LÖWENSTEIN
medical

Diagnostics

The TOP 6 features of our sleep diagnostics devices.

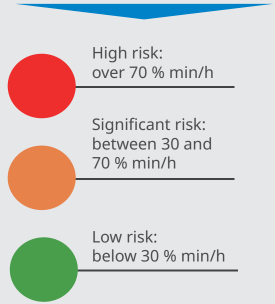
With people in mind

Hypoxic Burden

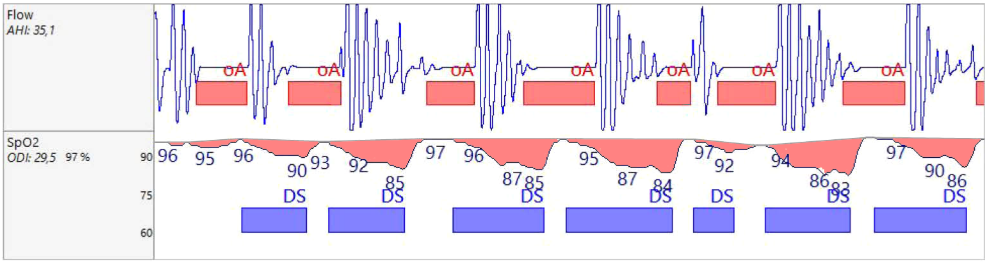
With all sleep diagnostic devices from Löwenstein Medical, the Hypoxic Burden can be output as a report parameter. Recording hypoxic burden in a sleep medicine examination is a strong predictor for determining cardiovascular risk due to associated obstructive sleep apnea. Conventional parameters such as AHI, ODI or arousal index ignore the depth and duration of their respective starting parameters.

The OSA-specific hypoxic burden (HB) quantifies the depth, frequency and duration of respiratory desaturations. Studies have shown that increased HB is significantly associated with several consequences for health.

Cardiovascular risk as a function of hypoxic burden



Hypoxic burden appears to be the marker most strongly associated with cardiovascular mortality.

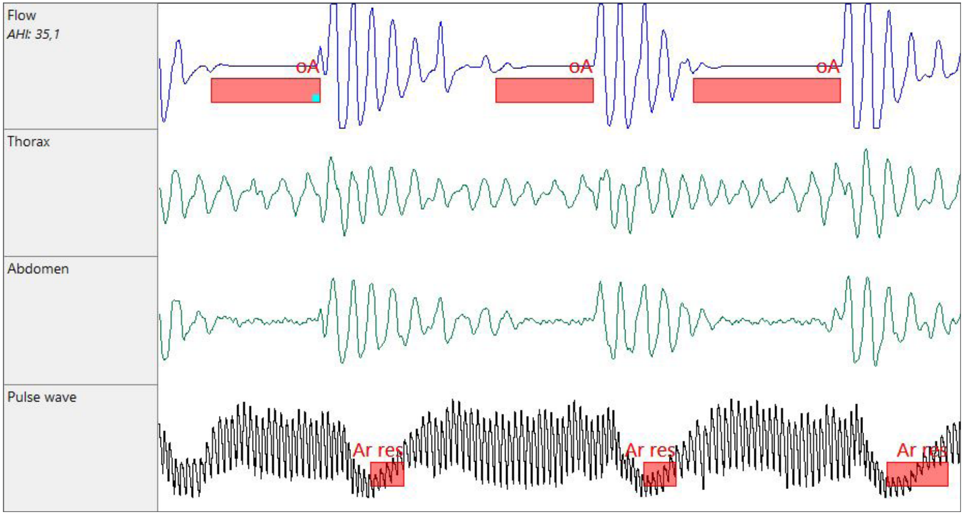


AHI	35.1 /h
RDI	37.7 /h
ODI	29.5 /h
Hypoxic burden	66.8% min/h

This excerpt of a graph shows a section of a measurement involving severe obstructive sleep apnea. The adjacent table shows severe sleep apnea and a high desaturation index. The elevated value for hypoxic burden highlights the severity of the hypoxic strain on the patient.

Pulse wave amplitude drops

Pulse wave amplitude drops (PWAD) indicate increased activity of the sympathetic nervous system and may indicate fragmented sleep. The drops are generally associated with an acceleration in pulse transit time (PTT). The amplitude drops can serve as additional information about stress reactions. In polygraphic measurements, they can likewise be used as surrogate parameters relating to cortical EEG arousal and support the determination of hypopneas and RERA.

