

# sleep disorders, sleep medicine

## Sleep

- is an active process
- is necessary (there is no substitute)
- affects all parts of the body
- reduction of reactivity to internal and external stimuli
- sleep occurs cyclically, sleep can be terminated immediately

# Meaning sleep

- restoration of brain capability memory (REM sleep) anabolic and somatic reparative processes (less energy requirement) proper immune system activity endocrine and vegetative management - proper activity the body is not ready for continuous 24-hour operation
- NREM - enables metabolic and structural regeneration
- REM - allows memory creation, deletion of irrelevant information, allows regeneration control in NREM

# chapters, groups of diseases

international classification of sleep disorders, ICSD-3, 2014

- **Insomnia**
- **Sleep-related breathing disorders**
- Central disorders with hypersomnia
- Disorders of circadian rhythm of sleep and wakefulness
- **Parasomnia**
- **Movement disorders associated with sleep**
- Appendix A: Somatic and neurological diseases associated with sleep
- Appendix B: Coding of addictive substance-induced sleep disorders according to ICD 10

# new insomnia concept

- Def.: sleep disorder, intermittent sleep, frequent (or) waking up early → lack of sleep, restlessness and fatigue
- Insomnia - three components of persistent sleep problems (falling asleep, duration, continuity, quality)
- Min. 3x per week, duration 1Mx6M ??, sleep efficiency below 85% (the ratio between sleep and wakefulness in bed)
- Sleep latency longer than 30 min., inability to sleep after waking up at night, premature waking up 30 minutes before waking up
- The “primary” and “secondary” insomnia of individual ICSD2 types are ignored
- THERAPY: pharmacological, psychotherapy

# sleep-related breathing disorders

- **Diseases with obstructive sleep apnea**
- **Central sleep apnea syndromes**
- Sleep-related **hypoventilation** diseases
- Sleep-related hypoxemia
- Standalone syndromes and standard variants

# Obstructive sleep apnea - OSA

- 4.-5. decade of age (M 21%, F 9%)
- OSA patients have demonstrably higher mortality and morbidity (Marin et al., 2005)
- Repeated episodes of complete or partial obstruction of upper respiratory tracts → apnea, hypopnea → decrease in spO<sub>2</sub> → waking reaction
- Clinic: apnea, hypopnoea, poor night sleep, waking up, daytime sleepiness, inefficiency, fatigue, headache
- adult x pediatric
- OSA → hypertension, heart failure, myocardial infarction, arrhythmia, stroke, DM type 2
- Therapy: conservative (PAP)  
surgical (UPPP, LAUP, RF ablation of the tongue root, TE, AT)

# Central sleep apnea syndromes

- CSA with Cheyne-Stokes breathing (CSA x prolonged hyperpnea), congestive heart failure, ac. stage of stroke, instability of respiratory control in the transition from alertness to sleep
- CSA induced by periodic breathing at high altitude (5000-7600 mnm, hypoxia-hyperventilation-alkalosis from hypocapnia-apnea / hypopnoea-hypoxia)

*(hypoxia leads to hyperventilation, followed by alkalosis from hypocapnia, followed by hypopnea to apnea, resulting in hypoxia)*

- CSA induced by drug or chemical (opioids, activation of mu receptors)
- Primary CSA from premature

# sleep-related hypoventilation diseases

- Obesity hypoventilation syndrome (BMI over 40, more in women)
- Congenital central syndrome of alveolar hypoventilation
- Central hypoventilation with late onset hypothalamic dysfunction
- Idiopathic central alveolar hypoventilation (decreased sleep ventilation)
- Sleep-related hypoventilation from drugs and chemicals
- Sleep-related somatic hypoventilation (neuromuscular disease, thoracic wall-kyphoscoliosis)

**The underlying symptom - insufficient sleep ventilation that leads to abnormally elevated PaCO<sub>2</sub> during sleep.**



# central disorders with hypersomnolence

- Narcolepsy type 1
- Narcolepsy type 2
  
- Idiopathic hypersomnia (increased need for daily sleep, length of night sleep 10 hours)
- Kleine Levin syndrome of recurrent hypersomnia (intervals from days to weeks, at least once per year, in the meantime without problems)
- Hypersomnia caused by somatic disease
- Hypersomnia due to drug or chemical
- Hypersomnia associated with psychiatric illness

