van Den Broecke

Workshops and exhibition area.

Our committed speakers conveyed their expertise via thematic modules, clinical demonstrations, and case studies, emphasizing ventilation, sleep, and intensive care to improve patient outcomes.

Beyond its medical program, the event provided an opportunity for personal and professional connections in a welcoming and friendly environment. Participants had the opportunity to test medical devices at different booths in a hands-on, interactive environment and to exchange insights with others.

A celebratory conclusion.

The first day concluded with the great pleasure of hearing a captivating lecture by Thomas Similowski, Professor of Pulmonology and author of "The Superpowers of Breathing." The gala evening delivered on its promise, featuring a sophisticated dinner, lively entertainment, a dance floor, and, of course, the Löwenstein mascot!

55

employees of Löwenstein Medical from France, Switzerland, and Germany who helped shape the event.

To the event video

Growth with foresight.

How we have expanded our international presence.

Jens Hallek, Vice President
International Partner Business

In the past two years, our company has strategically focused on the Iberian and Latin American regions, with tangible results: Seven new team members were recruited in total, playing a key role in advancing our international expansion. A key milestone was the founding of our Iberia office in December 2023, followed by its official opening in Madrid in December 2024 – marking our largest investment in the region so far.

Jens Hallek (l.), Vice President International Partner Business and Christoph Vetter (r.), Vice President Direct Hospital Business and Global Branch Management

"In my role overseeing the global dealer business, I intend to strategically invest in applications and service, directly at the regional level.

We view our relationships with partners – our distributors – as akin to a large family.

This collaborative relationship is the basis for mutual growth and for enhancing our support of customers around the world.

Jens Hallek

At the same time, we have substantially strengthened our presence in Latin America: Two years ago, only one person oversaw the entire continent; today, four individuals manage operations across Mexico, Ecuador, Brazil, and Argentina. These employees live on site and have an in-depth knowledge of the local markets. They strategically advance our activities and reinforce our relationships with clients and partners.

It all started in 2023 with the onboarding of Juan Corona, tasked with the strategic development of Iberia and Latin America. What began as a two-person team has grown into an international team of eight employees.

New organizational structures in international sales.

There have also been significant structural changes internationally: Since December of last year, there has been a clear division of responsibilities between Christoph Vetter and Jens Hallek. Christoph Vetter is responsible for managing the branch offices. Responsibility for the global dealer business has been transferred to Jens Hallek, who will continue to grow it, with a special emphasis on applications and service.

Focus on Asia: India and Japan in focus.

Asia is also seeing strategic investments: Two new team members are being recruited in India. Japan has already appointed a new Country Manager, with further positions set to be filled. Japan and India rank among the world's key markets, making the expansion of our local presence a natural next step.

Under the sign of the lion.

Löwenstein Medical at the World Sleep Congress 2025 in Singapore and the European Respiratory Society (ERS) International Congress 2025 in Amsterdam.

Anne Grünewald, Head of Product Market Management Homecare

Our on-site team: Anne Grünewald, Ari Pernas, Alexander Hubert, Benjamin Löwenstein (l. to r.)

Singapore, often referred to as the "Lion City," is a global hub for science, healthcare, and innovation – making it an ideal host for the World Sleep Congress 2025.

In a world that never stands still, sleep is regarded as a foundation for health, affecting everything from cardiovascular function to performance and mental well-being. Yet millions worldwide suffer from sleep disorders.

With a focus on the individual. Made in Germany.

The role of evidence-based therapies and technologies is more important than ever. The congress brought over 4,000 clinicians, researchers, and industry partners together to discuss progress in diagnostics, digital health, the role of artificial intelligence, and patient-focused care.

In the "Lion City," Löwenstein Medical is reaffirming its position at the forefront of this movement: Leveraging decades of experience in ventilation, sleep medicine, patient interfaces, and digital solutions, the company provides not just devices but also comprehensive care pathways via platforms like prisma CLOUD.

In a world that never stands still, sleep is regarded as a foundation for health, affecting everything from cardiovascular function to performance and mental well-being. Yet millions worldwide suffer from sleep disorders.

