Pediatric Polysomnography Report Clues

Dr.Zahra Parsapour

Sleep specialist

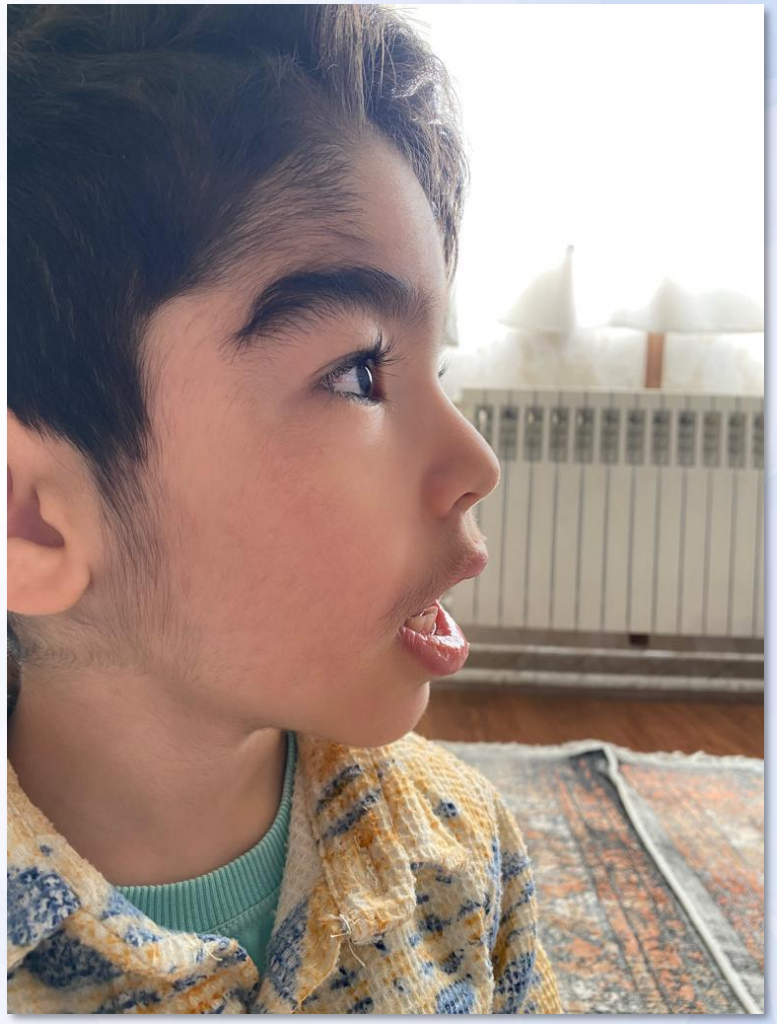
Pediatrician

Case presentation:

- A boy 4 years old,
- **History:** Loud snoring, witness apnea, mouth breathing, restless sleep, and poor concentration,
- **P.E:** maxillomandibular protrusion,

Tonsillar size: grade 2

Lateral x-ray: A/P ratio>50%



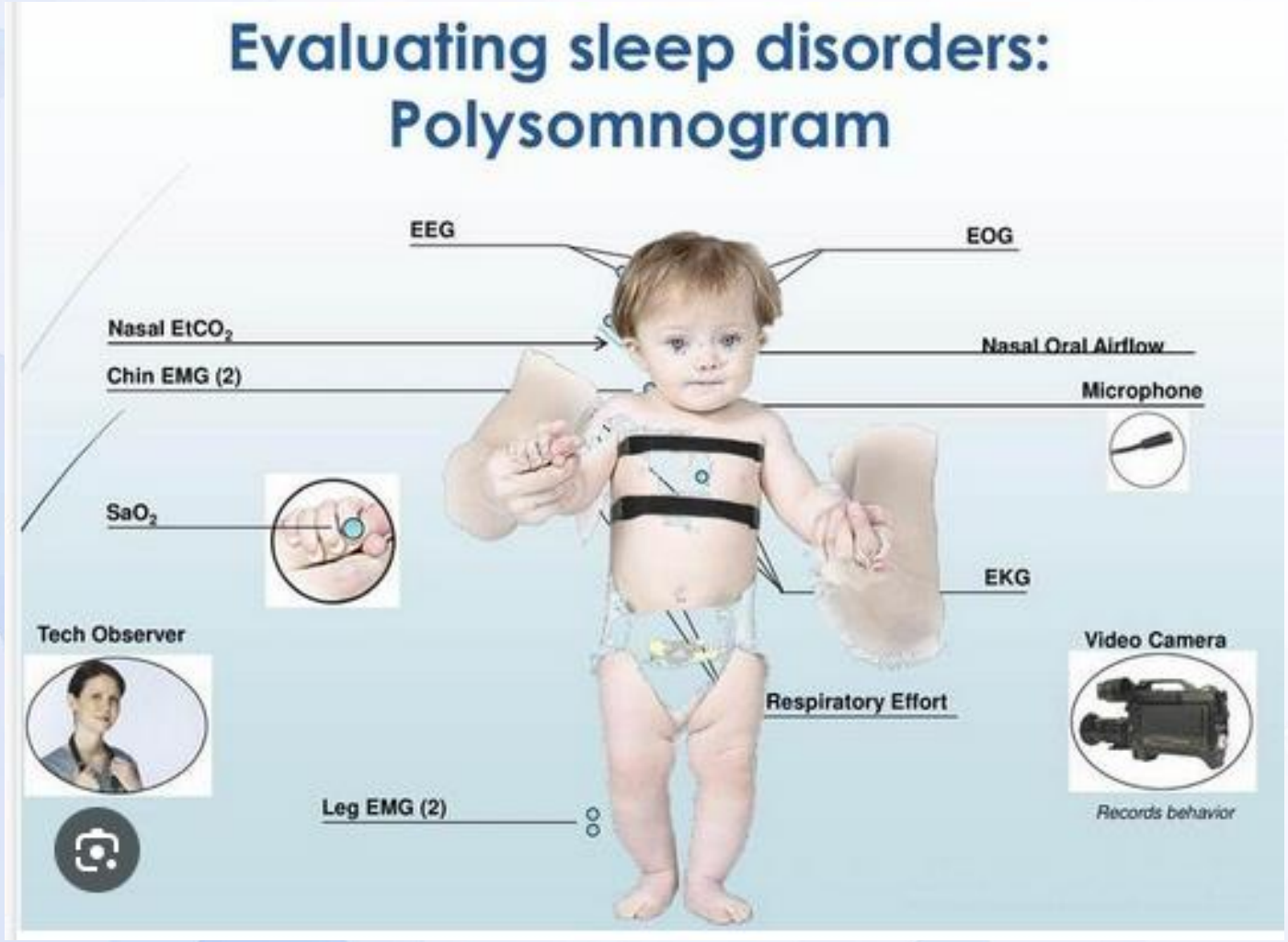
What's first diagnostic step?

- ***AAP Clinical Practice Guidelines (2012)***

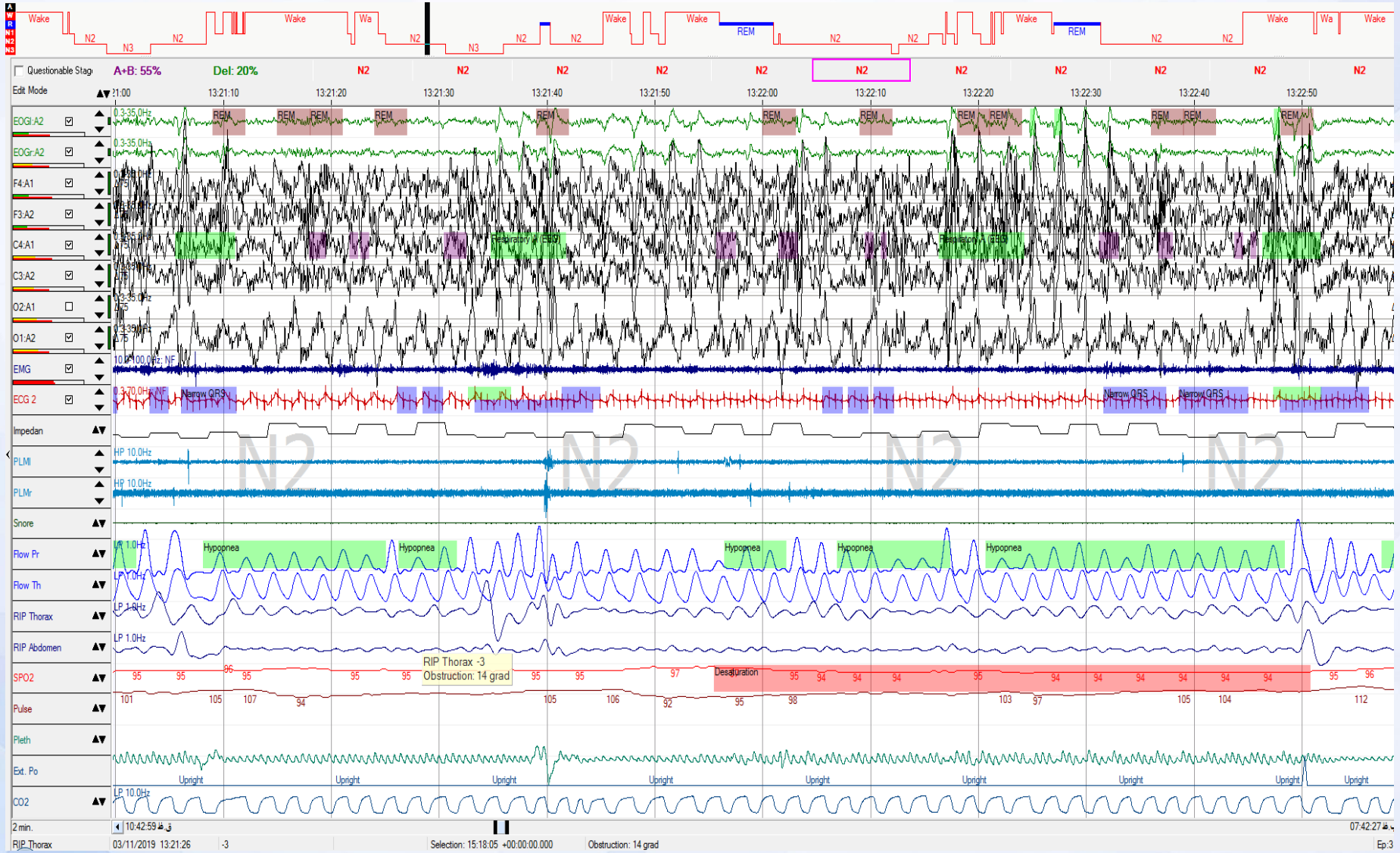
- As part of routine health maintenance, the clinician should inquire if the child snores. If yes, or if the child presents with signs/symptoms of OSA, the clinician should perform **a more focused examination.**

