BRIGHAM AND WOMEN'S HOSPITAL

The Lung Center

Sleepiness in Brain Injury, What to Expect and How to Help

Carolyn M. D' Ambrosio, MS, MD
Division of Sleep and Circadian Disorders

HARVARD MEDICAL SCHOOL

Outline

- Define sleepiness
- How to assess sleepiness
- Causes of sleepiness in brain injury
- Treatments

Case #1

- M.B. is a 42-year-old chef who had a fall at work one month ago, hit his head and caused a concussion.
- Comes in for evaluation of sleepiness.
- Never felt sleepy prior to the concussion.
- Bedtime 11 pm and wakes up at 7 am, no naps.

Case #1 continued

- He is in bed for ~8 hours per night.
- His wife does not complain about his nighttime snoring, but she describes herself as a heavy sleeper.

Case #1 Continued

- Has had type 2 diabetes for 11 years
- GERD and moderate depression.
- Weighs 220 lb (BMI of 31 kg/m2)
- Does not have hypertension or hypercholesterolemia.

Case #1

- What is “sleepiness” or hypersomnia?

Hypersomnia (sleepiness)

- Sleepiness or hypersomnia occurs when the patient has significant tendency to sleep or want to sleep during the normal wake period.

- A normal amount and quality of sleep the night before indicates the sleepiness is due to something else.

Causes of Sleepiness

Sleep-disordered breathing
Obstructive sleep apnea
Upper airway resistance syndrome
Central sleep apnea
Central alveolar hypoventilation syndrome

Neurologic disorders
Narcolepsy
Periodic limb movement disorder
Dementia
Parkinsonism
Idiopathic hypersomnia syndrome

Circadian rhythm disorders
Shift work sleep disorder
Jet lag (time-zone change)
Delayed and advanced sleep phase syndrome

Behavioral and psychiatric disorders

Insufficient sleep syndrome

Alcoholism

Malingering

Mental depression

Anxiety disorder

Panic disorder

Drug-related or environmental sleep disorders

Hypnotic-dependent or stimulant-dependent sleep disorder

Temperature-related or noise-related sleep disorder

Associated with other medical disorders

Myocardial ischemia

Chronic obstructive pulmonary disease

Gastroesophageal reflux disorder

Peptic ulcer disease

Causes of Sleepiness in Brain Injury

- Insomnia
- Sleep apnea, obstructive or central
- Parasomnia (PTSD)
- Medications such as narcotics
- Sleep deprivation/poor sleep quality
- Circadian rhythm disturbance
- Mood disorders (anxiety/depression)
- Rare narcolepsy, idiopathic

- What questions should you ask?

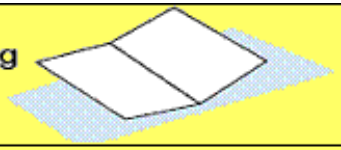
Case #1 continued

- Is the patient genuinely sleepy or just tired? Check screening questionnaires.
- Is the patient getting regular and sufficient sleep? Check on bedtime, wake time, sleep quality and pattern.
- Does the patient snore heavily or stop breathing during sleep? If so, consider obstructive sleep apnea.
- Is there a history of short-lived weakness on emotional arousal? If so, consider narcolepsy.

Case # 1 continued

- Is there evidence of depression (low mood or lack of pleasure in life)? If so, excessive daytime sleepiness might be symptomatic of a mood disorder
- Prescribed or recreational drugs be contributing to sleepiness?
- Are there other potentially relevant medical conditions disturbing sleep, such as chronic pain?
- Where possible, a history should be taken from the bed partner

How do we assess sleepiness?