Breathe deeply anywhere. Hello, Amsterdam.

Amsterdam evokes images of winding canals, historic buildings, and a lively international ambiance.

This distinctive setting provided the backdrop for the European Respiratory Society (ERS) International Congress 2025, held in the Dutch capital at the end of September.

Amid a growing emphasis on sustainable healthcare, the congress explored how technology and clinical expertise can collaborate to enhance patient outcomes and simultaneously alleviate pressures on healthcare systems. ERS 2025 provided Löwenstein Medical with a key platform to demonstrate our dedication to advancing respiratory care through dependable technologies and patient-focused solutions.

We were eager to connect with participants, share expertise, and showcase how our innovations, including CARO – our new mechanical insufflator-exsufflator – are helping to enhance respiratory care.

Dialogue, networking, and the sharing of knowledge at the 2025 ERS International Congress in Amsterdam

WE LOOK FORWARD TO SEEING YOU.

DGSM Congress 2025, 33rd Annual Meeting of the German Sleep Society (DGSM)
Nov. 27-29, 2025 Hannover

25th Congress of the German Interdisciplinary Association of Critical Care and Emergency Medicine (DIVI)
Dec. 3-5, 2025 Hamburg

World Health Expo (Formerly Arab Health)
Feb. 9-12, 2026 Dubai

Intensive Care and Critical Care Nursing Symposium
Feb. 11-13, 2026 Bremen

45th International Symposium on Intensive Care and Emergency Medicine (ISICEM)
Mar. 17-20, 2026 Brussels

66th Congress of the German Respiratory Society (DGP)
Mar. 18-21, 2026 Munich

RETTmobil International 2026
May 6-8, 2026 Fulda

HOSPITALAR 2026
May 19-22, 2026 São Paulo

Euroanaesthesia congress, organized by the European Society of Anesthesiology and Intensive Care (ESAIC)
Jun. 6-8, 2026 Rotterdam

52nd Annual Meeting of the Society for Neonatology and Pediatric Intensive Care Medicine (GNPI)
Jun. 17-19, 2026 Mannheim

All events and activities at a glance

For me, Löwenstein is...

An interview with Anna Wetzel.

Who are you? Please introduce yourself.

My name is Anna Wetzel, I am 24 years old, and I have been working at Löwenstein since 2019 – with a brief break in between.

What is your current position at Löwenstein Medical?

In 2024, I transferred to the Ludwigshafen branch. In my role there, I manage administrative duties in diagnostics for the Southwest region, organize and assist with training sessions, and oversee regional events.

Interested in becoming part of the Löwenstein team?

More information can be found here

How did you get there? Which apprenticeship did you choose at Löwenstein Medical?

In August 2019, I began my apprenticeship as an industrial clerk at Löwenstein Medical in Bad Ems, which I successfully completed in 2022. In the last months of my apprenticeship, I was already handling diagnostics administration and continued overseeing the area until July 2023. In early 2024, I rejoined Löwenstein Medical and resumed responsibility for the diagnostics area, along with a range of exciting new responsibilities.

Was there an experience/a special moment in your training that you look back on fondly?

It is not one big experience that stays with me, but many small, special moments. A particularly formative phase was my apprenticeship, much of which was influenced by the COVID-19 pandemic.

In recent years, I've had the opportunity to meet many wonderful people – including my best friend, whom I probably would never have met without Löwenstein.

Complete the following sentence "For me, Löwenstein is..."

...a modern company that is constantly evolving, cultivates a positive work culture with strong teamwork, while staying true to its roots.

What would you like to say to prospective apprentices, job applicants, and anyone interested in a career with the company?

Training at Löwenstein Medical is diverse and provides fascinating insights into an innovative, forward-looking company.
I had an excellent and diverse apprenticeship experience, which I would highly recommend to others.

Thank you very much, Anna.

Did you know?

In the “Did you know?” category, we provide you with brief and concise information about exciting facts on a wide range of topics relating to Löwenstein.

LUISA stands out in a cost comparison:

well-designed, efficient, cost-effective.

