11h00 – 11h20	Apport des Big data dans le suivi du SAS	Mohamed EL IBRAHIMI
11h20 – 11h40	La révolution du sommeil : faut-il encore faire des polygraphies et polysomnographies ?	Pierre ESCOURROU
11h40 – 12h00	Les troubles du sommeil chez l'obèse	Alice DESANCTIS
12h00 – 12h20	Cardiovascular comorbidities in OSA	Nashwa H ABDELWAHAB

La révolution du sommeil : faut-il encore faire des polygraphies et polysomnographies ?

P.Escourrou

Centre Interdisciplinaire du Sommeil
Paris 15
Réseau Morphée
pr.escourrou@cis-paris.fr

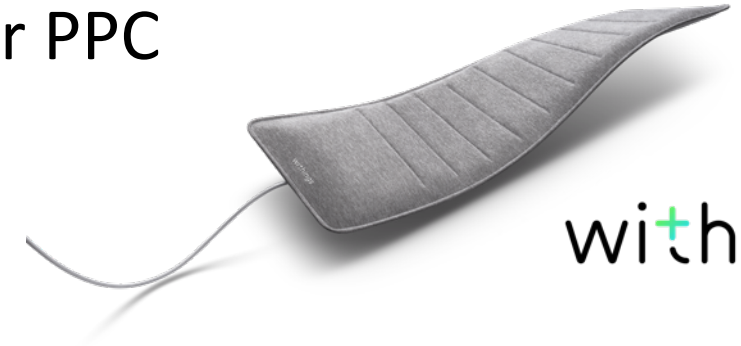
Déclaration de conflits d'intérêt

Pr. Pierre Escourrou

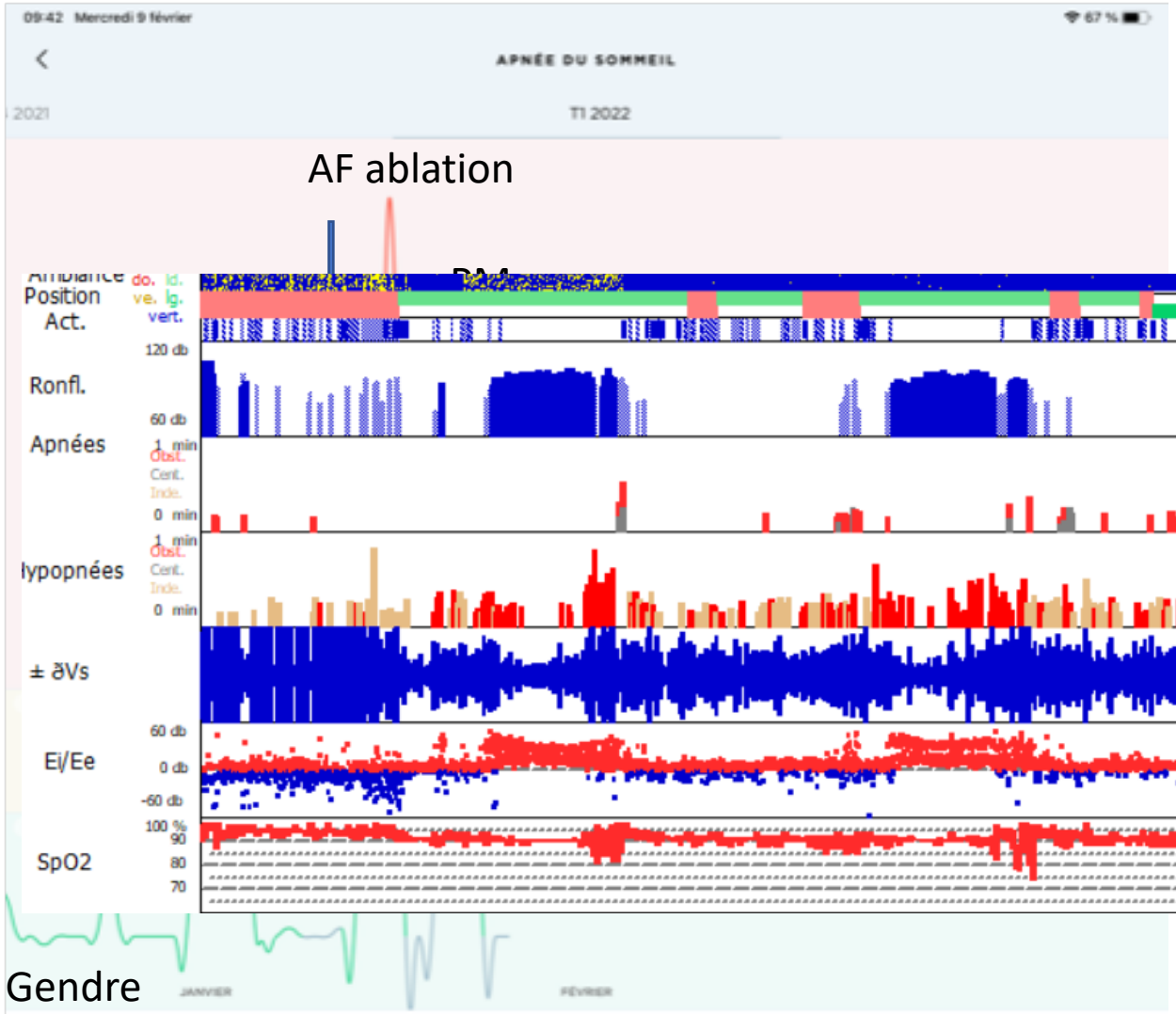
Affiliation / Financial interest	Commercial Company
Grants/research support:	Philips, Le Nouveau Souffle
Honoraria or consultation fees:	Bioprojet, Itamar, Withings
Participation in a company sponsored bureau:	No
Stock shareholder:	No
Spouse / partner:	
Other support / potential conflict of interest:	No

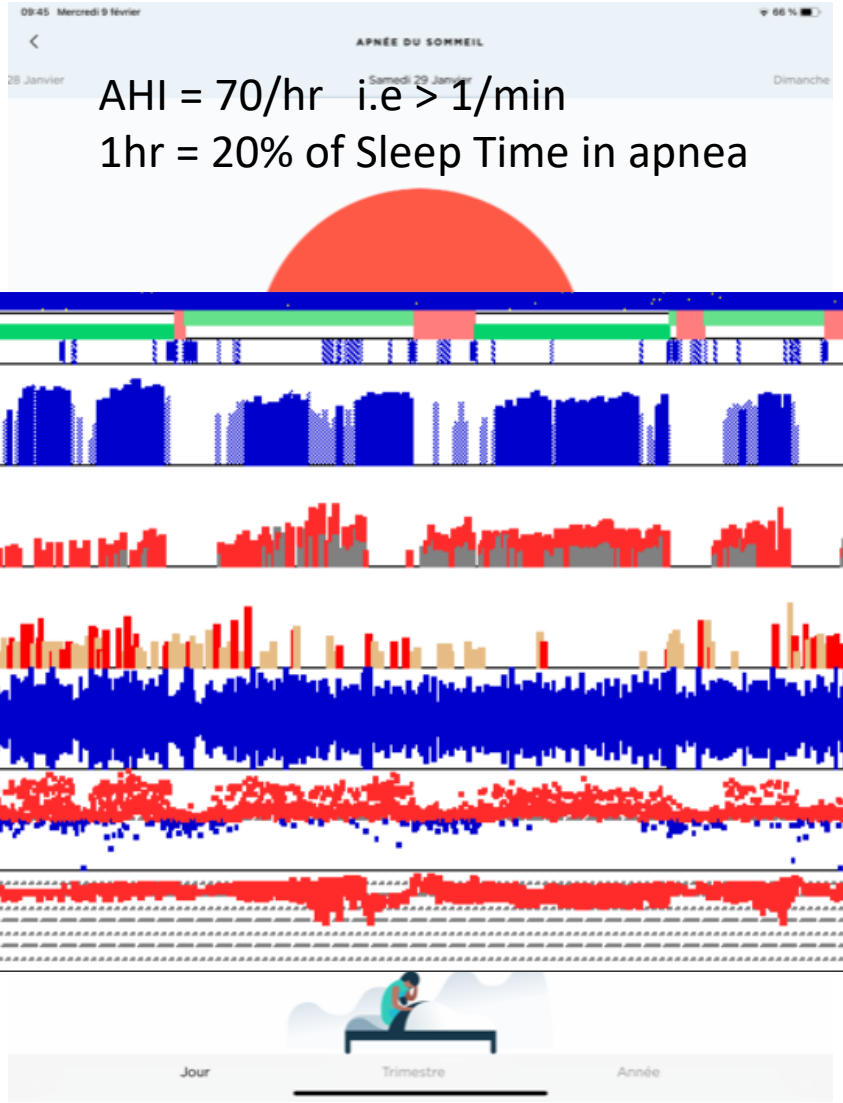
Patient MJ-F

- 78 ans, IMC 29kg/m2
- Vit en province
- Depuis >30 ans, ronfle, dort mal, pique du nez
- ACFA il y a 10 ans, cardioversion
- Ablation de Flutter et PM dans un hôpital parisien
- Avant et après son hospitalisation dort chez sa fille à Paris
- Son t est traité par PPC



Patient MJ-F





Gendre

CPAP Pt Pt Pt

Plan

- Les techniques actuelles: **PG, PSG**
  - Avantages/inconvénients
  - Les limitations de la reproductibilité du scorage EEG/respiratoire
  - Les limitations du calcul de l'AHI en PG
  - L'avenir de la PG/PSG

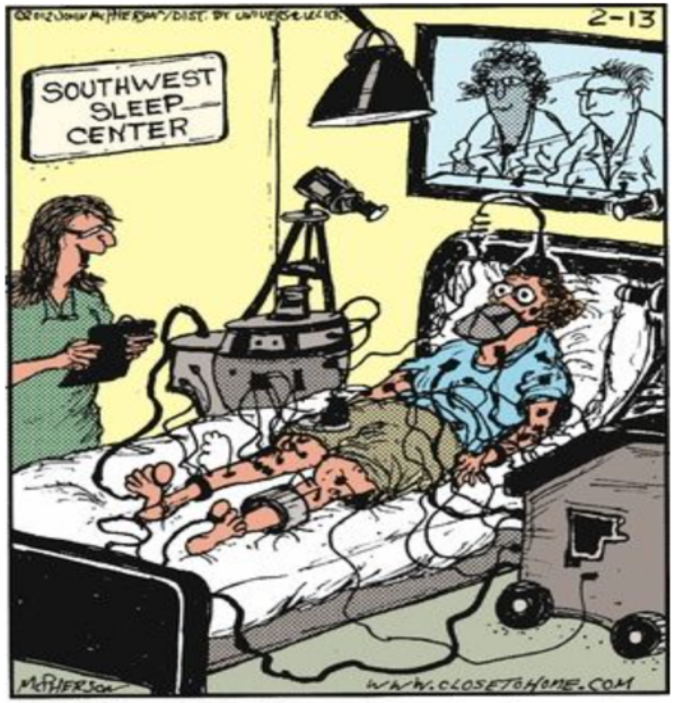
- Les nouvelles techniques:
  - Contact **sans mesure directe** du flux respiratoire
  - **Sans contact**

- La variabilité Inter-nuit et ses conséquences

- L'écosystème futur du sommeil

Quel diagnostic pour le SAS?

