Poruchy spánku u pacientů v intenzivní péči ...

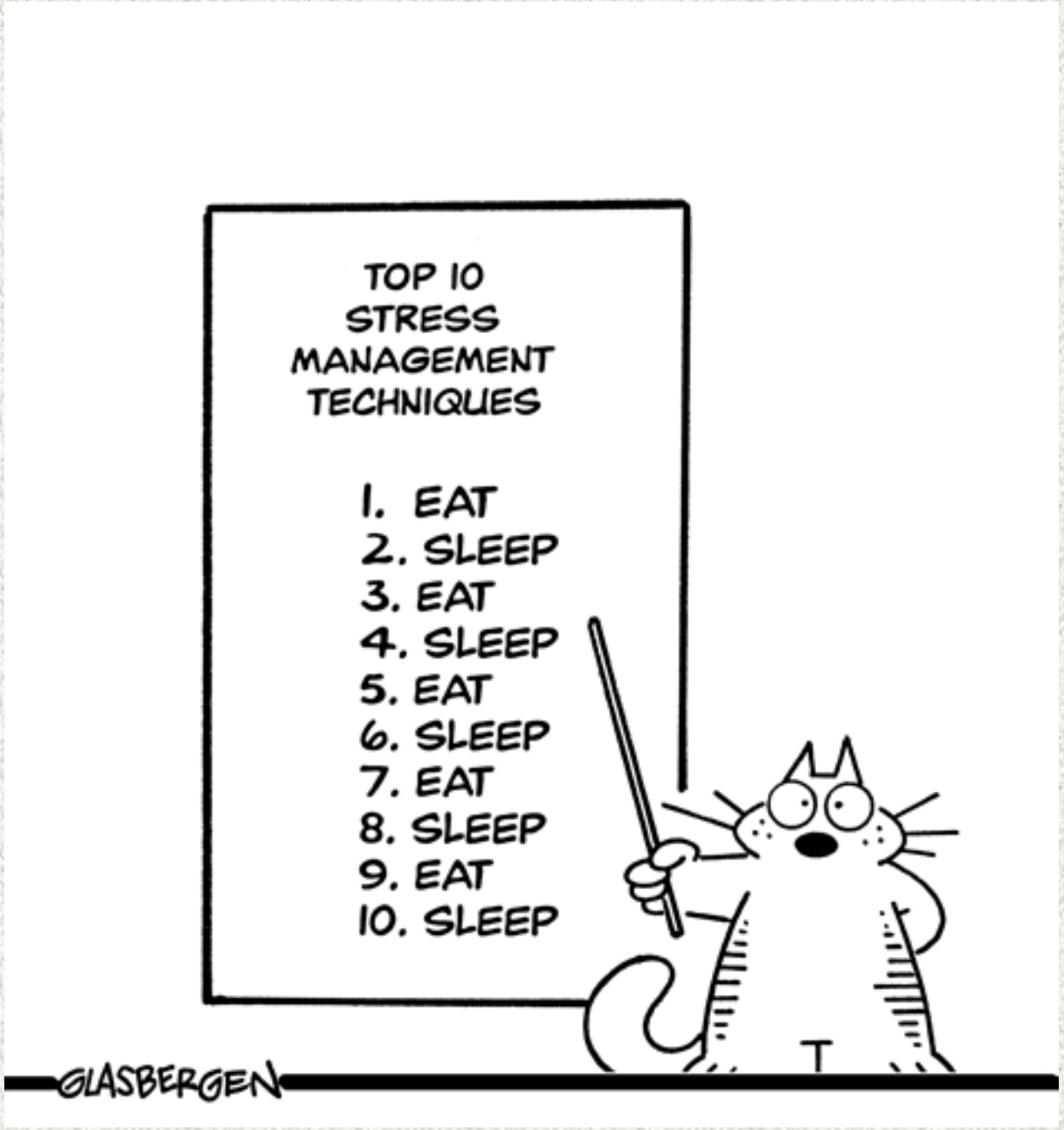
Vladimír Černý

Klinika anesteziologie, perioperační a intenzivní medicíny
Fakulta zdravotnických studií Univerzity J. E. Purkyně, Masarykova nemocnice Ústí nad Labem

Centrum pro výzkum a vývoj
Fakultní nemocnice Hradec Králové

Dept. of Anesthesia, Pain Management and Perioperative Medicine
Dalhousie University, Halifax, Canada

Klinika anesteziologie, resuscitace a intenzivní medicíny
Univerzita Karlova v Praze
Lékařská fakulta v Hradci Králové


TOP 10
STRESS
MANAGEMENT
TECHNIQUES
1. EAT
2. SLEEP
3. EAT
4. SLEEP
5. EAT
6. SLEEP
7. EAT
8. SLEEP
9. EAT
10. SLEEP
GLASBERGEN

Cíle přednášky

- ✓ Začít vnímat poruchy spánku jako jeden z faktorů ovlivňující klinický výsledek pacientů na ICU
- ✓ Začít vnímat dosažení spánku jako jeden z “early goals” na ICU
- ✓ Vyvolat zájem (z)měnit naše dosavadní vzorce chování jež se podílí na výskytu poruch spánku u pacientů v IP

ICU = intensive care unit, IP = intenzivní péče

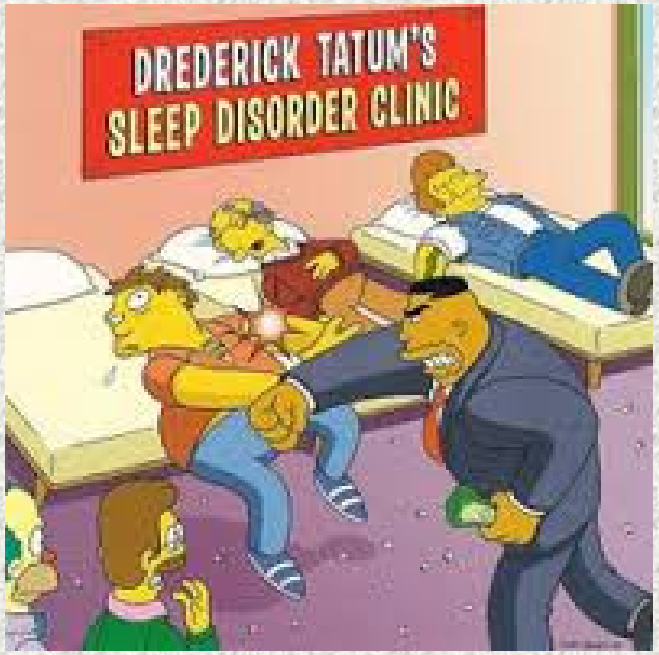
- **Sleeping disturbances** jako "velké" téma klinické medicíny
- **Spánek a "long haul" piloti**
- Poruchy spánku mají **47613** prací (PubMed)

Disease	Problem
Asthma	Nocturnal exacerbation, nocturnal GER
CHF	Orthopnea, paroxysmal nocturnal dyspnea, sleep-disordered breathing, increased sympathetic tone, nighttime diuresis, Cheyne-Stokes respiration
COPD	Persistent nocturnal hypoxemia with complications (e.g., cor pulmonale, polycythemia)
	Sporadic nighttime desaturations
	Early-morning airflow obstruction
	Inhibition of respiratory muscles in REM
	Decreased functional residual capacity from recumbent position during sleep
End-stage renal disease	Pruritus, nausea; increased risk of RLS and PLMD
Nocturnal GER	Nocturnal GER → decreased sleep, heartburn, coughing, asthma
OSA	Snoring with upper airway obstruction
Stroke	Focal neurologic deficits (e.g., dysphagia, weakness or paralysis)

J Hospital Med, 2008

Poznatky “spánkové medicíny” významně ovlivňují obor anesteziologie a intenzivní medicína …

- “Sleep specialist”
- “Sleep clinic”
- “Sleep center”



- **“Division of Pulmonary, Critical Care and Sleep Medicine”**

Obsah

1) Význam spánku
2) Poruchy spánku na ICU – jaké jsou a jak často se vyskytují ?
3) Faktory ovlivňující spánek na ICU
4) Lze spánek na ICU zlepšit ?
5) Jak (z)měnit naší dosavadní praxi ?