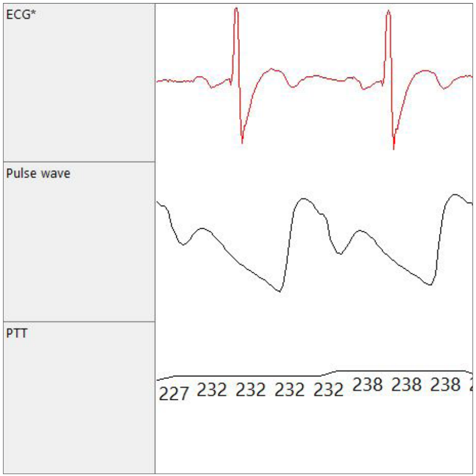


This excerpt of a screen shows three obstructive apneas. A clear pulse wave amplitude drop can be seen simultaneously with the end of respiratory events; the MSV software detects this as (autonomic) respiratory arousal.

Pulse transit time (PTT)

Pulse transit time determines how long the arterial pulse wave needs to cover the distance from the left aortic valve to a peripheral end point. A change in vascular stiffness, due to increased activity of the sympathetic nervous system for example, has a direct impact on pulse transit time and allows the recording of both so-called autonomic arousals and, indirectly, blood pressure changes. These should be considered as inversely proportional to PTT.

Löwenstein Medical's Sonata PSG system is capable of determining PTT on the basis of the ECG and pulse wave signals.



The R-wave of the ECG signal is used as the starting point for calculating PTT. The leading edge of the pulse wave marks the end point. PTT is output in milliseconds.

Obstructive events (obstructive apneas and hypopneas, RERA, obstructive snoring)

↓

(Autonomic) arousals arising are accompanied by increased activity of the sympathetic nervous system; this causes fluctuating heart rate and increased stiffness of the vascular system,

↓

resulting in fluctuations in blood pressure, PTT and pulse wave amplitude.

↓

Pulse transit time (PTT) is inversely proportional to blood pressure.

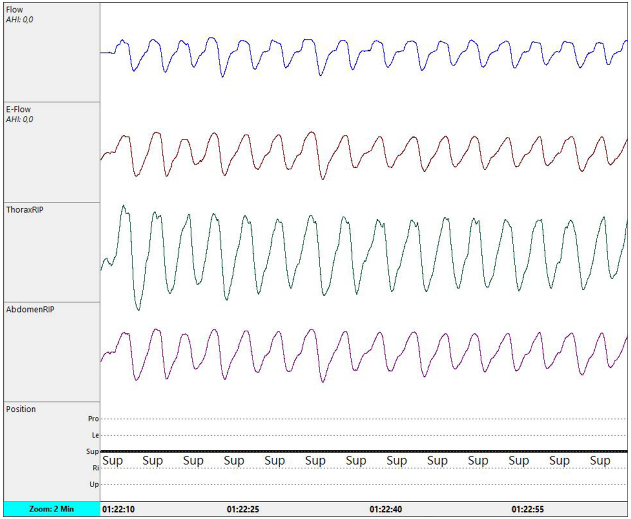
↓

PTT values do not correlate with absolute blood pressures at any particular time.
It is rather the case that blood pressure changes can be forecast within a short period of time.

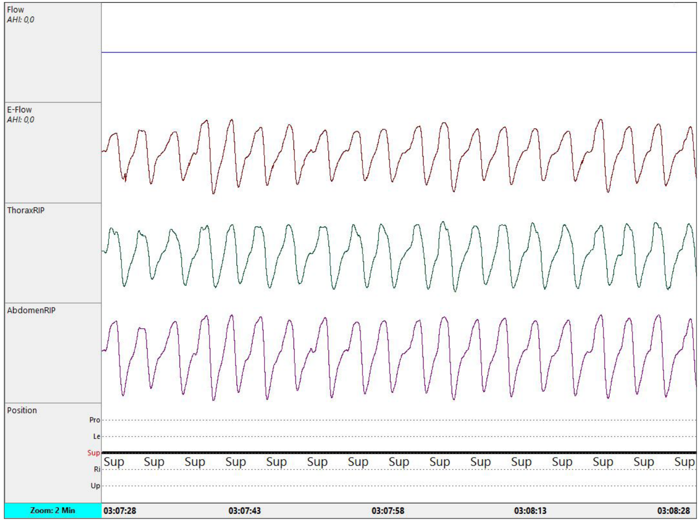
E-Flow

In the event that the flow signal is lost during a sleep diagnostic measurement night (e.g. due to patient movement), the MSV software offers the E-Flow feature.

For any completed measurement, the E-Flow signal can be calculated and analyzed after the event on the basis of the thoracic and abdominal signals.