During a strategic sales pitch, LUISA, our innovative ventilator, underwent a direct cost comparison with a competing product – yielding a clear result: LUISA offers significant economic advantages.

Special focus was placed on practical usability: The evaluation also took into account hygiene costs during change of patient, which are frequently not reimbursed by payers. Knowledge from the provider sector was likewise incorporated to ensure a practical and realistic perspective.

The result: LUISA stands out with its well-thought-out design and significantly lower follow-up costs.

Löwenstein Medical & WILAmed:

united for better respiratory care.

With the merger of Löwenstein Medical and WILAmed, a powerful company emerges with a unified mission: to build a fully integrated ecosystem for respiratory care that is seamless, reliable, and delivered from a single source.

Within the Löwenstein Medical Group, WILAmed brings its extensive expertise in designing precision humidifiers and user-friendly breathing tube systems, seamlessly complementing Löwenstein Medical’s innovative ventilators. This technological synergy guarantees top performance, safety, and ease of use in every care setting.

AIRcon Gen2

Jörg-Hermann-Peter Science Award:

An honor for outstanding achievements in sleep medicine.

The Jörg-Hermann-Peter award will be presented for the second time in 2025. This year, the award will go to Prof. Dr. med. Thomas Podszus.

The award is named after Prof. Dr. med. Dr. rer. nat. Jörg Hermann Peter († 2010), pioneer of modern sleep medicine and founding member of the German Sleep Society (DGSM).

As an internationally recognized researcher at the University of Marburg, for many years Prof. Dr. med. Dr. rer. nat. Peter headed a research group of physicians, scientists, and engineers whose groundbreaking scientific publications, innovative methodological approaches, and health-policy advocacy made a significant contribution to the development of interdisciplinary sleep medicine in Germany.

The Jörg-Hermann-Peter Award honors outstanding contributions to sleep medicine – in research, education, and patient care. The 2024 award recipient was Prof. Dr. med. Ulrich Koehler, who was honored for his many years of pioneering work in this field.

The prize, endowed with €5,000, is awarded by the Löwenstein Family Foundation to promote research in the field of sleep medicine.

The originators of this award are Reinhard Löwenstein and Dr. Uli Brandenburg, both of whom had a close personal and professional connection to Prof. Dr. med. Dr. rer. nat. Peter. In commemoration of his life's work, the desire arose to honor his memory with a scientific award.

The establishment of this project is supported by Dr. med. Helga Peter, the widow of Prof. Dr. med. Dr. rer. nat. Peter, as well as his son, Dr. med. Giso Peter, who also works in sleep medicine. Together with Prof. Dr. med. Ulrich Koehler, they form the award committee, which decides on the prize each year.

The Löwenstein Family Foundation is very pleased to honor the legacy of Prof. Dr. med. Dr. rer. nat. Jörg Hermann Peter through this project, and to further the development of sleep medicine.

Prof. Dr. med. Dr. rer. nat. Jörg Hermann Peter († 2010), Photo: private

With the portable Marburg suitcase, it became possible for the first time worldwide to examine patients with sleep-related respiratory disorders in their home environment.

It was developed in 1981 at Marburg's Philipps University in collaboration between the Clinical Time Series Analysis Group/J. H. Peter and the Central Electronics Development Laboratory/K. Meinzer.

Photos: W. Gladisch

New sleep breathing centers:

opened in Heppenheim (Hesse), Rottenburg, and Tübingen (both in Baden-Württemberg).

Since June 2025, a new point of contact for people with sleep-related breathing disorders has been available in Heppenheim, and since August in Rottenburg and Tübingen: Three new sleep breathing centers (SBCs) from Löwenstein Medical have opened their doors.

For people with sleep disorders, the new openings represent a significant improvement in care across homecare, diagnostics, and oxygen therapy.

In this, the success of sleep apnea therapy is not determined by technology alone, but also by the personal care provided on site.

This is just where the SBC concept comes into play: On site, experienced professionals are available to provide patients with individualized advice and support throughout the entire course of therapy.