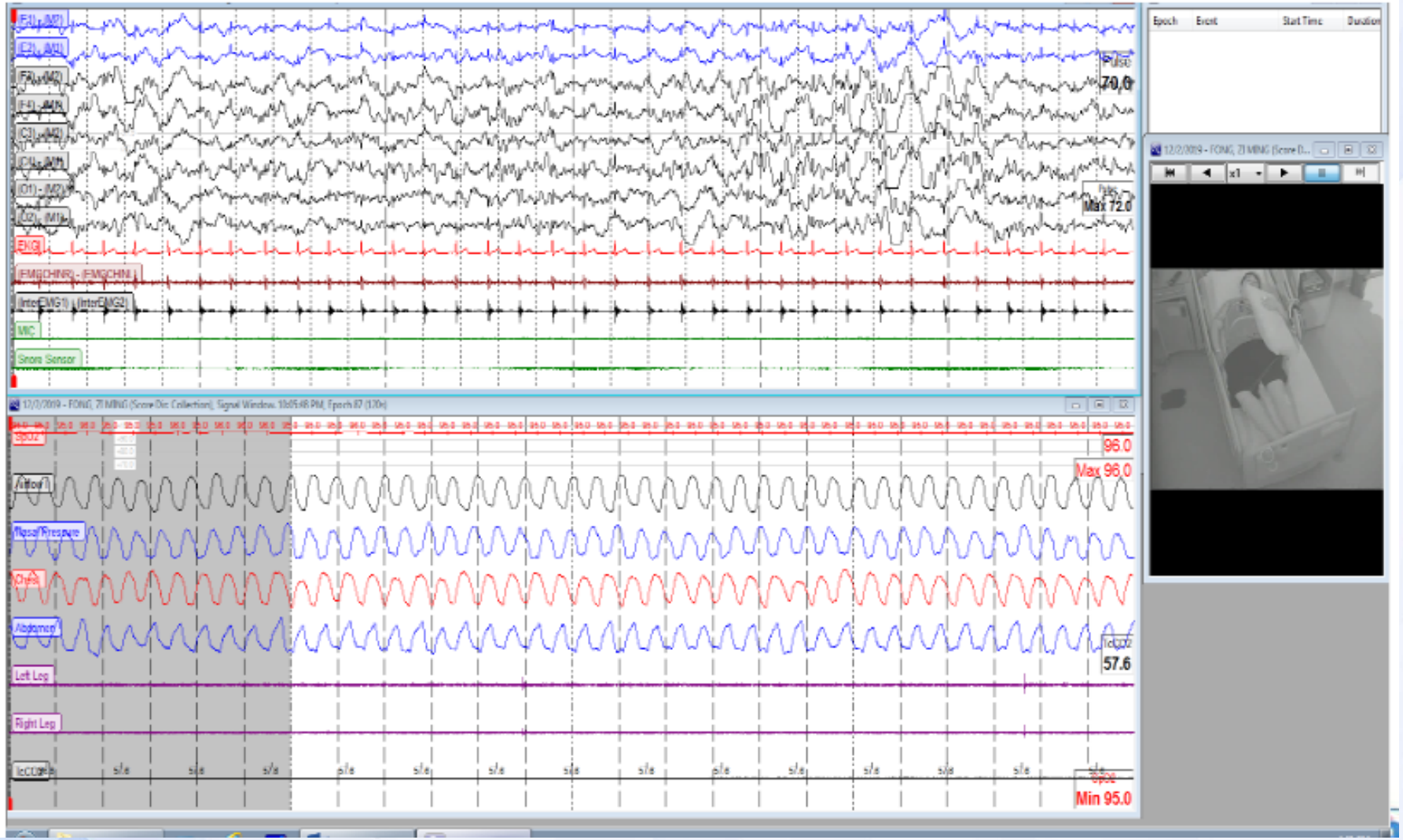
- If the child snores on a regular basis (≥3 times/week) and has signs/symptoms of OSA:
- **obtain PSG**
- **refer the patient to a sleep specialist or otolaryngologist**

Children's sleep lab



Typical PSG montage

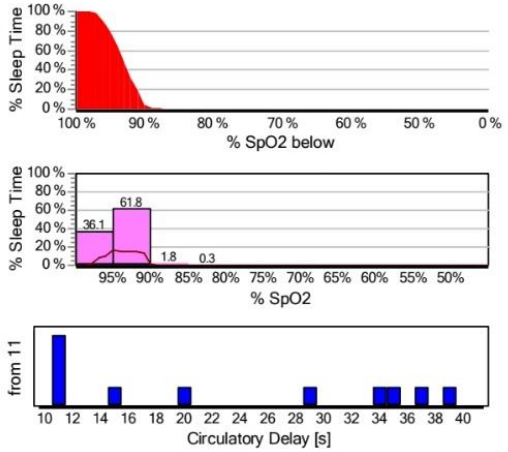



Pulse
70.0
Max 72.0
SpO2
96.0
Max 96.0
Airflow
Nasal Pressure
Chest
Abdomen
57.6
Left Leg
Right Leg
Min 95.0

What do we see in polysomnography repot?

O2 Saturation

	Number (Index)	Time
Number of Desaturations (Index)	**26 (6.1)**	
Minimal SpO2 [%]	**78**	04:15:40
Baseline O2 Saturation	**94**	
Average SpO2 [%]	94	
Number desaturations < 90 %	5	0.6 %
Number desaturations < 80 %	0	0 %
SpO2 Time < 90 %	2.1 %	00:05:17
Biggest Desaturation [%]	5	01:16:51
Average Desaturation [%]	3.6	15.4 s
Longest Desaturation [s]	40.7	01:42:56
Average Min. Saturation [%]	92	
Deepest Desaturation [%]	86	01:44:32
Sum all desaturation	00:06:40	2.6 %
Average Circulatory delay [s]	23.1	
Artefact [min]	94.8 (27.2%)	



Snore Analysis

	All	Prone	Supine	Left	Right	Upright
Snore (Index)	267 (53.2)	7 (60.9)	255 (56.6)	2 (126.3)	0 (0)	3 (7.8)
Absolute Snore [min]	2.7	0.1	2.6	0.0	0	0.0
Snore episodic [min]	14.7	0.2	14.3	0.0	0	0.2

Respiratory Analysis

	Number (Index)
Obstructive	25 (5)
Mixed	1 (0.2)
Central	3 (0.6)
Undef Ap.	0 (0)
Total Ap.	29 (5.9)
Hypopnea	10 (2)
A+H	**39 (7.9)**
Limitation	3 (0.6)
RERAs	0 (0)
RDI	42 (8.5)

	REM	Non-REM	Sleep
Apnea (Index)	1 (1.4)	28 (6.6)	29 (5.9)
Hypopnea (Index)	1 (1.4)	9 (2.1)	10 (2)
AHI/RDI [/h]	2.8 / 4.2	8.7 / 9.2	7.9 / 8.5
Flow Limitation (Index)	1 (1.4)	2 (0.5)	3 (0.6)
RERAs (Index)	0 (0)	0 (0)	0 (0)
Max. Apnea Duration [s]	28	34	34
Max. Hypopnea Duration [s]	20	25	25
Average Apnea Dur. [s]	27.6	16.3	16.7
Average Hypopnea Dur. [s]	20.1	17.6	17.9
Artefact [min]	0 (0%)	51.9 (16.9%)	51.9 (14.9%)

Hypopnea-rules 1: Desaturation 3 %, Ratio 70 %.

