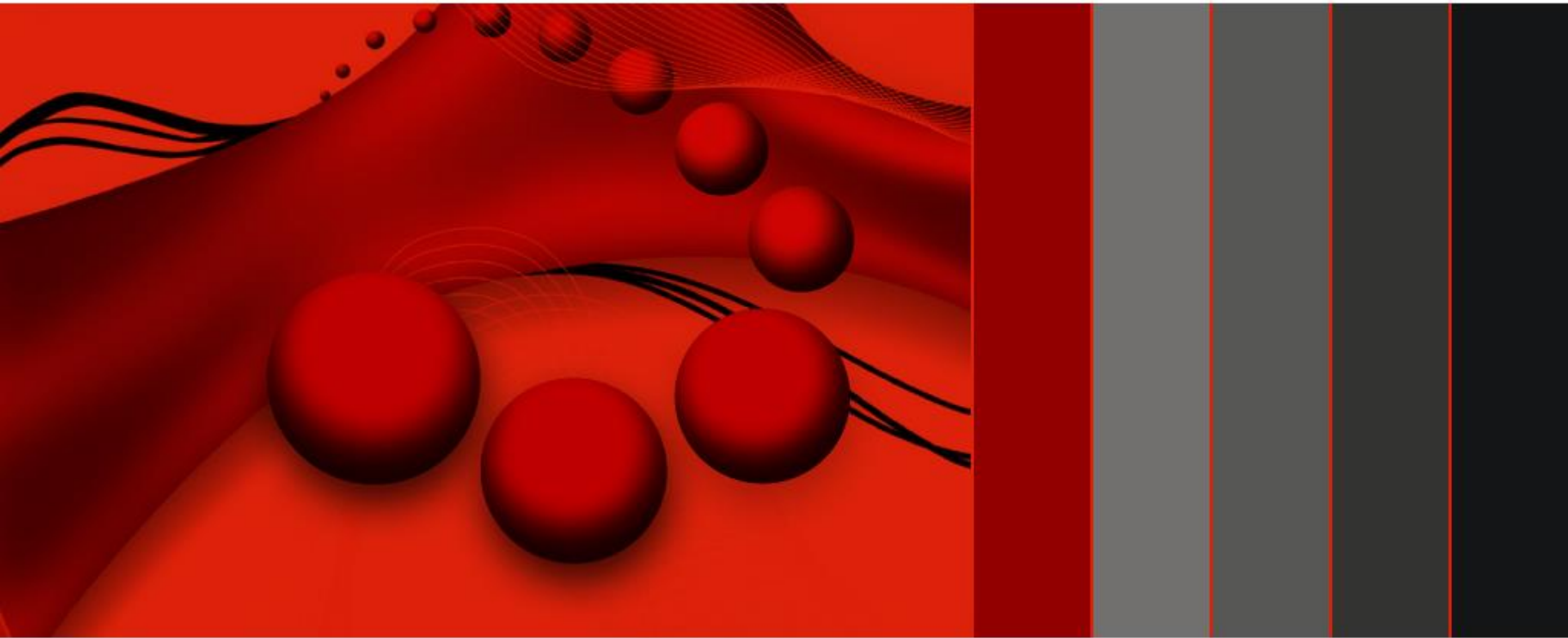


apneABP blood pressure Holter in pre-screening sleep apnea



Obstructive sleep apnea syndrome (OSAS)

- ♥ Sleep-related breathing disorder causing obstruction of the pharyngeal airway
- ♥ Definition: OSAS exists if the obstruction lasts more than 10 sec & it occurs at least 5 times / hour
- ♥ 12-14% of the general population is affected

OSAS symptoms, risk factors & identification

♥ Symptoms

- Loud snoring (with periods of silence followed by gasps)
- Awakenings, drowning nightmares
- Daytime sleepiness
- Resistant hypertension
- Stroke
- Arrhythmia