	P S G	POLYGRAPHIE
Avantages	précise	Simple
	« vrai » AHI, TST	Bas coût
	« Gold standard »	moins invasive?
	Qualité du sommeil Micro-éveils	Domicile: Sommeil naturel? Position usuelle?
Inconvénients	Complexe, longue	imprécise
	invasive	
	coût	
	Hôpital (ambu)	



SPECIAL ARTICLES

JCSM
Journal of Clinical Sleep Medicine

2013

http://dx.doi.org/10.5664/jcsm.2350

The American Academy of Sleep Medicine Inter-scorer Reliability Program: Sleep Stage Scoring

Richard S. Rosenberg, Ph.D., F.A.A.S.M.; Steven Van Hout, B.S.

American Academy of Sleep Medicine, Darien, IL

1,800 epochs de 30 sec
2,500 scorers, most with 3 or more years of experience

Table 3—Percentage agreement

Majority Score	W	N1	N2	N3
W	**84.1%**	10.0%	3.8%	0.3%
N1	10.9%	**63.0%**	21.7%	0.1%
N2	0.7%	6.3%	**85.2%**	6.6%
N3	0.1%	0.1%	32.3%	**67.4%**
R	1.1%	4.4%	3.9%	0.1%
Total				

Scorers in agreement with the majority score are shown in bold type.

SPECIAL ARTICLES

JCSM
Journal of Clinical Sleep Medicine

2014

http://dx.doi.org/10.5664/jcsm.3630

The American Academy of Sleep Medicine Inter-scorer Reliability Program: Respiratory Events

Richard S. Rosenberg, Ph.D., F.A.A.S.M.[1]; Steven Van Hout, B.S.[2]

Table 2—Scoring Agreement for the 15 Records Used

		None	OA	MA	CA	HY
Majority Score	None	97.4%	0.5%	0.1%	0.4%	1.6%
	OA	5.5%	77.1%	1.5%	1.4%	14.4%
	MA*	17.7%	17.8%	39.8%	22.1%	2.5%
	CA	11.1%	20.3%	5.5%	52.4%	10.7%
	HY	16.4%	14.8%	0.9%	2.4%	65.4%

*A single epoch was scored as a mixed apnea by the majority of scorers. OA, obstructive apnea; MA, mixed apnea; CA, central apnea; HY, hypopnea.

ARTICLE

DOI: 10.1038/s41467-018-07229-3 OPEN

Neural network analysis of sleep stages enables efficient diagnosis of narcolepsy

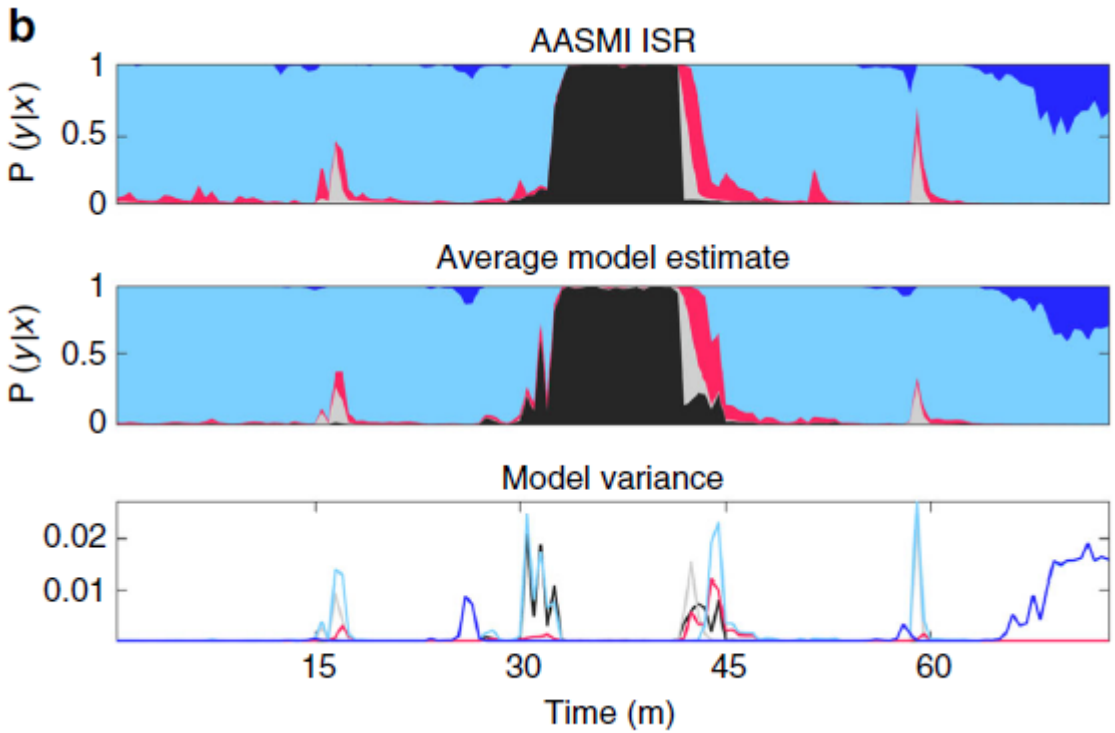
Jens B. Stephansen[1,2], Alexander N. Olesen[1,2,3], Mads Olsen[1,2,3], Aditya Ambati[1], Eileen B. Leary[1],

NATURE COMMUNICATIONS | (2018)9:5229 |

Consensus de
6 scorers: 90% d'agrément

Prédiction du
Modèle: précision 95% par rapport au consensus

« Probabilité » des stades de sommeil:



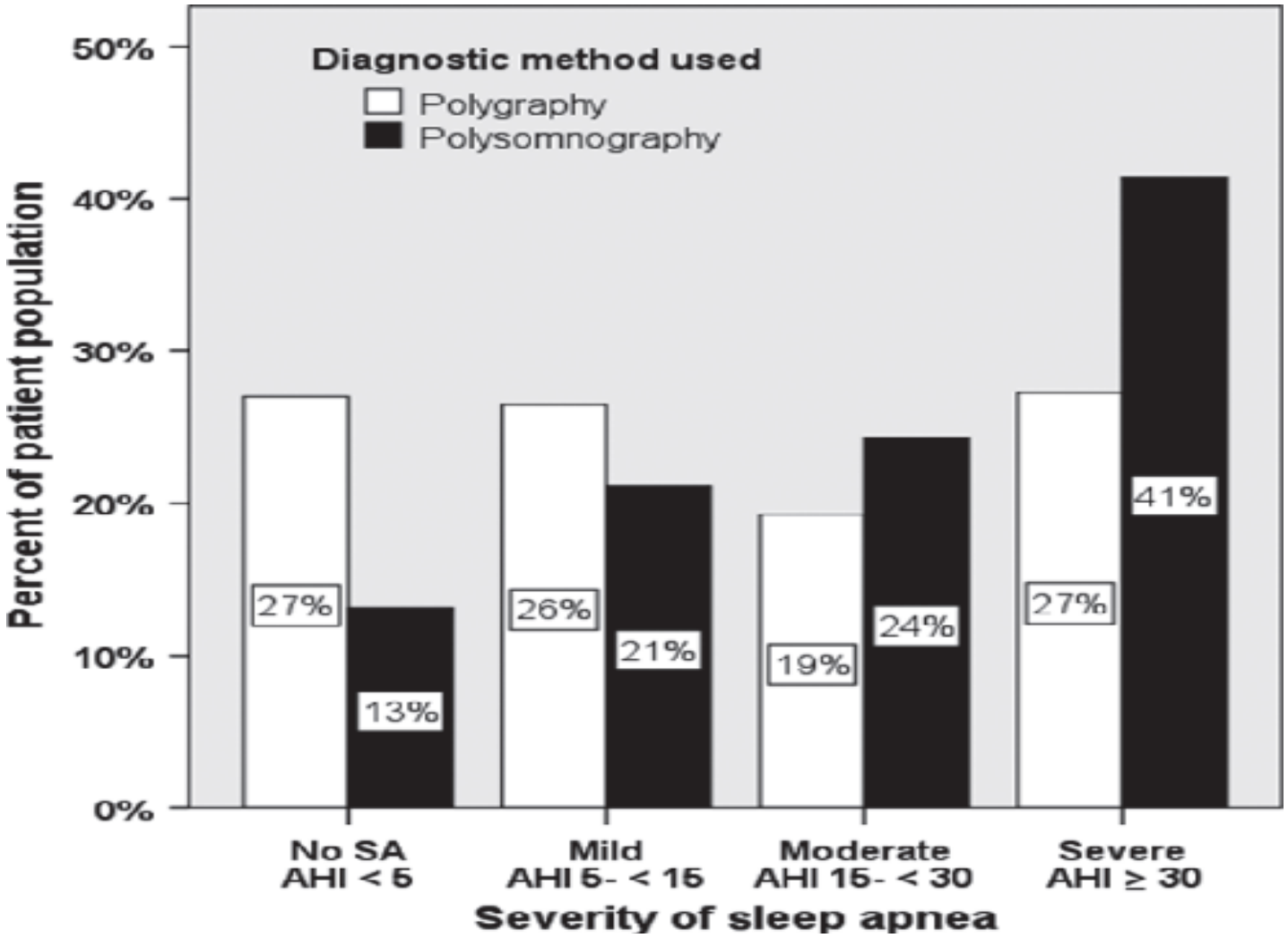
Color codes: white, wake; red, N1; light blue, N2; dark blue, N3; black, REM

Infinité niveaux d'éveil et de gradation de sommeil

>> Le sommeil/ l'éveil/ stades de sommeil:

= probabilité d'un état entre 0 et 1

Sous-estimation de la sévérité du SAS par la polygraphie ventilatoire



- 1- **Sur-estimation du temps de sommeil**
- IAHpg = Nb AH/T Enregistrement

  Λ V
- IAHpsg = Nb AH/T Total Sommeil

- 2-non prise en compte des **hypopnées** non désaturantes associées à un micro-éveil

Escourrou P et al., J Sleep Res 2015; 24(6):730-3.