Význam spánku 1

- **Základní biologická funkce**
- Silná asociace mezi “sleep hygiene and longevity and quality of life”
- Poruchy spánku a vznik demence ?

Sleep and recovery from critical illness and injury: A review of theory, current practice, and future directions*

Crit Care Med, 2008

Randall S. Friese, MD

Nová role spánku ?
Spánek odplavuje “smetí našich myšlenek”
Farmaka podporující transport “glial waste” …

NEUROSCIENCE 2013

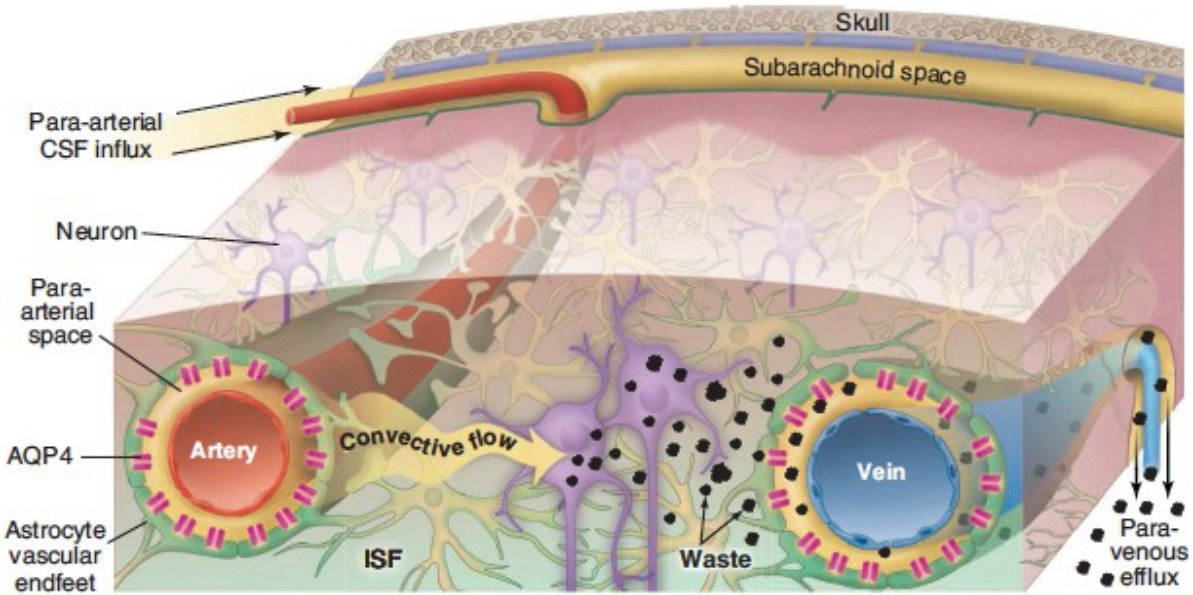
Garbage Truck of the Brain

Maiken Nedergaard

An intercellular "glymphatic" pathway clears cell waste from the brain and may reveal new targets for treating neurodegenerative diseases.

Essentially all neurodegenerative diseases are associated with misaccumulation of cellular waste products. Of these, misfolded or hyperphosphorylated proteins are among the most difficult for the brain to dispose. For example, tau and β-amyloid can accumulate as stable aggregates that are neurotoxic in conditions such as Alzheimer's disease (*1*). Intracellular proteasomal degradation and autophagy are considered the principal means for removing proteins in the central nervous system, and the dysfunction of each has been causally associated with neurodegeneration (*2*).Yet many cytosolic proteins are released into the interstitial space in the brain, suggesting that extracellular disposal routes may also eliminate waste (*3*).

Throughout the body's tissues, bulk flow of the fluid between cells, into the blood or lymph, plays an important role in the removal



Go with the flow. Convective glymphatic fluxes of CSF and ISF propel the waste products of neuron metabolism into the paravenous space, from which they are directed into lymphatic vessels and ultimately return to the general circulation for clearance by the kidney and liver.

Význam spánku 2

- **Spánek jako podmínka fungování procesů zotavení a reparace v organismu**
- Spánková deprivace má/může mít významné dopady na psychologické a fyziologické funkce

Sleep and recovery from critical illness and injury: A review of theory, current practice, and future directions*

Crit Care Med, 2008

Randall S. Friese, MD

Regulace spánku

1) Není plně vysvětlena
2) *Balance between homeostatic sleep need and intrinsic body clock (circadian pacemaker)*
3) Hypotalamus a hypofýza
4) Role melatoninu a kortisolu

Studované dopady spánkové deprivace u pacientů v IP

- Imunitní funkce
- Metabolismus
- Bilance dusíku
- Proteinová bilance
- Zpomalení recovery
- QOL
- **Delirium**

Table 1. Sleep deprivation and immune function

	Sleep Deprivation
Metabolic rate	Increased
PMN/lymphocyte counts	Decreased
NK cells	Dysfunctional
PMN	Dysfunctional
Antigen-specific defenses	Impaired
Mortality	Increased

PMN, polymorphonucleocyte; NK, natural killer.

Sleep and recovery from critical illness and injury: A review of theory, current practice, and future directions*

