



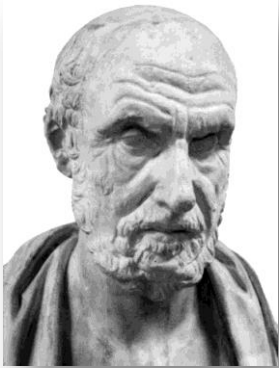
LA SLEEP APNEA FATTORE DI RISCHIO CARDIOVASCOLARE

Sleep apnea: screening con pacemaker nella pratica clinica

What Happens When you Sleep?



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Sia il sonno che l'insonnia, oltre la giusta misura, sono malattie.
(Ippocrate 460-370 a.C.)

Importance and management of chronic sleep apnoea in cardiology

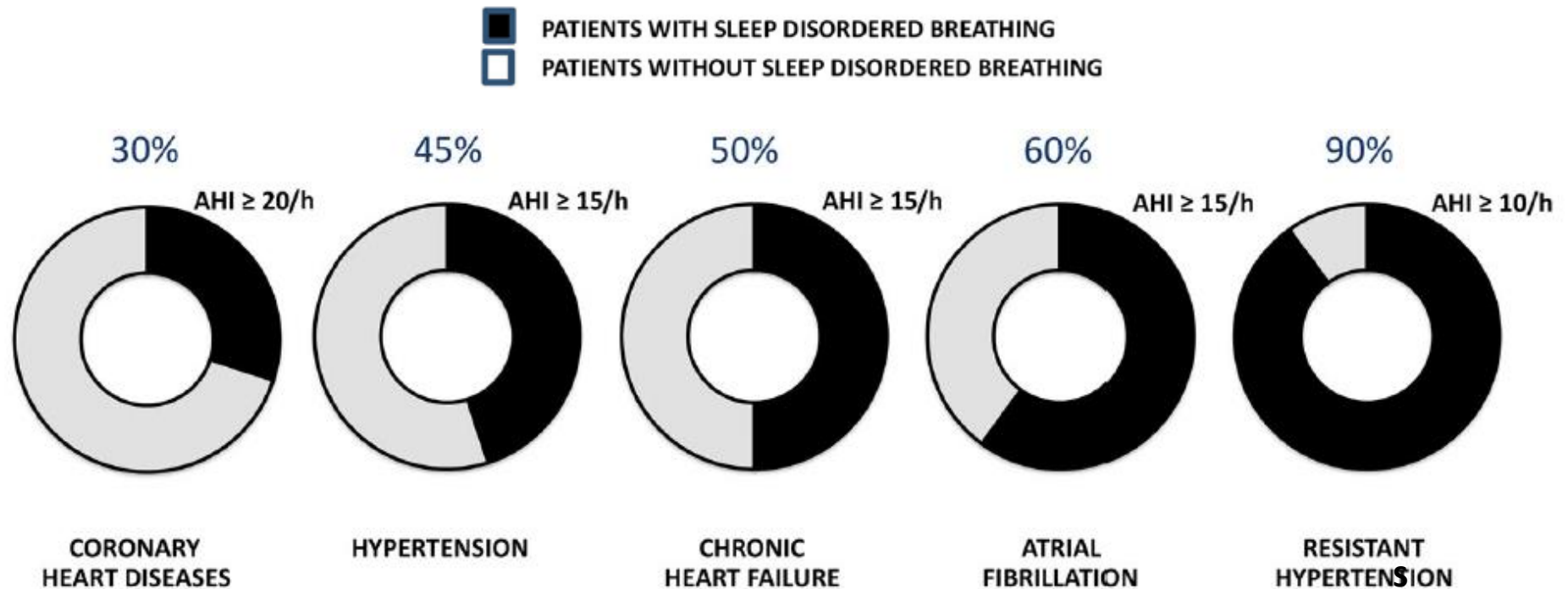
REVIEW

Sleep apnoea is a common, yet underestimated, chronic disorder with a major impact on morbidity and mortality in the general population.

It is becoming recognized as an independent risk factor for cardiovascular impairment.

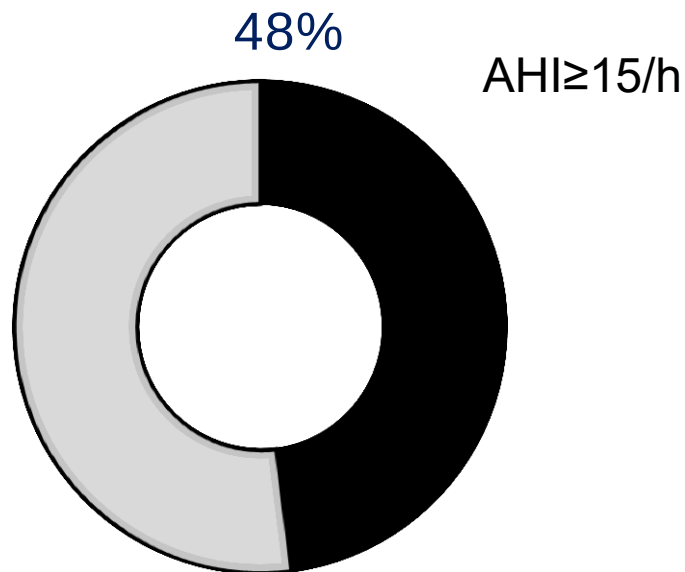
The importance of sleep-disordered breathing in cardiovascular disease

REVIEW



Prevalence of SDB in cardiovascular patients

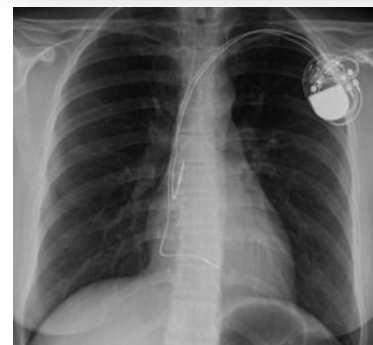
Relationship Among the Severity of Sleep Apnea Syndrome, Cardiac Arrhythmias, and Autonomic Imbalance



SSS, Bradyarrhythmias,
Atrioventricular nodal block

High Prevalence of Sleep Apnea Syndrome in Patients With Long-Term Pacing

The European Multicenter Polysomnographic Study

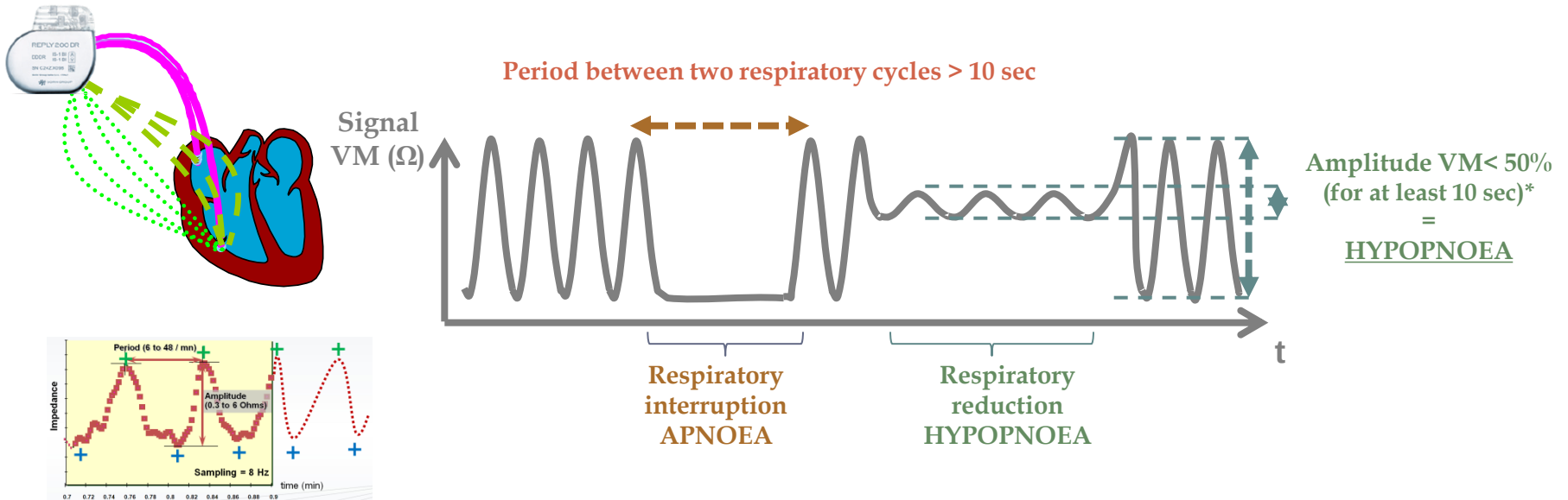


1. 59% of patients with long-term pacing for a spectrum of indications **exhibited sleep-disordered breathing**.
2. **Obstructive apneas and hypopneas** represented the predominant abnormal respiratory events in paced patients.
3. **In this population of patients, the presence of sleep apnea could not be predicted by symptoms or complaints traditionally reported by SAS patients, although it is severe in many cases.**
4. **No correlation existed between age, BMI, and severity of SAS.**

Consequently, **systematic screening** of these patients should be performed owing to the potential cardiovascular consequences of SAS.

SAM (Sleep Apnea Monitoring)

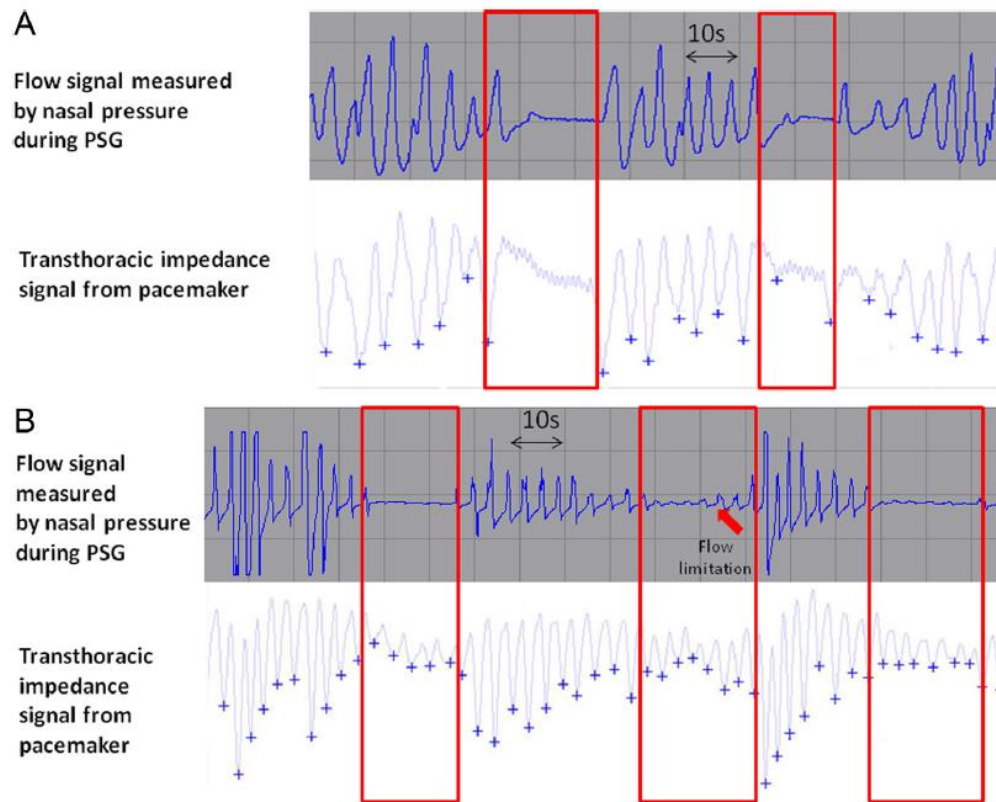
Some rate-responsive pacemakers have specific algorithms capable of detecting respiratory cycles, recognizing ventilation pauses and reductions, and deriving **indices** well correlated with the identification of severe OSA as determined by PSG. Automatic identification of apnoea and hypopnoea episodes for the automatic SAS screening in pacemaker patients (PM and CRT-P).



RDI (Respiratory Disturbance index): APNOEA & HYPOPNOEA
Number of hours of monitoring

RDI defines the severity of Apnoea

A pacemaker transthoracic impedance sensor with an advanced algorithm to identify severe sleep apnea: The DREAM European study



The DREAM study showed that a transthoracic impedance sensor with an advanced algorithm, **the SAM algorithm, could be used to identify severe SA in patients with PMs.**

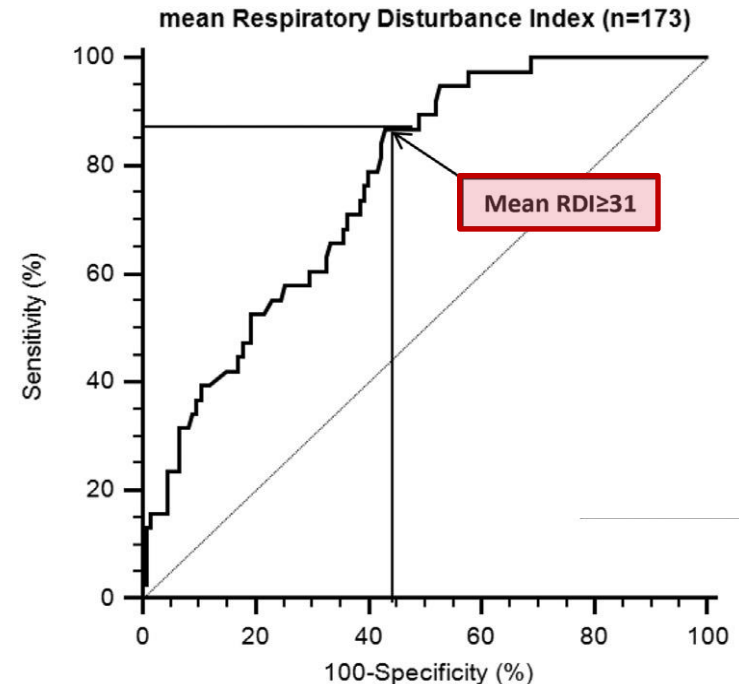
Nasal pressure measurements during polysomnography (PSG) and corresponding sleep apnea monitoring (SAM) recordings of transthoracic impedance from the minute ventilation sensor .