L’avenir de la PG/PSG

- **Simplification** du hardware (pose par le patient) moins **invasif,** jetable?
- Analyse **automatique** par IA du **sommeil** et de la **respiration**
- Transfert sur le **Cloud:** BBD
- Prise en compte d’autres critères que **l’IAH** (corrélation faible avec les conséquences cliniques)
  - Oxymétrie: ODI, hypoxic burden,
  - Evènements EEG: microéveils, spindles..
  - Evènements autonomes: variabilité de FC, variabilité du PPG…

Plan

- Les techniques actuelles: **PG, PSG**
  - Avantages/inconvénients
  - Les limitations du scorage EEG/respiratoire
  - L'avenir de la PG/PSG

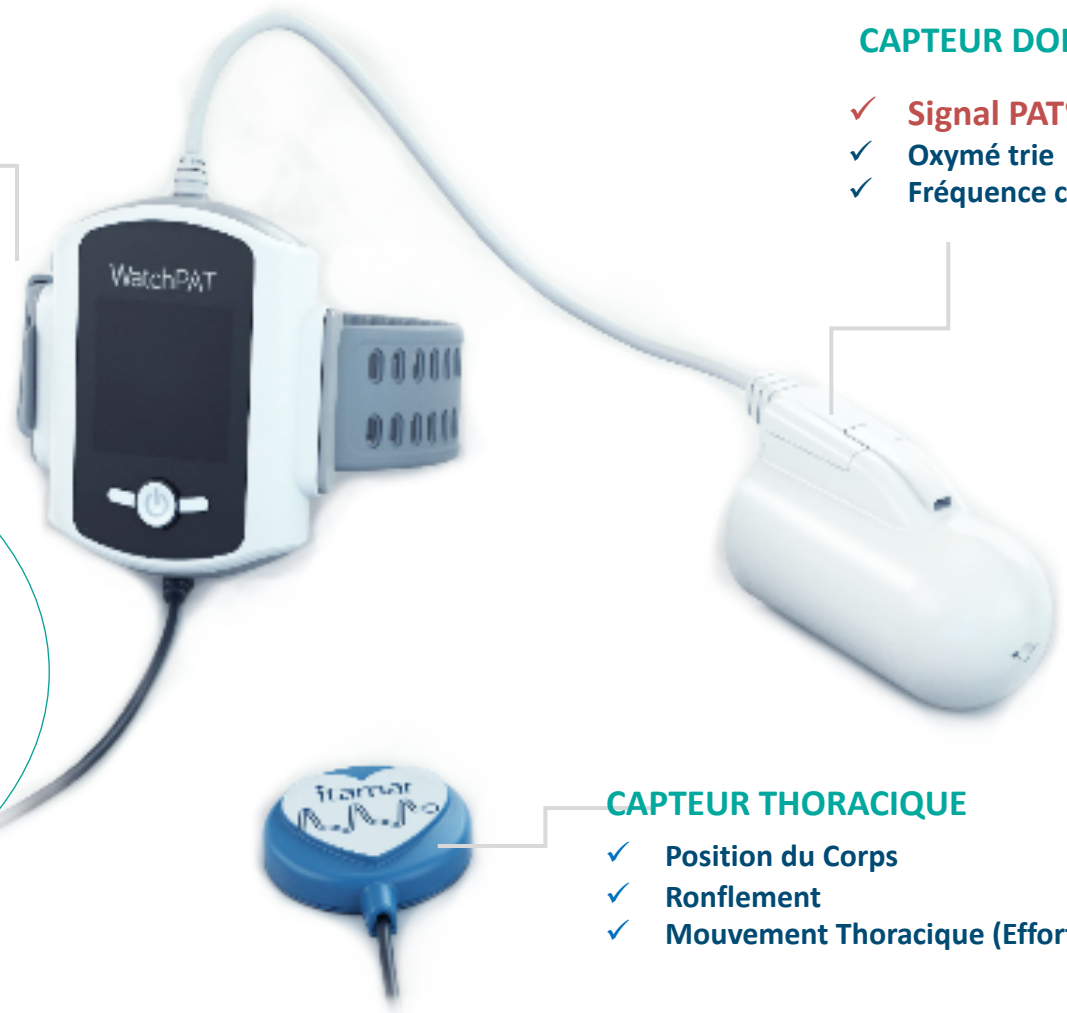
- Les nouvelles techniques:
  - Polygraphie **sans mesure directe** du flux respiratoire
  - **Capteurs connectés avec ou sans contact** avec le patient

WatchPAT® en France:

4 points de contact, 8 signaux

BRACELET

- ✓ Actigraphie

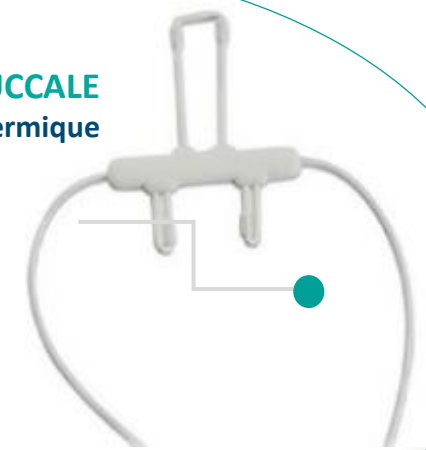


CAPTEUR DOIGTIER (PROBE)

- ✓ Signal PAT®
- ✓ Oxymé trie
- ✓ Fréquence cardiaque

THERMISTANCE NASO-BUCCALE

- ✓ Flux aérien thermique



Disponibilité estimée : 2022

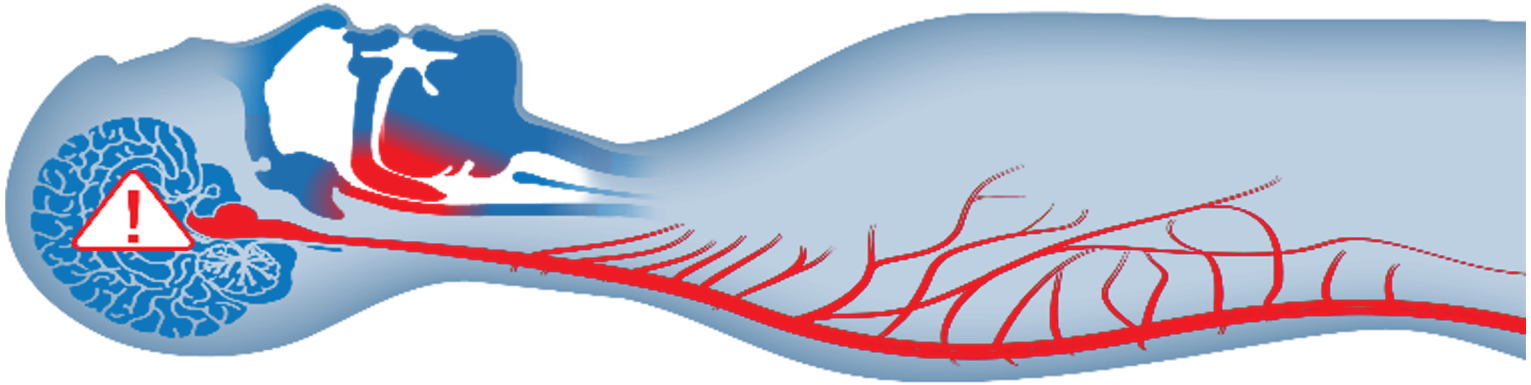
CAPTEUR THORACIQUE

- ✓ Position du Corps
- ✓ Ronflement
- ✓ Mouvement Thoracique (Effort Respiratoire)

PAT®: Peripheral Arterial Tone

Principes physiologiques

1



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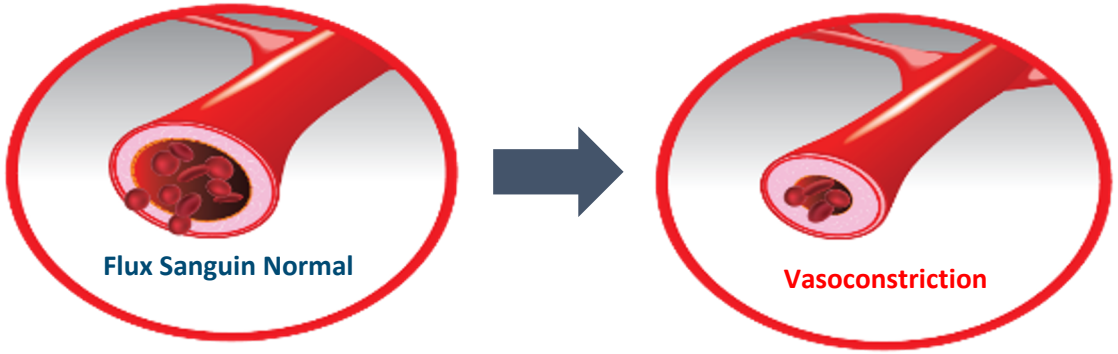