Position	Supine	not Supine	Left	Right	Prone	Upright
Sleep Time Fraction [%]	90.7	9.3	0.3	0	2	7.1
RDI	35 (6.6)	7 (12.9)	0 (0)	0 (0)	1 (8.7)	6 (14.6)
Obstructive Apnea (Index)	21 (4)	4 (7.4)	0 (0)	0 (0)	1 (8.7)	3 (7.3)
Central Apnea (Index)	2 (0.4)	1 (1.8)	0 (0)	0 (0)	0 (0)	1 (2.4)
Mixed Apnea (Index)	1 (0.2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Hypopnea (Index)	8 (1.5)	2 (3.7)	0 (0)	0 (0)	0 (0)	2 (4.9)
Flow Limitation (Index)	3 (0.6)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
RERAs (Index)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Number of Desaturations (Index)	18 (3.4)	9 (16.6)	1 (63.2)	0 (0)	2 (17.4)	6 (14.6)

Pediatric Polysomnography Report

Reason for Study

History

Sleep Staging and Architecture:

Total in bed time

Total sleep time

Sleep efficiency

Sleep latency

Sleep architecture

Arousal index

Electrocardiography

PLMs index

Respiratory findings:

- AHI
- OAI
- CAI
- ODI
- Base line oxygen
- Lowest oxygen
- O2 oxygen saturation>90% time

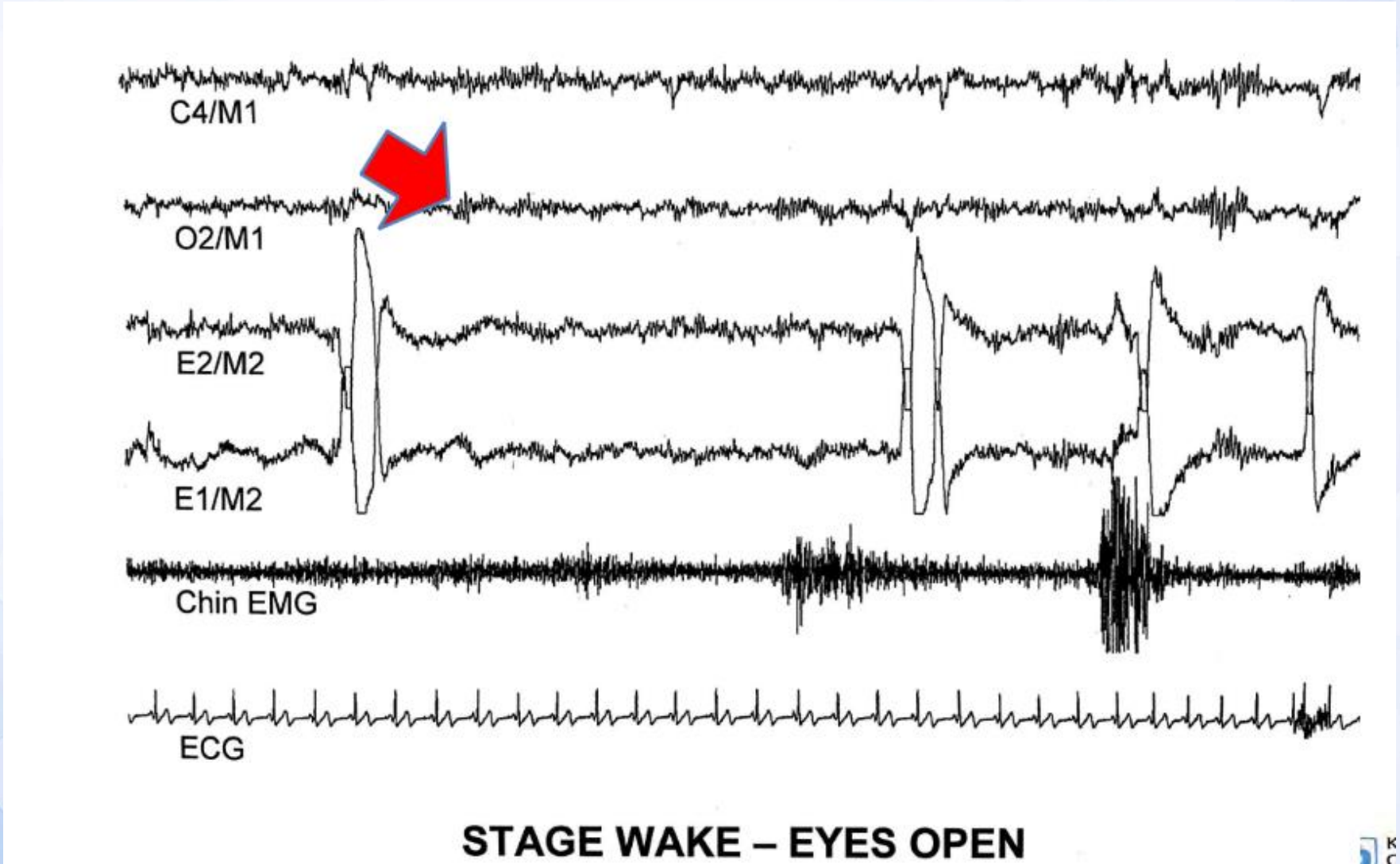
Diagnosis

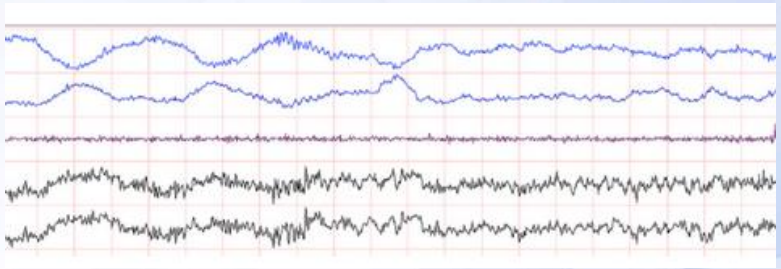
Recommendations

General Scoring of Sleep Stages

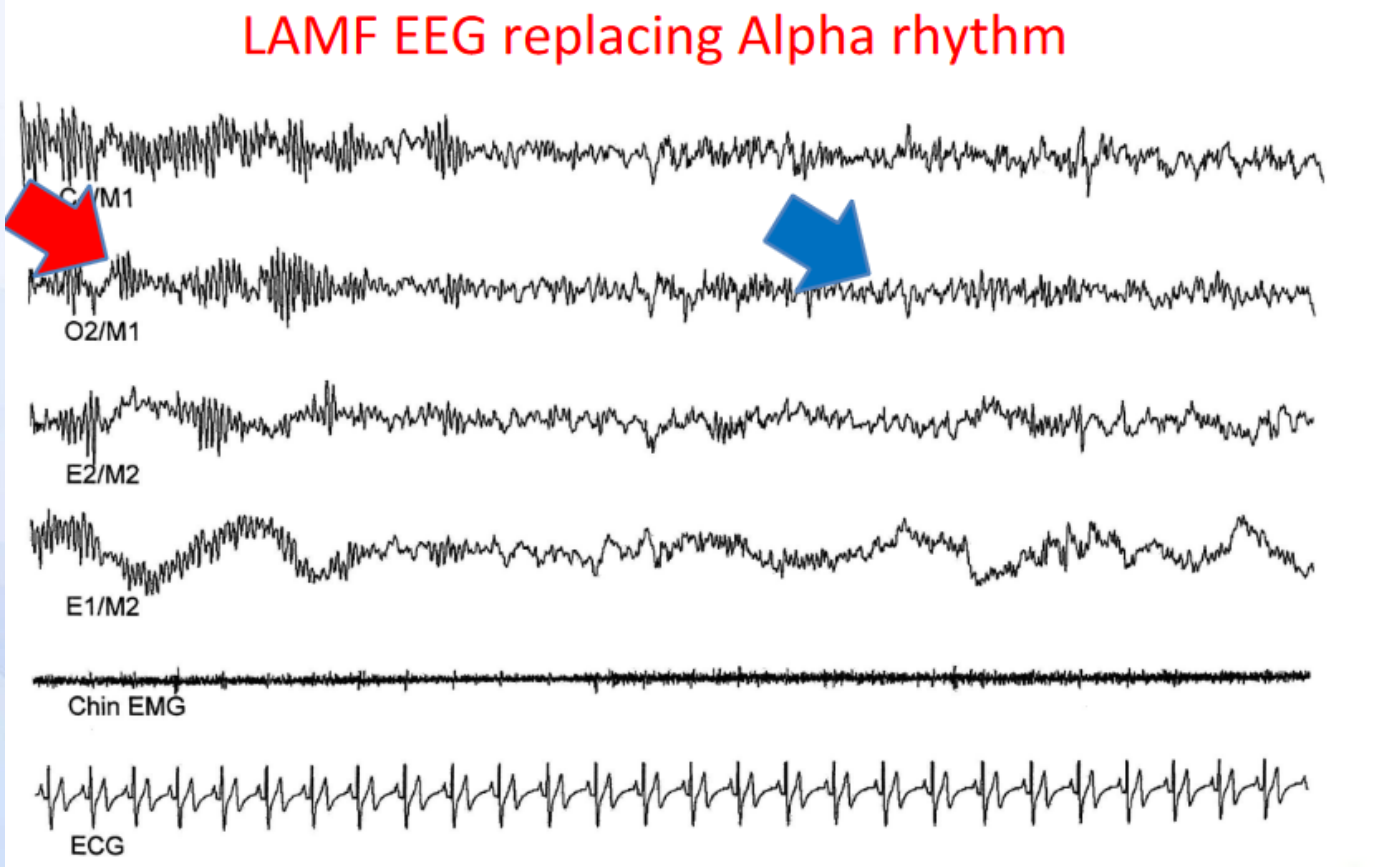
- a. Stage W (Wakefulness)
- b. Stage N1 (NREM 1)
- c. Stage N2 (NREM 2)
- d. Stage N3 (NREM 3)
- f. Stage R (REM)