Sensitivity	Specificity
88,9%	84,6%
PPV	NPV
88,9%	84,6%

Implantable cardioverter-defibrillator–computed respiratory disturbance index accurately identifies severe sleep apnea: The DASAP-HF study ^e

173 patients implanted with an ICD or cardiac resynchronization therapy with ICD (CRT-D) endowed with the ApneaScan diagnostic feature.

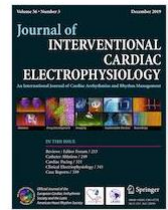
In 49 patients the RDI and AHI values were available for the same night.



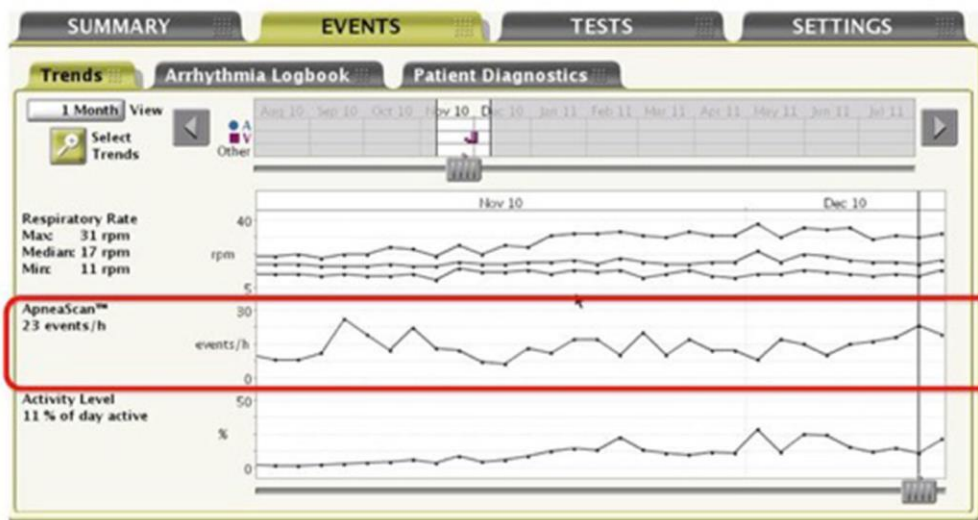
At an RDI value of 31 episodes/h, severe SA was detected with 87% (95% CI 72%–96%) sensitivity and 56% (95% CI 48%–66%) specificity.

RDI closely correlated with AHI recorded during the same night
($r=0.74$; 95% CI 0.57–0.84; $p<0.001$).

Feasibility of automated detection of sleep apnea using implantable pacemakers and defibrillators: a comparison with simultaneous polysomnography recording



29 pts (20 men, 70 ± 8 years) with indications for implantation of ICD or Pacemaker with ApneaScan™ system.



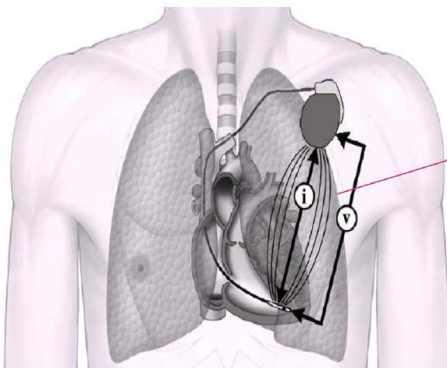
Optimal RDI cutoff value to identify severe SRBD was **47** episodes/h (sensitivity 100%, specificity 100%).

In the present study, the novel transthoracic impedance-based monitoring system ApneaScan™ appeared effective in **screening** PMK and ICD patients for SRBD.

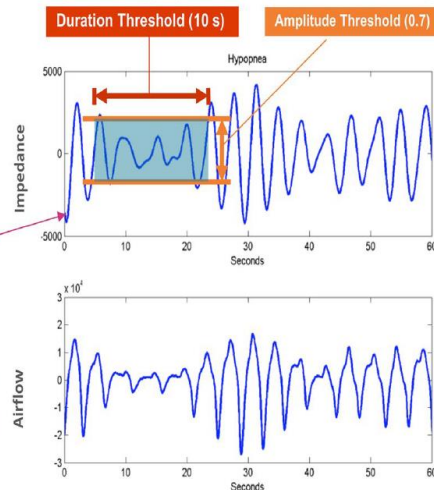
OPEN

Validation of an apnea and hypopnea detection algorithm implemented in implantable cardioverter defibrillators. The AIRLESS study

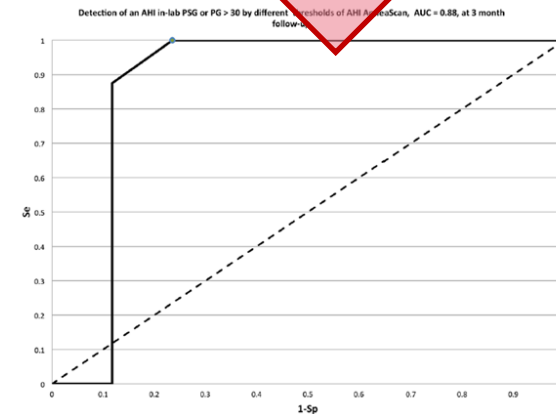
Implanted Impedance-based Respiratory Sensor



Apnea / Hypopnea Event Detection Example



25 pts (24 men, 59.9 ± 14.4 years; LVEF $30.3 \pm 6.4\%$; BMI 25.9 ± 4.2 kg/m²) with indications for implantation of ICD or CRT-D (INCEPTA; Boston Scientific) were included.



R.O.C. curve. Threshold of **30** for AHI-AS. Sensitivity is 100%, Specificity 76.47%, PPV 66.67%, NPV 100%.

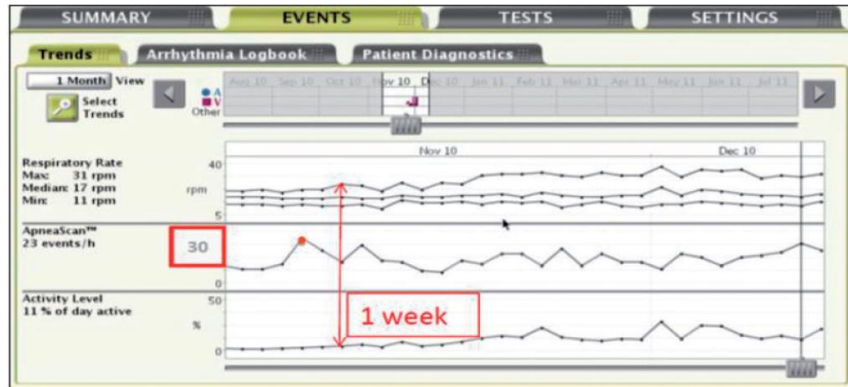
OPEN

Validation of an apnea and hypopnea detection algorithm implemented in implantable cardioverter defibrillators. The AIRLESS study

The AIRLESS study shows that a transthoracic impedance sensor (ApneaScan algorithm) implemented in the ICDs for SA detection through the assessment of transthoracic impedance is a reliable tool to identify patients suffering of severe sleep disorders. The availability of this new technology might improve the clinical management of this patient population. **Larger and long-term prospective studies are needed to collect data on the clinical impact.**

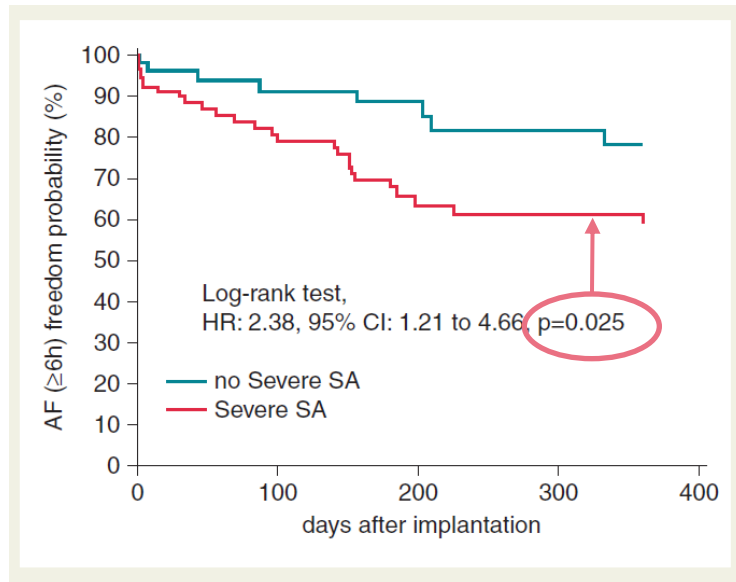
Pacemaker-detected severe sleep apnea predicts new-onset atrial fibrillation

Pacemakers were equipped with the ApneaScan diagnostic feature (Boston Scientific).



In patients who received a pacemaker, **severe device-detected sleep apnea** at the baseline was independently associated with a **higher risk of AF** during follow-up.

Severe sleep apnea on follow-up data review identified patients who were 2-fold more likely to experience an atrial fibrillation episode in the next 3 months.



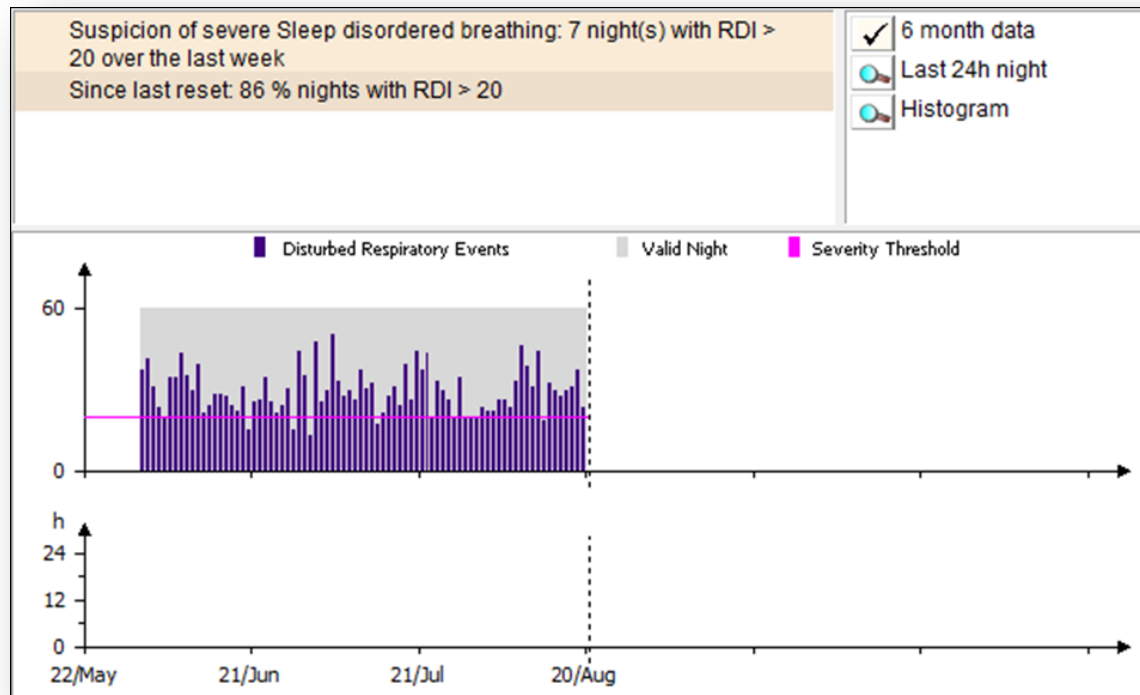
COSA ABBIAMO IMPARATO?



Case 1, women, 83 years old

22/5/2015

Sick sinus syndrome, resistant hypertension, obesity, snorer, daytime hypersomnolence, PAF.