Randall S. Friese, MD

Crit Care Med, 2008

Peptides 44 (2013) 135–138

Contents lists available at SciVerse ScienceDirect

Peptides

journal homepage: www.elsevier.com/locate/peptides

Review

Neuropeptides in sepsis: From brain pathology to systemic inflammation

Fabiano Pinheiro da Silva*, Marcel Cerqueira César Machado, Irineu Tadeu Velasco

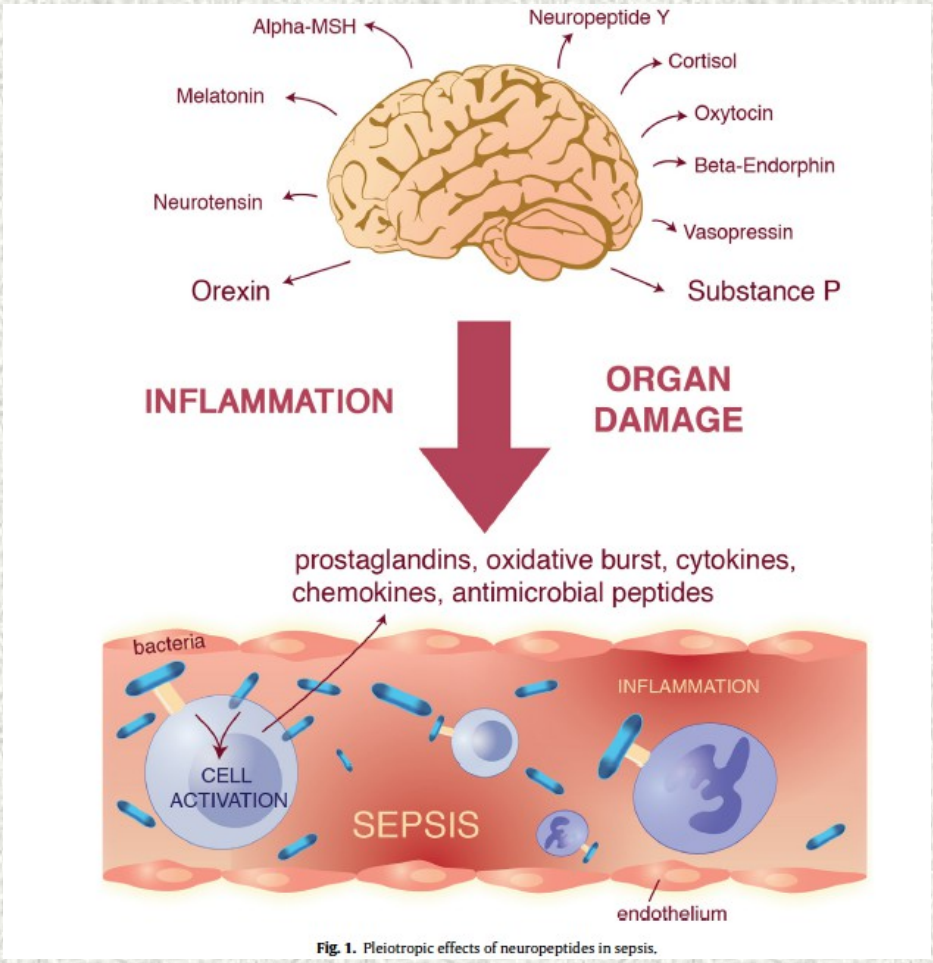


Fig. 1. Pleiotropic effects of neuropeptides in sepsis.

Sleep disorders in the Intensive Care seem to lead to the development of 1)**delirium and** 2)**increased mortality.**

Sleep disturbances impair the immune system, regenerative processes, memory and cognitive functions …

Association between Endothelial Dysfunction and Acute Brain Dysfunction during Critical Illness

Anesthesiology 2013

Christopher G. Hughes, M.D.,* Alessandro Morandi, M.D.,† Timothy D. Girard, M.D.,‡ Bernhard Riedel, M.D., Ph.D.,§ Jennifer L. Thompson, M.P.H.,‖ Ayumi K. Shintani, Ph.D.,# Brenda T. Pun, M.S.N.,** E. Wesley Ely, M.D.,†† Pratik P. Pandharipande, M.D.‡‡

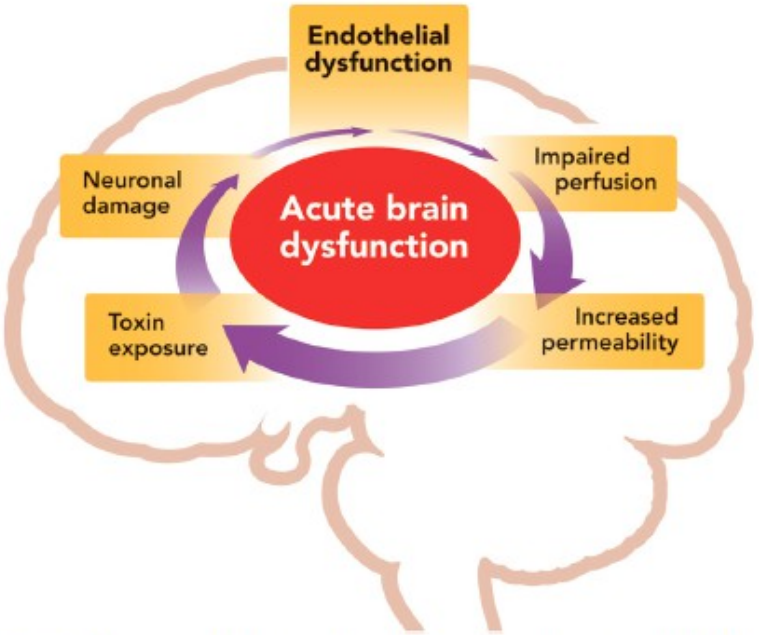
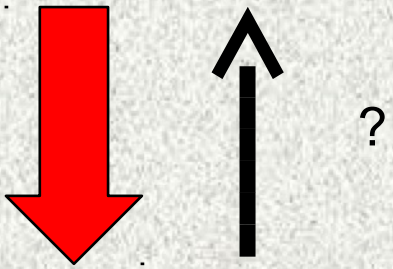


Fig. 1. Proposed relationship between systemic endothelial dysfunction and acute brain dysfunction. Systemic endothelial dysfunction may contribute to impaired cerebral perfusion, increased blood–brain barrier permeability, and exposure of the brain to toxic substances, causing neuronal damage and further brain organ injury. This may present clinically as acute brain dysfunction (delirium and coma).