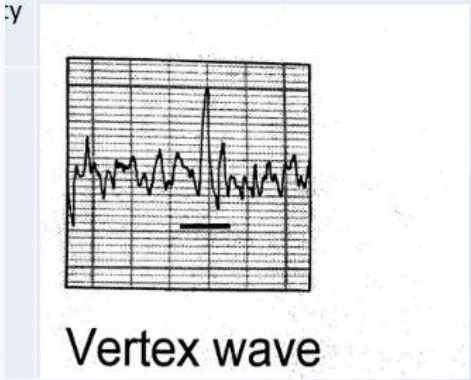
wakefulness



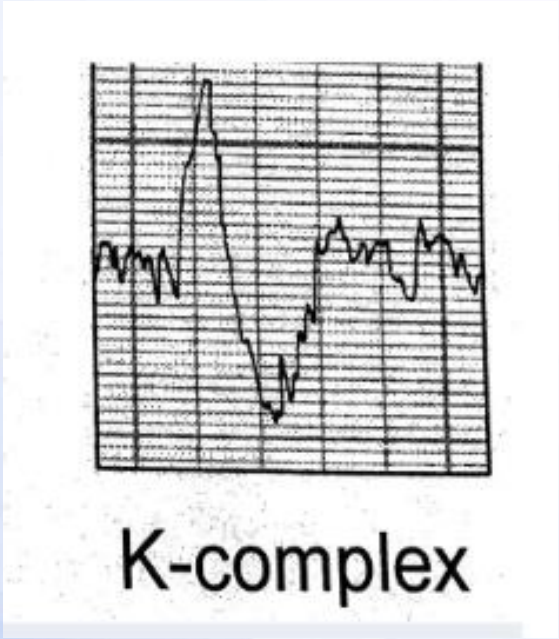


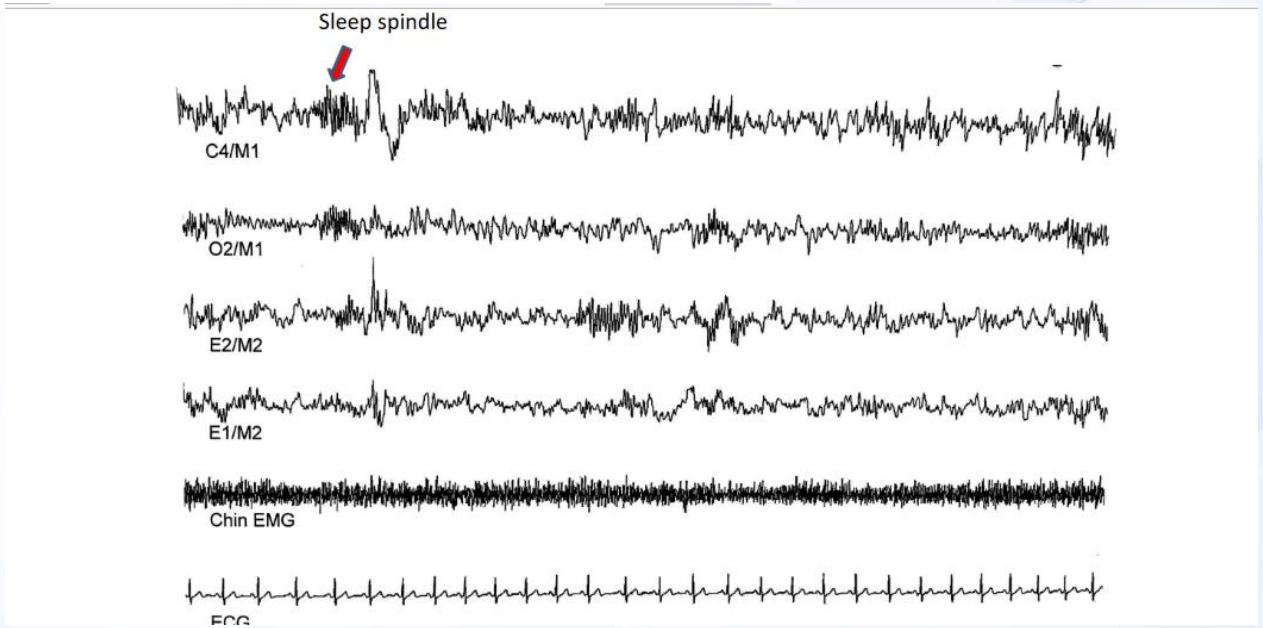
Stage N1


LAMF EEG replacing Alpha rhythm
O2/M1
E2/M2
E1/M2
Chin EMG
ECG

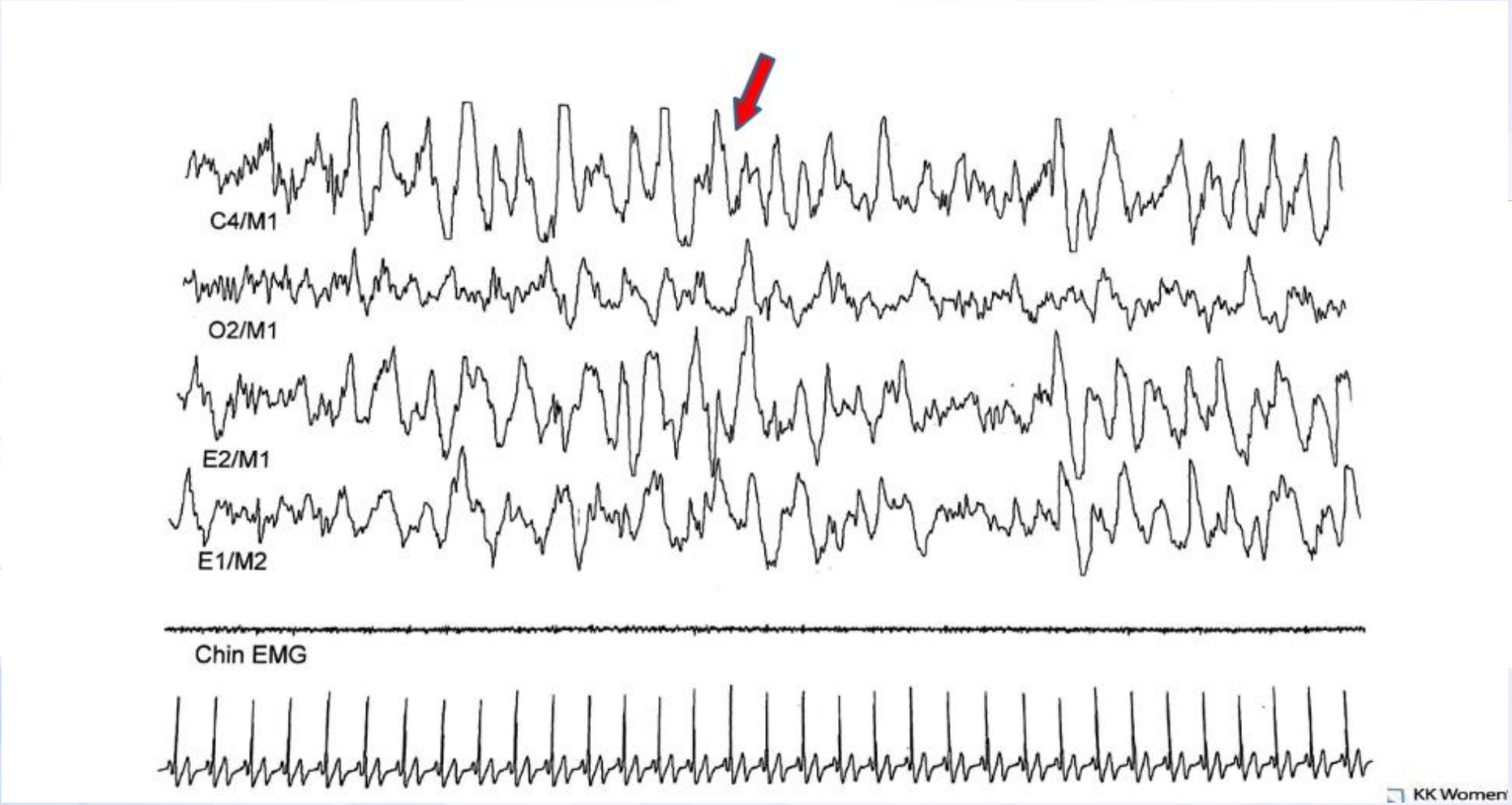

Vertex wave

Stage N2

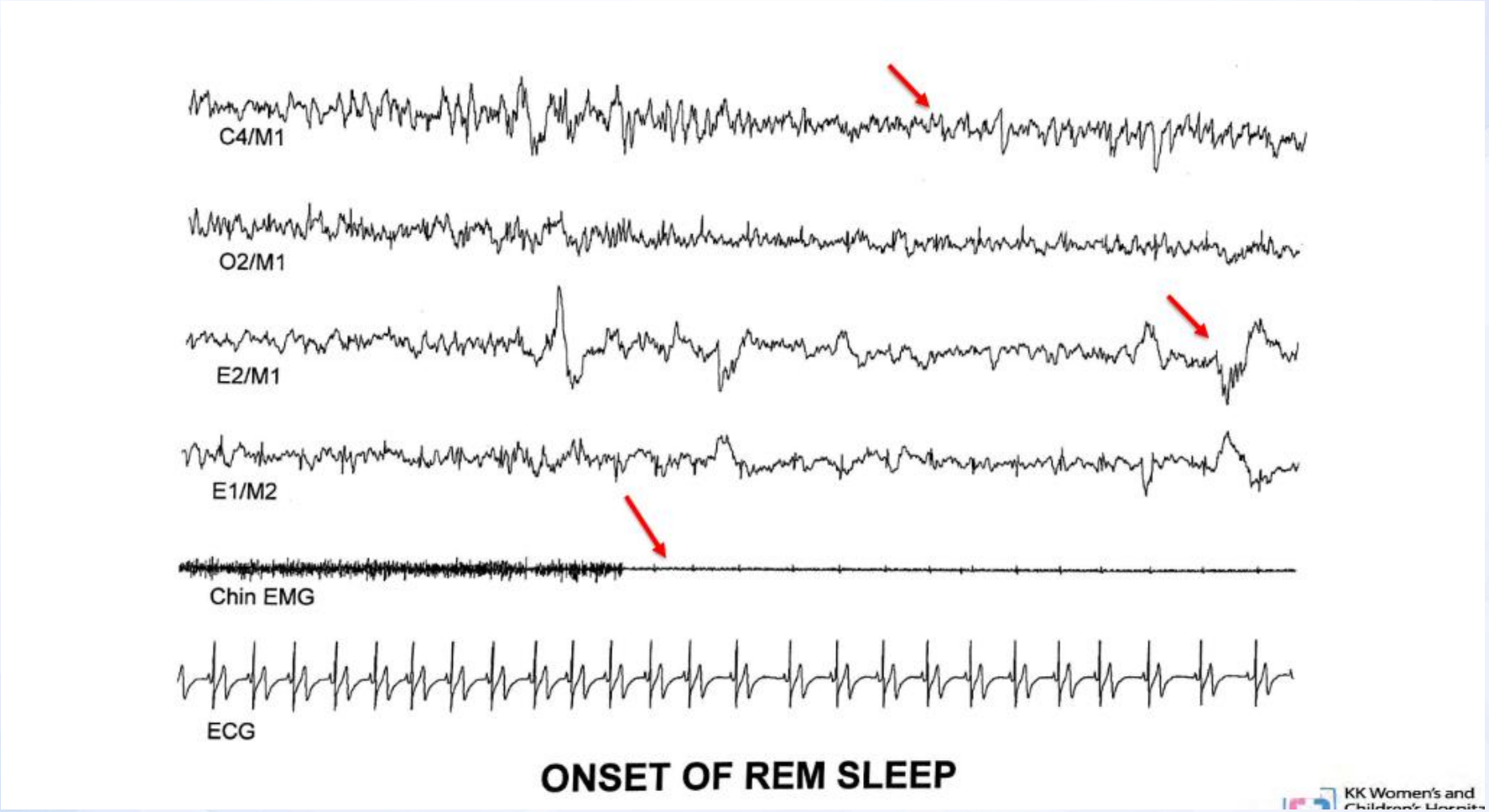


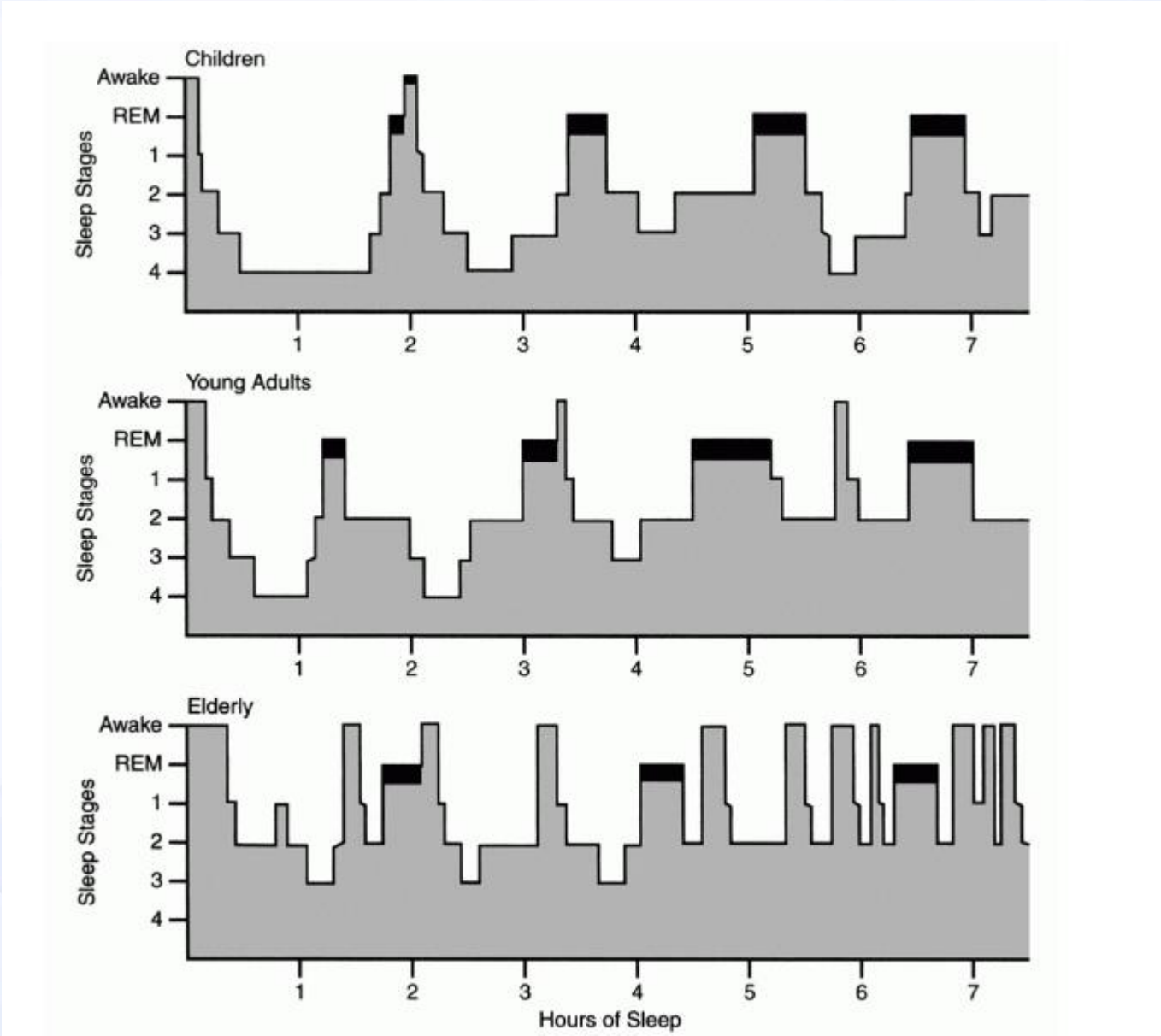


Stage N3



REM stage




Children
Awake
REM
1
2
3
4
Sleep Stages
1
2
3
4
5
6
7
Young Adults
Awake
REM
1
2
3
4
Sleep Stages
1
2
3
4
5
6
7
Elderly
Awake
REM
1
2
3
4
Sleep Stages
1
2
3
4
5
6
7
Hours of Sleep