Clinical Case Reports

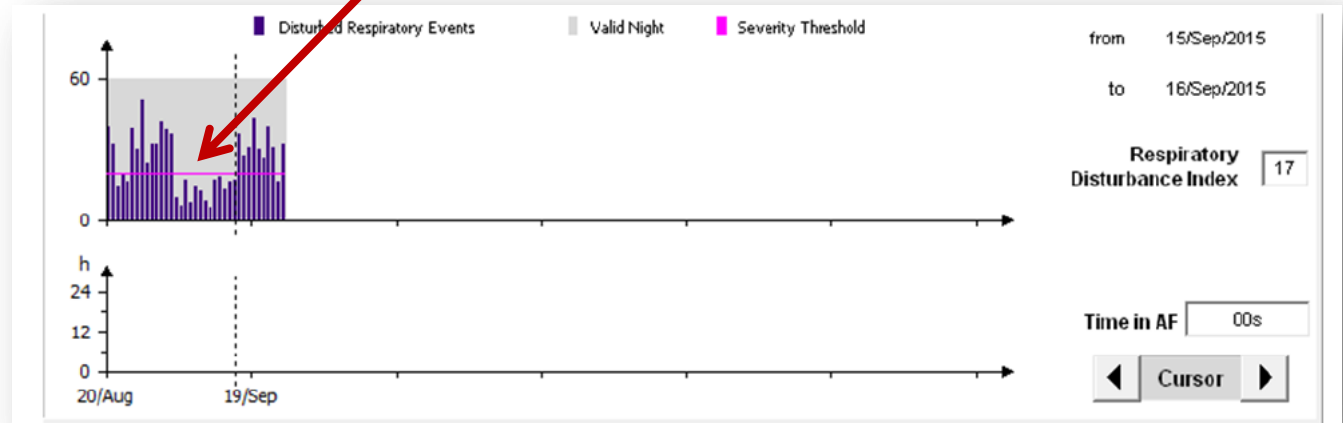
Open Access

CASE REPORT

Severe obstructive sleep apnea: first screening with an implanted pacemaker

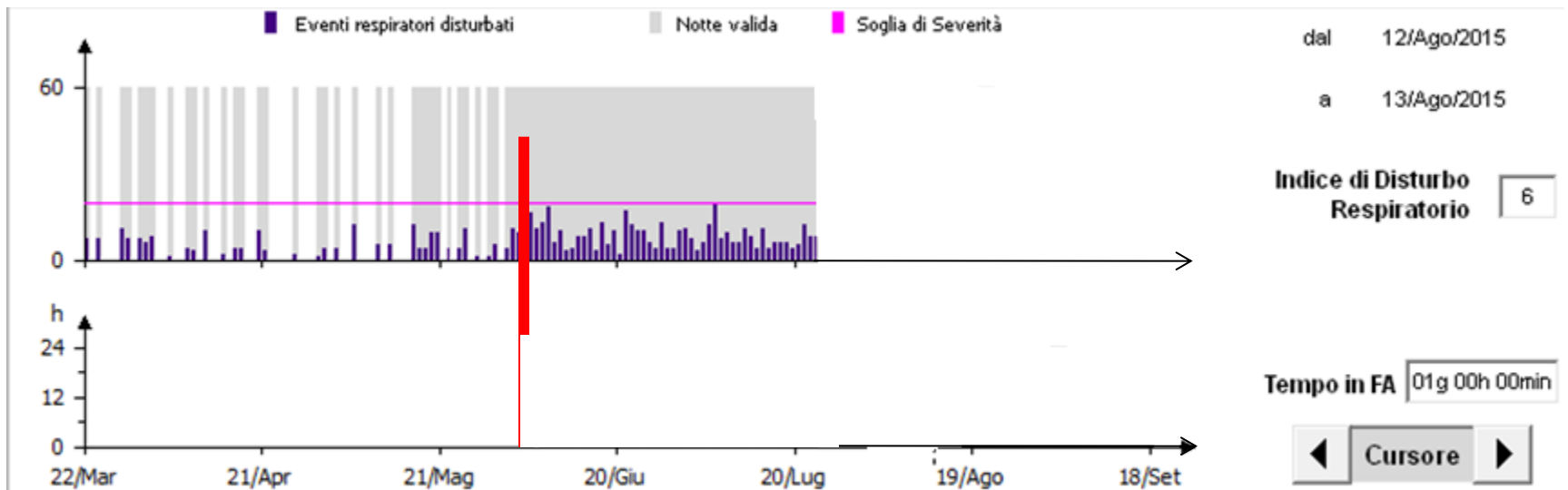
	Before CPAP
AHI (/h)	49
ODI (/h)	51,2
SaO ₂ (%)	92,7

AHI: Apnea-Hypopnoea Index. ODI: Desaturation Index; SaO₂: Average Saturation.