♥ Risk factors

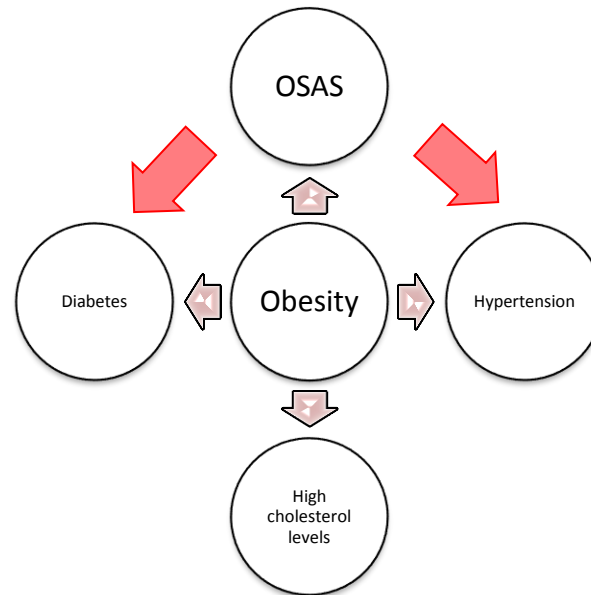
- Obesity
- Male gender
- Smoking
- Alcohol consumption

♥ Identification

- Screening
Sleep questionnaires, ECG, ABPM, pulse oximetry
- Diagnosis
Sleep lab tests
- Treatment
CPAP therapy

The OSAS effects

♥ OSAS effects



♥ Risks of undiagnosed OSAS



10-32x
increase in
cardiovascular
mortality



15-20x
increase in
sleep-related
traffic
accidents



7-10x
increase in
cerebrovascular
mortality

Connenction between OSAS & hypertension

- ♥ OSAS = most common cause of secondary hypertension
- ♥ ~ 80% of OSAS patients have hypertension
- ♥ ~ 40% of hypertensive patients suffer from OSAS, in this case:
 - The hypertension is usually diastolic
 - Night dipping is low or non existent
 - Night blood pressure variability is greater than during the day

Main target group of apneABP

- ♥ Male
- ♥ Between 40 and 60
- ♥ With (abdominal) obesity

- ♥ Who is hypertensive / suffered a stroke / diabetic
- ♥ In whom OSAS must be ruled out due to occupation (pilots, drivers)



apneABP benefits

- ♥ to manage/control hypertension
In case of white-coat hypertension, drug-resistant hypertension, masked hypertension, hypotensive symptoms with antihypertensive medications.
- ♥ to screen for sleep apnea
Sleep apnea is the most common cause of secondary hypertension. If it is left undiagnosed, sleep apnea increases the risk of cardiovascular diseases, sleep-related traffic accidents and stroke.
- ♥ to control CPAP therapy
- ♥ to assess COPD
- ♥ to assess asthma



How to use - programming

Programming: apneABP - 1 1

Summary | BP Settings | Storage parameters

Patient data
Name: 1 1
ID: 1

BP
Morning: -
Day: 06:00 - 22:00 / 15 min
Night: 22:00 - 06:00 / 30 min
Special: -

Device data
Connected: USB
Serial number: ---

Pulseoxy. Enabled
Mov. det. Enabled

Time
Start: 2017.11.27. 11:27
Length: 27 hour

PC date and time
2017.11.27. 11 22

Memory card
Size: > 2GB

Cover letter to be printed after programming

Load Save Used card memory

Programming: apneABP - 1 1

Summary | BP Settings | Storage parameters

Enable programmed BP measurements

Enable morning period Enable special period

	Start (hh:mm)	End (hh:mm)	Interval
Morning period:	05:00	06:00	10 minute(s)
Day period:	06:00	22:00	15 minute(s)
Night period:	22:00	06:00	30 minute(s)
Special period:	12:00	13:00	