# Narcolepsy – states of imperative sleep

- Several times during the day you fall asleep, rest after sleep, but after different time repeats...
- Hypnagogic hallucinations 80% (auditory, visual, touch delusions)
- Sleep paralysis 40% (discomfort of inability to move, dysregulation of HR, breathing, anxiety)
- Night sleep restless, living dreams, SOREM, N3 deficit
- Narcolepsy with cataplexy - cataplexy - states of sudden muscular atony associated with sagging of facial, neck and muscles

# Narcolepsy dg.

- Sleep latency below 8 min, more below 5, at least 2x SOREM (PSG + MSLT)
- 95% is HLA-DQB1 \* 0602 positive
- Hypocretin level in cerebrospinal fluid below 110pg / l

## Therapy :

**methylphenidate** (Ritalin<sup>®</sup>) psychostimulans, cortical activation, stimulation of RAS

**modafinil** (Vigil<sup>®</sup>) central stimulant, enhancing brain alpha1 adrenergic activity

**sodium oxybate** (Xyrem<sup>®</sup>) sleep support with slow delta waves, sleep consolidation

**TCA-clomipramine** (Anafranil<sup>®</sup>), SSRI

# General criteria of circadian sleep and wakefulness disorders

- A. Chronic or recurrent pattern of sleep and wake rhythm disorders primarily due to alteration of endogenous circadian timing system or inconsistency between endogenous circadian rhythm and sleep and wake regimen required or required by the environment or social / work schedule.
- B. Impaired circadian rhythm leads to symptoms of insomnia and / or excessive sleepiness
- C. Sleep and waking disorders cause clinically significant problems or worsening of mental, physical, social, professional, educational and other activities

# Circadian rhythm disorders of sleep and wakefulness

- DSP delayed sleep phase time delay > 2 and more hours (unable to sleep, sleep lasts until afternoon)
- ASP-advanced sleep phase illness, with increasing age
- Illness with irregular sleep rhythm and wakefulness (CR breakdown)
- Exchange-related illness (50-60%)
- Jet Lag Disorder
- Circadian rhythm sleep and wakefulness disease not further specified

# NREM sleep parasomnia

- **Waking up with confusion** (psych. Confusion, confusing behavior, from delta sleep in the first half of the night.)
- **Somnambulism** (complex automatic behavior with walking, sitting, leaving bed, returning or falling asleep elsewhere, walking, micturition outside the toilet, furniture, trauma)
- **Night Terror** - nocturnus maple (sudden episode of terror, crying, shouting, fear, physical activity, minutes duration, vegetat. Accompaniment)
- **Eating disorder associated with sleep**

# Disorders of waking from NREM sleep, general criteria

- Recurrent episodes of incomplete sleep awakening
- Inadequate or missing response to interviews or attempts to regulate the patient during the episode
- Limited or no mental activity or dreamy imagination
- Partial or complete amnesia per episode

# REM sleep parasomnia

- **Behavioral disorder in REM sleep** (REM without atonia) -RBD  
(abnormal behavior during REM sleep, association with ongoing dream, motor manifestations, trauma, aggression, rarely walking, eyes closed)
- **Recurrent isolated sleep paralysis** hypnagogic x hypnopompic  
sleep paralysis  
Loss of free movement (not ocular muscles and diaphragm), anxiety,  
consciousness preserved
- **Nightmare illness** (repeated frightening dreams in REM with waking,  
anxiety, stasis, immediate alertness, childhood)



# other parasomnias

1. Head Explosion Syndrome (sudden perception of loud sound explosion impact, painless)
2. Sleep-related hallucinations (deceptive dreamy sensations, complex visual hallucinations)
3. Sleep enuresis (prim. X sec.)
4. Parasomnia caused by somatic disease
5. Parasomnia caused by a drug or chemical
6. Parasomnia unspecified

# movement disorders associated with sleep

1. RLS sy. restless legs (forced to move limbs associated with discomfort, worse at rest, evening, TV), RI, Fe deficiency, pregnancy, polyneuropathy
2. PLMD sy. periodic limb movements (repetitive, highly stereotyped. 0.5-5 sec., amplitude, series, sleep disorder, daily fatigue)
3. Lower limb cramps associated with sleep (sudden involuntary muscle contraction)
4. Bruxism associated with sleep clicking, squeezing
5. Disease with rhythmic movements associated with sleep (rhythmic, stereotyped)
6. Benign sleep myoclonus in children
7. Propriospinal myoclonus during sleep
8. Sleep related movement disorders caused by somatic disease
9. Sleep related movement disorders caused by a drug or chemical