Systémová endoteliální dysfunkce

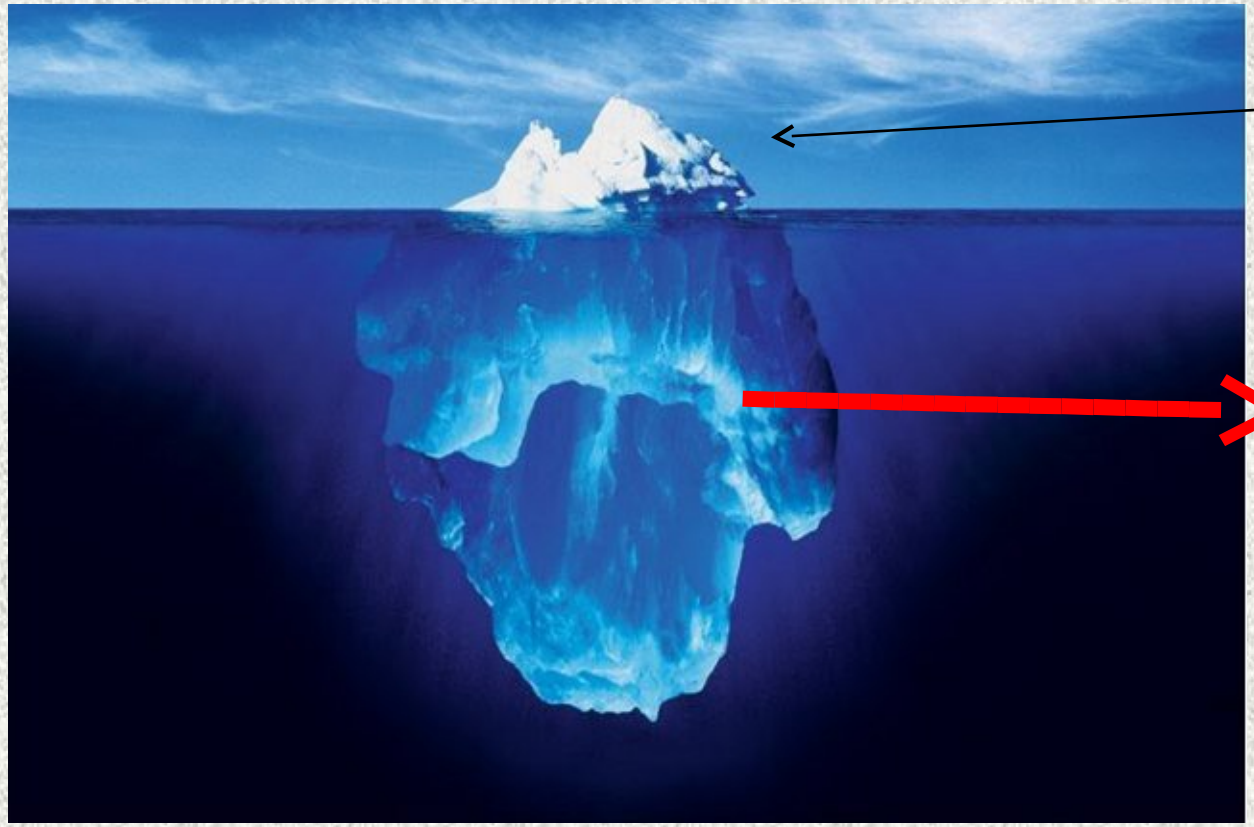


Mozková dysfunkce
Delirium
Kognitivní dysfunkce
Poruchy spánku

Měníme paradigmata na ICU ?
… ANO !

Je spánek na ICU "vážné" téma nebo jde jen o to, zda pacient má zavřené oči a "neotravuje" ?

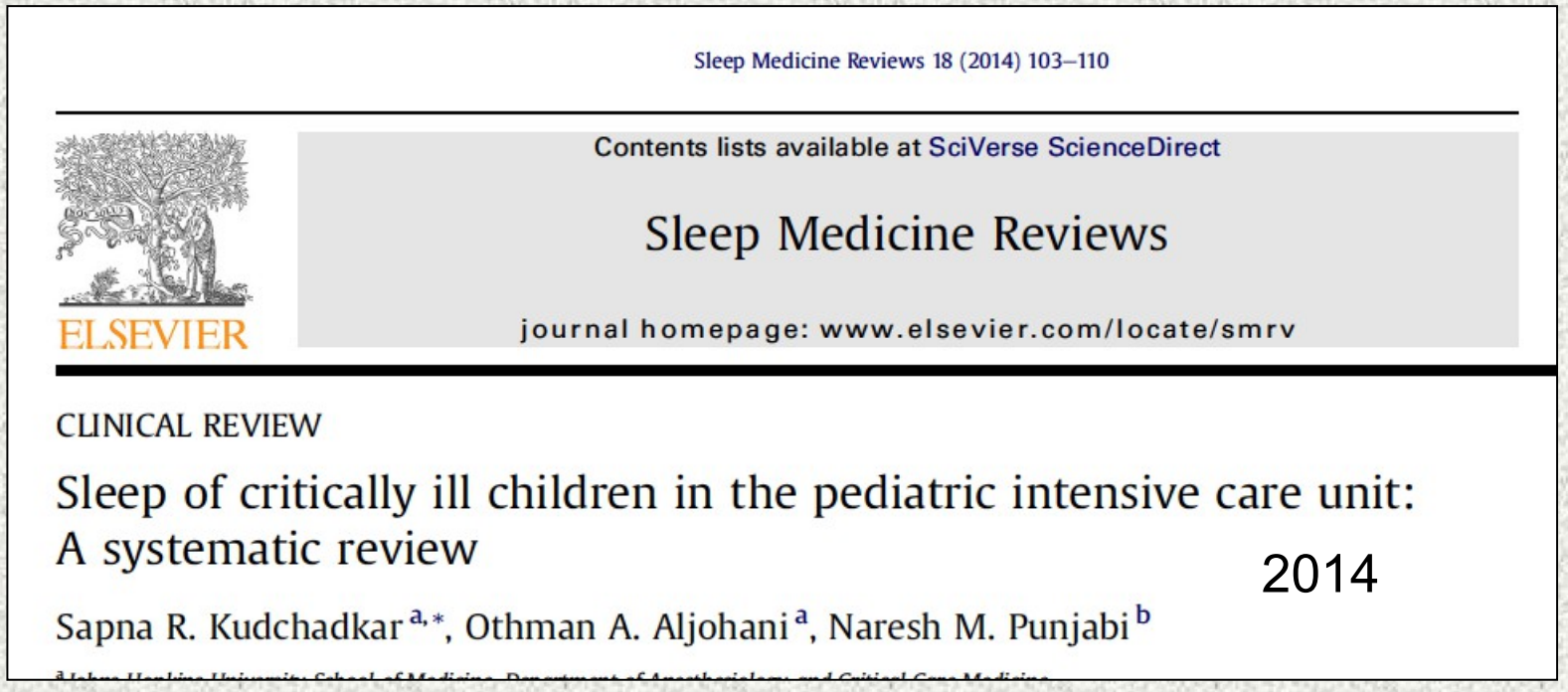
Další z **“nových”** paradigmat IP =
Porucha spánku u kriticky nemocných je spojena s vyšší morbiditou a mortalitou



“No tak nespí,
vyspí se doma …”

Vědomě zvyšujeme Riziko morbidity a mortality !