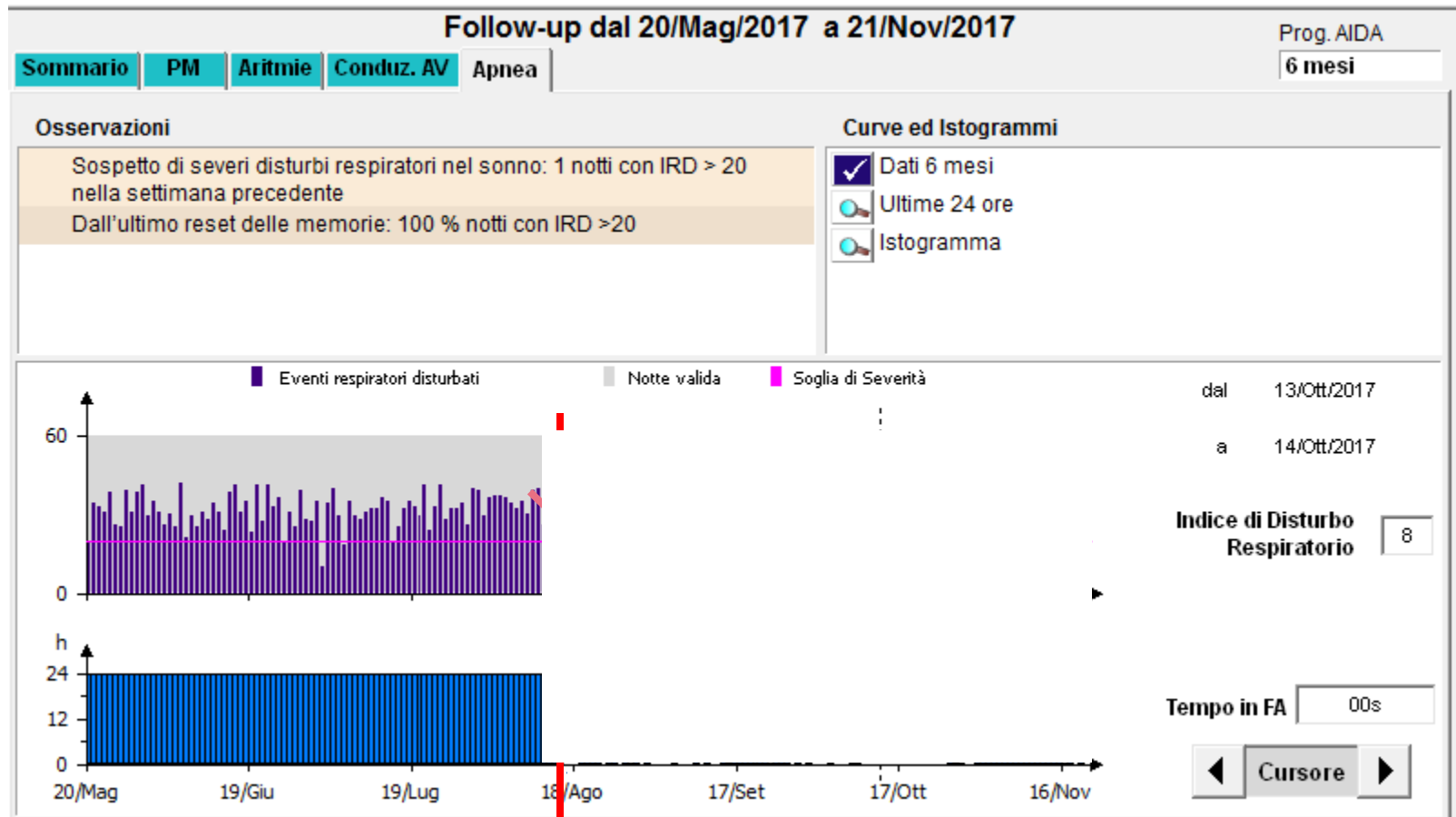


Case 2, man, 82 years old

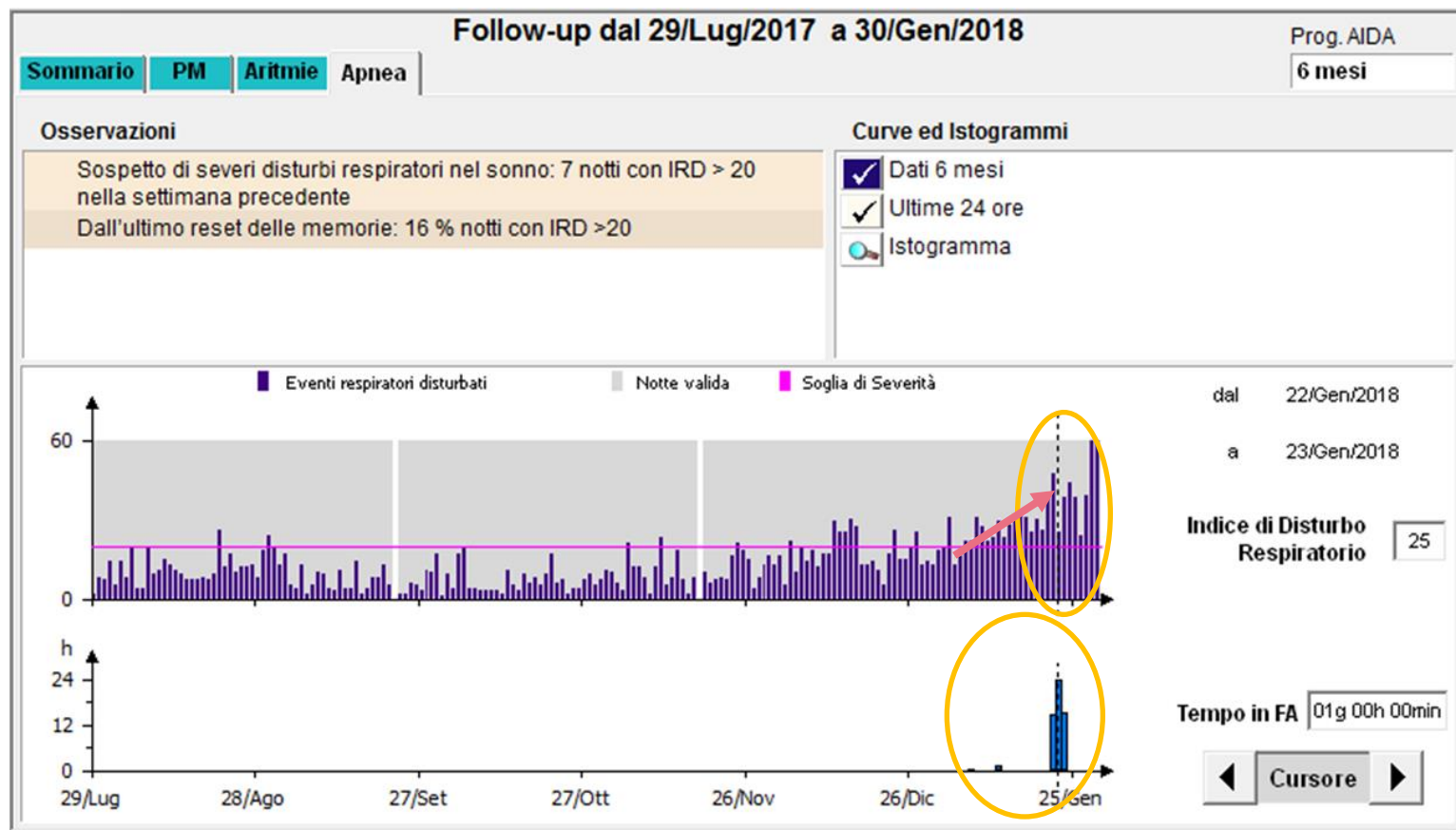
21/2/2015, FU 23/7/2015



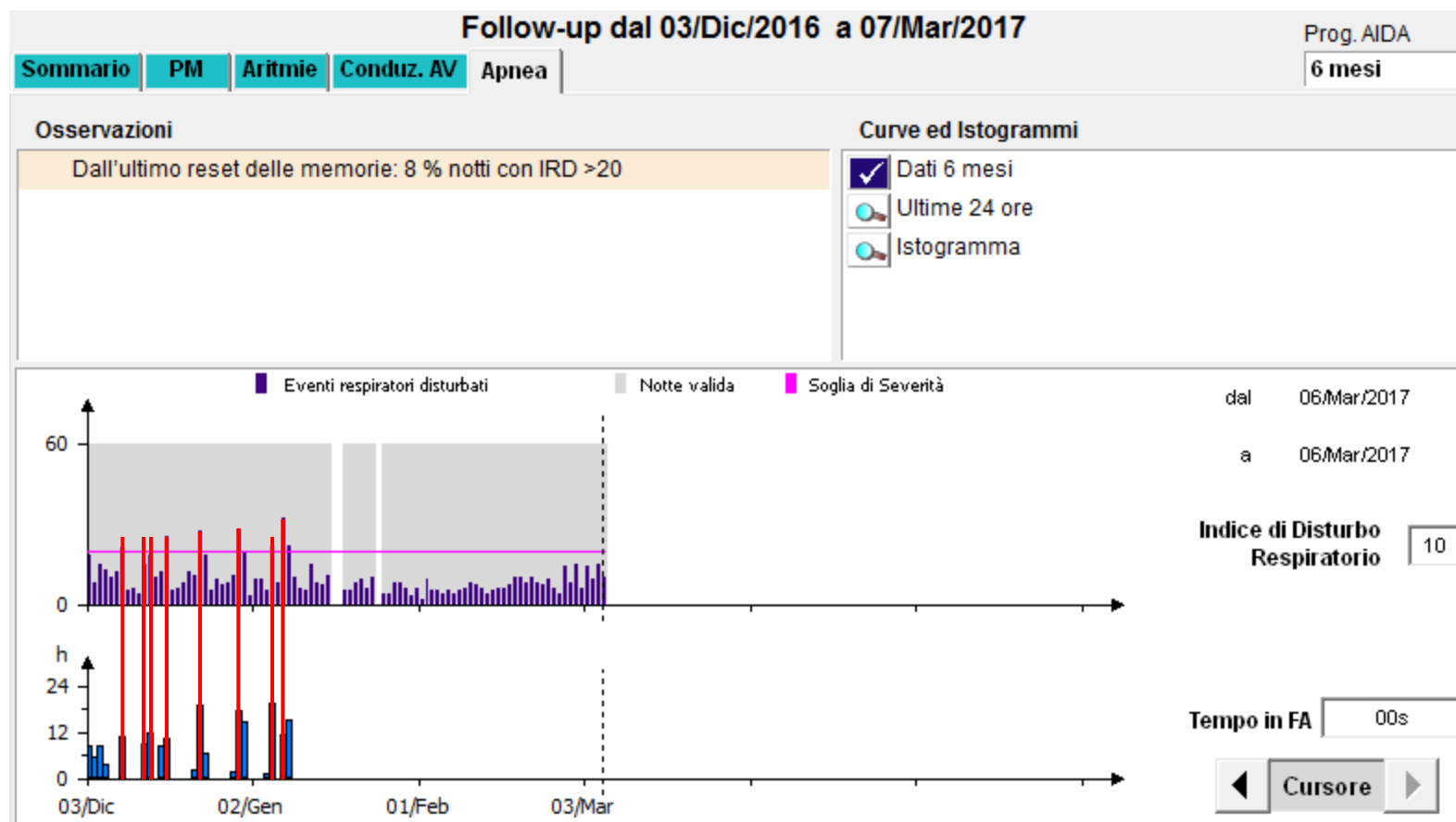
Case 3, women, 89 years old



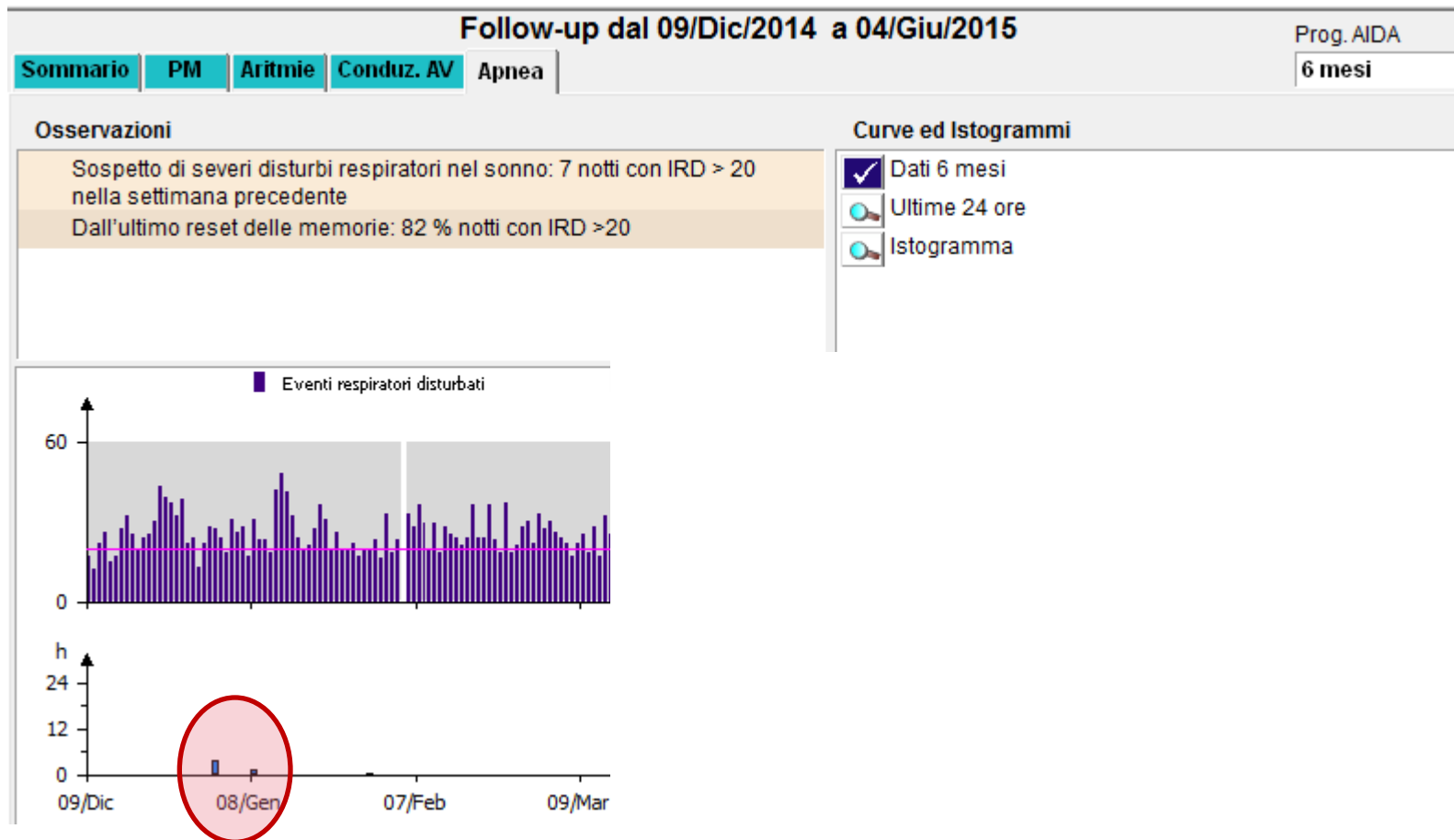
Case 4, women, 75 years old



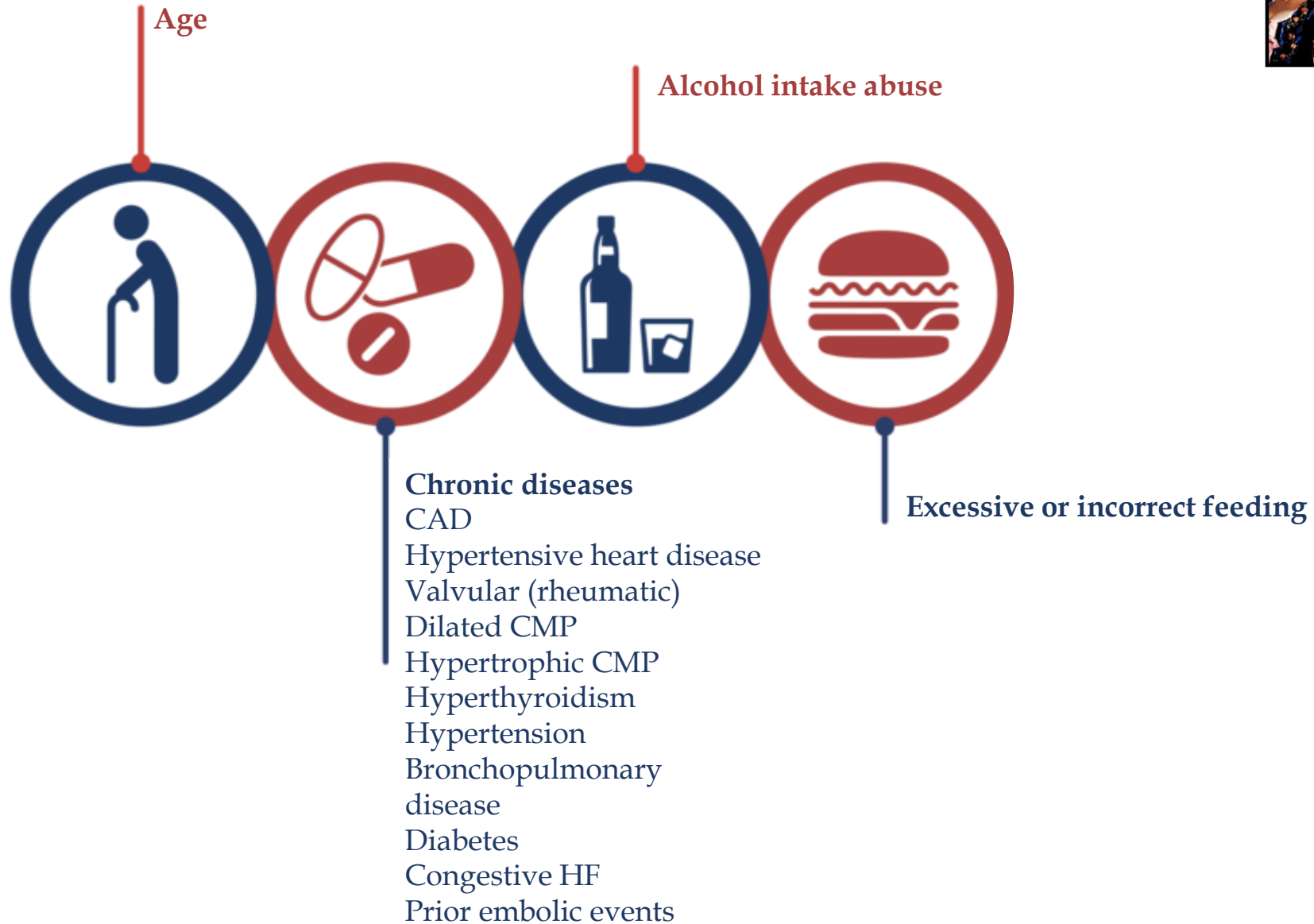
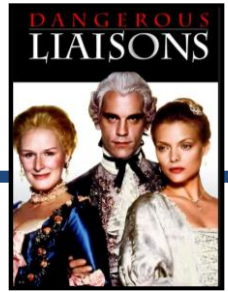
Case 5, women, 75 years old



Case 6, men, 65 years old

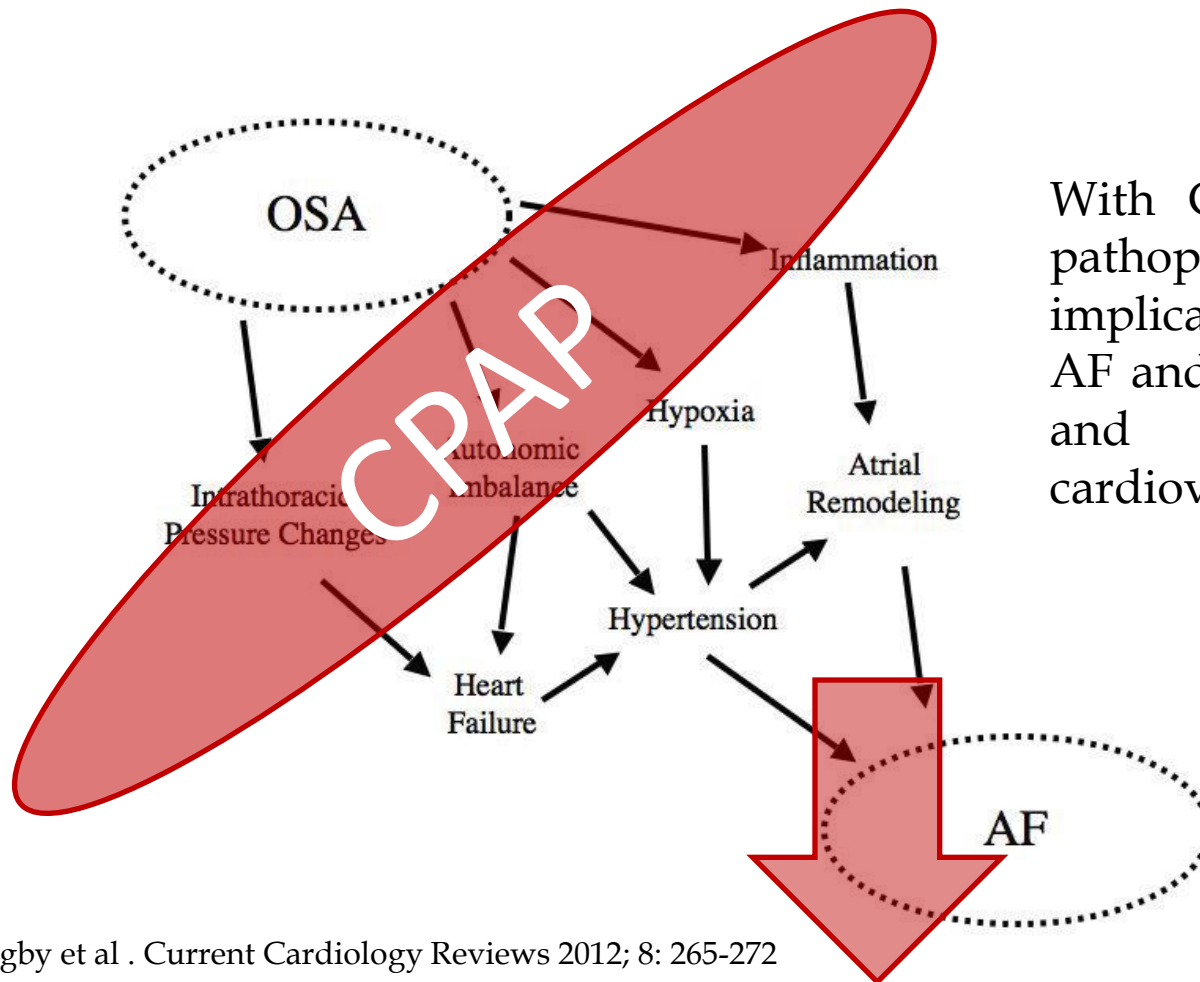


AF and “dangerous liaisons”