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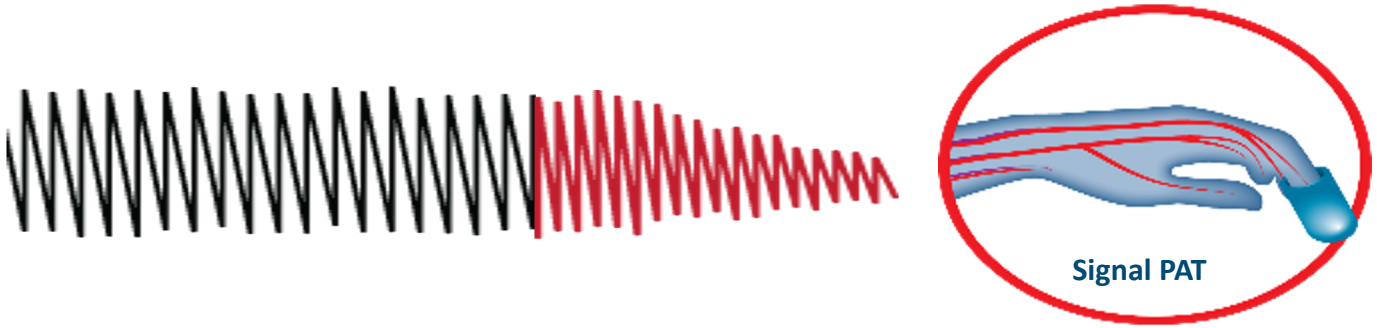
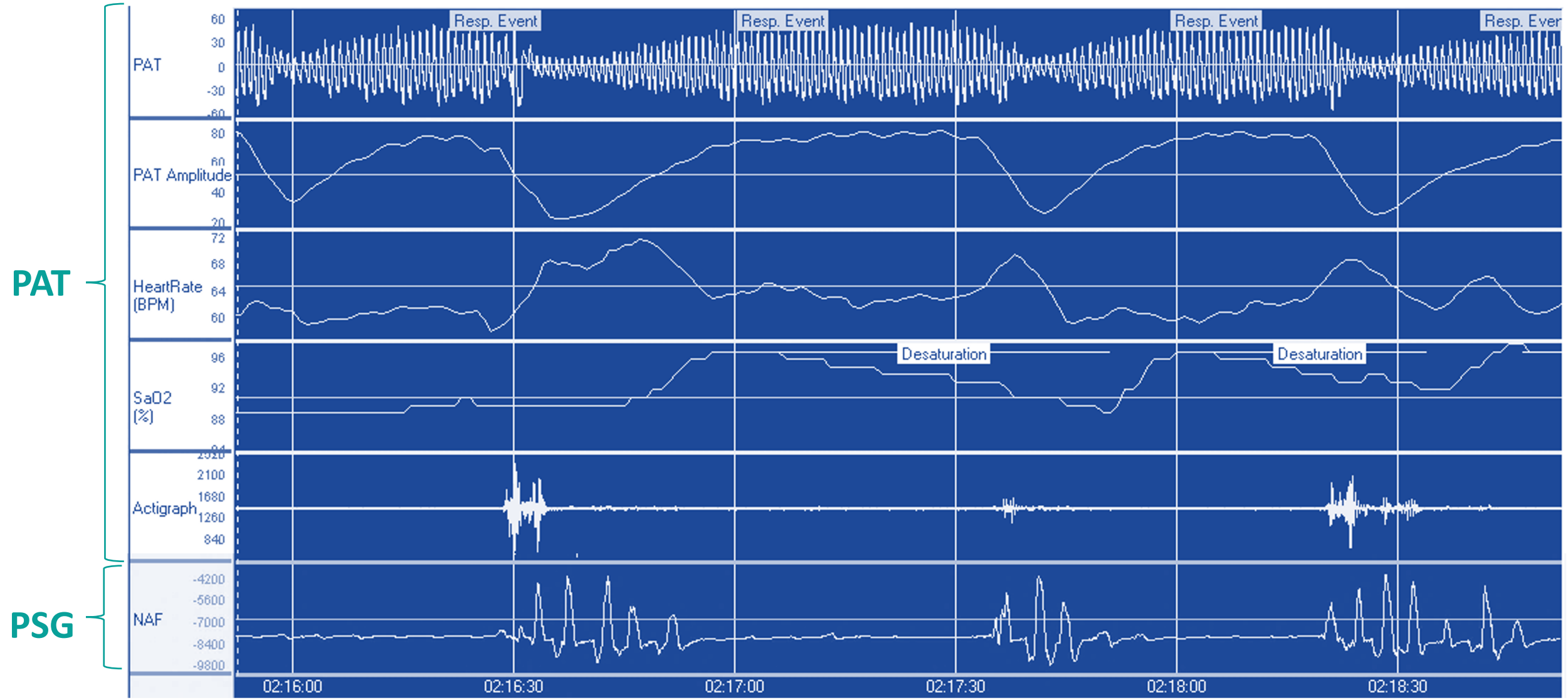


Corrélation entre le signal de PAT et le débit aérien en PSG: APNÉE



Rapport automatique WatchPAT® (1/2)

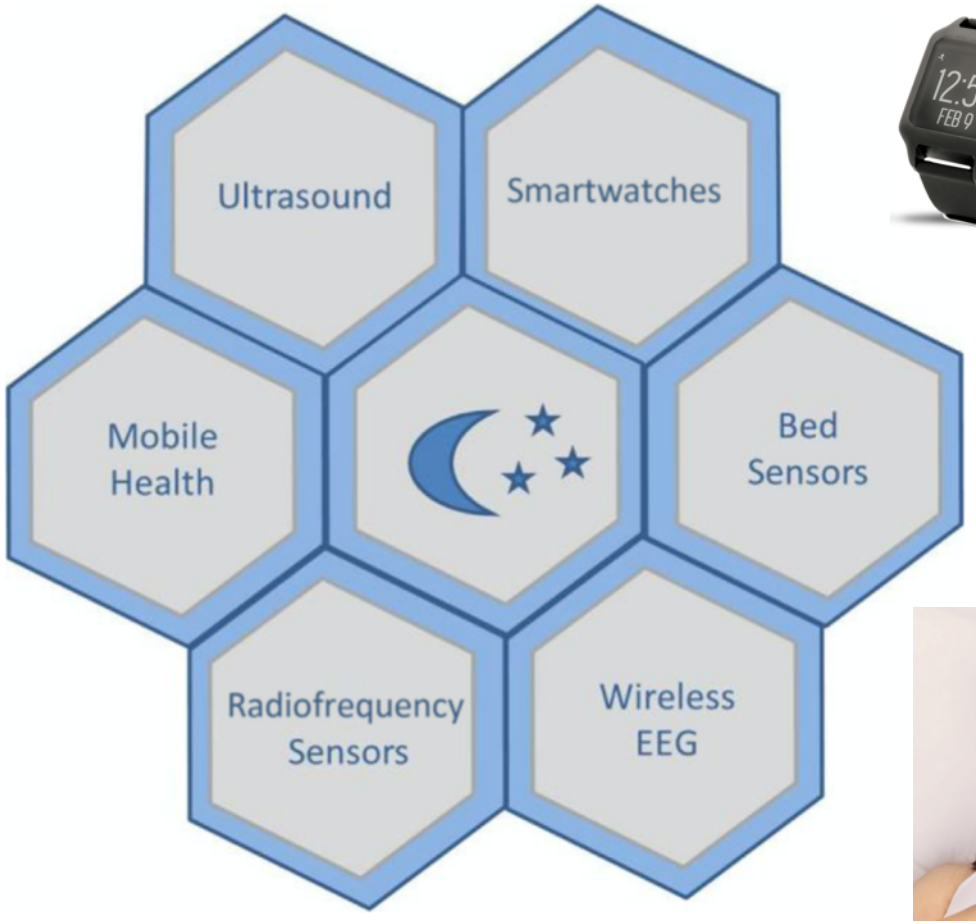
RÉSUMÉ DU SOMMEIL
- ✓ Heure de début et de fin de l'enregistrement
- ✓ Temps d'enregistrement total et temps réel de sommeil

INDICES RESPIRATOIRES
- ✓ pITR
- ✓ pIAH
- ✓ IDO
- ✓ pIAHc
- ✓ %RCS

INFORMATIONS SUR la SaO2 ET LE POULS
- ✓ Statistiques de saturation en oxygène
- ✓ Désaturation en oxygène, %
- ✓ Désaturation en oxygène
- ✓ Statistiques du rythme cardiaque

HYPNOGRAMME & GRAPHIQUES DE TENDANCES
- ✓ Evènements Respiratoires Totaux
- ✓ Ronflement/ Position du Corps
- ✓ SaO2 / Fréquence Cardiaque
- ✓ Stades d'éveil/ sommeil

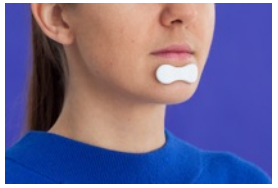
Technologies d’évaluation du sommeil



Oura

Sunrise

Dreem



Wespers

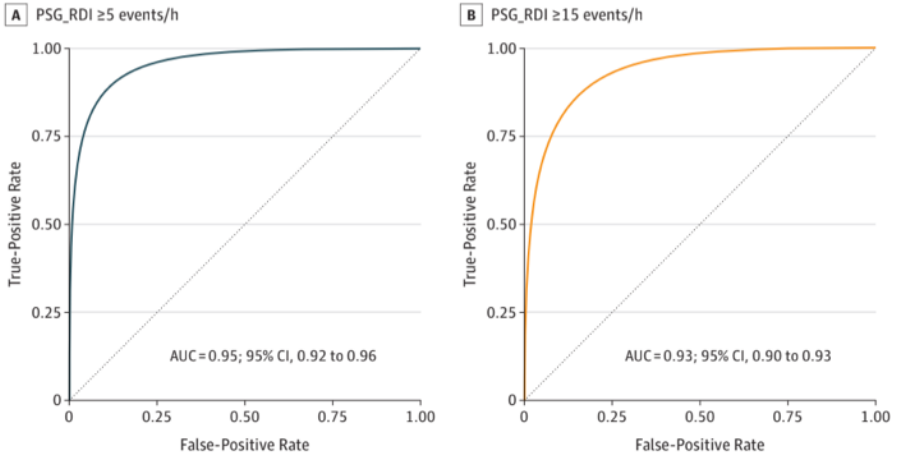
JAMA Network Open

Original Investigation | Pulmonary Medicine

Assessment of Mandibular Movement Monitoring With Machine Learning Analysis for the Diagnosis of Obstructive Sleep Apnea