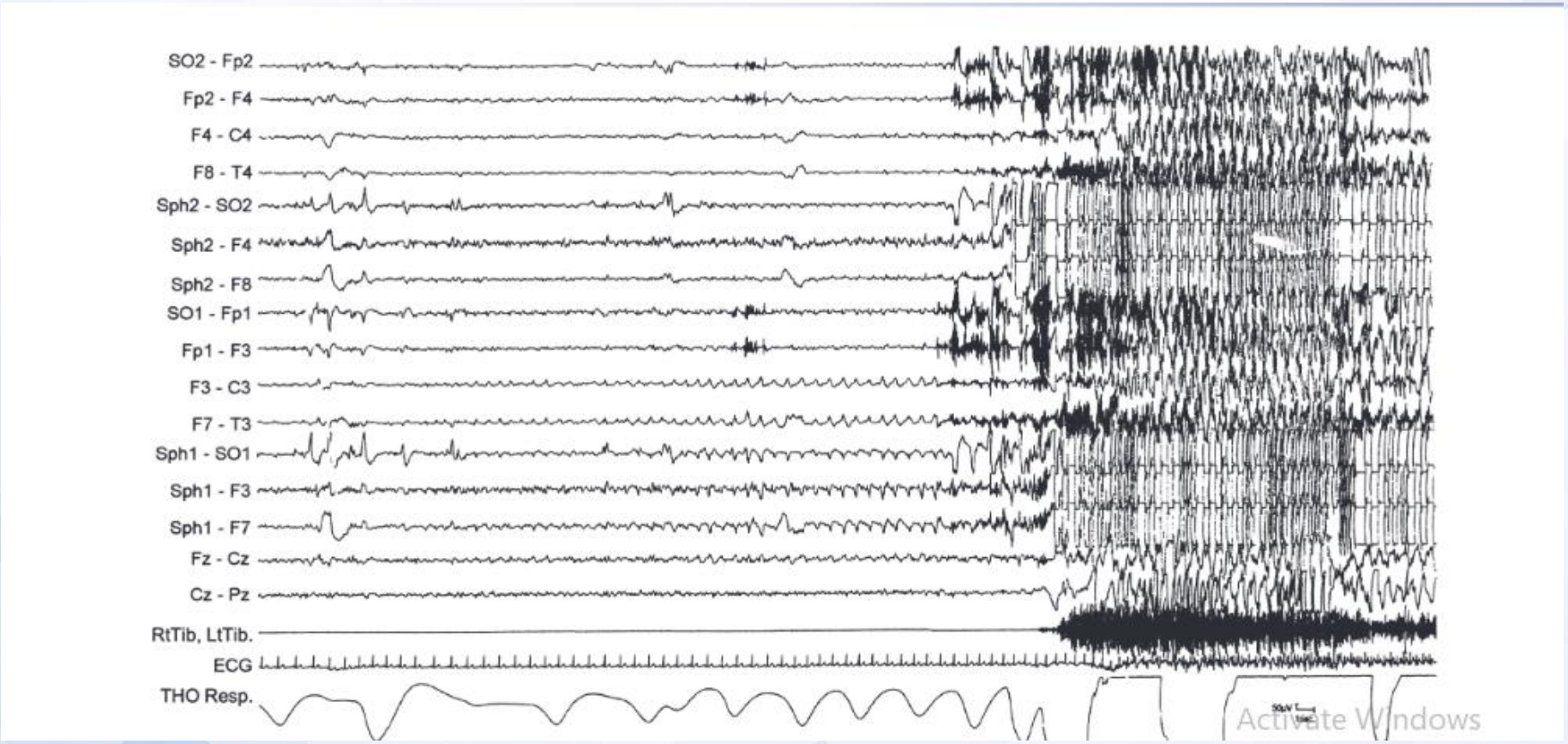
Normal Polysomnographic Values in Children

TABLE 28.2 Polysomnographic Data in Normal 5–10-year-old Children

SLEEP		RESPIRATORY	
EEG arousal index, n/h	7±22	Obstructive apnea Index, n/h TST	0.0±20.1
Sleep efficiency, %	84±213	Obstructive hypopnea Index, n/h TST	0.1±20.1
Stage 1, %TST	5±23	Central apneas with desaturation n/hr TST	0.0±20.1
Stage 2, %TST			
Slow wave sleep, %TST	51±29		
	26±28	Duration of Hypoventilation ($P_{ET}CO_2$ ≥45 mmHg), %TST	1.6±20.8
REM sleep, %TST	19±26	Peak $P_{ET}CO_2$, mmHg	46±23
REM cycles, n	4±21	S_pO_2 Nadir, %	95±21