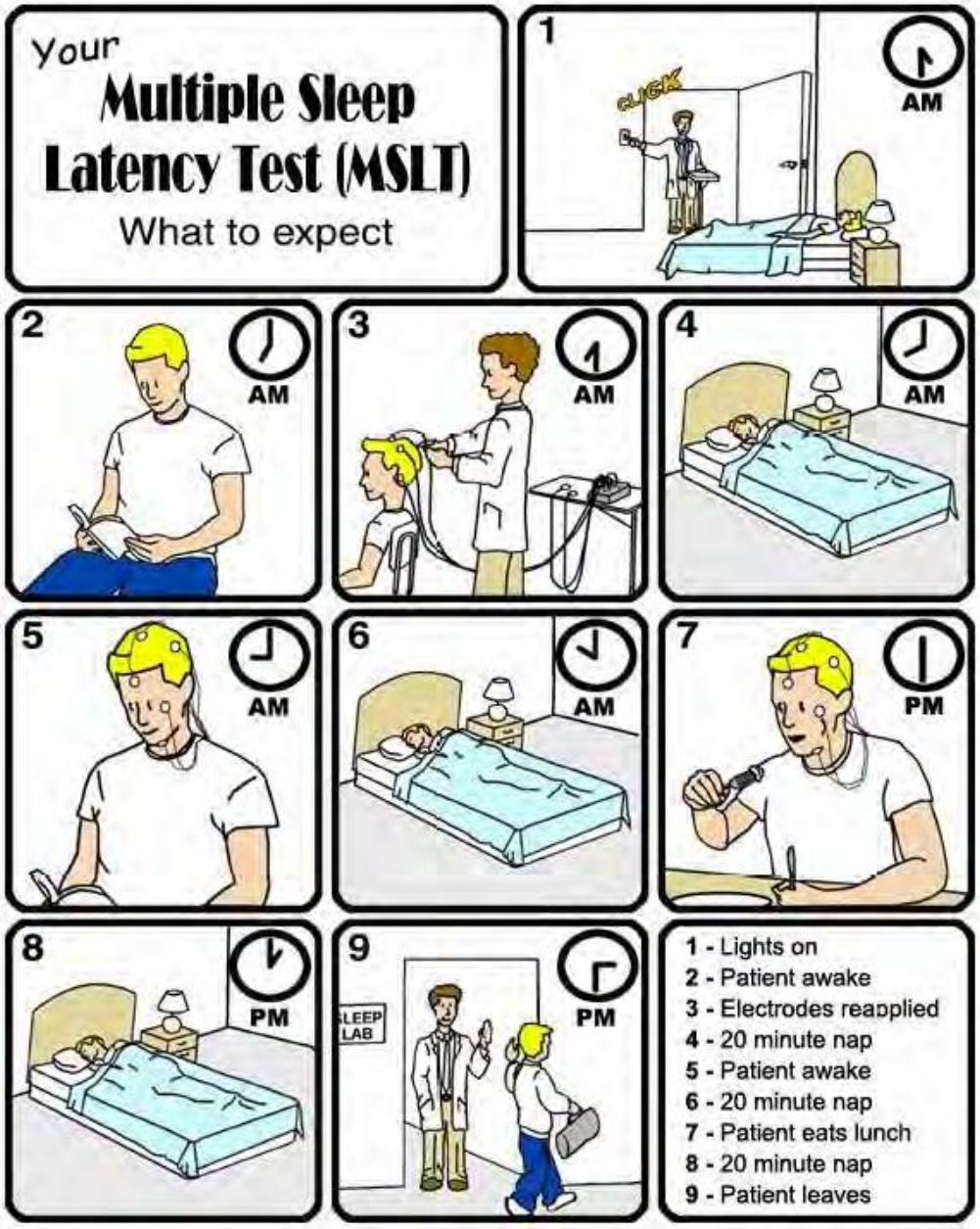
Sitting and reading 	chance of dozing: _____
Watching television 	chance of dozing: _____
Sitting inactive in a public place, for example, a theater or meeting 	chance of dozing: _____
As a passenger in a car for an hour without a break 	chance of dozing: _____
Lying down to rest in the afternoon 	chance of dozing: _____
Sitting and talking to someone 	chance of dozing: _____
In a car, while stopped in traffic 	chance of dozing: _____
Sitting quietly after lunch (when you've had no alcohol) 	chance of dozing: _____

Epworth Sleepiness Scale (ESS)

- Scale to measure daytime sleepiness
- Subjects rate their probability of falling asleep on a scale of increasing probability from 0 to 3 for 8 different situations
- Maximum possible score = 8 X 3 =24
- More than 10 = Sleepy

Sleepiness in Brain Injury

- Multiple Sleep Latency Test (MSLT)
  - Measures tendency to fall asleep, especially Stage R sleep
  - Sleep latency is a surrogate for sleepiness
  - Well validated
  - 5 naps in one day, each ~ 20 minutes separated by 2 hours awake
  - Typically used to evaluate for narcolepsy


Your
Multiple Sleep Latency Test (MSLT)
What to expect
1
CLICK
AM
2
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AM
4
AM
5
AM
6
AM
7
PM
8
PM
9
SLEEP LAB
PM
1 - Lights on
2 - Patient awake
3 - Electrodes reapplied
4 - 20 minute nap
5 - Patient awake
6 - 20 minute nap
7 - Patient eats lunch
8 - 20 minute nap
9 - Patient leaves

Sleepiness in Brain Injury

- Multiple Sleep Latency Test (MSLT)
  - average the time to fall asleep on all naps
  - < 5 minutes is pathologic (e.g. narcolepsy)
  - 5-10 minutes is sleepy
  - > 10 is normal.
  - Two naps with REM sleep is also abnormal
  - Typically used for dx narcolepsy

Traumatic Brain Injury

Traumatic Brain Injury

- Up to 80% of TBI patients have sleep complaints: hypersomnia, insomnia, etc.
- Mild TBI:
  - 30% report in the first 10 days
  - Risk factors for persistent issues: female, poor sleep prior to injury

Traumatic Brain Injury

- Severe TBI:
  - Up to 84% have sleep disturbances initially, 60% after one month

> 6 months since injury many with hypersomnia, insomnia, increased sleep need, sleep apnea.