Sleep Apnea and Atrial Fibrillation; 2012 Update

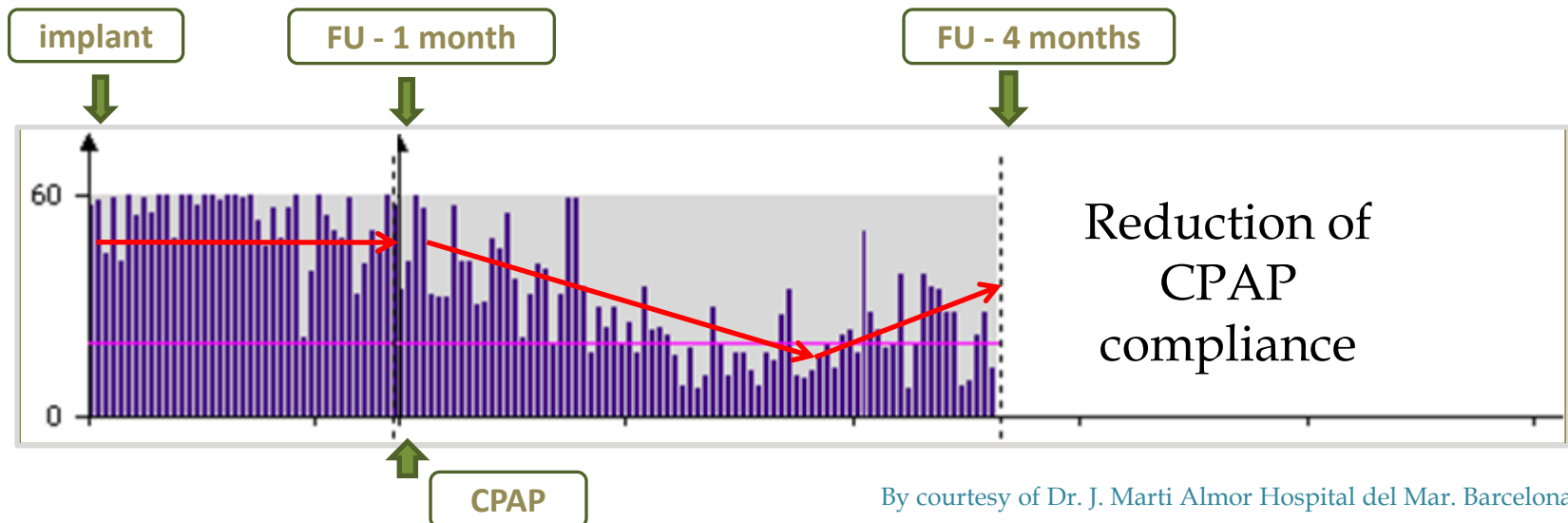
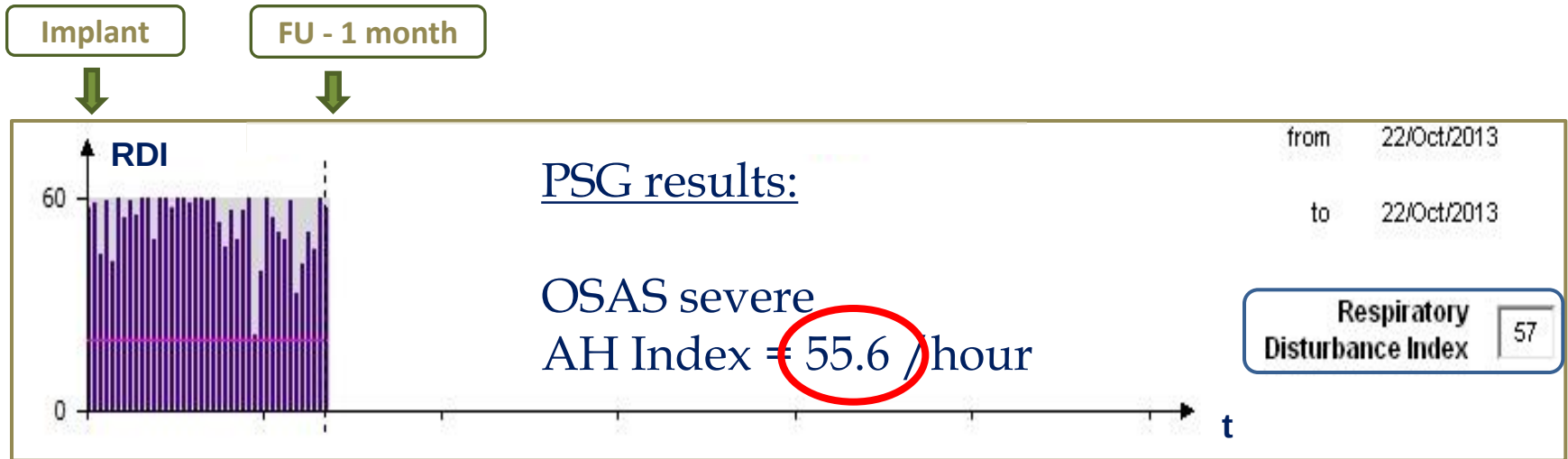
The effects of CPAP in OSA patients may even extend as far as affecting the atrial electrical remodeling: CPAP reduce maximum P-wave dispersion and maximum P-wave duration presents in moderate to severe OSA, shortening of signal-averaged P-wave after four or six weeks of therapy.



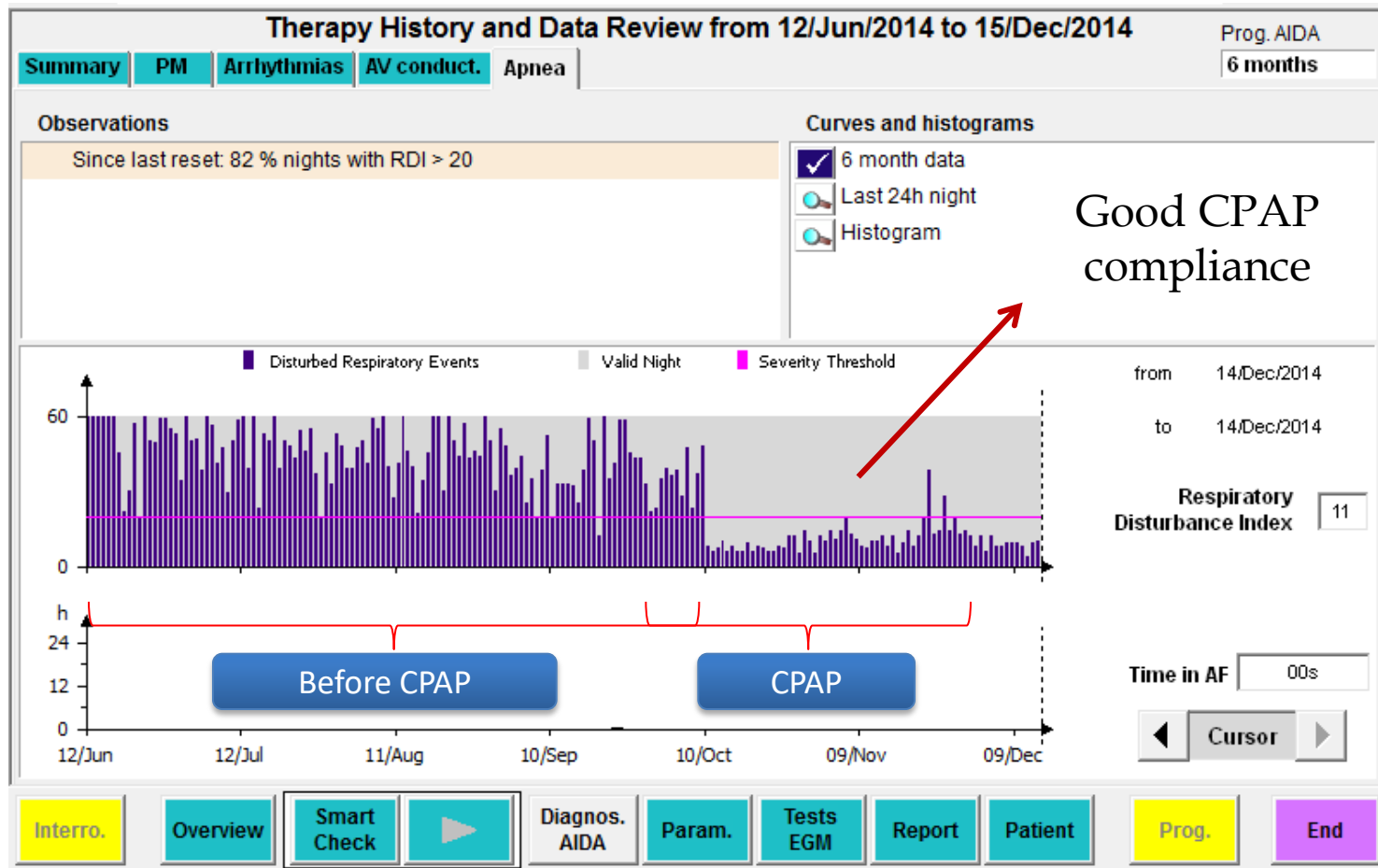
With CPAP we can treat the pathophysiological mechanisms implicated in linking OSA and AF and can reduce AF episodes and AF recurrences after cardioversion and after ablation.