# somatic and neurological diseases associated with sleep

- Epilepsy
- Headache
- GI reflux
- Myocardial ischemia
- Laryngospasm
- Fatal familial insomnia (rapid progression. heredofamilary, degeneration of thalamic nuclei, AD, pharmacoresist. insomnia)

# methods of sleep medicine

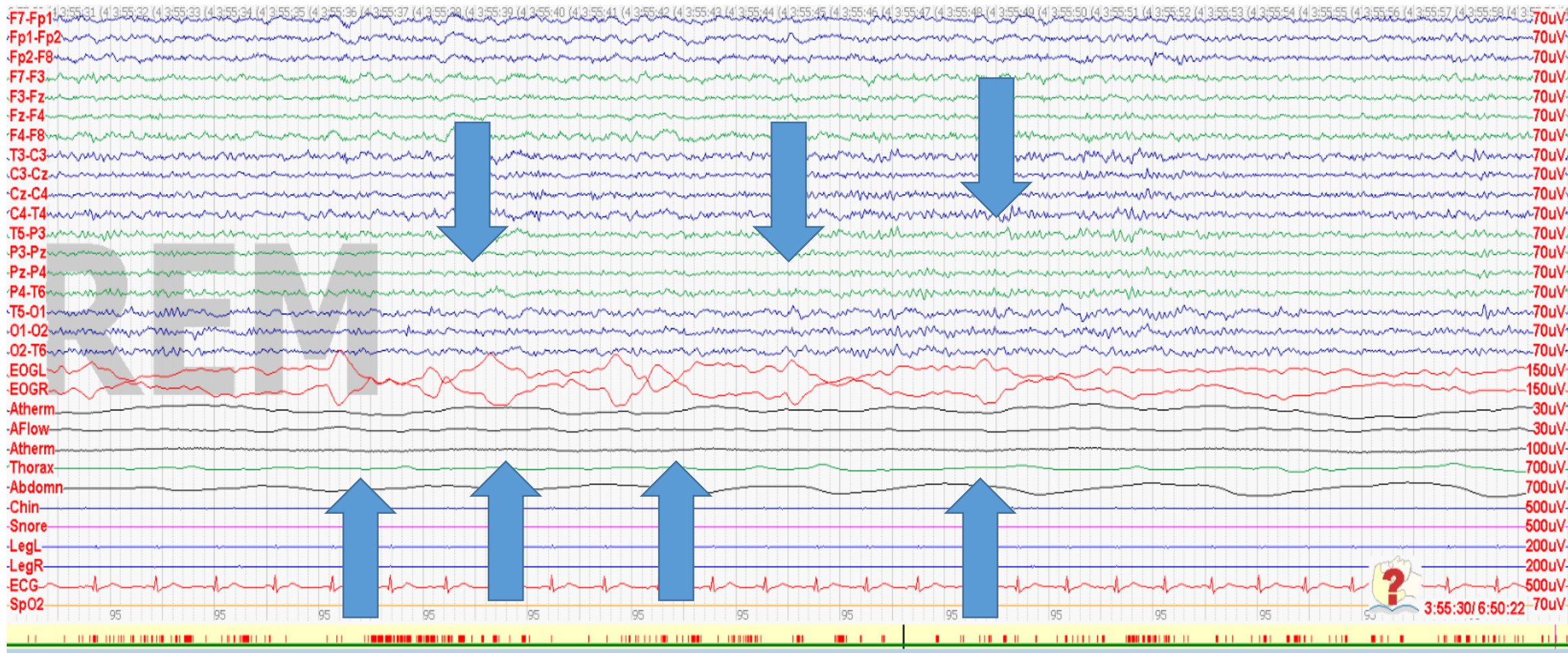
- **Polysomnography**
  - **Polygraphy**
  - **Actigraphy** – motion recording (graphical display) in sleep - few movements
  - **Multiple sleep latency test (MSLT)** – demonstration of excessive sleepiness  
EEG,EOG,EMG  
5 measurements in 2 hours Intervals (average, latency, SOREM)
- Maintenance of Wakefulness (**MWT**) – vigilance test