Morning Day Night Special

00:00 03:00 06:00 09:00

Enable measurement repeat
 Enable manual day/night shift

Load Save

Programming: apneABP - 1 1

Summary | BP Settings | Storage parameters

BP settings

Display during measurement

Cuff type: Normal

Maximum pressure: 300 mmHg

Enable pulseoximetry recording

Error display: Display, beep

Enable triggered BP: 10 sec

Repeat BP measurement

Low trigger value (SpO2 %): 90

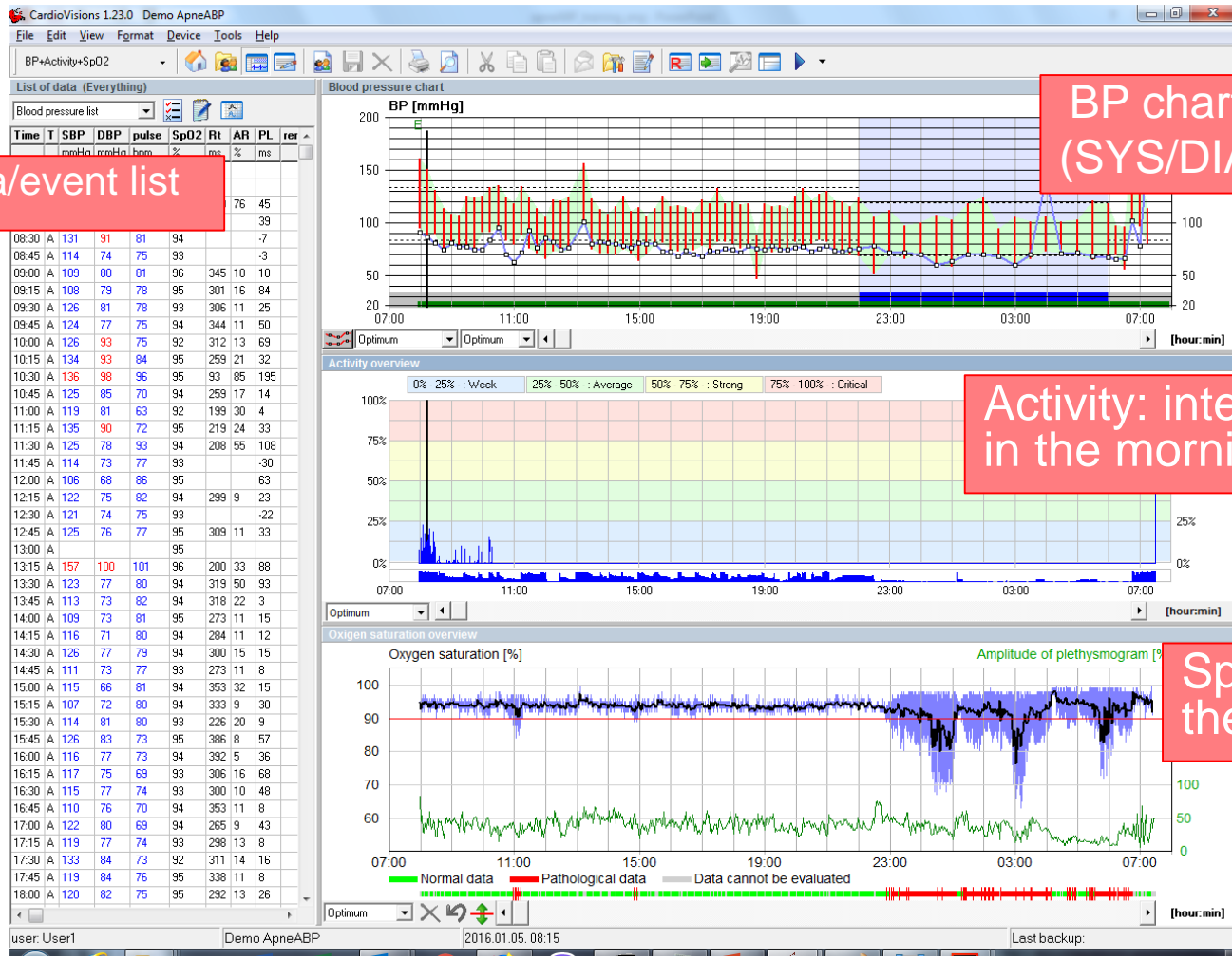
High trigger value (SpO2 %): 94

Enable movement detection

Load Save Used card memory: 2% Close Help

- Availabilities:
- ambulatory BP
 - SpO2
 - movement detection

How to use – analysis (3in1 view: ABPM+ activity + SpO2)