A bohužel to samé platí asi i u dětí v IP …



Sleep Medicine Reviews 18 (2014) 103–110

Contents lists available at SciVerse ScienceDirect

Sleep Medicine Reviews

journal homepage: www.elsevier.com/locate/smrv

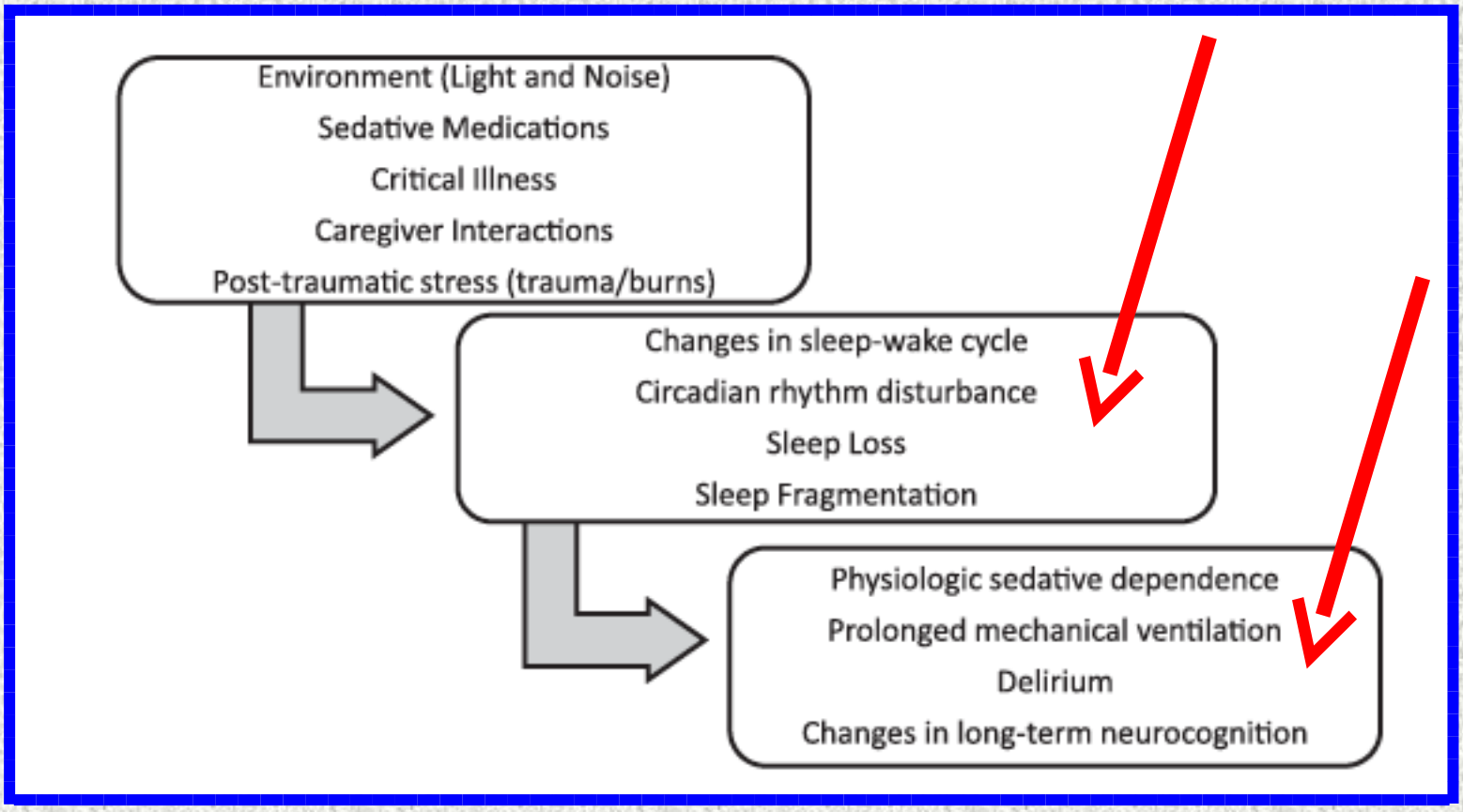
CLINICAL REVIEW

Sleep of critically ill children in the pediatric intensive care unit: A systematic review

2014

Sapna R. Kudchadkar [a,*], Othman A. Aljohani [a], Naresh M. Punjabi [b]

Dlouhodobá porucha kognitivních funkcí v celém jejich rozsahu …



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CLINICAL REVIEW

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Sapna R. Kudchadkar [a,*], Othman A. Aljohani [a], Naresh M. Punjabi [b]

2014

Je výskyt poruch spánku na ICU častý ?

ANO

Scientific evidence is very limited …

(85% ?)

Jde jen o jednu "univerzální" poruchu spánku ? NIKOLIV !

- Sleep deprivation
- Sleep disruption
- Abnormal sleep architecture
- Atypical sleep

Atypical Sleep in Ventilated Patients: Empirical Electroencephalography Findings and the Path Toward Revised ICU Sleep Scoring Criteria

Paula L. Watson, MD[1,2]; Pratik Pandharipande, MD, MSCI[3,4]; Brian K. Gehlbach, MD[5]; Jennifer L. Thompson, MPH[6]; Ayumi K. Shintani, MPH, PhD[6]; Bob S. Dittus, MD, MPH[7,8,9]; Gordon R. Bernard, MD[1]; Beth A. Malow, MD, MS[2,10]; E. Wesley Ely, MD, MPH[1,8,9]

Crit Care Med, 2013

Spánková architektura

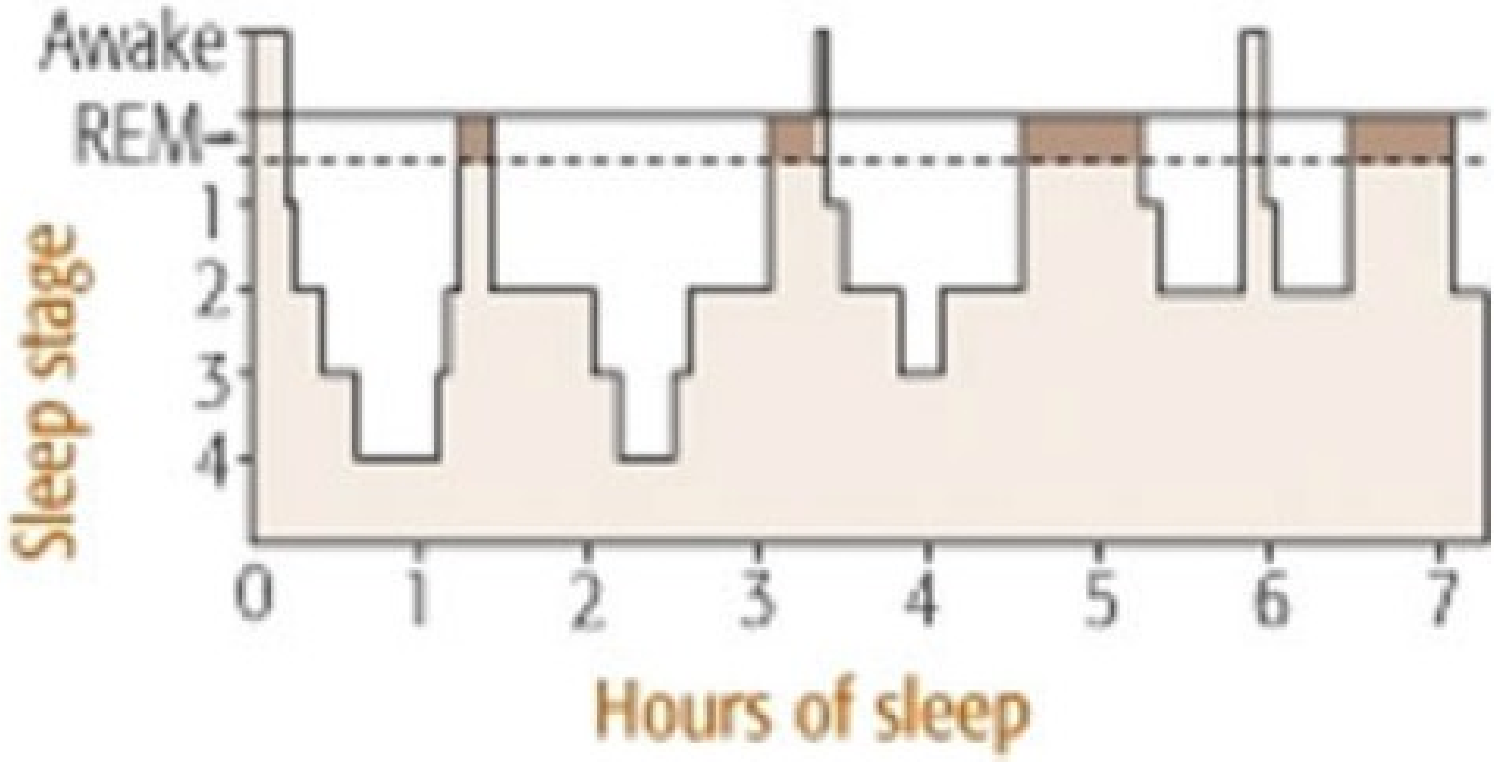


FIGURE 1. Normal sleep architecture includes cycles of 2 main stages, non-REM and REM sleep, as depicted in this hypnogram.