Case 7, man, 57 years old



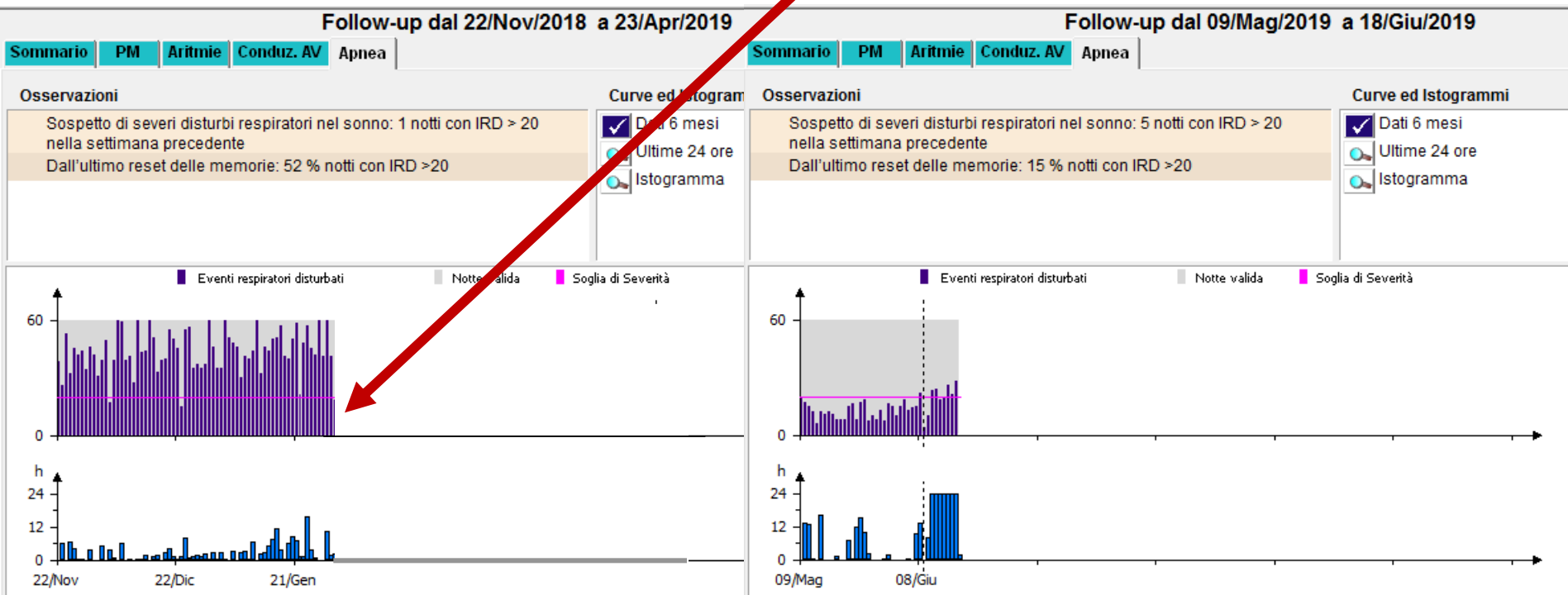
Case 8, man, 75 years old



Case 9, men, 70 years old

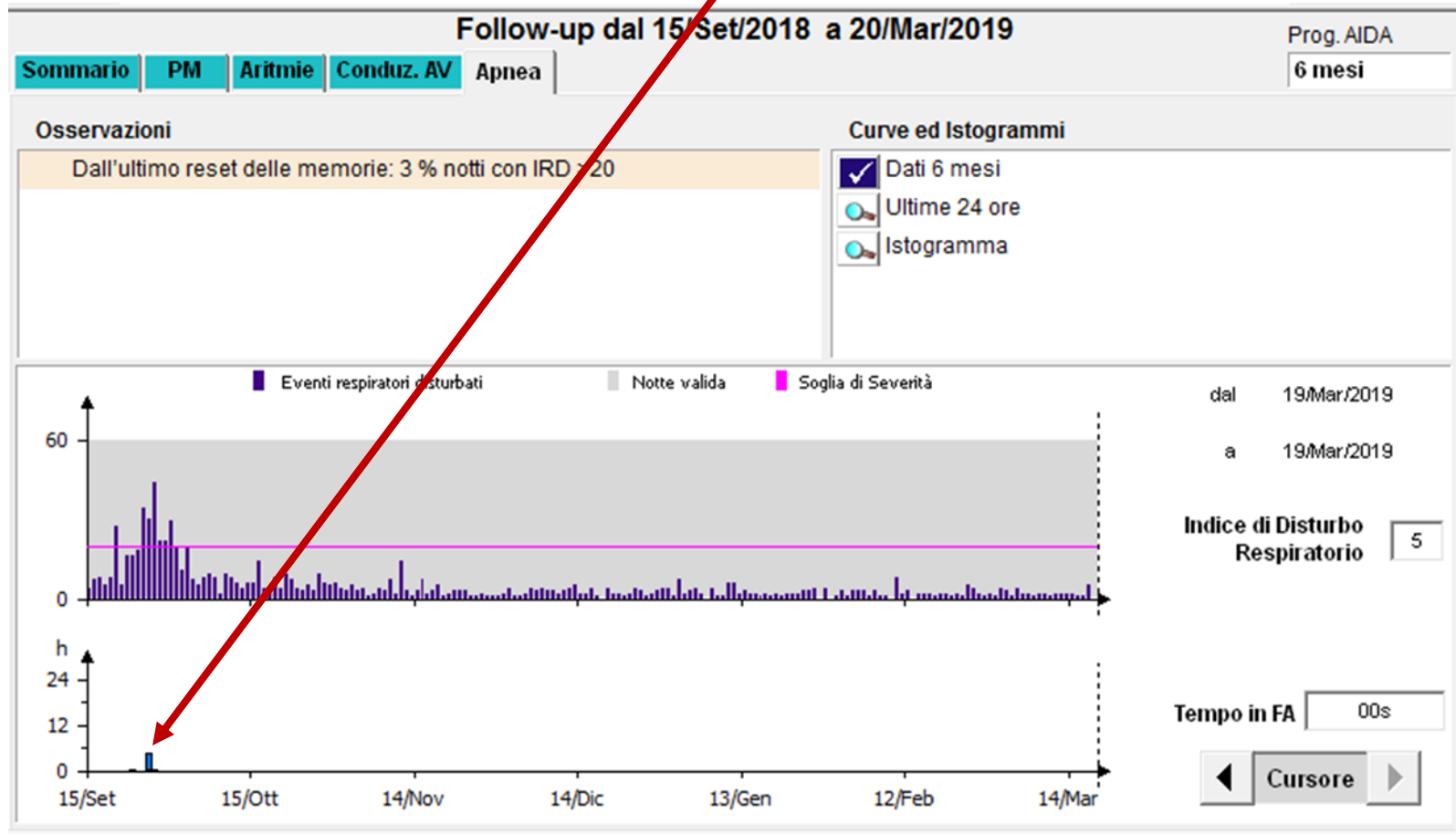
PSG	AHI	ODI	SaO2
1	48.3	48.6	92,4

START CPAP

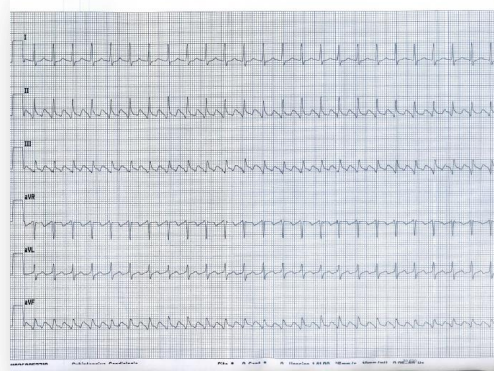
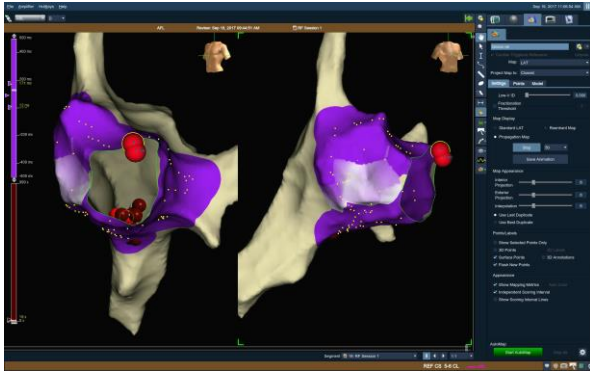


Case 10, men, 79 years old

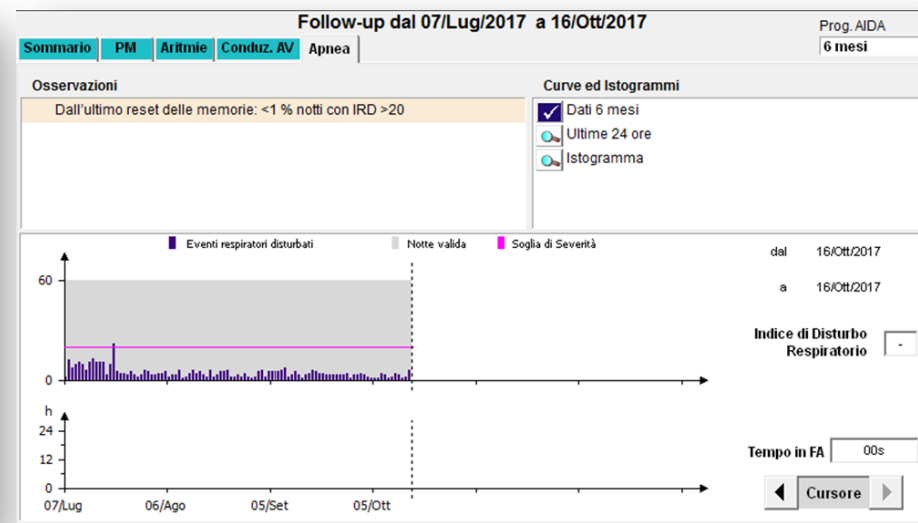
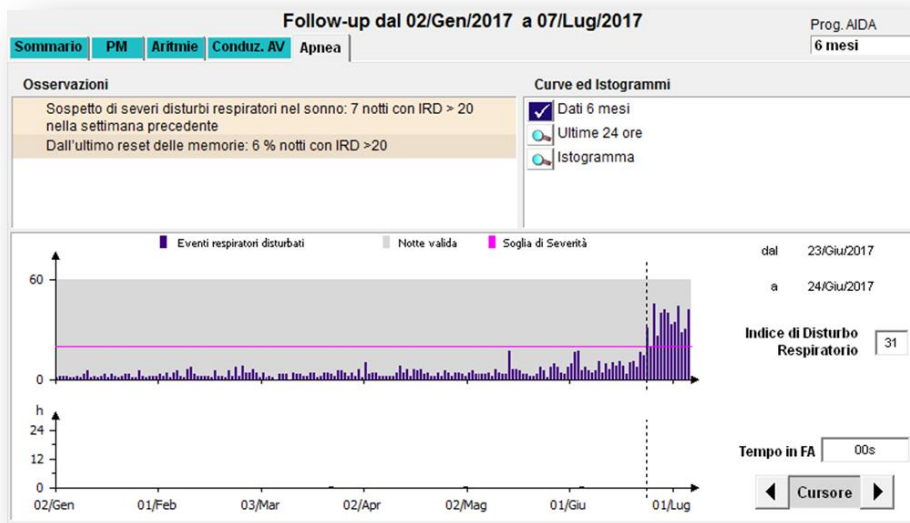
Atrial Flutter



Case 11, men, 70 years old



Ablazione efficace di flutter atriale tipico comune, al ripristino del ritmo sinusale riscontro di malattia del nodo del seno. Impianto di pacemaker.





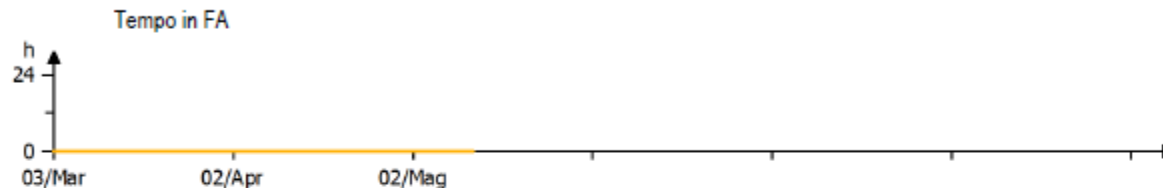
Home Monitoring



KORA 250 DR
N. serie: 217BE233

Data di nascita: yy/yyyy/19yy
Data impianto: yy/yyyy/2016

FA



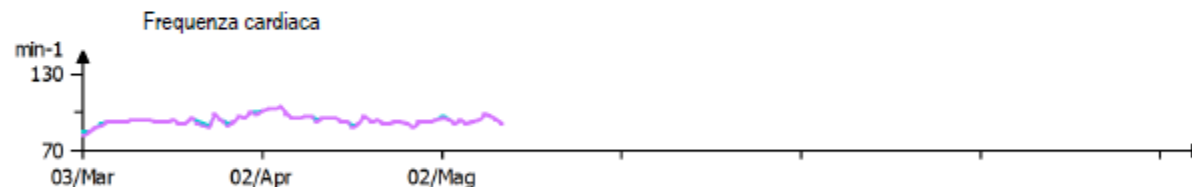
APNEE NOTTURNE

- Eventi respiratori disturbati
- Notte valida
- Soglia di Severità



FREQUENZA CARDIACA

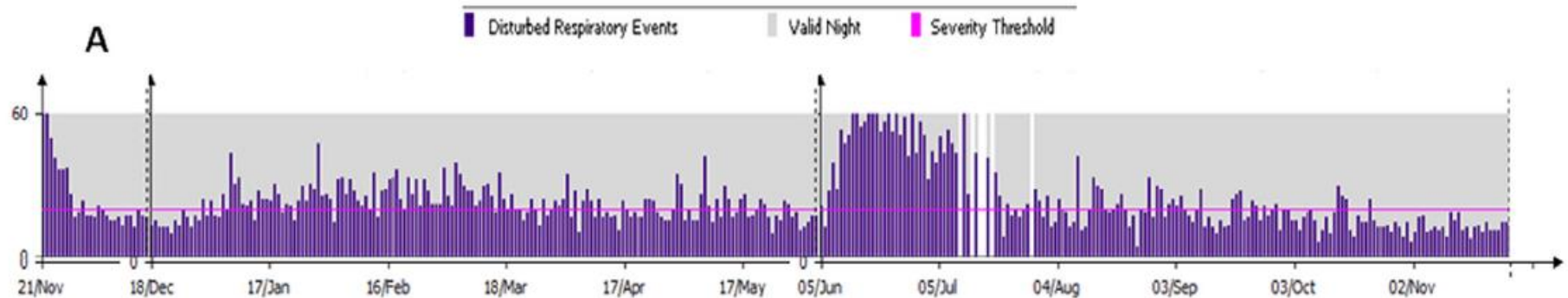
■ A ■ V



COSA POSSIAMO FARE DI PIU'?



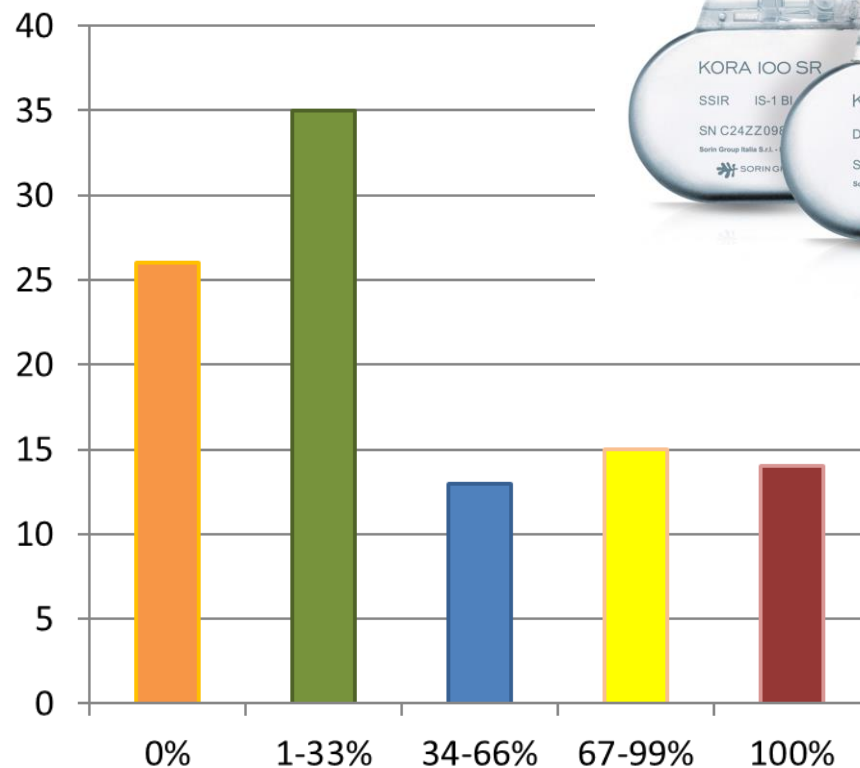
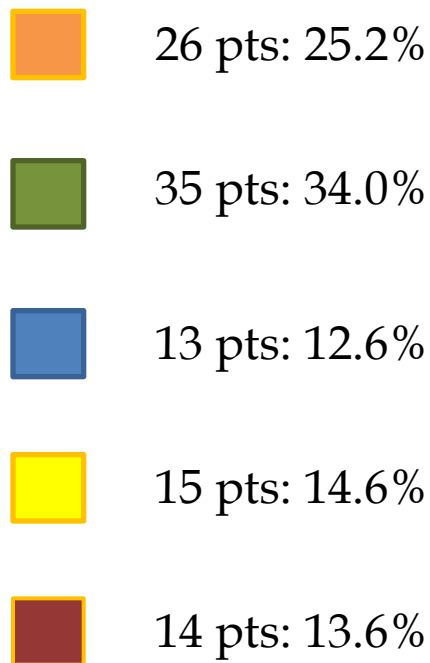
Variability in obstructive sleep apnea: Analysis of pacemaker-detected respiratory disturbances



CONCLUSION OSA is frequent in patients with a pacemaker and is reliably detected by pacemakers. OSA is highly variable and could probably be best analyzed in terms of burden.