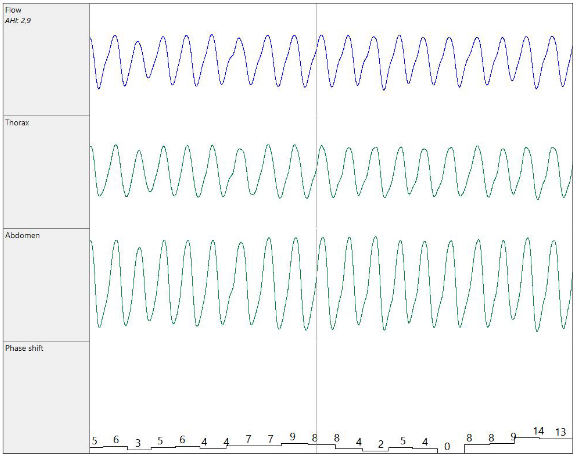
This excerpt from a recording shows a flow signal and, underneath it, also the calculated E-Flow.



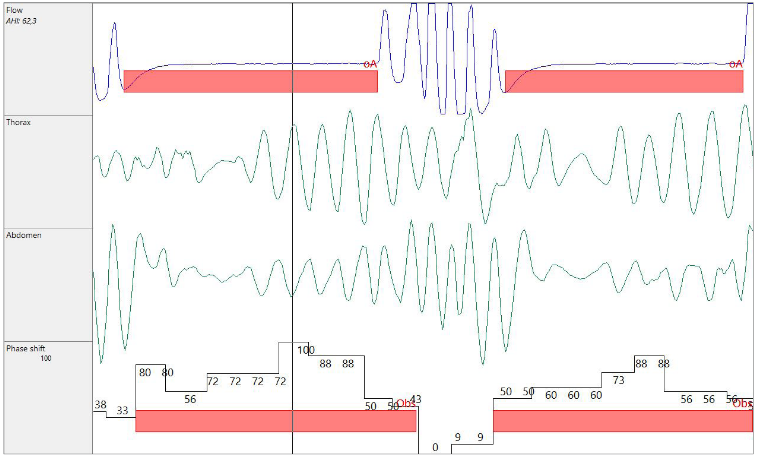
This excerpt from a recording shows where a flow signal has been lost (zero line) and, underneath it, also the calculated E-Flow.

Phase T-A

The MSV software analyzes phase coherence between the thoracic and abdominal respiratory curves. The so-called paradoxical/ reverse breathing which often occurs in patients with obstructive symptoms is apparent in a phase shift of these two signals and is output in the software in the form of the Phase T-A (T for “thorax”, A for “abdomen”).



This excerpt of a curve shows a section with no phase shift.
Signal values are shown in the Phase T-A to make the visualization clearer. These values represent phase shift in %. Zero % indicates absolute phase coherence.



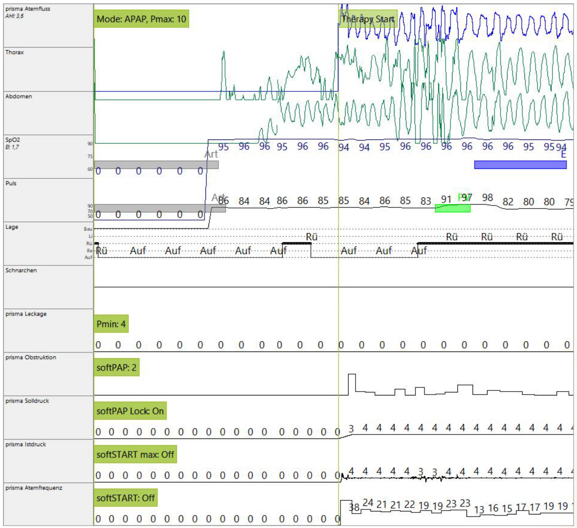
The vertical line set in the first obstructive apnea indicates a clear complete phase shift between thorax and abdomen. In parallel, a value of 100 % is shown in the Phase T-A; this visualizes the phase shift of 180° and thus the paradoxical/reverse breathing which has occurred during the obstruction.

The red event highlighted in the Phase T-A channel simply indicates the obstruction, it does not inform reporting.

Bluetooth™ connectivity with therapy devices

The Bluetooth™ interface integrated in the Samoa and prisma SOFT/SMART devices (plus/max versions) allows the devices to connect and to communicate with one another. This makes it possible for both device platforms, polygraphy and therapy, to exchange patient therapy information wirelessly, delivering a comprehensive depth of information during the simultaneous use of both products.

When both products are used in parallel, values calculated and acquired live from the prisma device (e.g. flow, pressure, leakage, respiratory rate etc.) are transmitted to the Samoa device by Bluetooth™ and saved there at the same time as the polygraphy data and subsequently visualized when the measurement is read out. The prisma device also transmits status information about therapy settings and the course of therapy. The MSV software uses all the transmitted signals for analysis.



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