Sleep in Hospitalized Medical Patients, Part 1: Factors Affecting Sleep

J Hospital Med, 2008

Spánková architektura

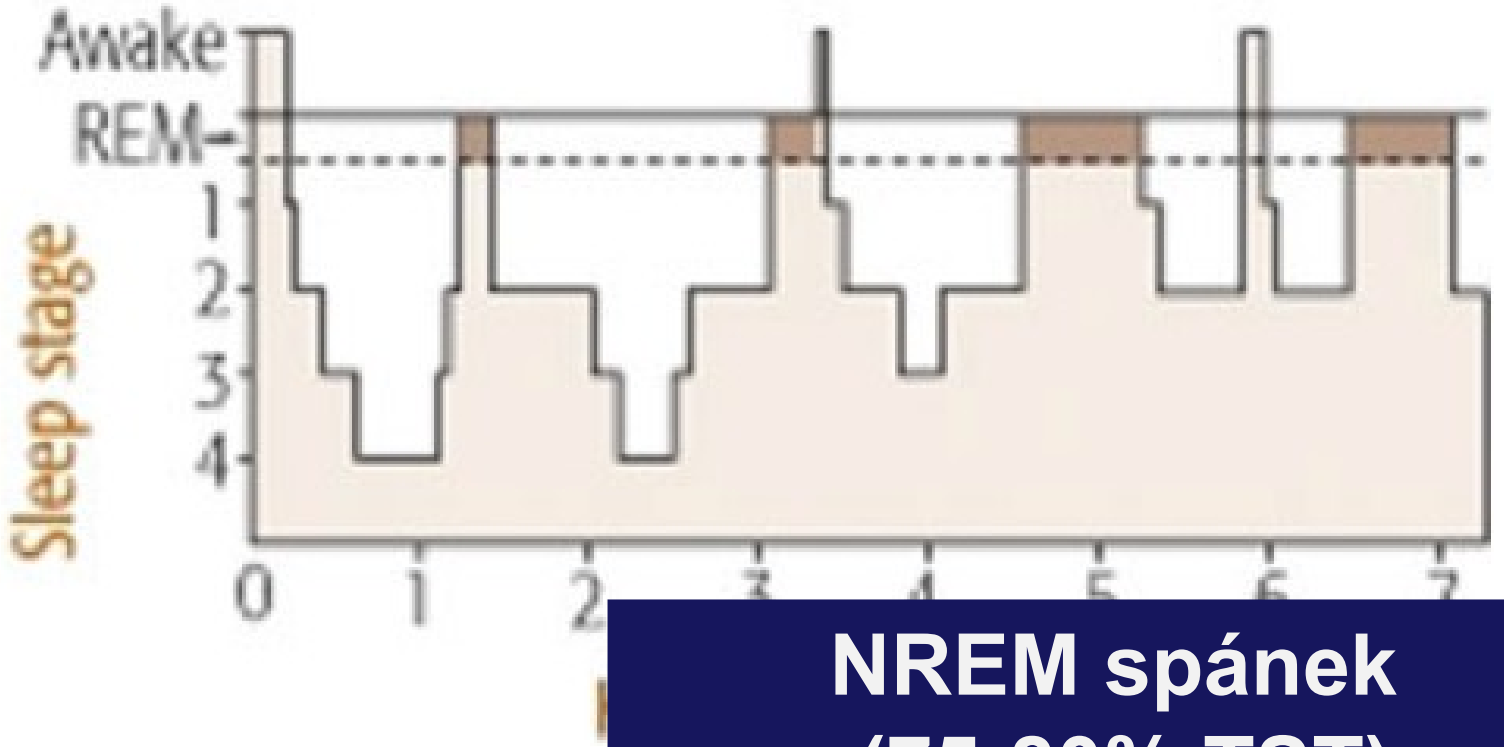


FIGURE 1. Normal sleep arc

REVIEW

Sleep in Hospitalized Medical Patients, Part 1: Factors Affecting Sleep

NREM spánek (75-80% TST)

REM spánek (20-25% TST)

Spánková architektura

Table 2. Sleep abnormalities in intensive care unit patients

Total sleep time	Unchanged/decreased
Sleep latency	Unchanged/increased
Sleep efficiency	Decreased
NREM stage 1	Increased
NREM stage 2	Increased
Sleep fragmentation	Increased
NREM stage 3	Decreased
NREM stage 4	Decreased
REM	Decreased

NREM, nonrapid eye movement; REM, rapid eye movement.

COCC 2007

Sleep disruption in the intensive care unit

Jonathan Y. Gabor, MSc, Andrew B. Cooper, MD, FRCPC, and Patrick J. Hanly, MD, FRCPC, ABSM

Jak “opravdu” spí náš pacient ?

Spí, když se zdá že spí ?

(= má zavřené oči a “neobtěžuje” ?)

The Journal of TRAUMA® *Injury, Infection, and Critical Care*

Quantity and Quality of Sleep in the Surgical Intensive Care Unit: Are Our Patients Sleeping?

Randall S. Friese, MD, Ramon Diaz-Arrastia, MD, PhD, Dara McBride, RN, Heidi Frankel, MD, and Larry M. Gentilello, MD

2007

Celková doba “spánku” 8 hodin

ALE …

- **Výrazná fragmentace spánku**
- **Převážně abnormální struktura**

Role svalové relaxace ?

- Pacienti na UPV
- 24 hodin polysomnografie
- NMBA - 22% doby “spánku” nespali

Sleep in Critically Ill Chemically Paralyzed Patients Requiring Mechanical Ventilation*

Kimberly A. Hardin, MD, MS, FCCP; Masud Seyal, MD, PhD; Ted Stewart, MS, RPSGT; and H. William Bonekat, DO

(CHEST 2006; 129:1468–1477)