“Sleep apnea Severity SCore” SSSC

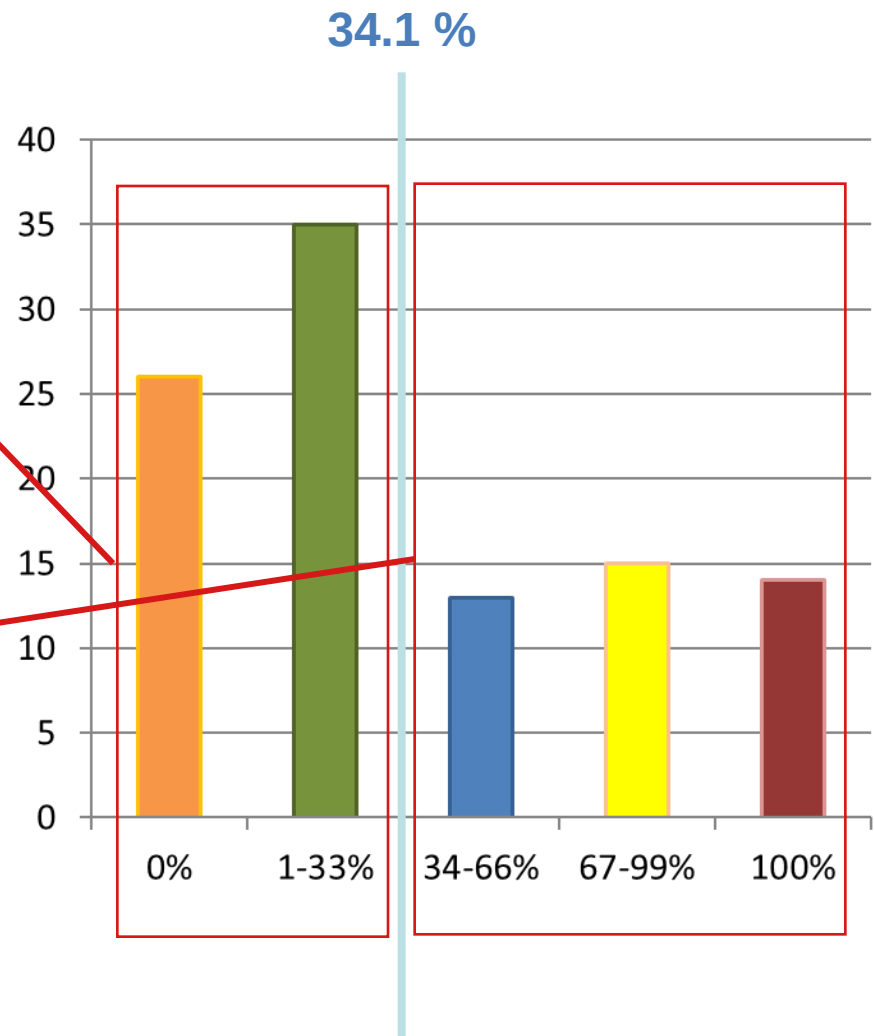
We have collected 103 consecutive pts implanted with single and dual-chamber Microport pacemakers with SAM algorithm, irrespective of the type of implantation (first implantation or generator replacement) and pacing indication. From January 2015 to October 2017. We classified patients according to the percentage of their nights with RDI>20. (Sleep apnea burden).



“Sleep apnea Severity SCore” SSSC

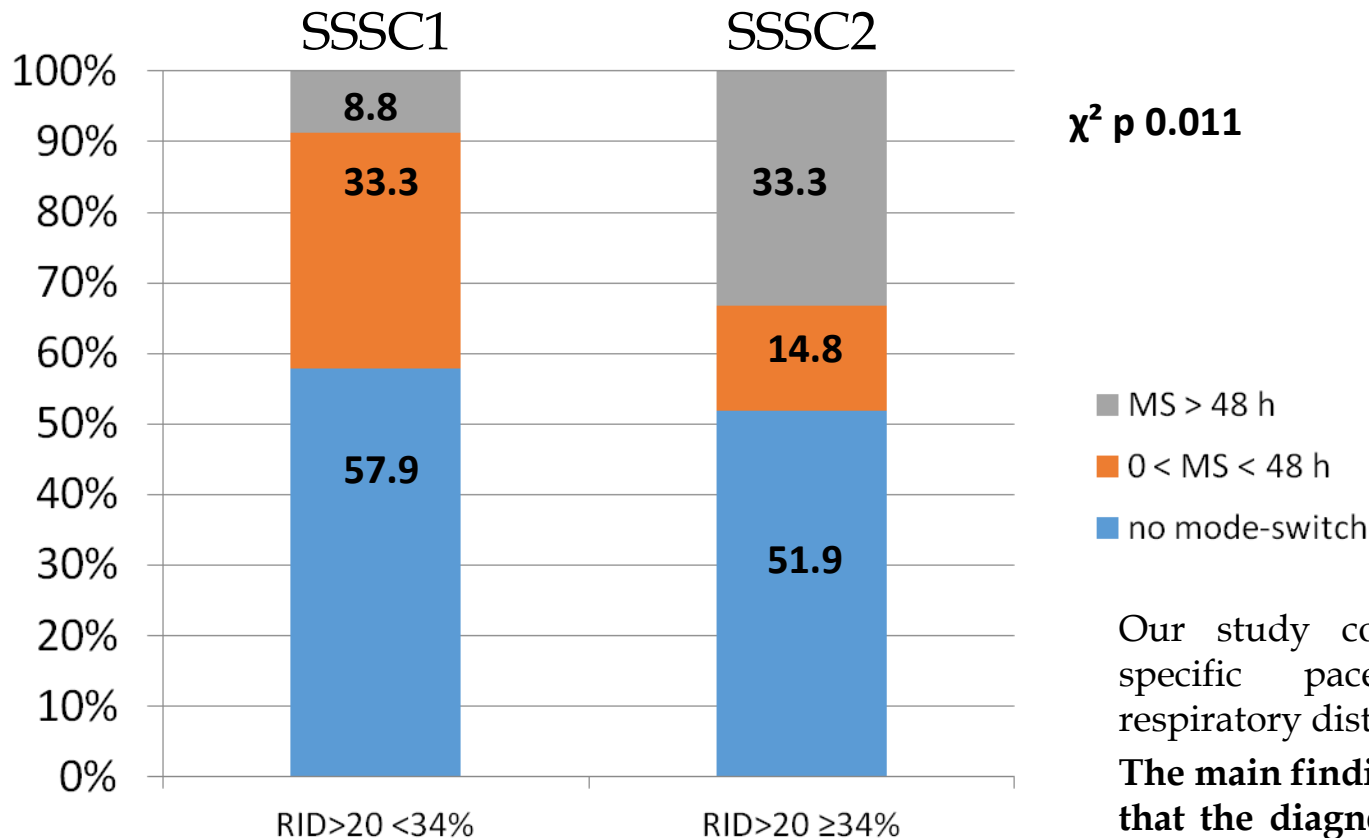
SSSC 1: no or “mild”
OSAS = 59%

SSSC 2: “moderate to
severe” OSAS = 41%



Results

Sleep apnea burden and mode-switch



χ^2 p 0.011

- MS > 48 h
- 0 < MS < 48 h
- no mode-switch

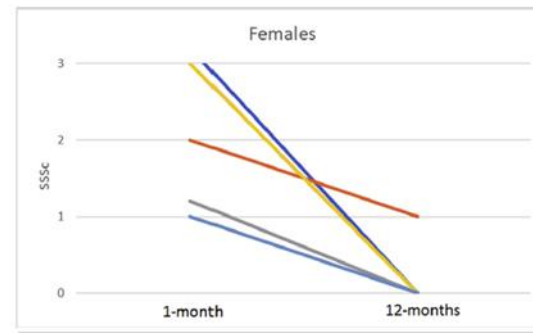
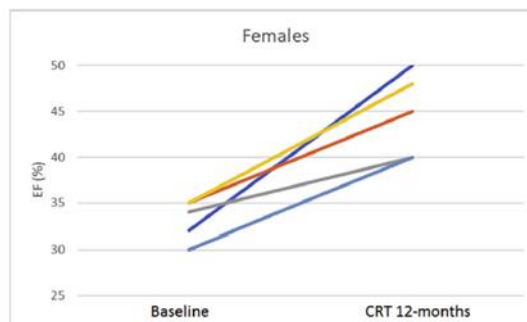
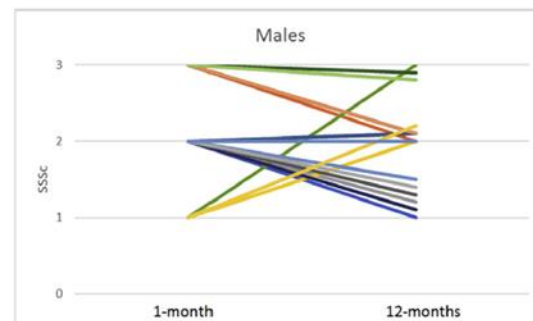
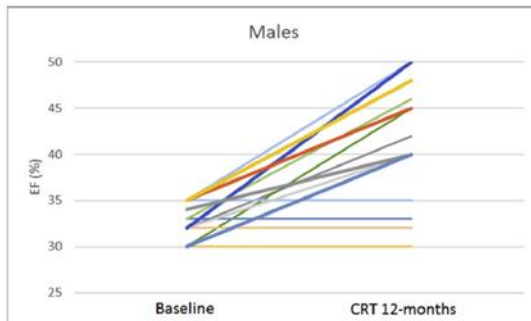
Our study confirmed the ability of specific pacemakers to measure respiratory disturbances.

The main finding of this study suggests that the diagnosis of OSA is probably not binary but introduce the concept of sleep apnea burden.

Finally confirms the relationship between SA and AF burden.

Original Article

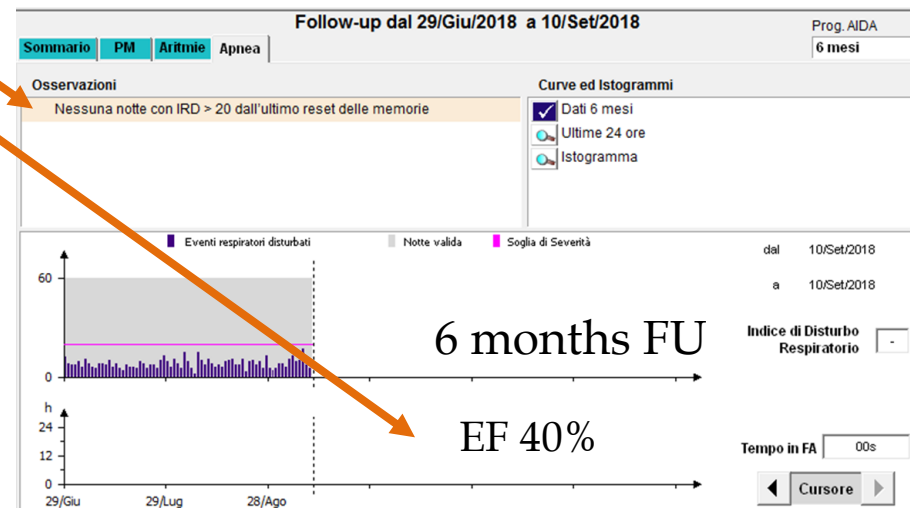
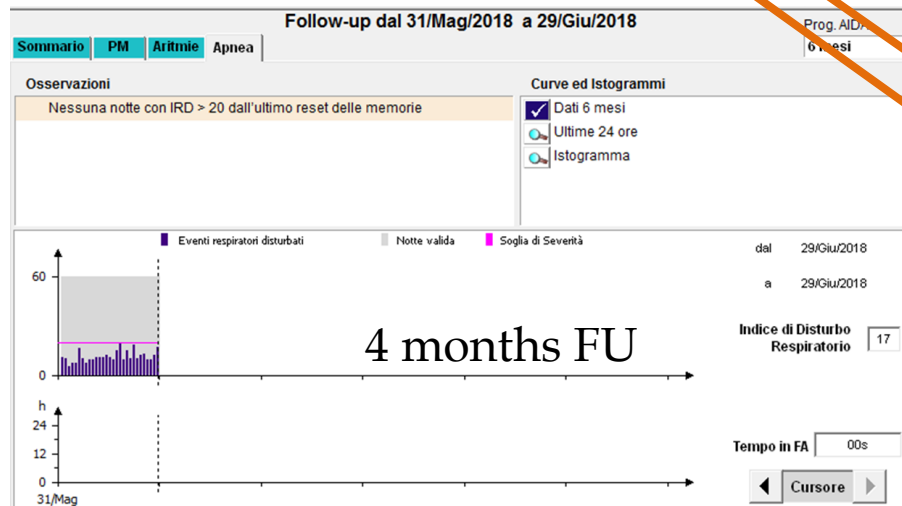
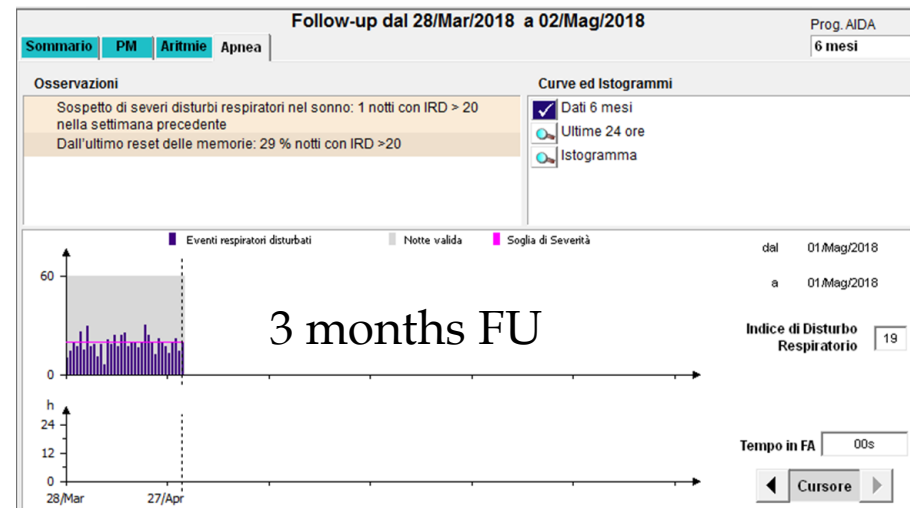
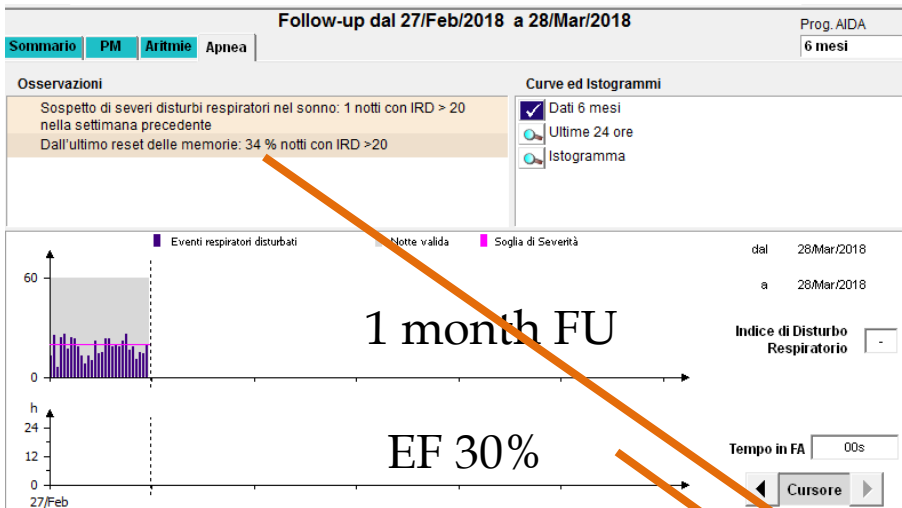
Sleep-disordered breathing and effectiveness of cardiac resynchronization therapy in heart failure patients: gender differences?