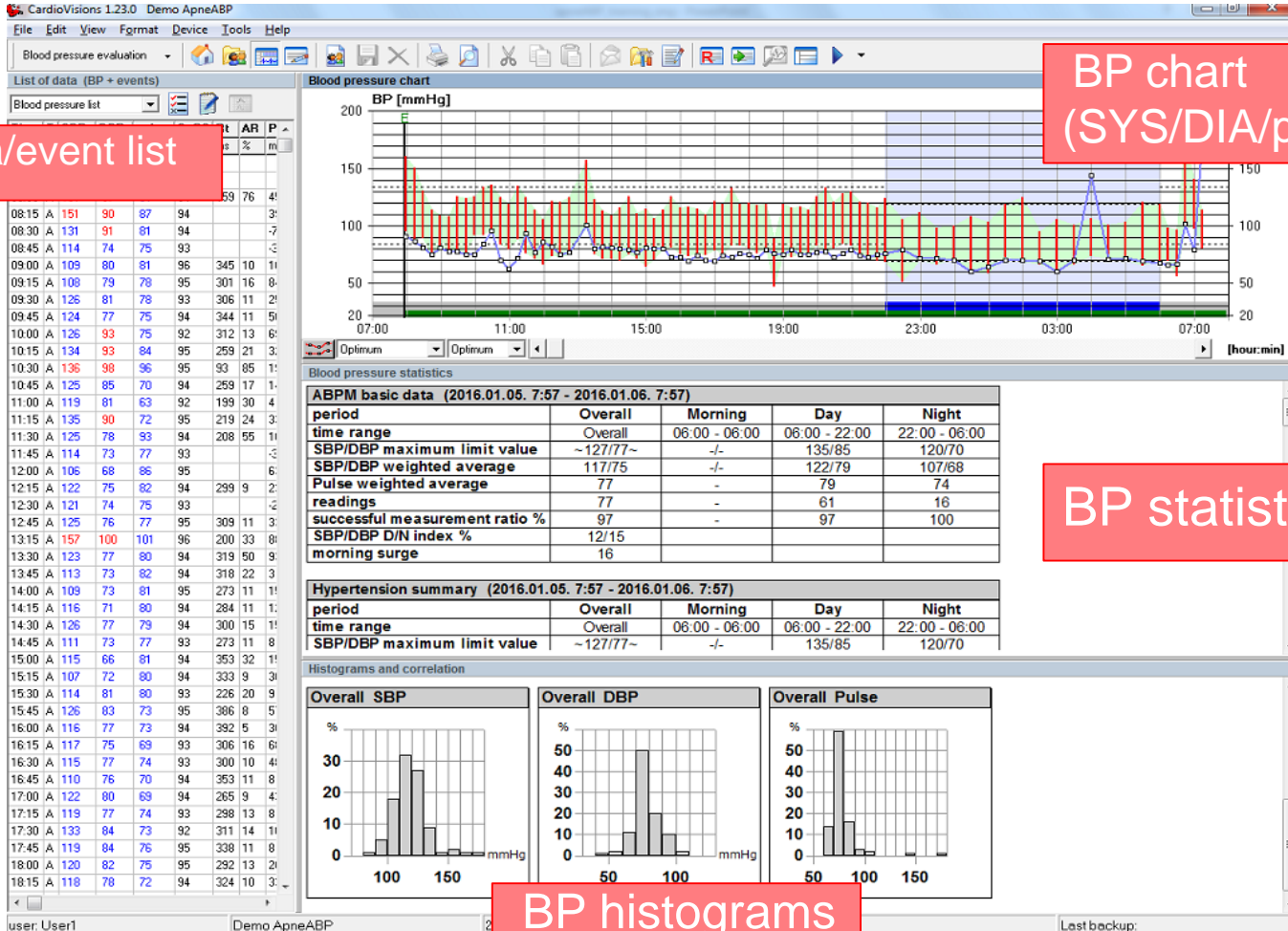
Data/event list

BP chart
(SYS/DIA/pulse)

Activity: intense
in the morning

SpO2: critical in
the evening

How to use - analysis ABPM



How to use – SpO2 (review)

CardioVisions 1.19.2 Demo apneABP

File Edit View Format Device Tools Help

Pulse oximetry

List of data (Everything)

Blood pressure list

Time	T	SBP	DBP	pulse	SpO2	Rt	AR	PL	remark
		mmHg	mmHg	bpm	%	ms	%	ms	
07:51	E			067	96	264	16	57	
				076	94	249	22	36	
08:16	A				94				
08:30	A	154	102	063	96	226	21	78	
08:45	A	149	098	072	94	253	22	73	
09:00	A	144	094	065	96	244	17	53	
09:15	A	154	095	076	98	248	13	35	
09:30	A	135	086	071	96	279	26	28	
09:45	A	155	098	076	96	239	27	20	
10:00	A	142	099	084	94	186	35	21	
10:15	A	130	079	068	95	273	22	67	
10:30	A	138	086	073	94	296	14	50	
10:45	A	157	097	072	95	267	17	63	
11:00	A	142	076	070	95	249	28	-5	
11:15	A	136	079	074	95	237	20	1	
11:30	A	134	076	076	96	223	22	17	
11:45	A	129	080	075	96	245	25	6	
12:00	A	140	085	099	94	133	76	-6	
12:15	A	157	093	082	94	298	11	70	
12:30	A	147	079	077	96	99	88	146	
12:31	A				90				
12:45	A	145	081	070	96	126	78	92	
13:00	A	144	076	072	96	228	18	37	
13:15	A	149	084	080	95	289	11	39	
13:30	A	132	074	075	93	281	19	2	
13:45	A	151	076	076	91			58	
14:00	A	128	094	097	97	153	28	29	
14:01	A				90				
14:15	A	143	079	068	96	259	15	23	