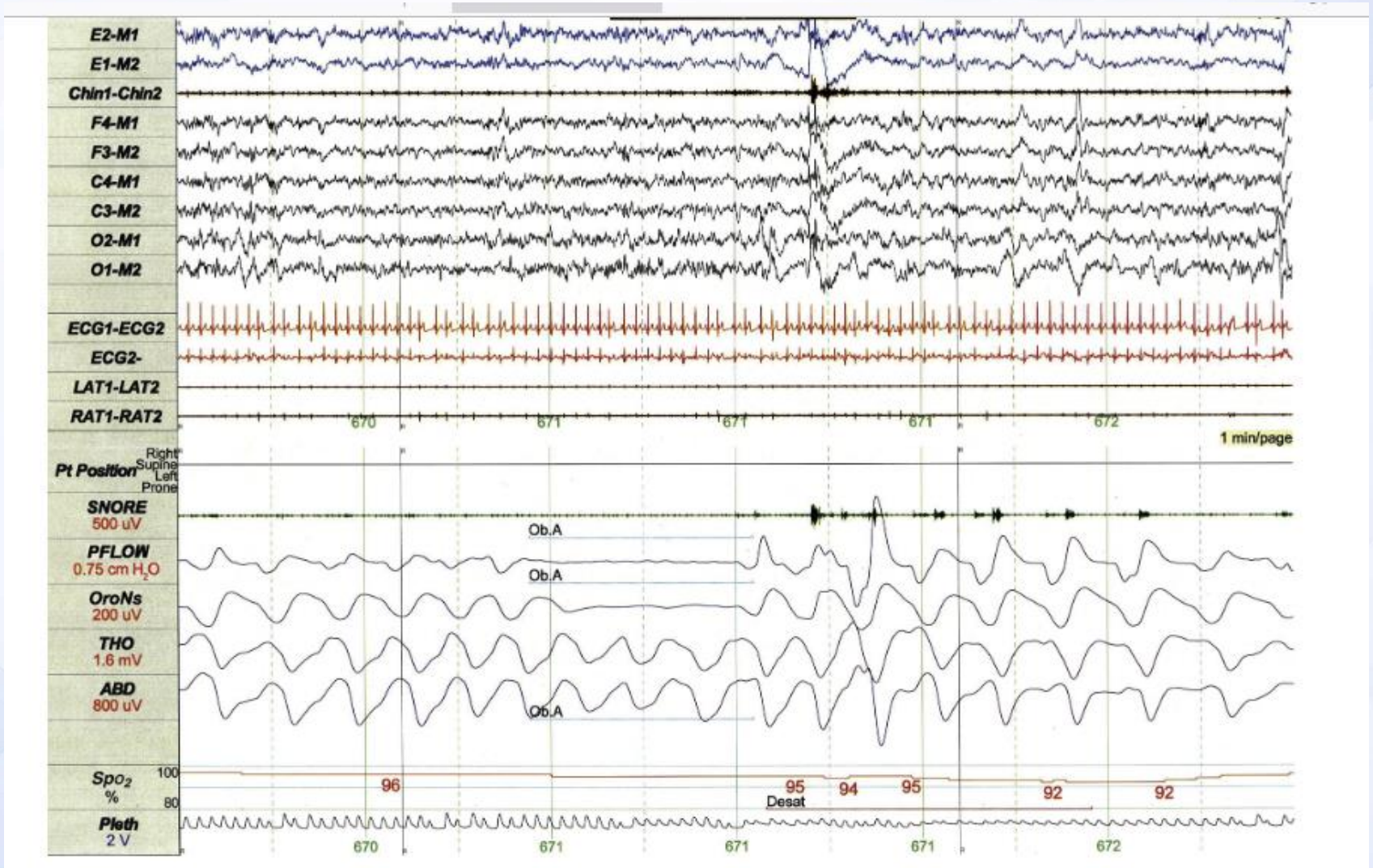
Data, Mean ± 2 SD; see references[47,48,70,72]