Our study at first reports a correlation between CRT response and sleep apnoea burden considering gender differences. In particular, HF-women responders to CRT demonstrate a significant linear decrease in sleep apnoea burden determined through a device algorithm, when compared to a similar male population.

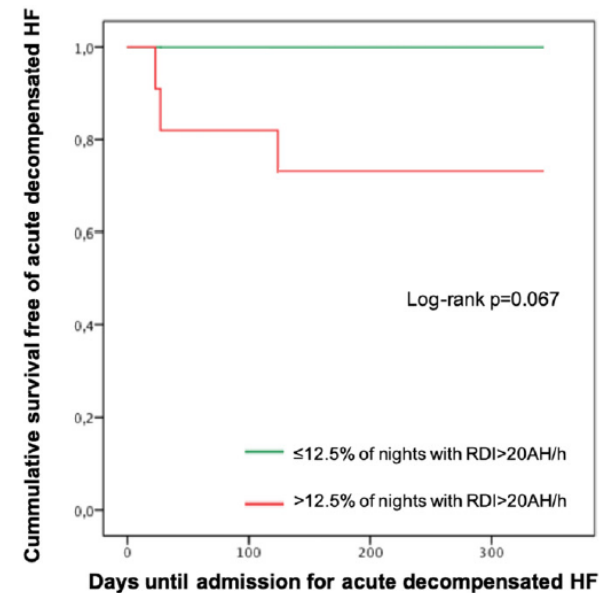
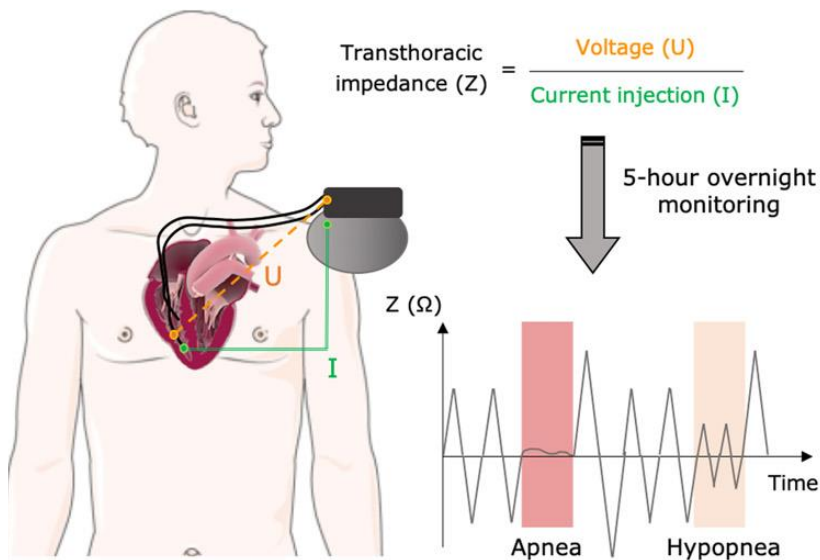


Case 13, women, 80 years old



Utility of Pacemaker With Sleep Apnea Monitor to Predict Left Ventricular Overload and Acute Decompensated Heart Failure

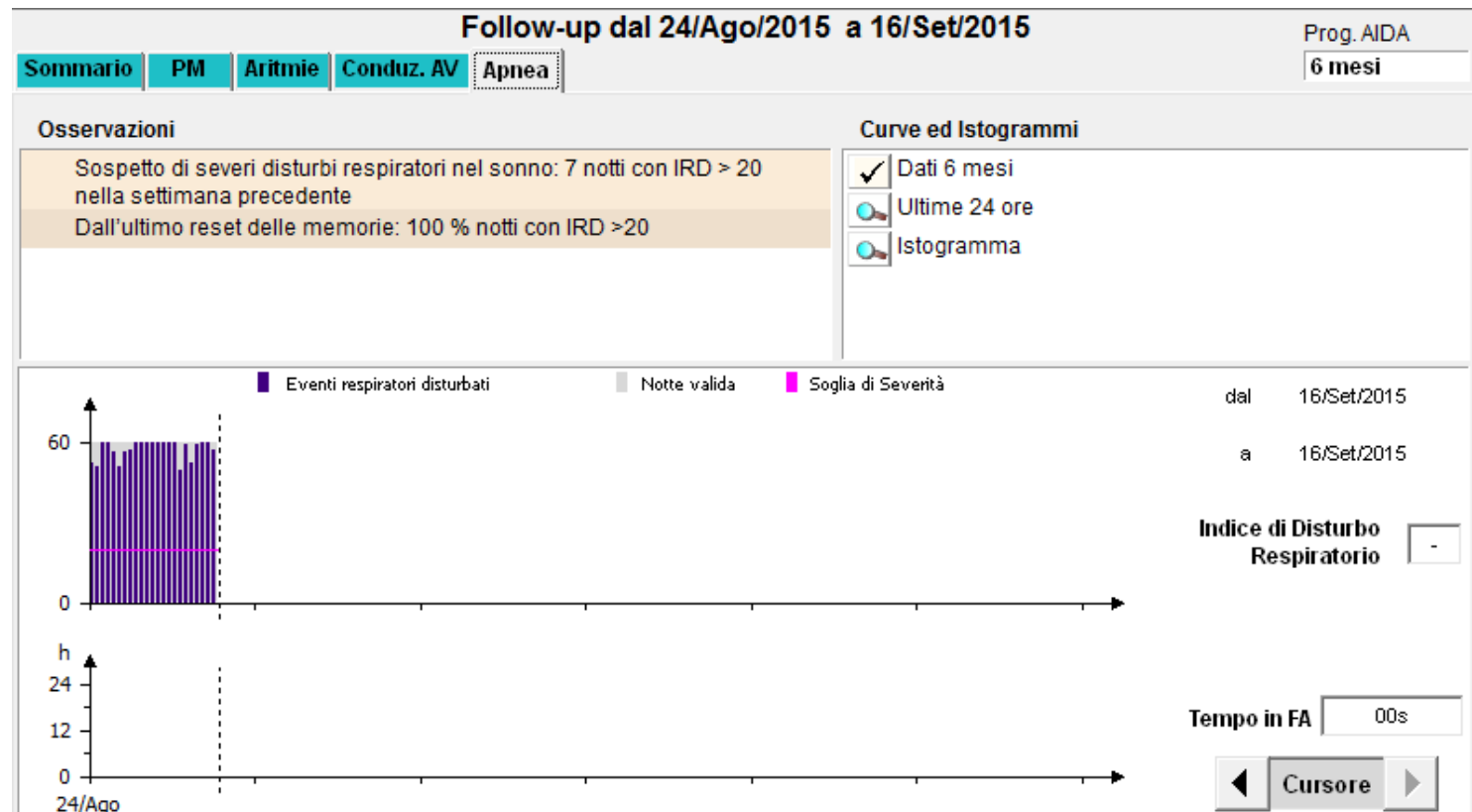
A high **burden** of apneas/hypopneas at night is associated with elevated NT-proBNP and PCWP values and an increased risk of ADHF over 1 year. **These patients might benefit from early tailored clinical management.**



Case 12, man, 84 years old

24/8/2015 , FU 16/9/2015

Sick sinus syndrome.



Case 12, man, 85 years old

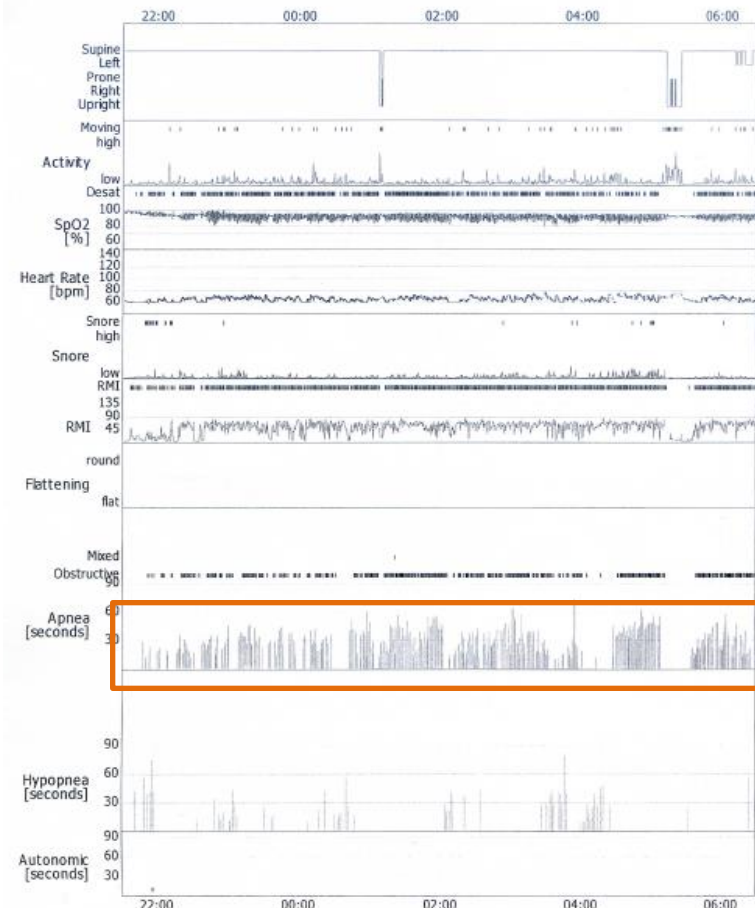
PSG 07/06/2016



Statistiche Apnea/Ipopnea

Respirazione	Numero	%	A o H/h	Supino	Non-Supino	Media [secondi]	Più lungo [secondi]
Apnea	323	83,5	37,6	313	10	30,3	73,0
Ostruttiva	322	83,2	37,5	312	10	30,3	73,0
Centrale	0	0,0	0,0	0	0	-	-
Mista	1	0,3	0,1	1	0	46,8	46,8
Ipopnea	64	16,5	7,5	64	0	30,1	80,0
Totale	387		45,1	377	10	30,3	80,0

Grafici Riassuntivi



CONCLUSION 1



1.582.000: patients unknown but affected by SDB in Italy

About 20 people / for each center / for all days in 1 year including Sundays and holidays should be evaluated



Pacemakers have an advantage over PSG in monitoring sleep every night and could provide new long-term information on sleep disorders.

A new screening and monitoring tool.

CONCLUSION 2



L'ASSOCIAZIONE **ATTIVITÀ** STRUMENTI AGENDA INFERMIERI E TECNICI AGGIORNAMENTO

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XVII Congresso Nazionale AIAC
Bologna, 23 - 24 aprile 2020

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L'AIAC cura il mantenimento di tre Registri:

LA SLEEP APNEA FATTORE DI RISCHIO CARDIOVASCOLARE

GRAZIE PER L'ATTENZIONE

What Happens When you Sleep?



Dott.ssa Marzia Giaccardi
Laboratorio di Elettrofisiologia
UOC Cardiologia I - Firenze