# indications of polysomnography

- **SRBD** (sleep related breathing disorders)
  - Titration **PAP therapy (positive airway pressure)**
  - Before upper respiratory tract surgery for snoring
  - **Control positive airway pressure therapy**
  - **Cardiovascular disease** (ICHS, heart failure, stroke, brady / tachyarrhythmia)
- **PLMS (periodic limbs movement in sleep)**
- **Narcolepsy (+ MSLT), (hypersomnia)**
- **Diff. dg. parasomnia x epileptic seizures** (video, EMG, others canals EEG)

# polysomnography methodology, what do we monitor?

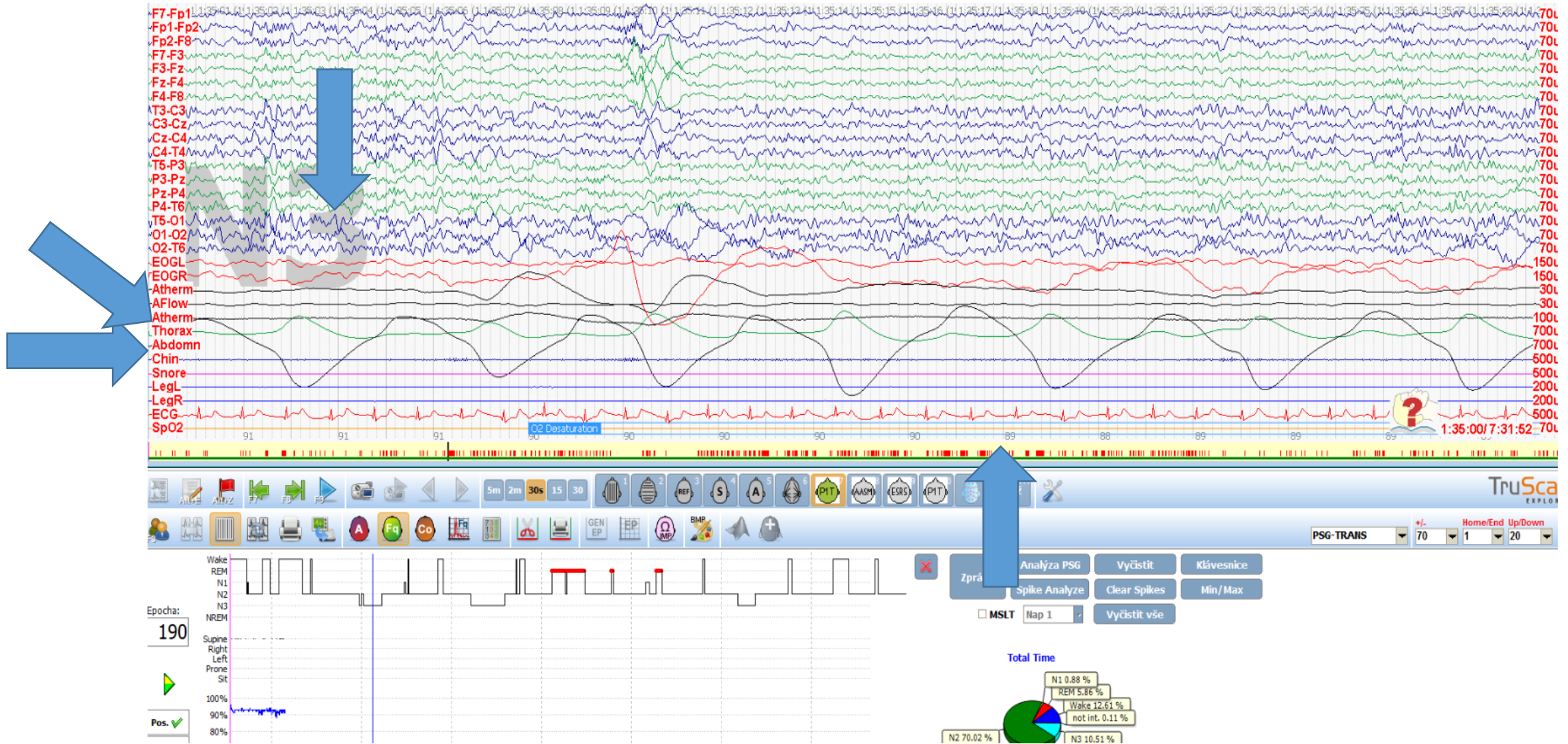
- EEG (C3-M2, F3-M2, C4-M1, F4-M1)
- EOG ( electrooculogram)
- ECG
- EMG (m. mentalis, m. tibialis ant.)
- Air flow (thermistor in front of nose and mouth)
- Chest movements (elastic band with resistance measurement, inductive plethysmography)
- Abdominal movements
- Snoring (miniature microphone, vibration registration)
- Oxygen saturation of blood, spO2 (pulse oximetry)
- Body position (videomonitoring, gravity sensor)
- HYPNOGRAM - graphical record of duration and changes of individual sleep stages during the reference period