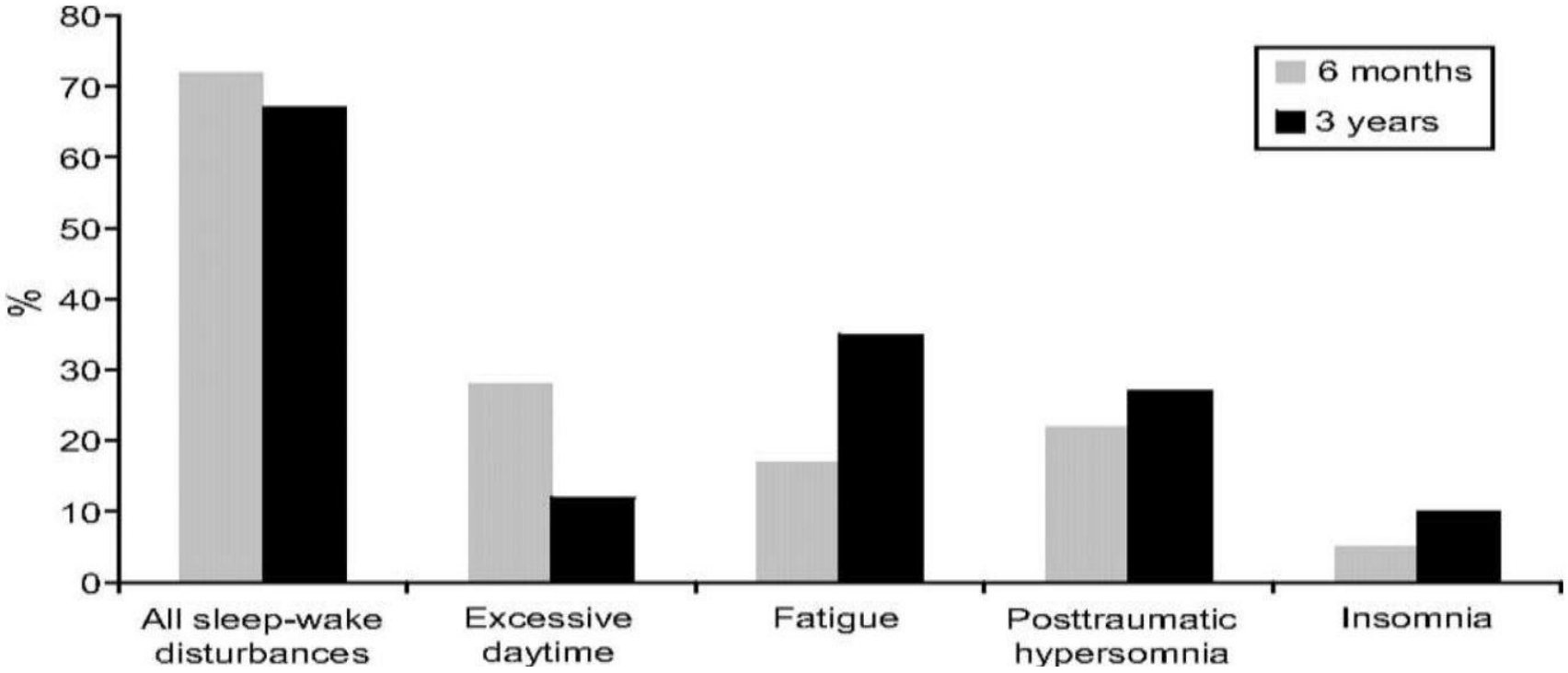
Sleepiness in TBI

- Sleepiness usually noted during sedentary times
- Fatigue usually prevents or restricts active times

Sleepiness in TBI

- Insomnia or poor sleep habits can be a cause of sleepiness
- Pleiosomnia (an increased need for sleep) occurs in TBI, up to 22%.
- Patients with TBI underestimate sleepiness and need for sleep, thus need to get information from family and friends.

Traumatic Brain Injury



Kempf J et al. J Neurol Neurosurg Psychiatry 2009

Sleepiness in TBI

- Post-traumatic Hypersomnia
- Medications
- Sleep apnea (obstructive and central)
- Circadian rhythm disorders
- Periodic limb movement disorders
- Narcolepsy

Sleepiness in TBI

- Possible reasons:
  - Orexin low in first few hours after TBI
  - Orexin neurons in hypothalmus reduced in autopsy specimens
  - Orexin levels normalize by 6 months
  - Loss of other wake promoting neurons in brain
  - Altered melatonin secretion