14:30	A	133	086	078	95	218	20	31	
14:45	A	142	086	077	94	239	76	136	
15:00	A	147	079	067	95	243	24	58	
15:15	A	136	086	071	95	255	16	18	
15:30	A	137	088	073	96	260	12	23	
15:45	A	131	109	083	94				
16:00	A	146	087	067	96	379	20	66	
16:15	A	148	093	070	93	249	24	20	
16:30	A	140	089	074	96	329	12	61	
16:45	A	134	070	073	95	246	22	31	
17:00	A	137	086	076		258	23	28	
17:15	A	135	087	079	95	464	65	-17	

Oxygen saturation overview

Oxygen saturation [%]

Amplitude of plethysmogram [%]

50
0

08:52 12:52 16:52 20:52 00:52 04:52 08:52

Normal data Data cannot be evaluated No data

optimal

Plethysmogram and SpO2

2012.05.02.
21:10:03

5 mm/s

SpO2 100
70

5 mm/s 1x

Pulse oximetry statistics

Pulse oximetry statistics			
Basic data		Total period:	
Start of monitoring:	2012.05.02. 07:51	Maximum:	100 %
End of monitoring:	2012.05.03. 07:44	Average:	93 %
Length of recording:	23 hour 53 minute	Minimum:	76 %
Length to be evaluated:	19 hour 23 minute	Number of pathological periods (strips):	230
Pathological limit:	90 %	Total pathological periods:	0 hour 44 minute
Selected period:		Selected period:	
Starting time:	2012.05.02. 21:02	Maximum:	0 %
Ending time:	2012.05.03. 00:34	Average:	0 %
Length to be evaluated:	0 hour 0 minute	Minimum:	0 %
Pathological limit:	90 %	Number of pathological periods (strips):	0
		Total pathological periods:	0 hour 0 minute