Epilepsy

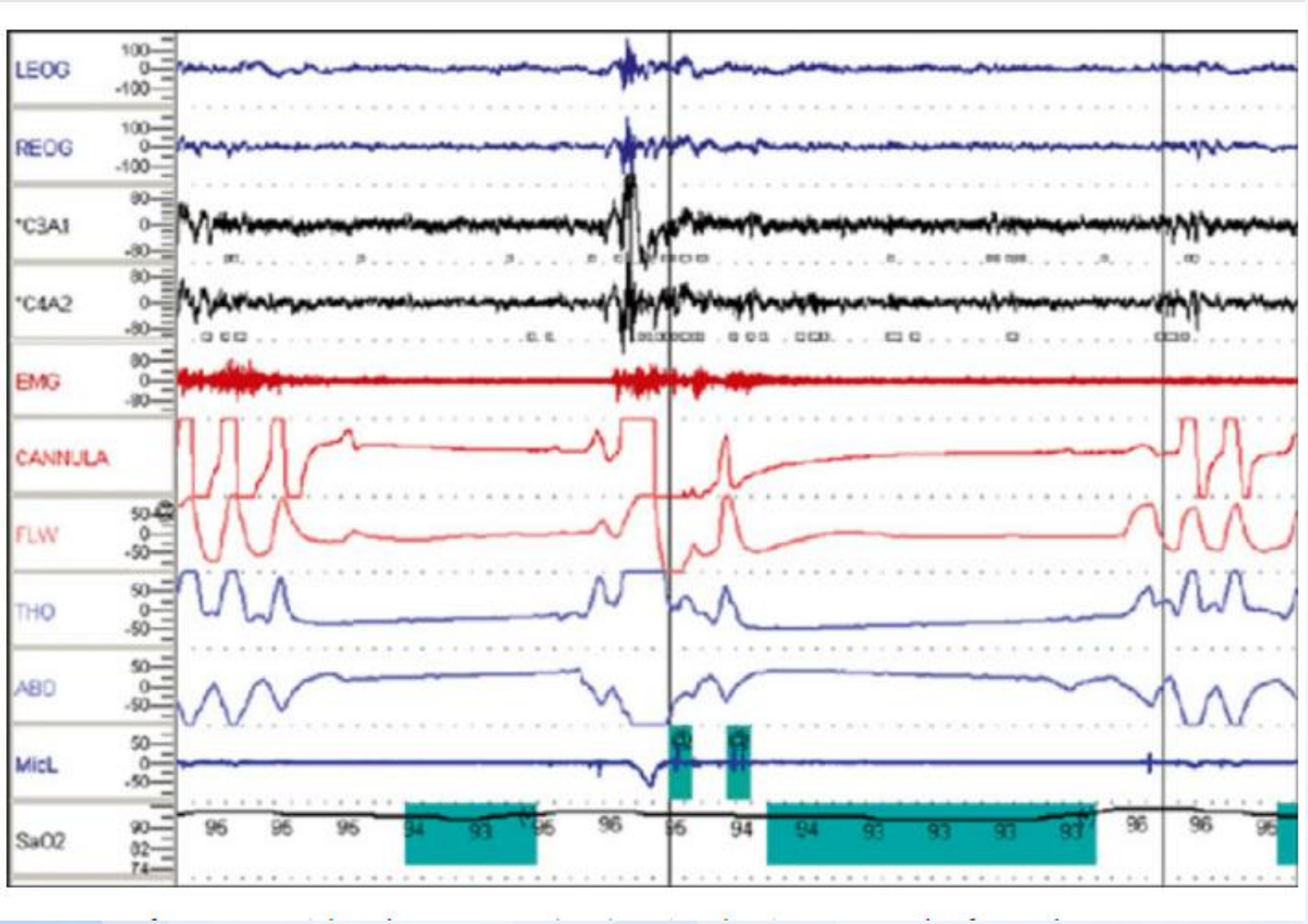


Respiratory Events

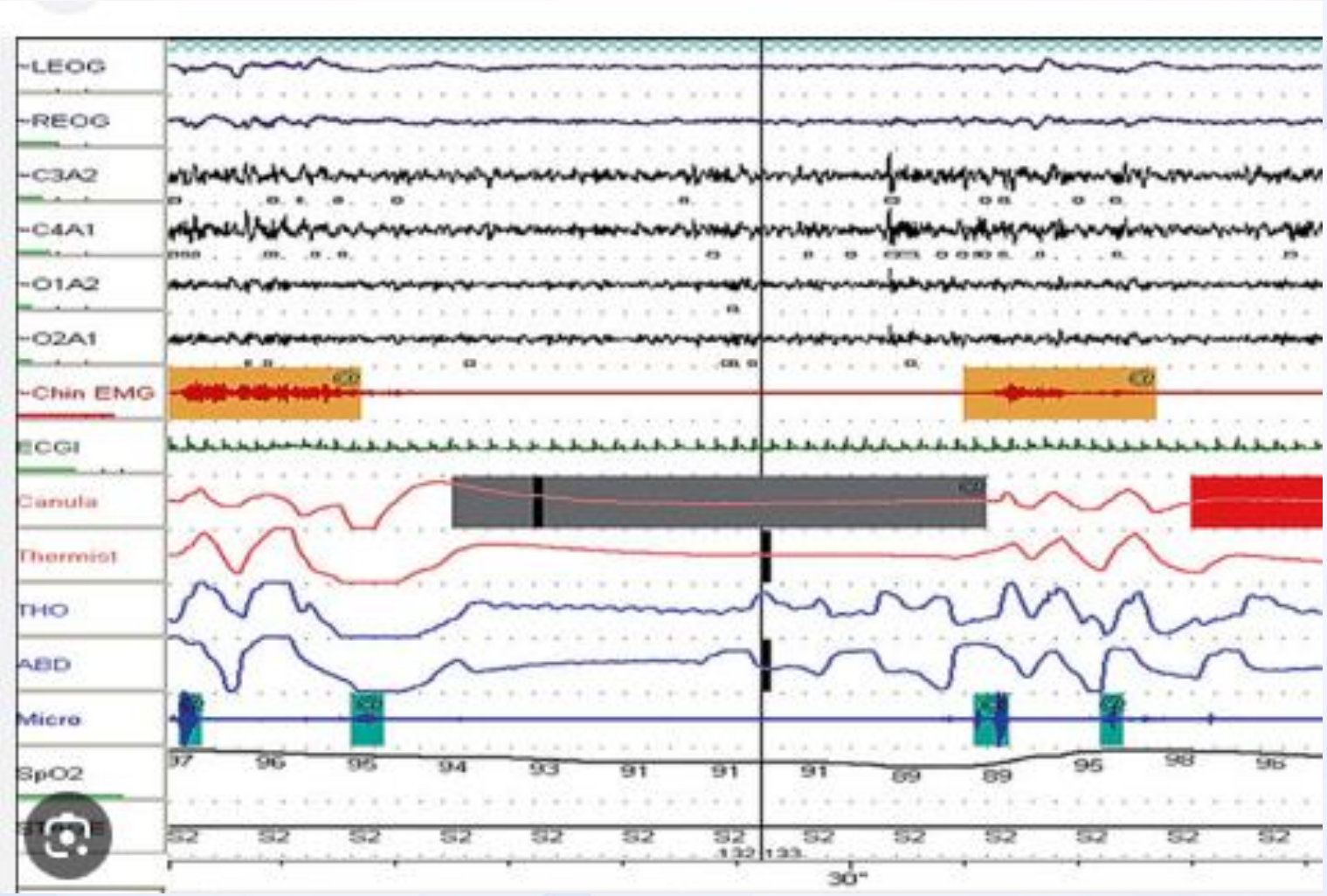
Obstructive apnea



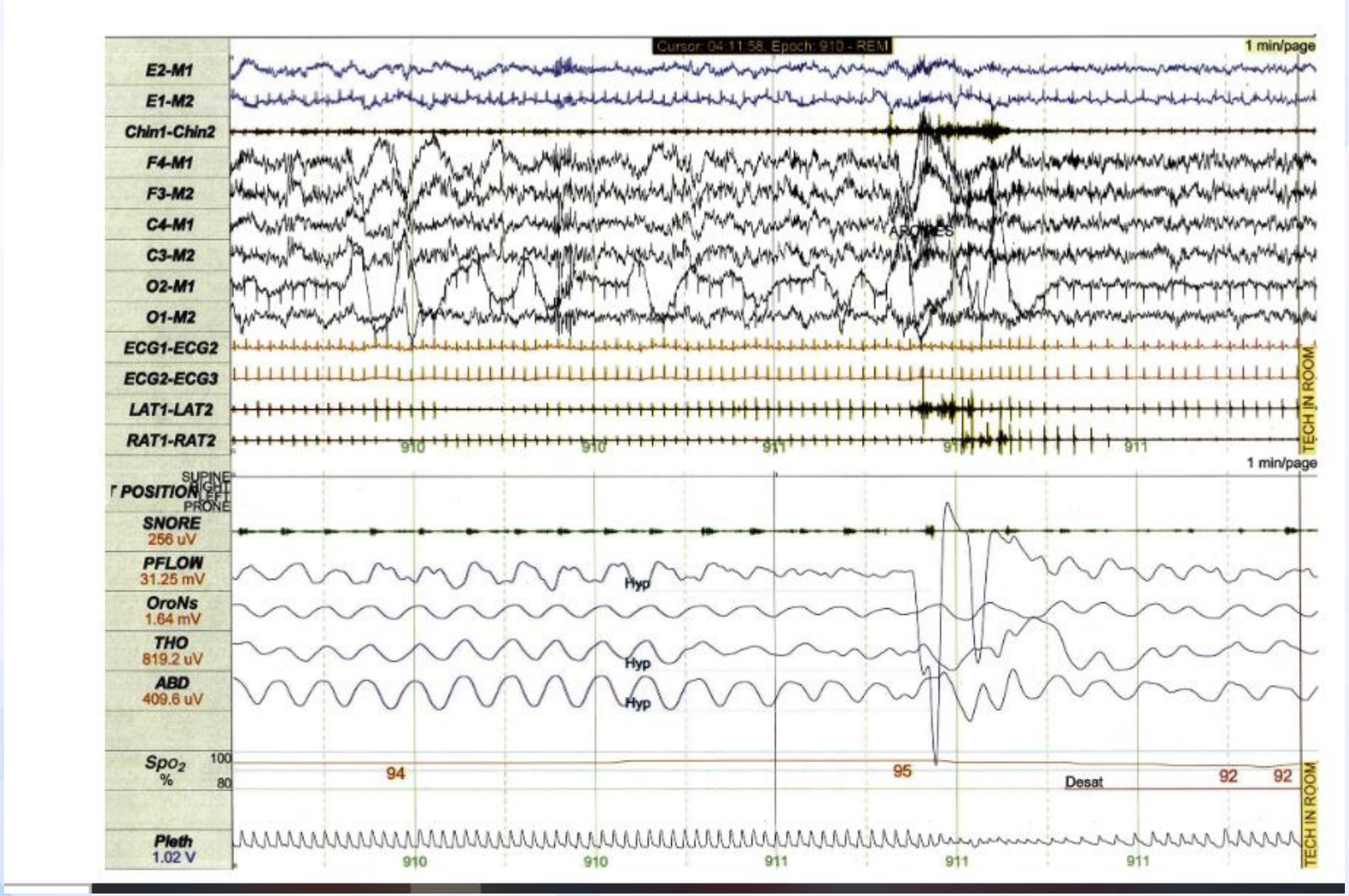
Central apnea



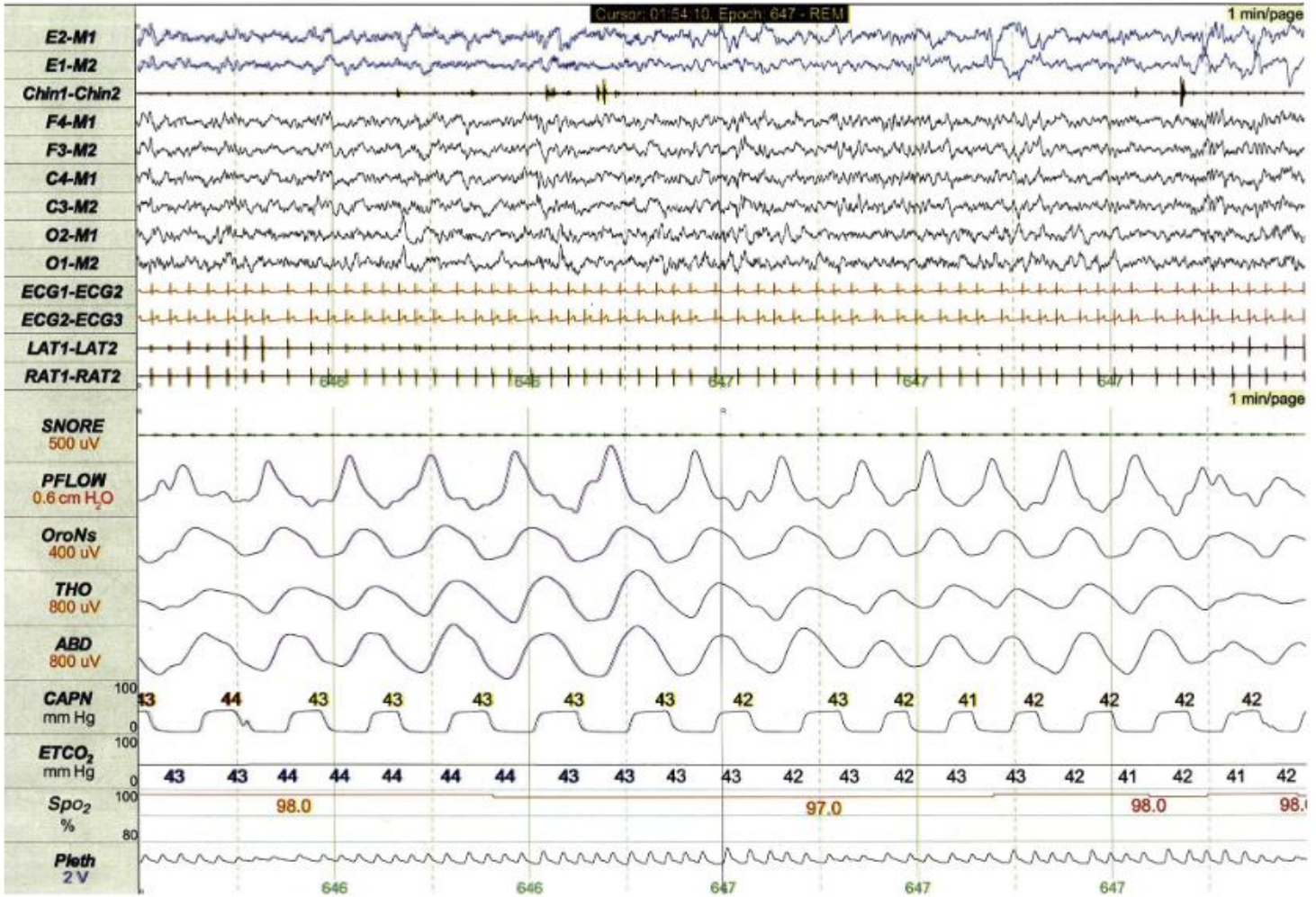
Mix apnea


LEOG
REOG
C3A2
C4A1
O1A2
O2A1
Chin EMG
ECGI
Canula
Thermist
THO
ABD
Micro
SpO2
97 96 95 94 93 91 91 91 89 89 95 98 96
30"