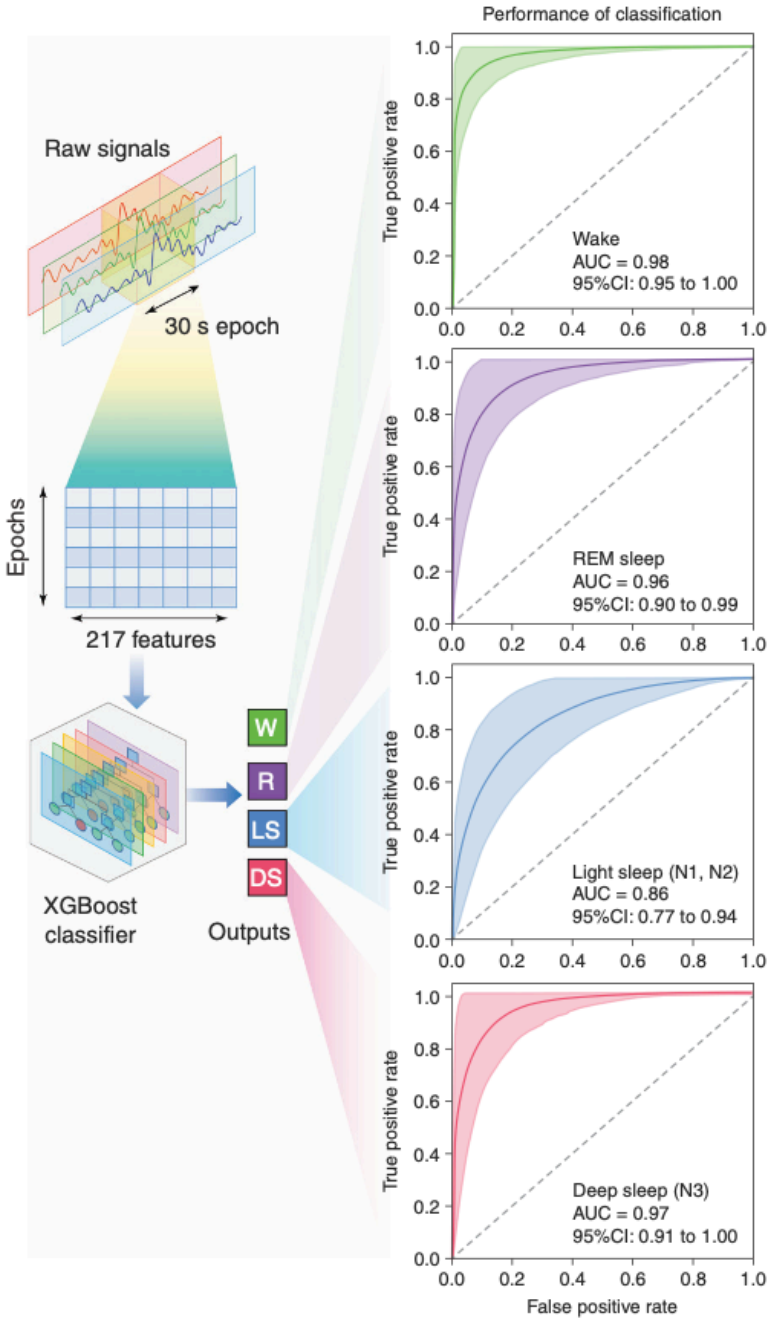
Jean-Louis Pépin, MD, PhD; Clément Letesson, PhD; Nhat Nam Le-Dong, MD, PhD; Antoine Dedave, MSc; Stéphane Denison, MSc; Valérie Cuthbert, MSc; Jean-Benoît Martinot, MD; David Gozal, MD, MBA

Figure 3. Receiver Operating Characteristic Curve Analysis for Evaluating the Performance of the Sunrise System Respiratory Disturbance Index (Sr-RDI) in Obstructive Sleep Apnea Diagnosis



JAMA Network Open. 2020;3(1):e1919657. doi:10.1001/jamanetworkopen.2019.19657

sun✳rise



JCSM
Journal of Clinical Sleep Medicine

EMERGING TECHNOLOGIES

An Evaluation of the NightOwl Home Sleep Apnea Testing System

Frederik Massie, MSc[1]; Duarte Mendes de Almeida, MSc[1]; Pauline Dreesen, MSc[2]; Inge Thijs, MSc, PhD[2]; Julie Vranken, MSc[2]; Susie Klerkx, MD[3]

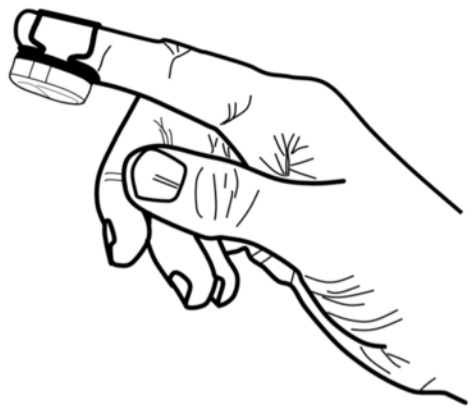
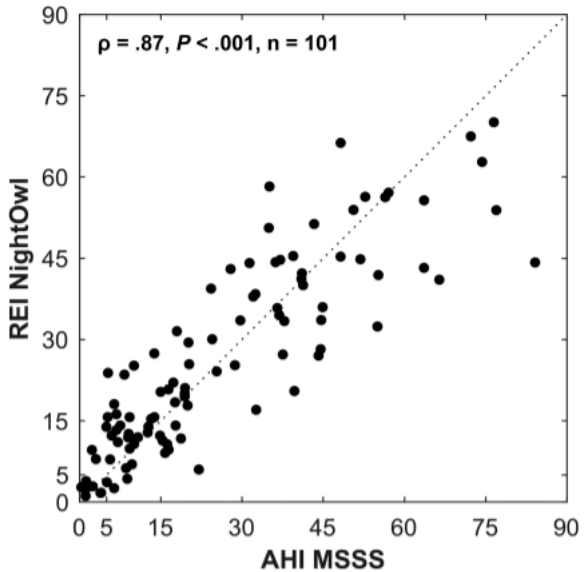


Figure 1—An illustration of the NightOwl sensor.



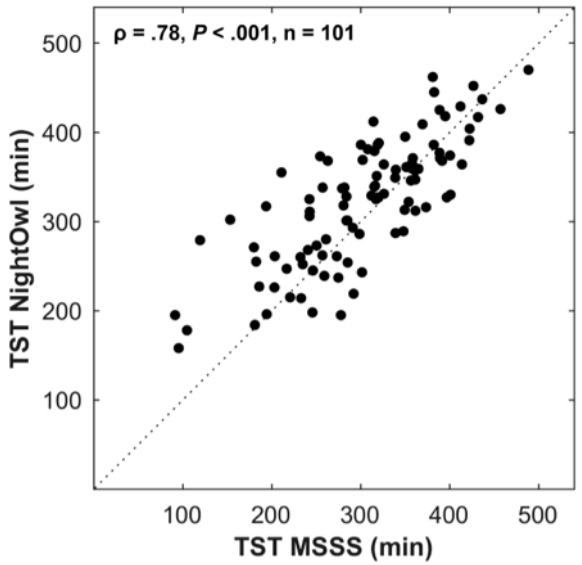


Table 2—Performance metrics for correct NightOwl-REI classification and ZOL-AHI classification at different MSSS-AHI cutoff values.

	Se		Sp		NPV		PPV	
AHI Cutoff	ZOL	NightOwl	ZOL	NightOwl	ZOL	NightOwl	ZOL	NightOwl
5	0.92	0.98	1.00	0.80	0.56	0.80	1.00	0.98
15	0.94	0.97	0.87	0.83	0.89	0.94	0.92	0.89
30	0.76	0.90	0.97	0.97	0.87	0.94	0.94	0.94

Oura ring: sleep scoring

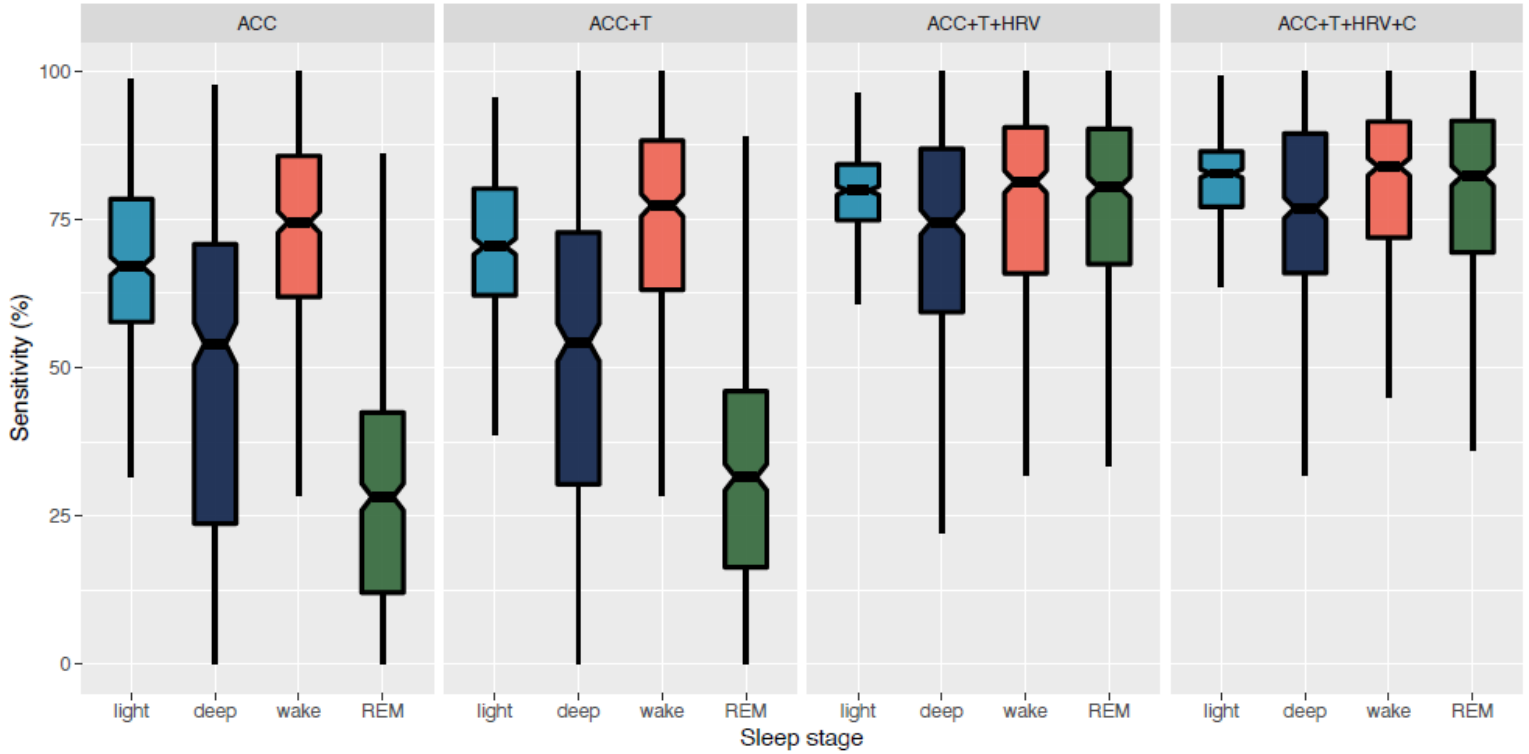


Figure 11. Epoch by epoch sensitivity for 4-stage classification and the four models compared in this paper. Whiskers are computed as 1.5 times the interquartile range.