Statistics

user: Meditech Demo apneABP Last backup:

Data/event list

Oxygen saturation and plethysmograph/blood flow data

plethysmograph/blood flow chart with SpO2

Statistics

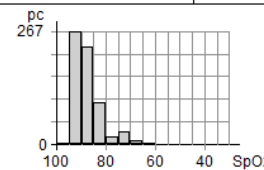
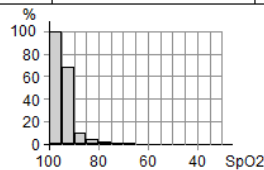
How to use – SpO2 (statistics)

General SPO2 overview:
Total 391 apnea events have been recorded during 2 hours and 21 mins.

Pulse oximetry statistics (Total period:)			
Start of monitoring:	2016.01.05. 07:57	Minimum:	63 %
End of monitoring:	2016.01.06. 07:30	Maximum:	100 %
Length of recording:	23 hour 33 min	Average:	93 %
Length to be evaluated:	23 hour 7 min	Number of pathological periods:	391
Pathological limit:	90 %	Total pathological periods:	2 hour 21 min

Desaturation events (Total period:)			
Number of apnoe events:	383	Avg. minimum of apnoe events:	84 %
Event index (ODI):	28,2 /hour	Avg. events period:	0 min 47 sec
Event limit:	4 %	Max. (22:05:32):	7 min 18 sec
Event period:	min. 10 sec	Time in events:	507 min 29 sec

Desaturation periods (Total period:)			Number of events	
SpO2 limit (%)	Time	%	SpO2 level (%)	Number
< 100	23:06:02	99,9	99 - 95	1
< 95	15:49:46	68,5	94 - 90	267
< 90	02:20:30	10,1	89 - 85	230
< 85	00:55:20	4,0	84 - 80	97
< 80	00:27:18	2,0	79 - 75	18
< 75	00:11:29	0,8	74 - 70	30
< 70	00:01:31	0,1	69 - 65	7
< 65	00:00:08	0,0	64 - 60	1
< 60	00:00:00	0,0	59 - 55	0
< 55	00:00:00	0,0	54 - 50	0
< 50	00:00:00	0,0	49 - 45	0
< 45	00:00:00	0,0	44 - 40	0
< 40	00:00:00	0,0	39 - 35	0
< 35	00:00:00	0,0	34 - 30	0



Total 10,1% of the monitoring period was pathological (=SpO2 is below 90%)

Raw pulse wave data statistics (artery status)

Plethysmogram analysis (Total period:)				
	Maximum:	Average:	Minimum:	Deviation:
Reflection time:	419	279	51	66
Amplitude ratio:	171	27	5	28
Pulse latency:	195	1	-30	50