TruScan EXPLORER  
 PSG-TRANS 70 +/- Home/End Up/Down 1 40 V

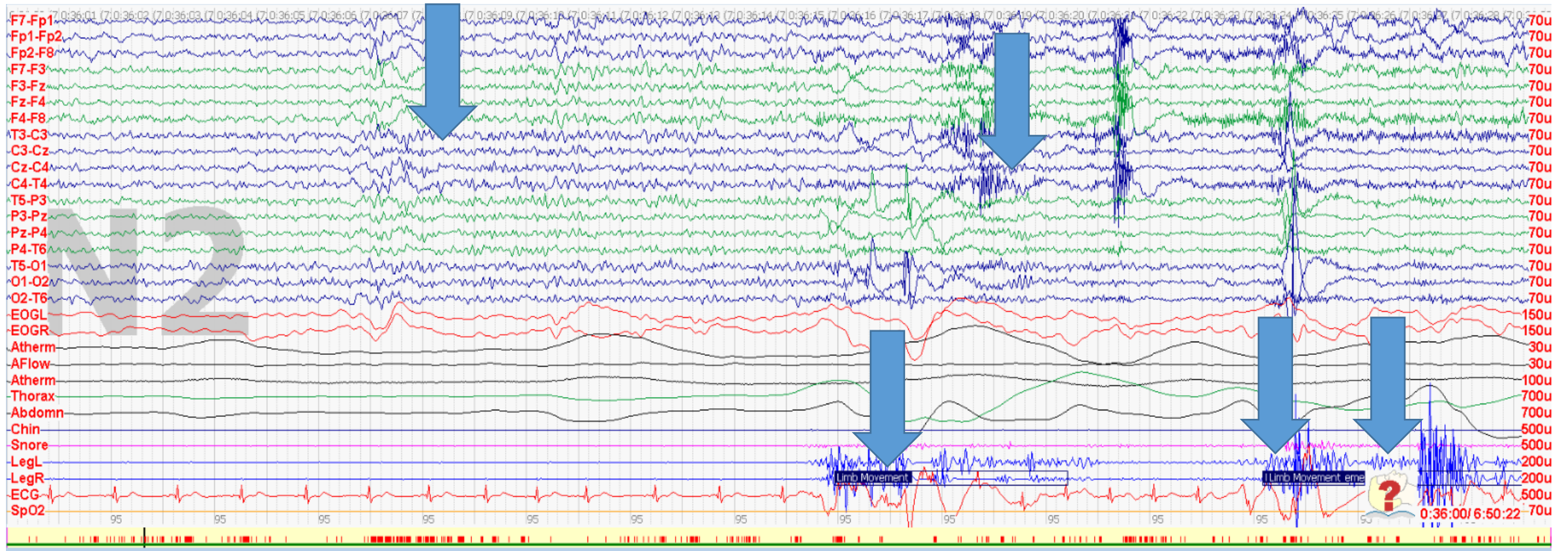
Epocha: 471  
 Wake REM N1 N2  
 Zpráva Analyza PSG Vyčistit Klavesnice  
 Spike Analyze Clear Spikes Min/Max

# OSA, spO2



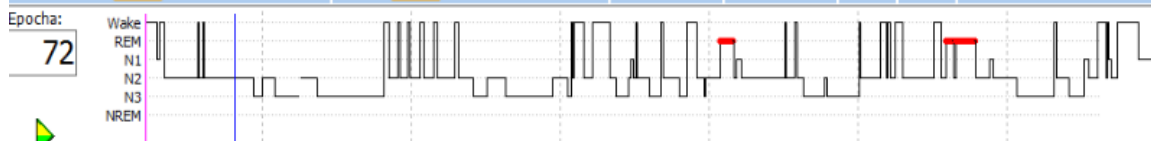


# PLMS



TruSca EXPLOR

PSG-TRANS +/- 70 Home/End Up/Down 1 40



Zpráva  
Analýza PSG  
Vyčistit  
Klávesnice  
Spike Analyze  
Clear Spikes  
Min/Max  
MSLT Nap 1  
Vyčistit vše