Faktory ovlivňující kvalitu spánku

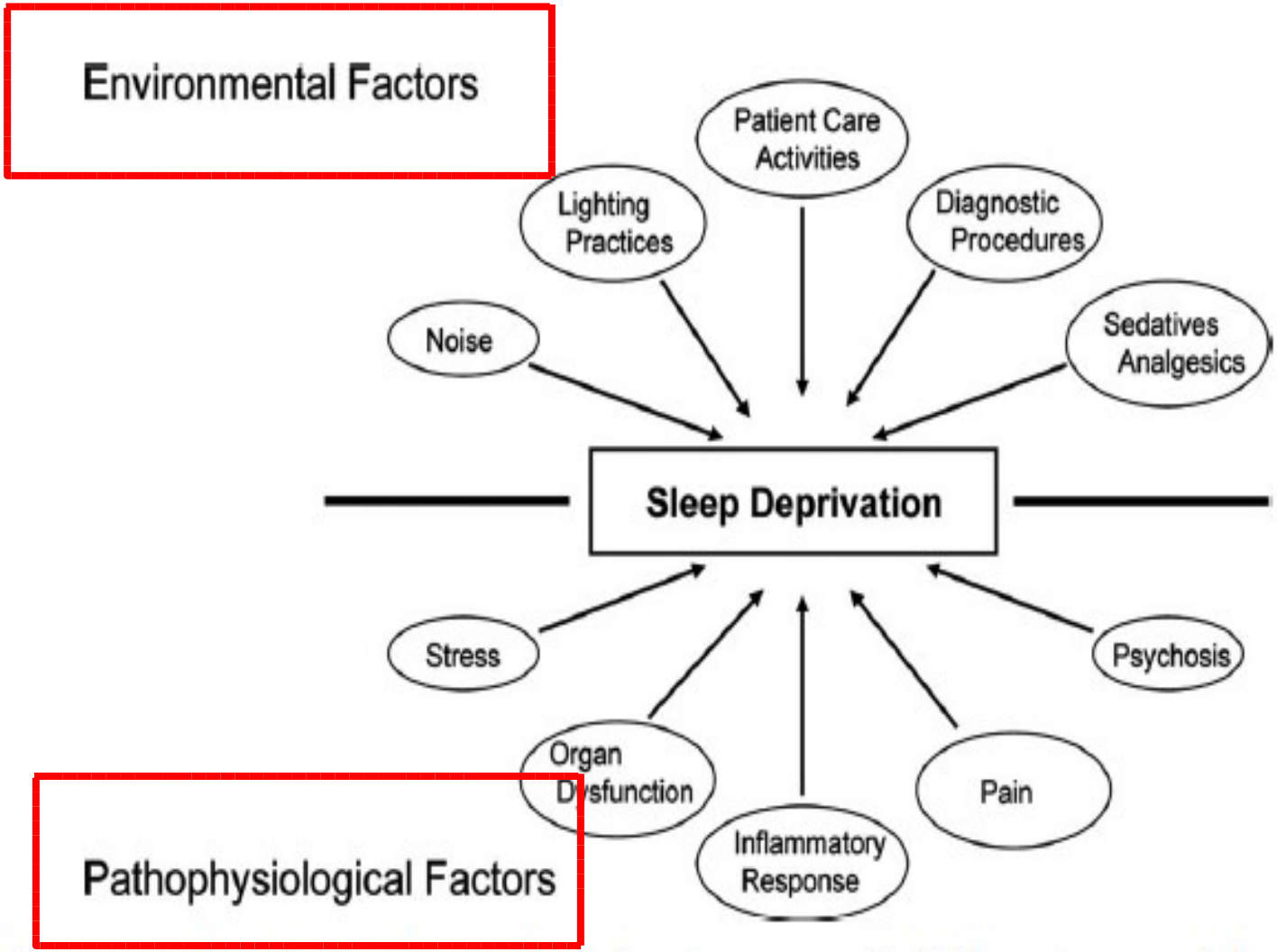


Figure 1. Causes of sleep deprivation in the intensive care unit. Both environmental and pathophysiological factors contribute to sleep deprivation in the intensive care unit.

Friese, Crit Care Med, 2008

Lze spánek na ICU a jeho kvalitu ovlivnit ?

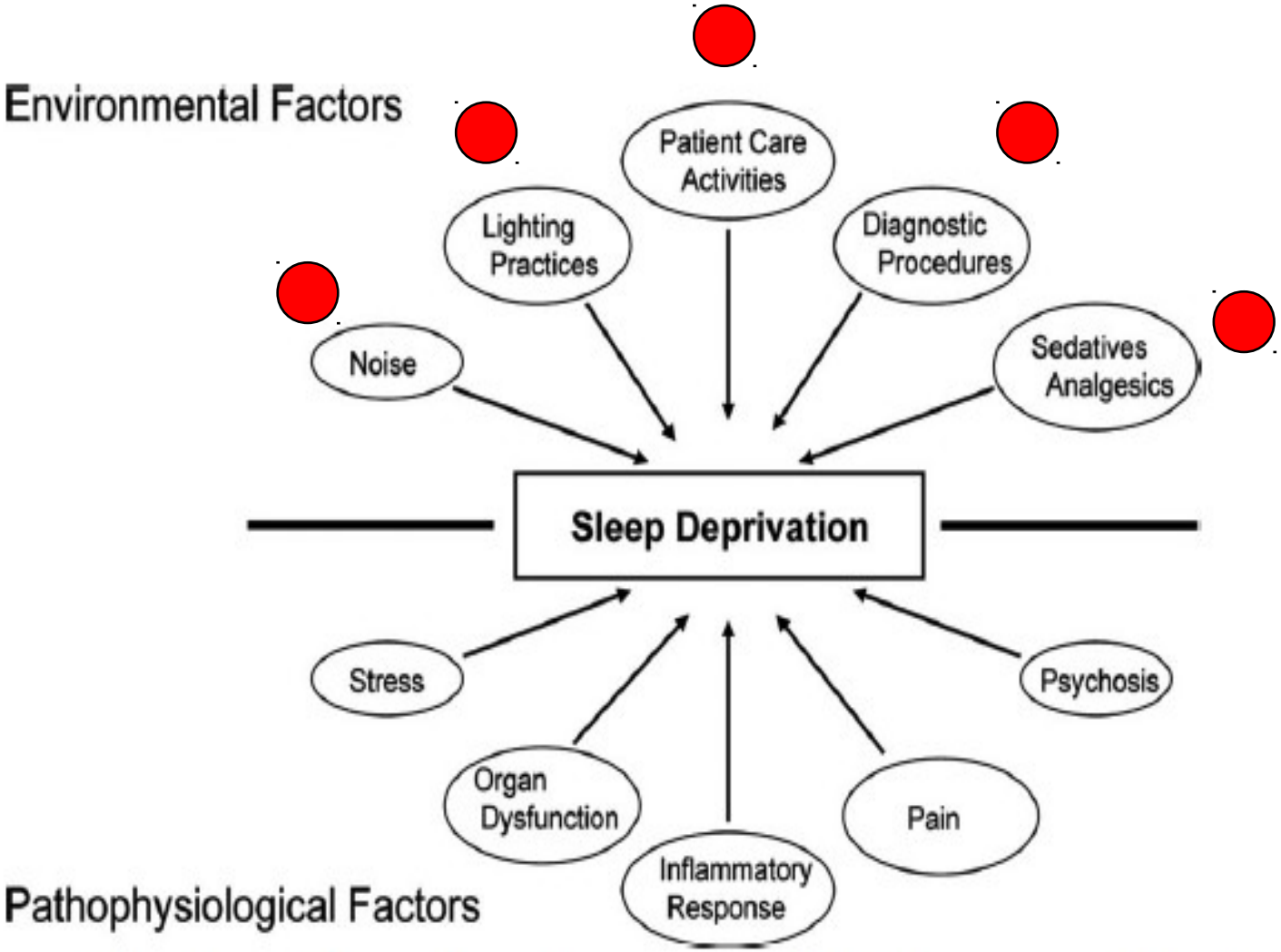


Figure 1. Causes of sleep deprivation in the intensive care unit. Both environmental and pathophysiological factors contribute to sleep deprivation in the intensive care unit.