Whether CPAP, APAP, or BiLevel therapy – at a local SBC, patients not only receive the appropriate supply but also a team that takes the time to address their individual needs.

200+ branches

A sustainable new beginning:

Relocation of Löwenstein Medical Switzerland.

In spring 2026, Löwenstein Medical Switzerland will relocate its headquarters from Neuenhof to Untersiggenthal.

The acquired building features a forward-looking energy concept. It is heated with district heat from a nearby incineration plant and has a photovoltaic system on the flat roof that covers most of its electricity needs.

The planned installation of two wallboxes in the carports is intended to promote sustainable mobility by providing electricity for future electric and hybrid vehicles.

Löwenstein Medical in Switzerland

The new building, with a total usable area of 1,120 m², offers not only ecological benefits but also modern offices and meeting rooms, a cafeteria, restrooms, and a freight elevator.

The building's multiple award-winning architecture completes the overall picture, making the new location a showcase for sustainable and responsible business practices.

With this move, we are sending a clear signal of our long-term commitment to sustainability – environmentally, economically, and socially.


Löwenstein Medical in Hamburg

Start of construction projects in Neuhäusel and Hamburg.

At the Neuhäusel site, a semi-automated small parts warehouse with innovative shuttle technology is being built. The previous "man-to-goods principle" is being replaced by an efficient "goods-to-man principle."
In the future, a shuttle system will handle the delivery of containers from the automated small parts warehouse and transport them directly to the workstation via a conveyor belt.

In the summer of 2025, excavation work for the new building began – with a depth of eight meters, a technical feat that also required infrastructural adjustments. The relocation of the oxygen tank on the site was particularly challenging. With a capacity of 50,000 liters of liquid oxygen, it is essential for the daily care of up to 2,500 patients.

With the new storage technology and infrastructural adjustments, the Neuhäusel site is entering a new phase of efficiency and modernization.

In Hamburg, the groundbreaking for a major construction project also took place in the summer of 2025. A new, modern building with an area of 7,500 m² is being constructed here. The renovation of the old building has already been completed, and the spaces are back in use. The dismantling of the atrium will begin in mid-October.

Löwenstein is consistently focusing on energy efficiency and sustainability in the new building.

Löwenstein Medical receives the 2025 Health Award.

Löwenstein Medical was once again honored with the prestigious 2025 Health Award in the category of respiratory and sleep therapy products.

The award is presented by the news channel ntv and the German Institute for Service Quality (DISQ) and is based on an extensive consumer survey with over 43,000 participants.

Among the criteria evaluated were value for money, product range, customer service, and likelihood of recommendation. A total of 533 companies across 68 healthcare categories were evaluated.

Andreas Bosch attended the award ceremony in Berlin.

A heartfelt thank you goes to all patients and customers for their trust – as well as to the employees of the Löwenstein Group, who contribute to our success every day with their expertise and customer focus.

Photos: Christian Schlenker/ntv/DISQ

Employee anniversaries from July 1 to December 31, 2025.

	10 years	15 years	20 years	25 years	30 years	35 years
Löwenstein Medical	21	25	3	7	1	1
Löwenstein Medical Technology Hamburg + Karlsruhe	2	1	2	5	2	1
Löwenstein Medical Innovation Steinbach	3					
IfM Wettenberg	7	4	1			
Medigroba Balingen-Frommern		2				
SANIMED Ibbenbüren	5	2	3	3	2	1
WILAmed Kammerstein	1			1		

The management would like to thank all those celebrating anniversaries for their commitment, loyalty and faithfulness. We wish you all the best for your professional and private future.

To the current digital issue of Inspiration

Help us make the next edition of Inspiration even better!

As with our products, we want to improve this magazine. What should we include? Share your suggestions and feedback by writing to: **marcom@loewensteinmedical.com**

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The editorial team is committed to finding a language that is understandable for the entire readership and at the same time does not exclude anyone. All people are expressly addressed – even if the masculine form has been used for personal designations and personal nouns for reasons of better readability.

Thank you and see you in the next issue!

With people in mind

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