Sleepiness in TBI

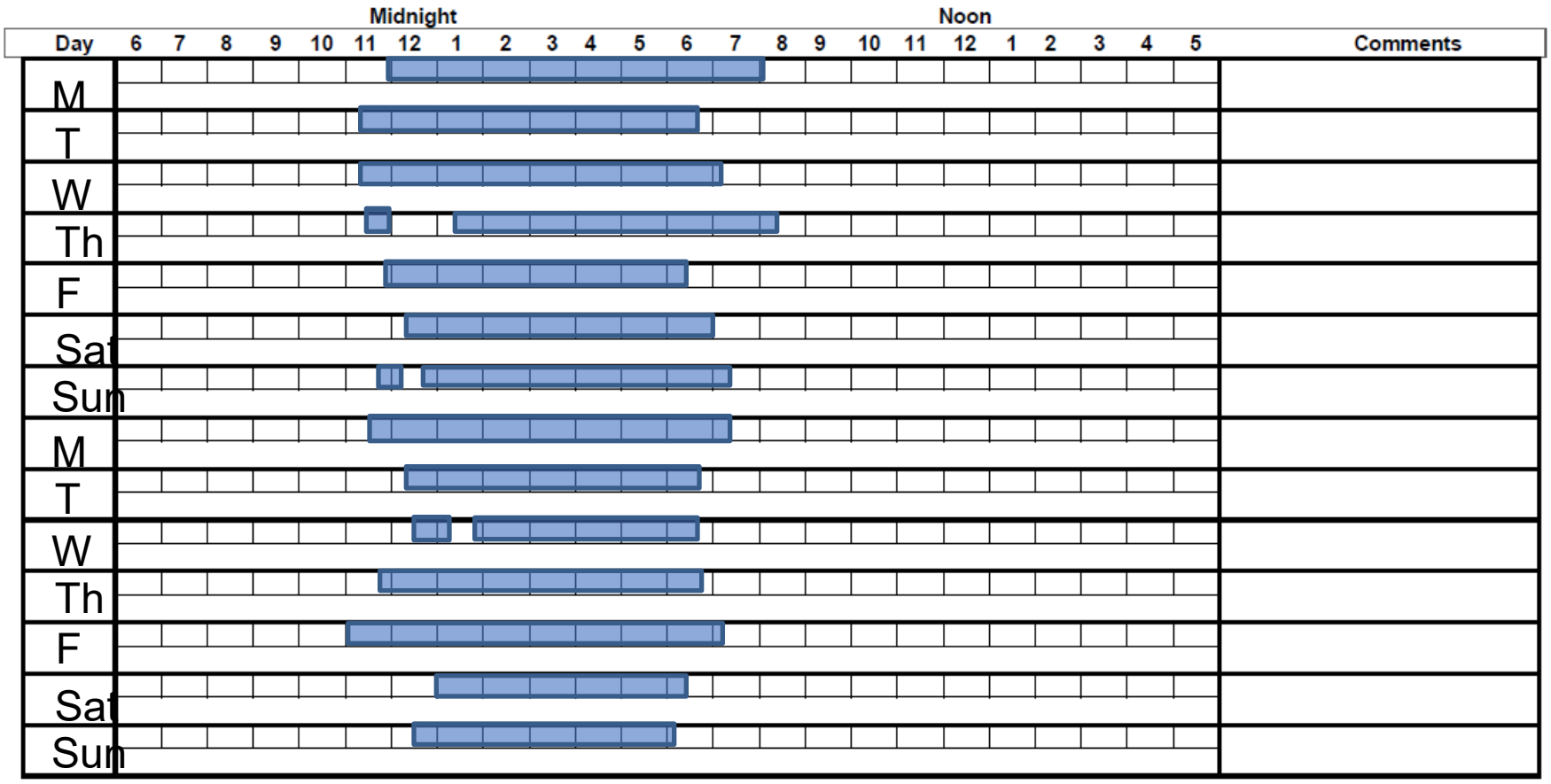
- Questionnaires:
  - Epworth, TBI patients underestimate sleepiness
  - Pittsburgh Sleep Quality Index validated but hard to administer

Sleepiness in TBI

- Narcolepsy rare 0.5% in general population
  - 7 % in TBI patients
  - Diagnosis with symptoms and MSLT needed.
  - EDS x 3 months and MSLT with mean sleep latency of < 8 minutes and less than 2 naps with REM = “post traumatic hypersomnia”
  - EDS x 3 months and MSLT with mean sleep latency of < 8 minutes and > 2 naps with REM = “post traumatic narcolepsy”