Hypopnea


Cursor: 04:11:58, Epoch: 910 - REM
1 min/page
E2-M1
E1-M2
Chin1-Chin2
F4-M1
F3-M2
C4-M1
C3-M2
O2-M1
O1-M2
ECG1-ECG2
ECG2-ECG3
LAT1-LAT2
RAT1-RAT2
TECH IN ROOM
910
911
POSITION
SUPINE
RIGHT
LEFT
PRONE
SNORE
256 uV
PFLOW
31.25 mV
OroNs
1.64 mV
THO
819.2 uV
ABD
409.6 uV
Hyp
Spo2
%
100
80
94
95
92
92
Desat
Pleth
1.02 V

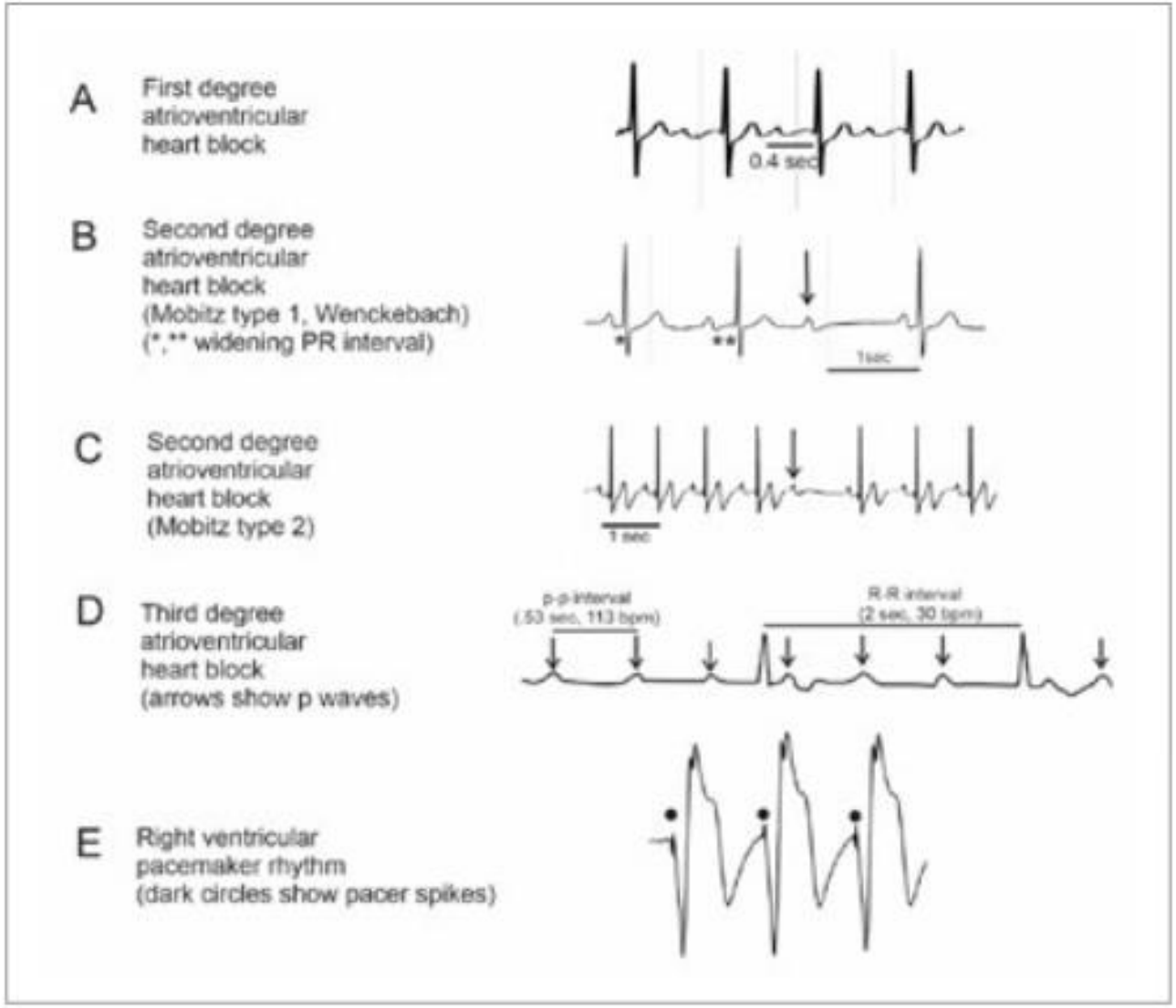
Hypoventilation



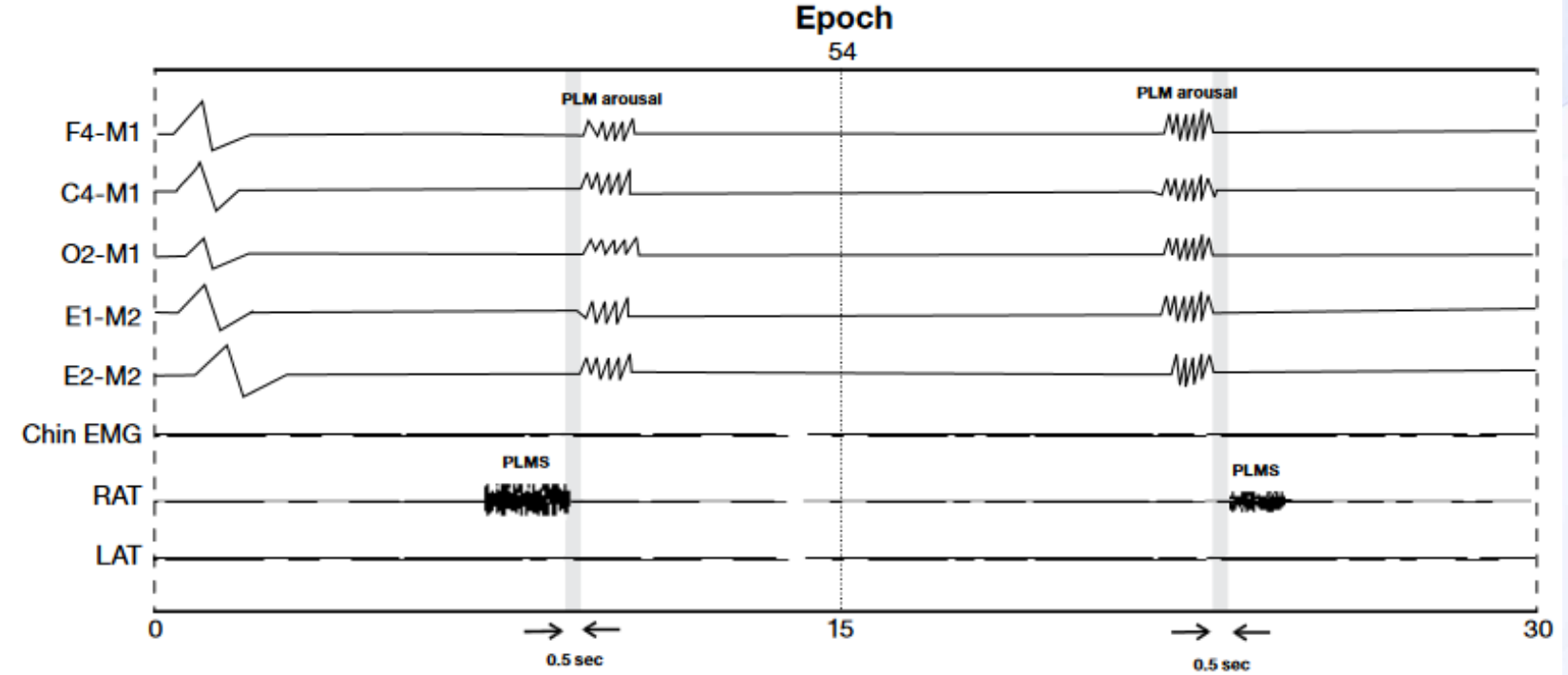
Normal Polysomnographic Respiratory Values in Children

		(ONE OR MORE OF THE FOLLOWING)			
	APNEA INDEX (Events/h)	SpO_2 NADIR (%)	$P_{ET}CO_2$ PEAK (Torr)	$P_{ET}CO_2 > 50$ Torr (%TST)	AROUSALS (Events/h)
Primary Snoring	≤1	>92	<53	<10%	EEG <11
Upper Airway Resistance Syndrome	≤1	>92	<53	<10%	RERA >1 EEG >11
Mild OSAS	1–4	86–91	>53	10–24%	EEG >11
Moderate OSAS	5–10	76–85	>60	25–49%	EEG >11
Severe OSAS	10	≤75	>65	≥50%	EEG >11

Cardiac Events


A
First degree atrioventricular heart block
0.4 sec
B
Second degree atrioventricular heart block
(Mobitz type 1, Wenckebach)
(*,** widening PR interval)
1sec
C
Second degree atrioventricular heart block
(Mobitz type 2)
1 sec
D
Third degree atrioventricular heart block
(arrows show p waves)
p-p interval
(.53 sec, 113 bpm)
R-R interval
(2 sec, 30 bpm)
E
Right ventricular pacemaker rhythm
(dark circles show pacer spikes)

Movement Events


Epoch
54
PLM arousal
PLM arousal
F4-M1
C4-M1
O2-M1
E1-M2
E2-M2
Chin EMG
PLMS
PLMS
RAT
LAT
0
15
30
0.5 sec
0.5 sec

Question?

- طب خواب شامل اپروچ های نوین و کاربردی در تشخیص بیماری‌هاست ولی کاربردش در ارزیابی تکامل طبیعی دستگاه عصبی بسیار جای سخن دارد و امیدوارم از آرای اساتید بهره ببرم.

Thanks for your attention