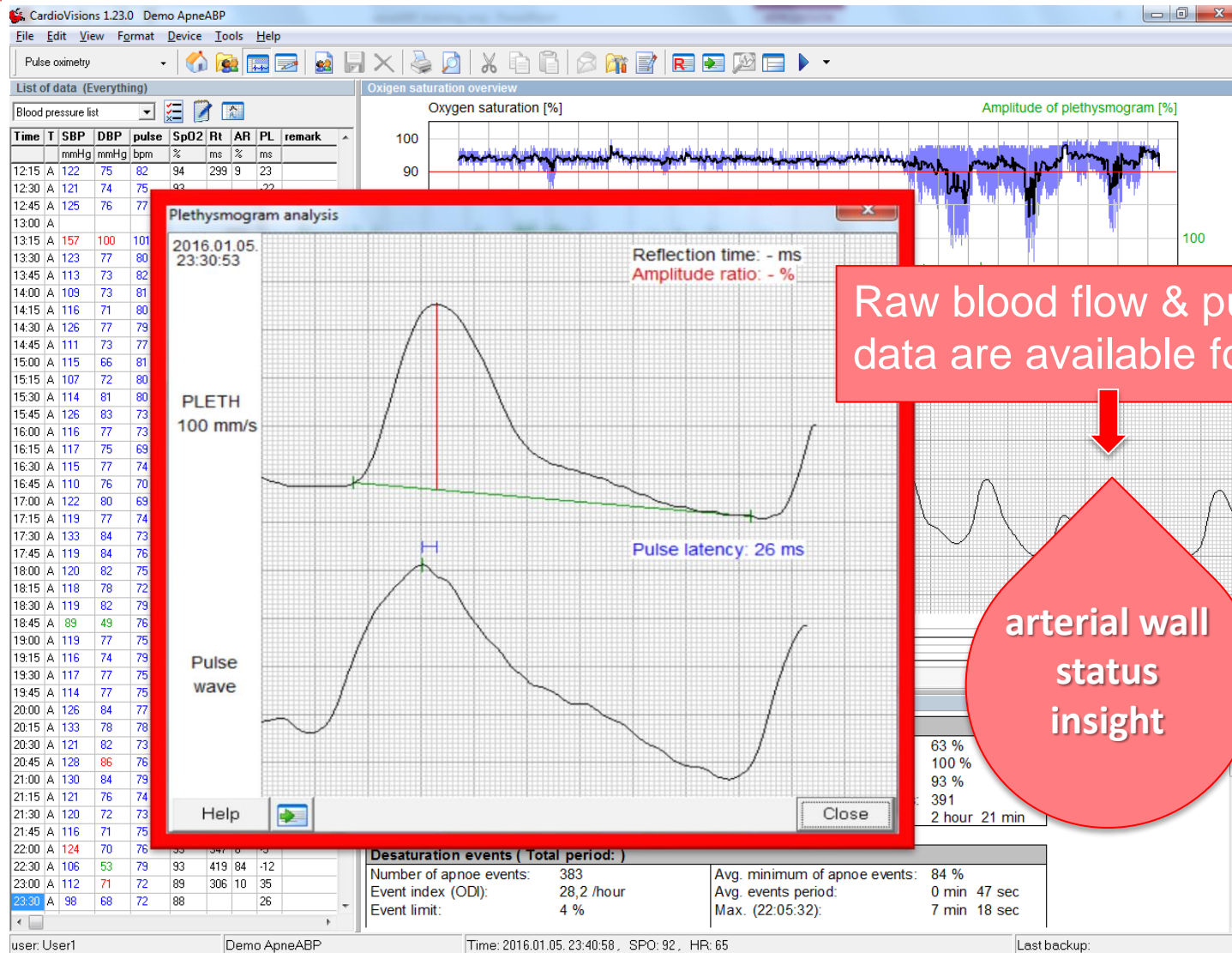
ODI/Oxygen desaturation event index

is available for each hour. On the basis of ODI apnea severity can be judged.

General limits for apnea severity:

<5/hr: NA
5-15/hr: mild
15-30/hr: moderate
>30/hr: severe

How to use – SpO2 (raw data analysis)



Raw blood flow & pulse wave data are available for a click

arterial wall status insight

Summary

♥ OSAS & apneABP

OSAS: frequent but barely diagnosed and treated.

Treating OSAS not only decreases **hypertension** but also other **cardiovascular risks & sleep-related traffic accidents**.

With apneABP OSAS can be screened on an ambulatory/outpatient basis.

♥ Distribution channels

General practices

In many countries: screening for OSAS is necessary for having a driving license!

Heart centers, cardiology departments

University research departments

Sleep diagnostic centers
(*before expensive sleep studies are done*)