JCSM | Journal of Clinical Sleep Medicine

SCIENTIFIC INVESTIGATIONS

Screening for obstructive sleep apnea using a contact-free system compared with polysomnography

Rui Zhao, MD[1,*]; JianBo Xue, MD[1,*]; Xiao Song Dong, MD[1]; Hui Zhi, MD[1]; JiaNan Chen, MD[2]; Long Zhao, BS[1]; XueLi Zhang, BS[1]; Jing Li, BS[1]; Thomas Penzel, PhD[3,4]; Fang Han, MD[1]

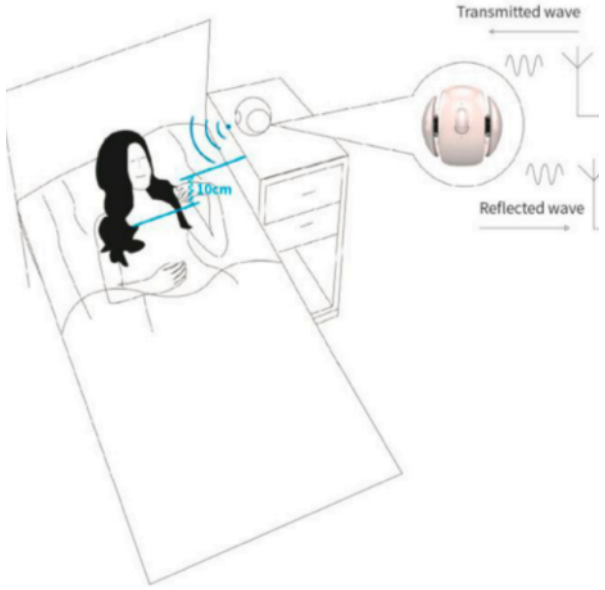
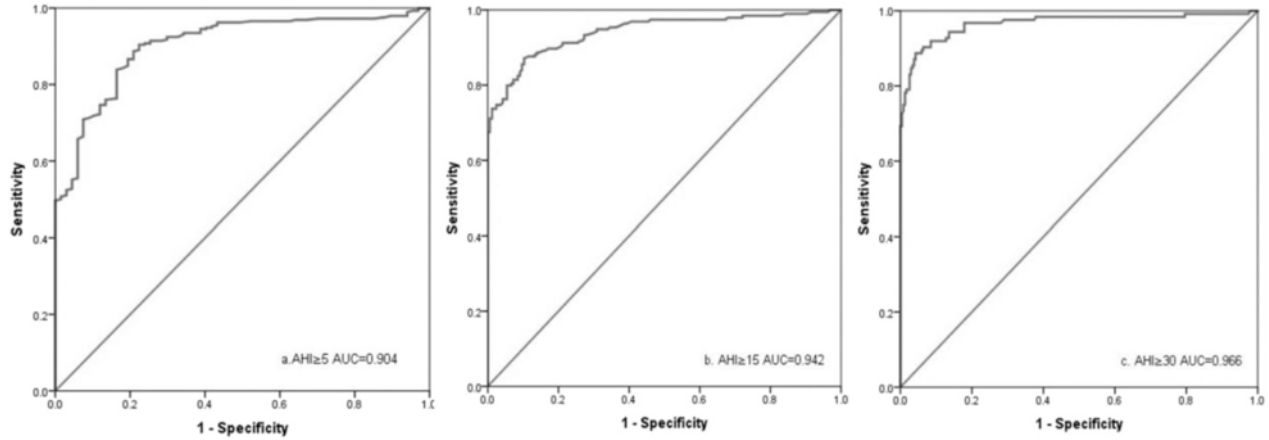


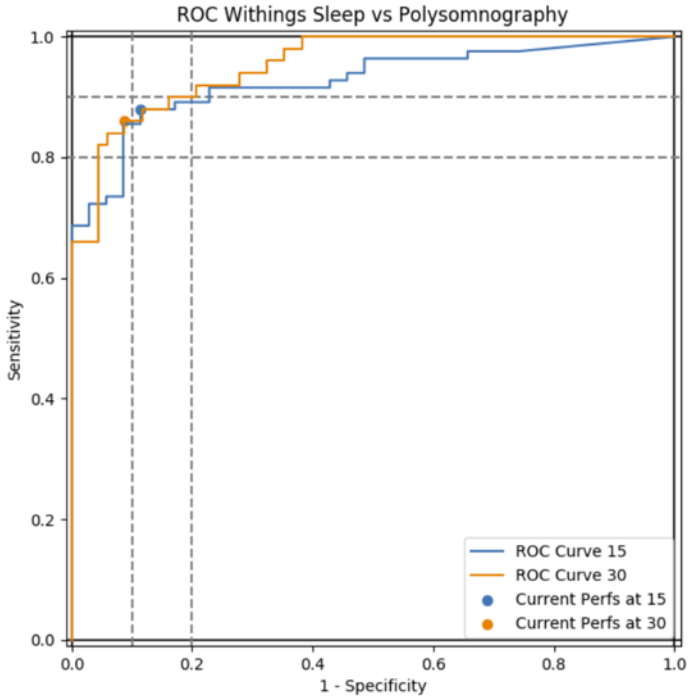
Figure 4—Receiver operating characteristic curves for the OrbSense estimated REI vs the PSG AHI.



Performances of the Withings Sleep Analyzer

- Signaux: pression (RR, FC), actigraphie, ronflement
- Performance identique à la PG en comparison avec la PSG

withings



Performances against PSG

	PG	WSAD
Sensitivity_{15}	63.9%	88.0%
Specificity_{15}	97.1%	88.6%
AUROC_{15}	0.958	0.926
Sensitivity_{30}	58.0%	86.0%
Specificity_{30}	100.0%	91.2%
AUROC_{30}	0.950	0.954
RMSE (h^{-1})	16.2	12.5
Bias (h^{-1})	9.9	1.6

Table 2: PG and WSAD performances against PSG

Edouard et al, JCSM 2021

Plan

- Les techniques actuelles: **PG, PSG**
  - Avantages/inconvénients
  - Les limitations du scorage EEG/respiratoire
  - L'avenir de la PG/PSG

- Les nouvelles techniques:
  - Contact **sans mesure directe** du flux respiratoire
  - **Sans contact**

- La variabilité Inter-nuit et ses conséquences

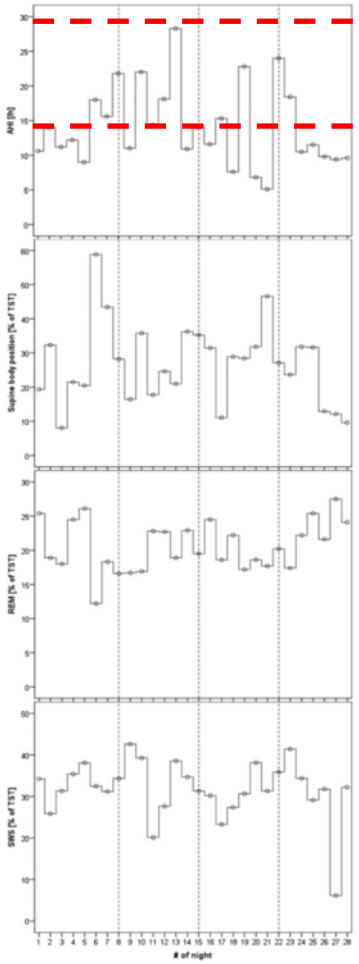
JCSM | Journal of Clinical Sleep Medicine

CASE REPORTS

Long-term variability of the apnea-hypopnea index in a patient with mild to moderate obstructive sleep apnea

Ingo Fietze, MD, PhD; Martin Glos, PhD; Sandra Zimmermann, MSc; Thomas Penzel, PhD

Figure 1—Synchronized time series of 28 nights.



Night to night variability Of AHI

JCSM | Journal of Clinical Sleep Medicine

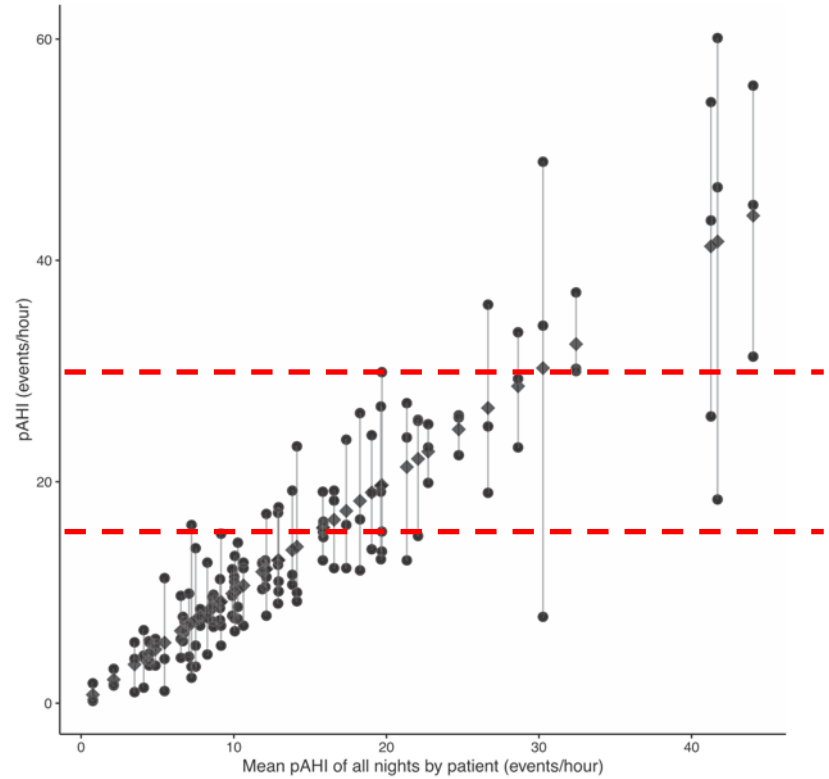
SCIENTIFIC INVESTIGATIONS

Night-to-night variability in obstructive sleep apnea using peripheral arterial tonometry: a case for multiple night testing