Sleepiness in TBI

- Sleep diaries: used in insomnia
- Actigraphy: used in insomnia
- Sleep study (polysomnogram)
  - Only used if obstructive or central sleep apnea and concern for hypersomnia/narcolepsy
  - TBI has more awakenings and less REM sleep
  - Not helpful with insomnia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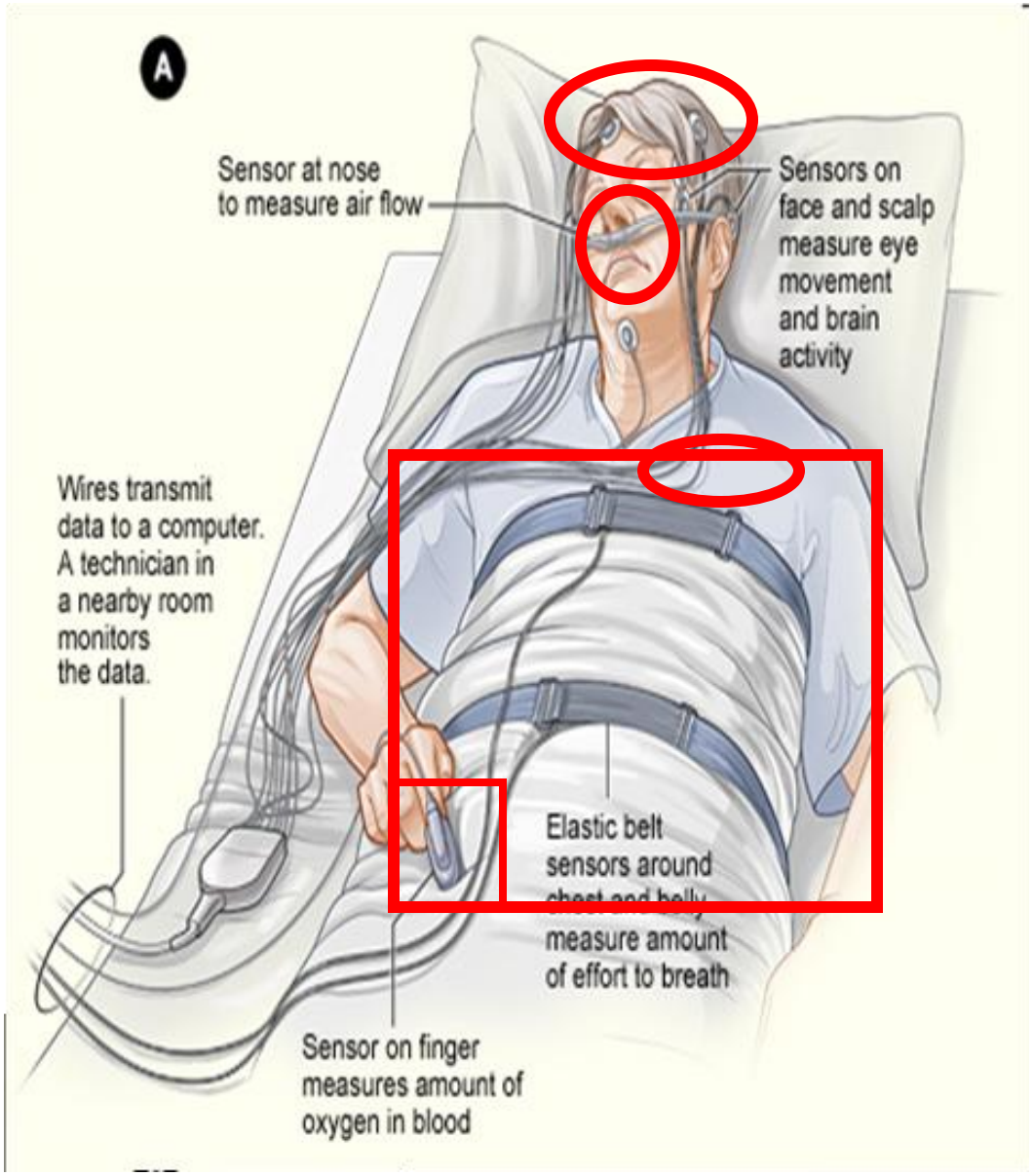
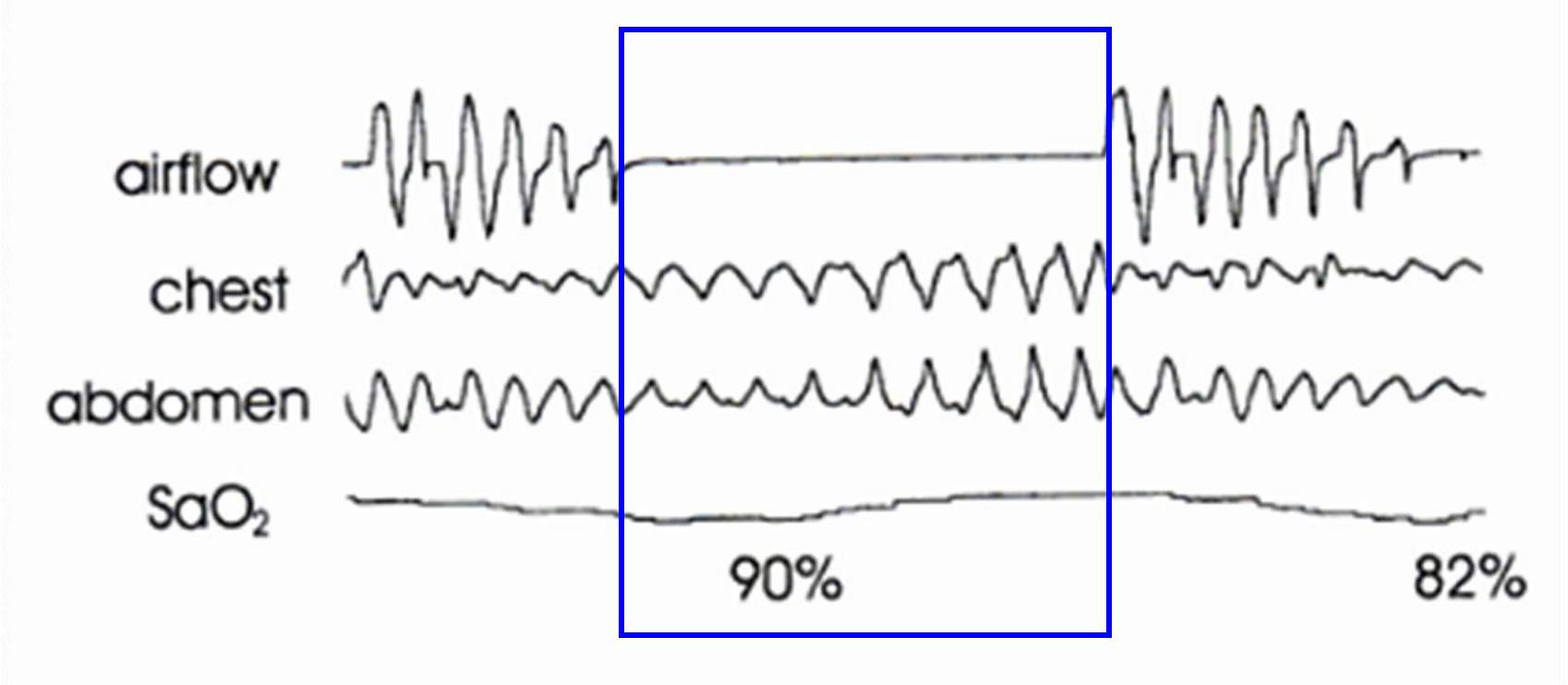
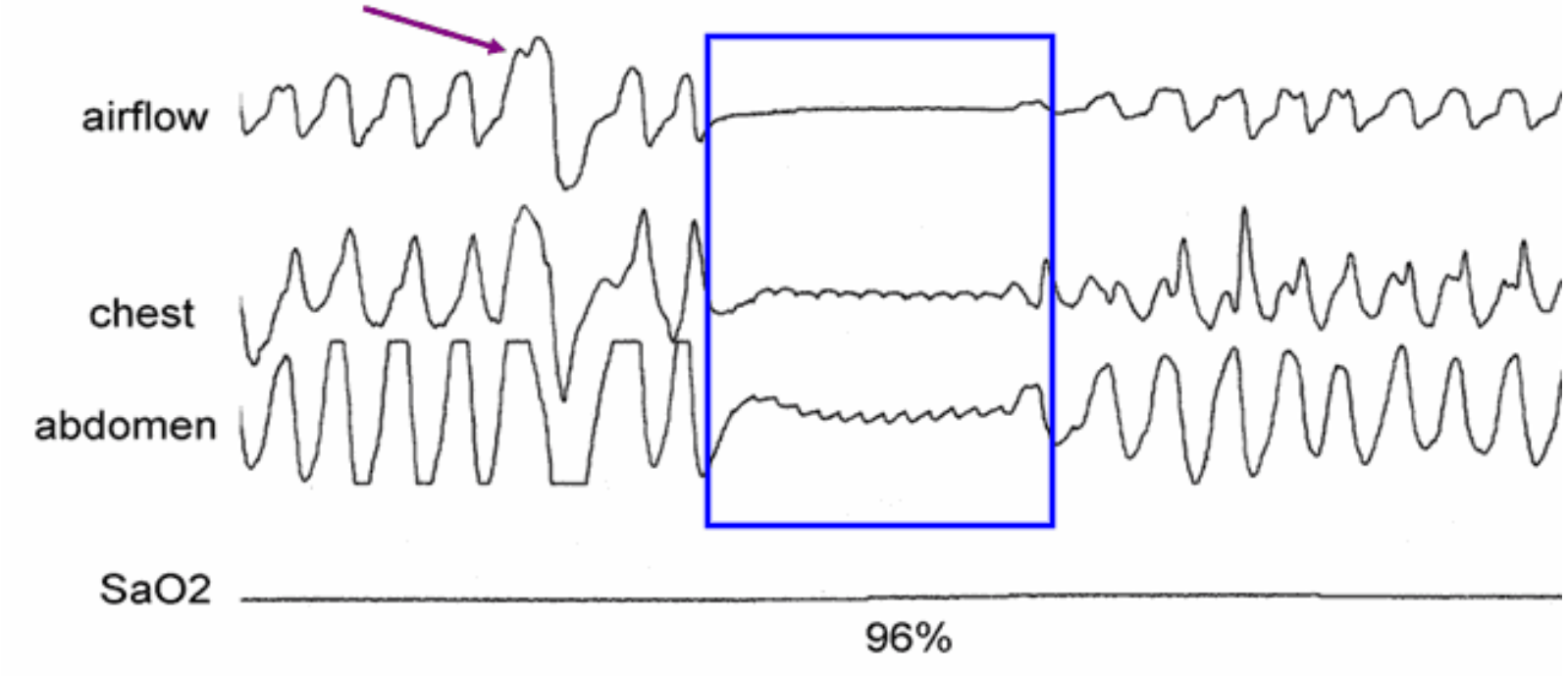

A
Sensor at nose
to measure air flow
Sensors on
face and scalp
measure eye
movement
and brain
activity
Wires transmit
data to a computer.
A technician in
a nearby room
monitors
the data.
Elastic belt
sensors around
measure amount
of effort to breath
Sensor on finger
measures amount of
oxygen in blood

Obstructive Sleep Apnea



Central Sleep Apnea



Sleepiness in TBI

Treatment:

Goal is to mitigate symptoms, improve function and recovery

Underlying or contributing causes need to be addressed: OSA, depression, medication effect, insufficient sleep,anxiety, etc.

Sleepiness in TBI

Treatment:

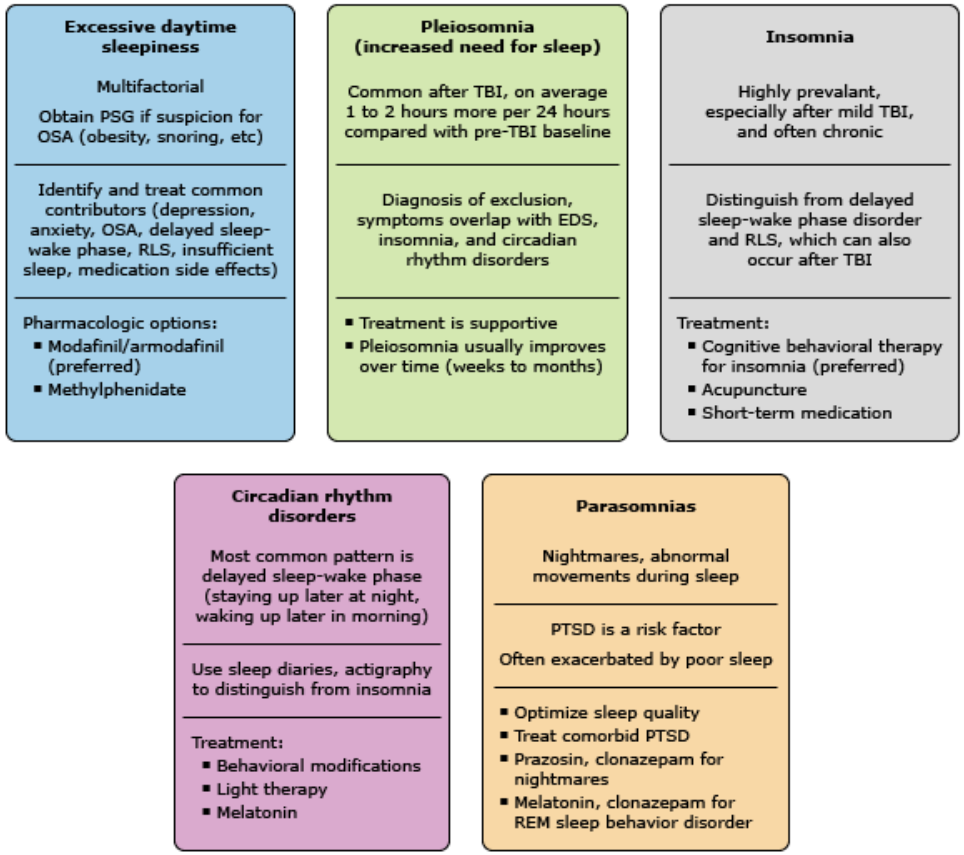
- No FDA approved medication for this
- Modafanil and Armodafanil should be 1st
- side effect is headache
- Both improve ESS and MSLT results

Sleepiness in TBI

Treatment:

- Bright light therapy in the morning has some benefit in sleepiness
- Melatonin not effective in TBI
- Set expectations and change behavior