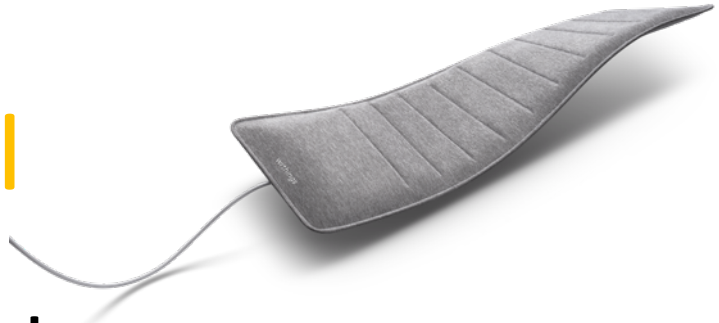
Samuel Tschopp, MD[1]; Wilhelm Wimmer, PhD[1,2]; Marco Caversaccio, MD[1], Urs Borner, MD[1,*]; Kurt Tschopp, MD[3,*]

24% misclassification rate

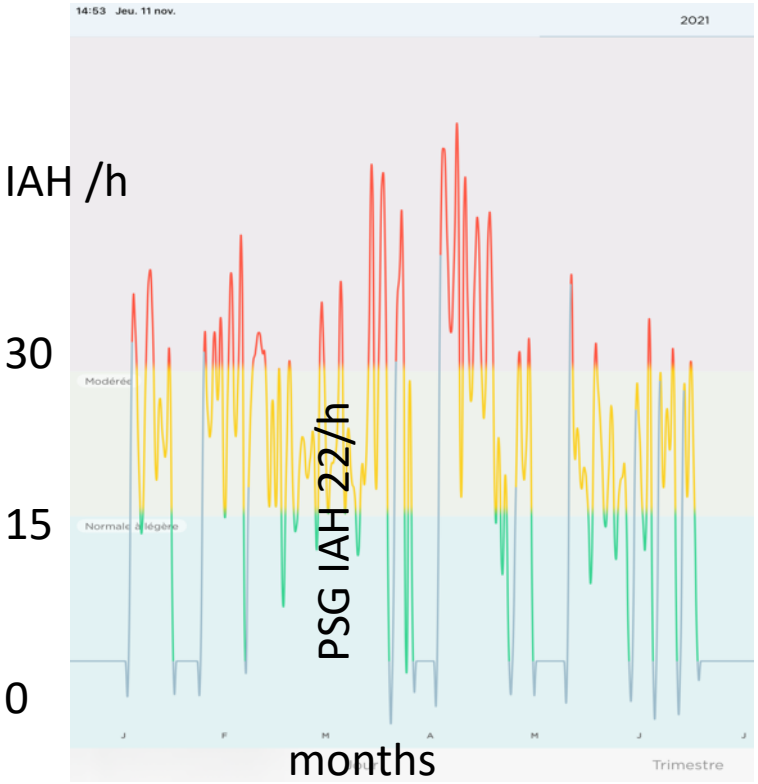
Figure 1—An overview of all pAHI measurements grouped by the mean of a patient.



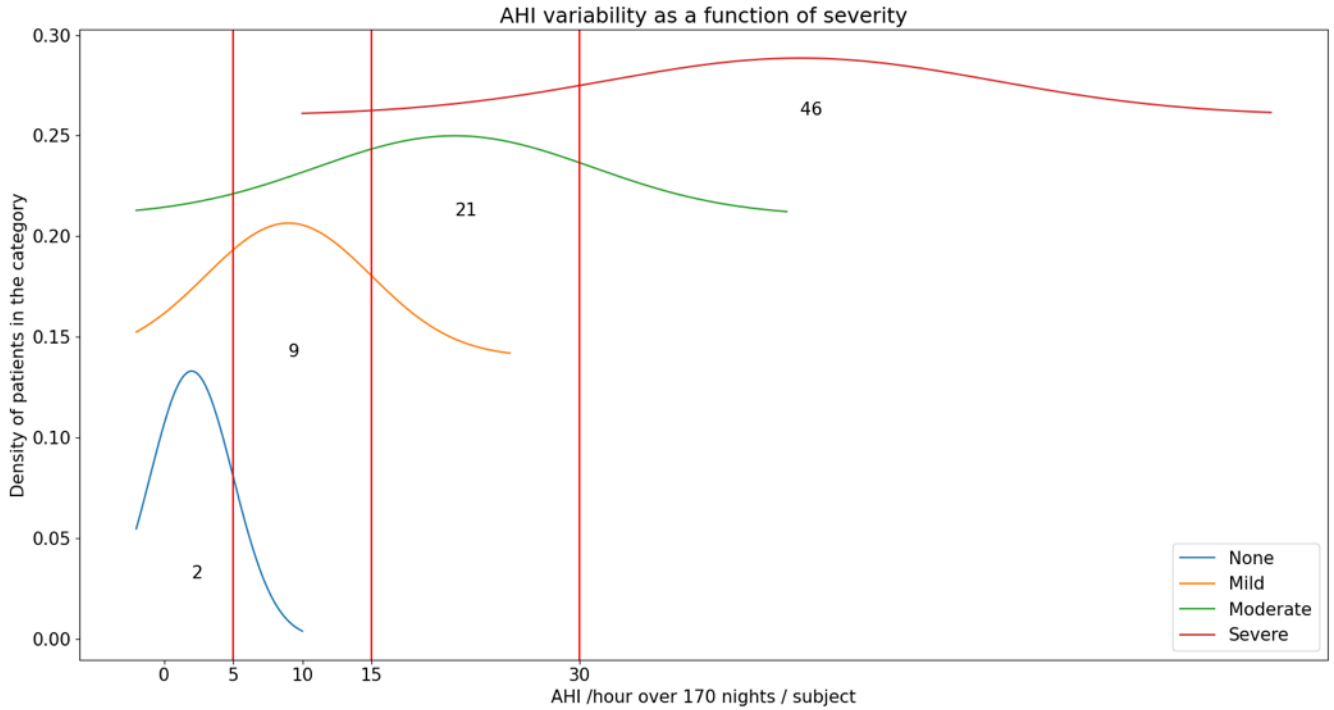
Night to Night Variability of AHI



1 subject over 6 months



67.000 subjects on an average of 170 nights

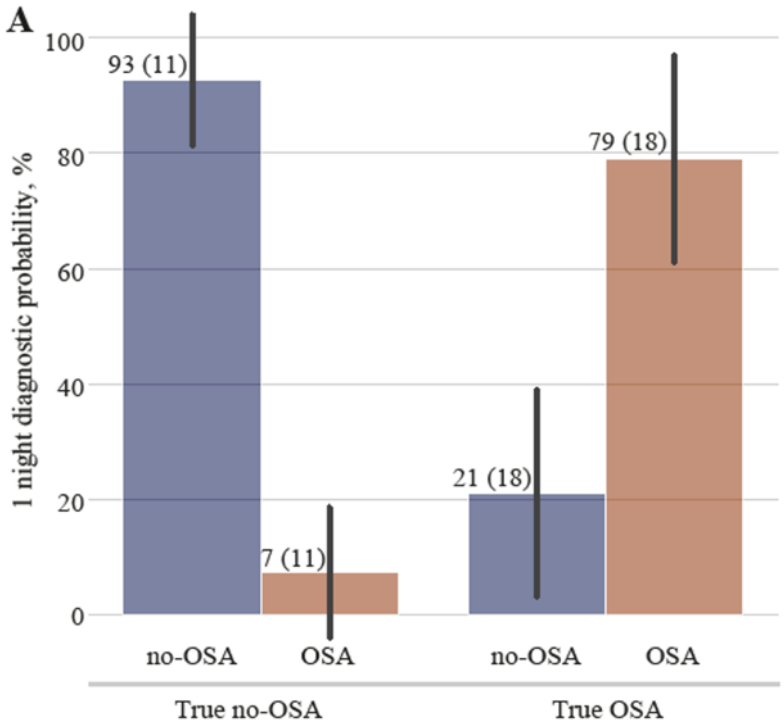


B.Lechat et al AJRRCM 2021

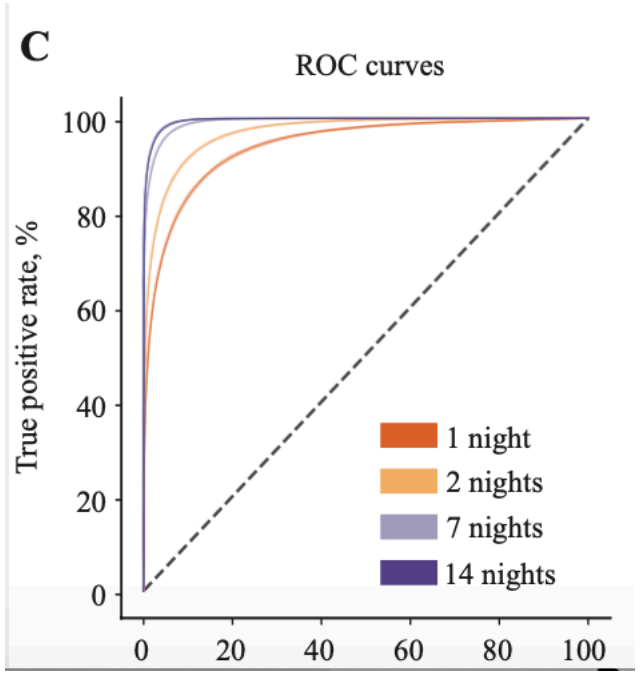
Severity misclassification linked to NtoN variability