Overview of sleep-wake disorders in patients with traumatic brain injury



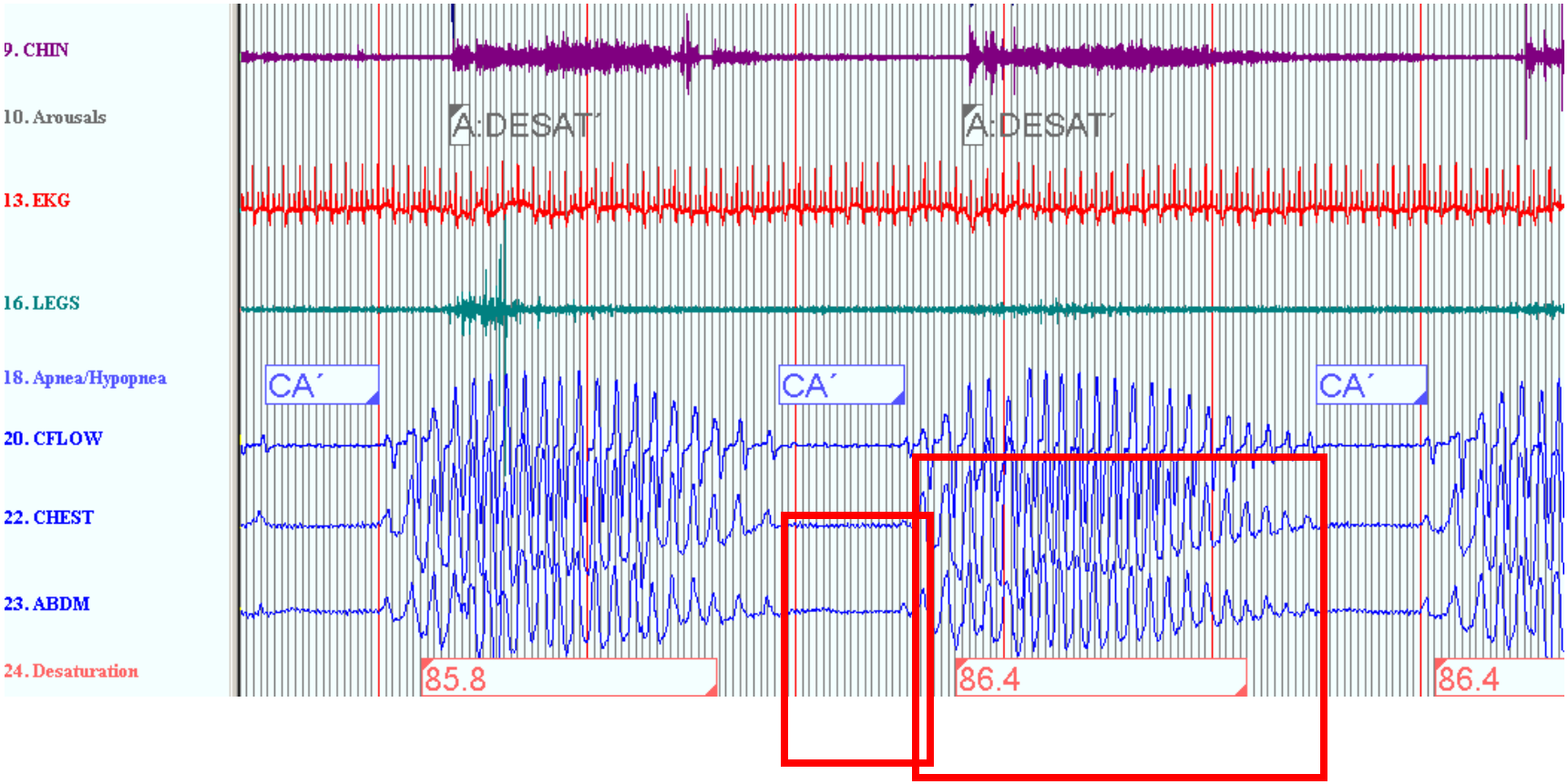
Sleep-wake disturbances are among the most prevalent and persistent sequelae of TBI. Patients suffering from TBI of any severity, in both the acute and chronic phases, commonly report EDS, increased sleep need, insomnia, and sleep fragmentation. Identification and treatment of sleep disorders in patients with TBI is important and can complement other efforts to promote maximum functional recovery. Refer to UpToDate topic review on sleep-wake disorders in patients with TBI for more information.

PSG: polysomnography; OSA: obstructive sleep apnea; RLS: restless legs syndrome; TBI: traumatic brain injury; EDS: excessive daytime sleepiness; PTSD: posttraumatic stress disorder; REM: rapid eye movement.

UpToDate®

Sleepiness Post Stroke

- Most likely sleep disordered breathing
- In the first three days: central apnea (Cheynes-Stokes)
- 3 months or more: obstructive apnea


9. CHIN
10. Arousals
13. EKG
16. LEGS
18. Apnea/Hypopnea
20. CFLOW
22. CHEST
23. ABDM
24. Desaturation
A:DESAT´
A:DESAT´
CA´
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85.8
86.4
86.4

Case #1

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Case #1 Continued

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- suffers from GERD daily and has moderate depression.
- Weighs 220 lb (BMI of 31 kg/m2)
- Does not have hypertension or hypercholesterolemia.

Case #1 Continued

- Has new sleepiness, ESS 14
- Has risk factors for OSA (HTN, DM, GERD, depression)
- PSG and MSLT done: no sleep apnea but MSLT showed sleep latency 7.5 minutes, no REM sleep.
- Treated with modafinil with good results

Questions?

References

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