67.000 subjects on an average of 170 nights

Misclassifications for AHI 15/h



Number of recording nights necessary for the actual diagnosis of OSAS

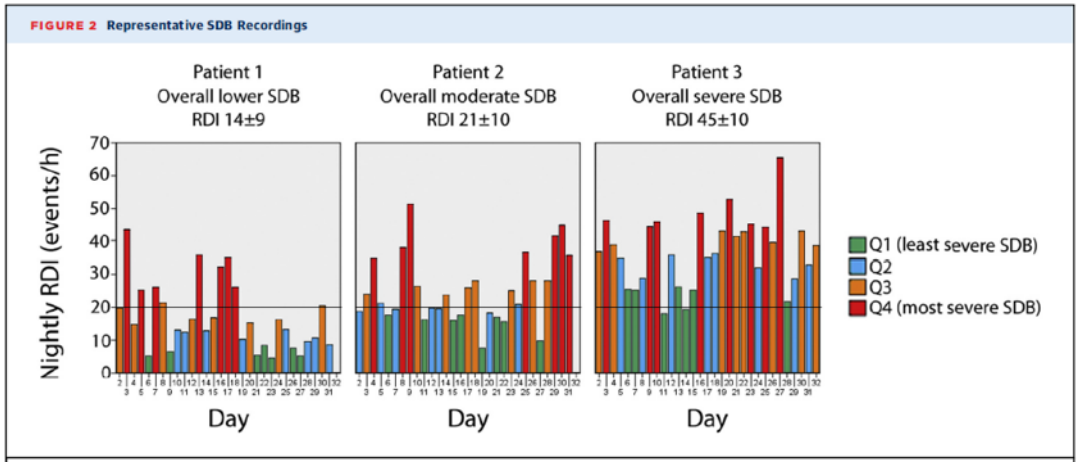


B.Lechat et al AJRRCM 2021

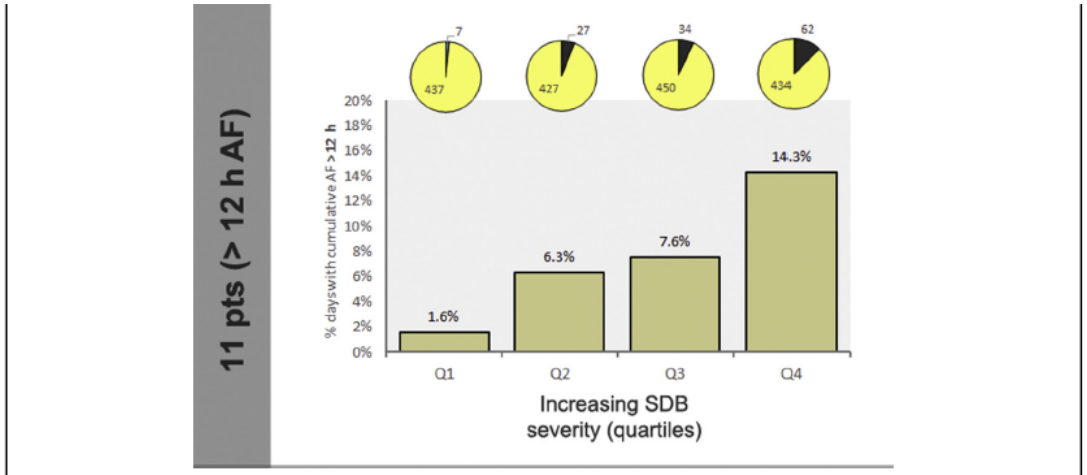
Significance of NtoN variability

The VARIOSA-AF Study
Linz JACC 2019

Variability of PM detected apnea



Increased burden of AF in Nights with severe apnea

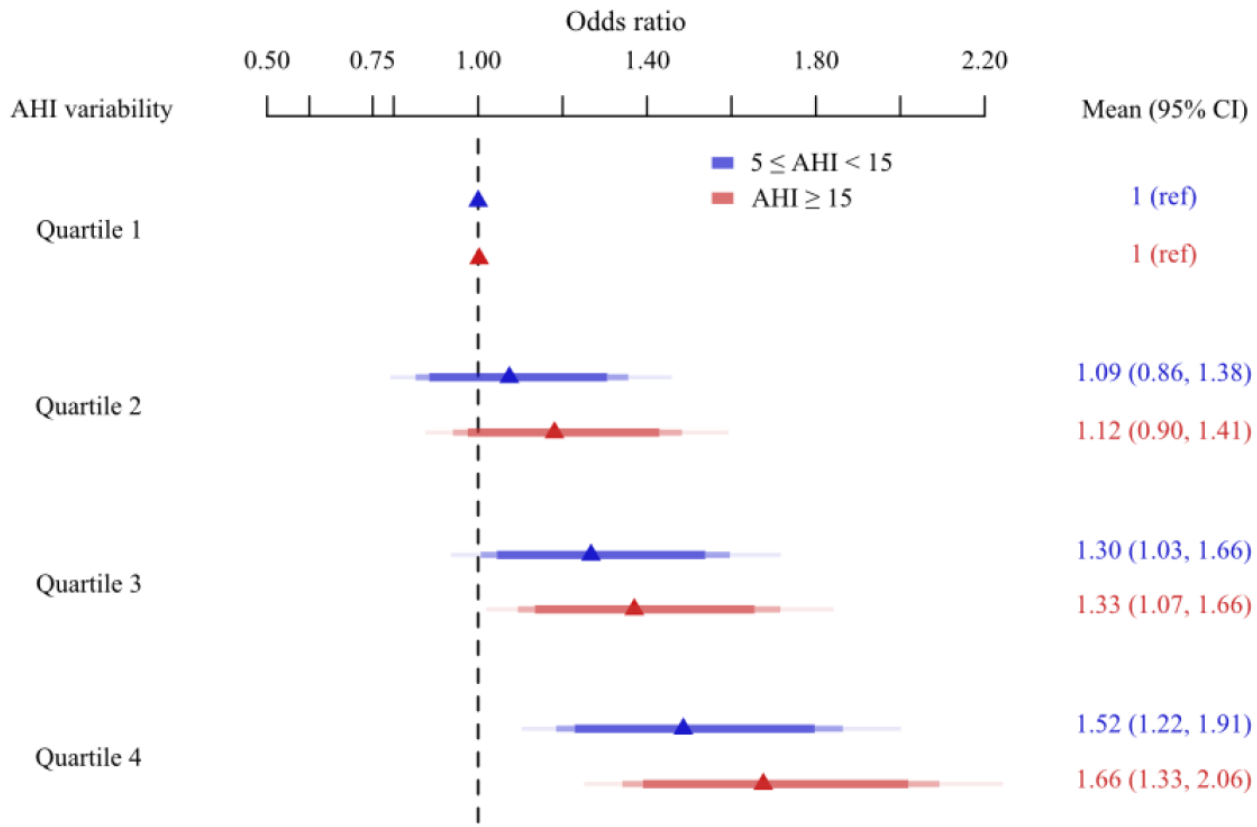


Percentage of days with at least >5 min, >1 h, and >12 h of AF for each within-patient quartile (Q1 to 4) of SDB severity, assessed by nightly RDI. **Pie chart black sections** indicate days with at least >5 min, >1 h, and >12 h of AF; **yellow sections** indicate days without at least >5 min, >1 h, and >12 h of AF. Abbreviations as in Figure 1.

HIGH NIGHT-TO-NIGHT VARIABILITY IN SLEEP APNOEA SEVERITY IS ASSOCIATED WITH HYPERTENSION AND BLOOD PRESSURE VARIABILITY

B Lechat

in press



Plan

- Les techniques actuelles: **PG, PSG**
  - Avantages/inconvénients
  - Les limitations du scorage EEG/respiratoire
  - L'avenir de la PG/PSG
- Les nouvelles techniques:
  - Contact **sans mesure directe** du flux respiratoire
  - **Sans contact**
- La variabilité Inter-nuit et ses conséquences
- L'écosystème futur du sommeil

DEPISTAGE et SUIVI du SAS et des COMORBIDITES

Weight
Diet & activity programs

Smart scales

Sleep sensor

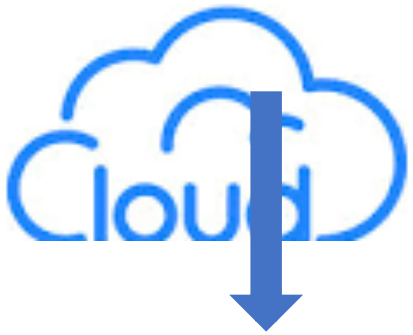
AHI, sleep quality
Actual compliance

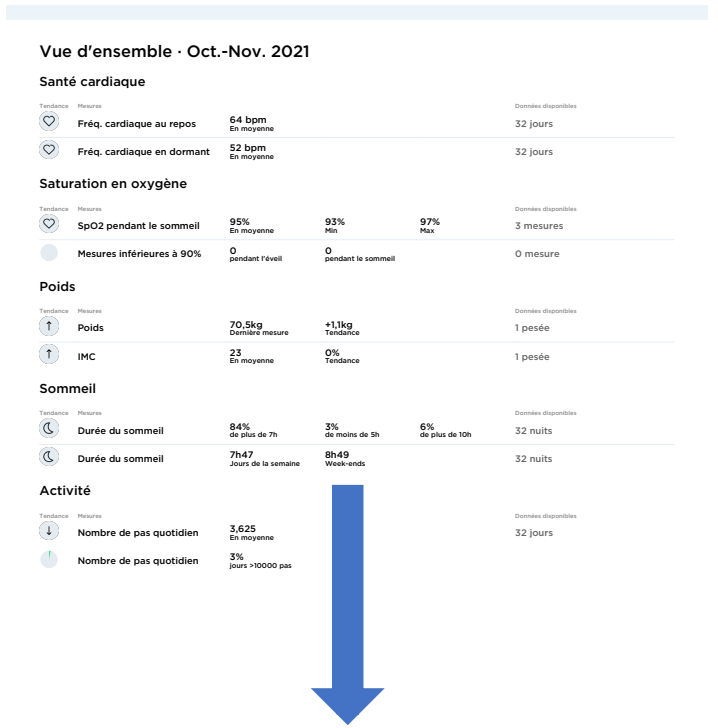
Glucometer
Glycemia
Diabetes

SpO2, ECG
Hypoventilation, AF

Blood pressure monitors

BP
HTN





Mon Espace Santé

Vers une Révolution du Sommeil

- Diagnostic: screening, nouvelles populations, moindre coût
- Titration du traitement: OAM, Stim
- Education et prise en main par le patient
- Suivi des comorbidités