Friese, Crit Care Med, 2008

The Effect of a Quality Improvement Intervention on Perceived Sleep Quality and Cognition in a Medical ICU*

Crit Care Med, 2013

Biren B. Kamdar, MD, MBA, MHS[1,2]; Lauren M. King, RN, MSN[1,3]; Nancy A. Collop, MD[4]; Sruthi Sakamuri, BS[5]; Elizabeth Colantuoni, PhD[1,6]; Karin J. Neufeld, MD, MPH[1,7]; O. Joseph Bienvenu, MD, PhD[1,7]; Annette M. Rowden, PharmD[8]; Pegah Touradji, PhD[1,9,10]; Roy G. Brower, MD[2]; Dale M. Needham, MD, PhD[1,2,10]

In conclusion, using a structured process, we implemented a multifaceted, multistage quality improvement intervention to promote sleep, demonstrating that such efforts were feasible as part of routine ICU care and were associated with significant reductions in perceived nighttime noise levels and a substantial decrease in delirium/coma.

Komplexní intervence je proveditelná součást rutinní péče

Oblasti možných intervencí ke zlepšení kvantity a kvality spánku

Komplexní proces typu "bundle"

zahrnující nefarmakologické a farmakologické postupy

Table 3. Considerations for an integrated strategy to promote sleep in the intensive care unit

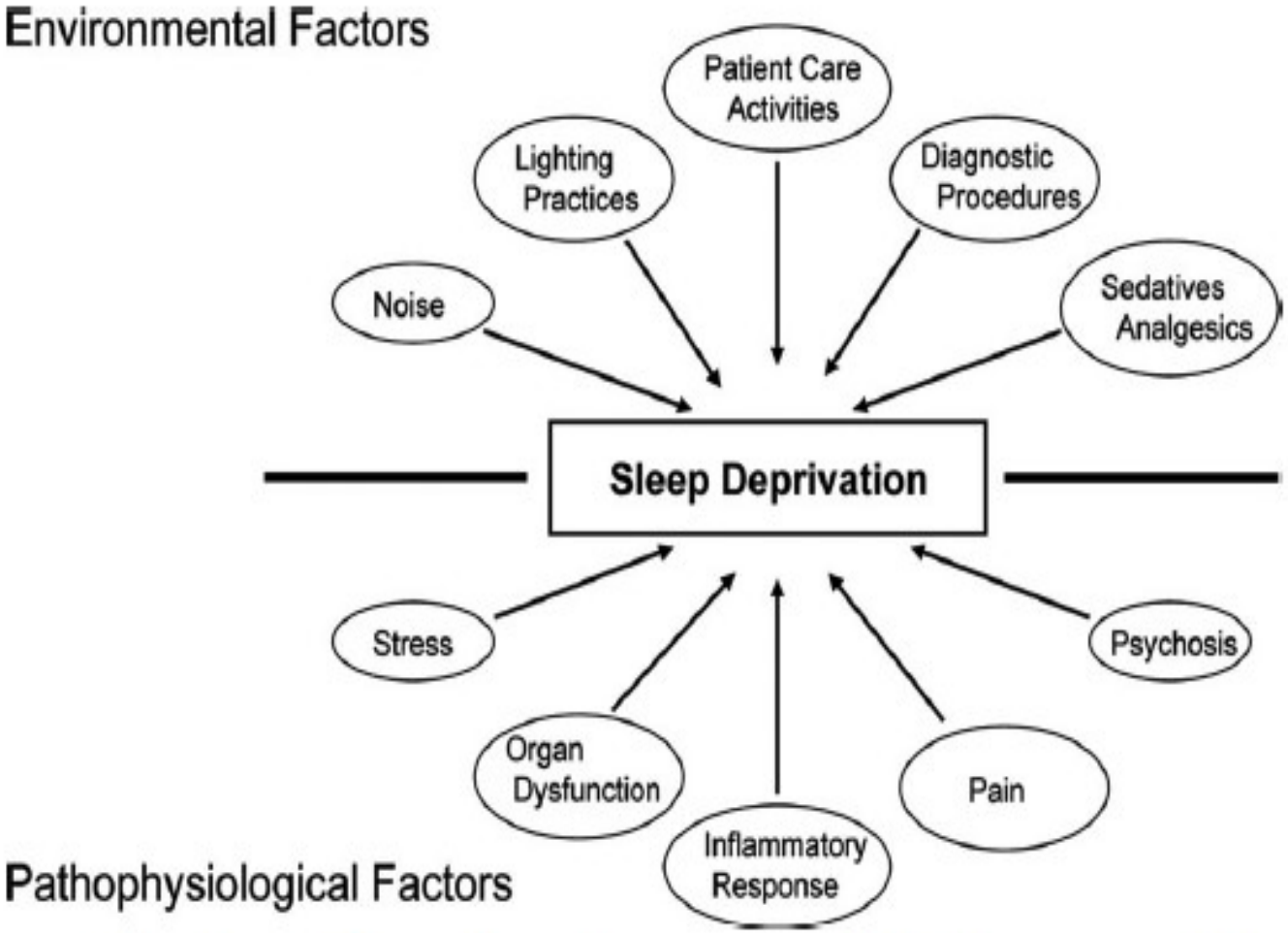
- Noise reduction
- Diurnal lighting practices
- Use of sleep-promoting pharmacologic agent
- Minimizing use of pharmacologic agents inhibiting sleep
- Uninterrupted time for adequate sleep
- Appropriate physiologic support
- Active promotion of patient orientation
- Patient-ventilator synchrony
- Relaxation techniques

Komplexní pojetí vyžaduje zásadní změnu dosavadního chování všech, kteří o pacienty na ICU pečují …

TABLE 2. Implementation of Sleep Quality Improvement Interventions

Intervention	Completion
Patient daytime interventions ($n = 735$ patient-days), n (%)[a,b]	
Blinds raised	578 (79)
Caffeine avoided after 3PM[c]	248 (54)
Less than 50% of day shift spent napping[d]	287 (45)
Patient nighttime interventions ($n = 826$ patient-nights), n (%)[a]	
Room lights dimmed before 10PM	642 (78)
Room curtain closed before 10PM	528 (64)
Warm bath before 10PM	403 (49)
Unnecessary alarms prevented	640 (77)
Room temperature optimized	637 (77)
Pain appropriately controlled	559 (68)
Television off	486 (59)
Estimated number of nurse interruptions between 10PM and 7AM	
0–5 interruptions	231 (28)
6–10 interruptions	177 (21)
>10 interruptions	111 (13)
Not reported	307 (37)
Soft music offered and accepted[e]	62 (11)
Eye mask offered and accepted[e]	10 (2)
Earplugs offered and accepted[e]	5 (1)
Medication given per sleep guideline[f]	61 (13)

Podstatou **“sleep – promoting”** intervencí jsou nefarmakologické postupy



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Friese, Crit Care Med, 2008

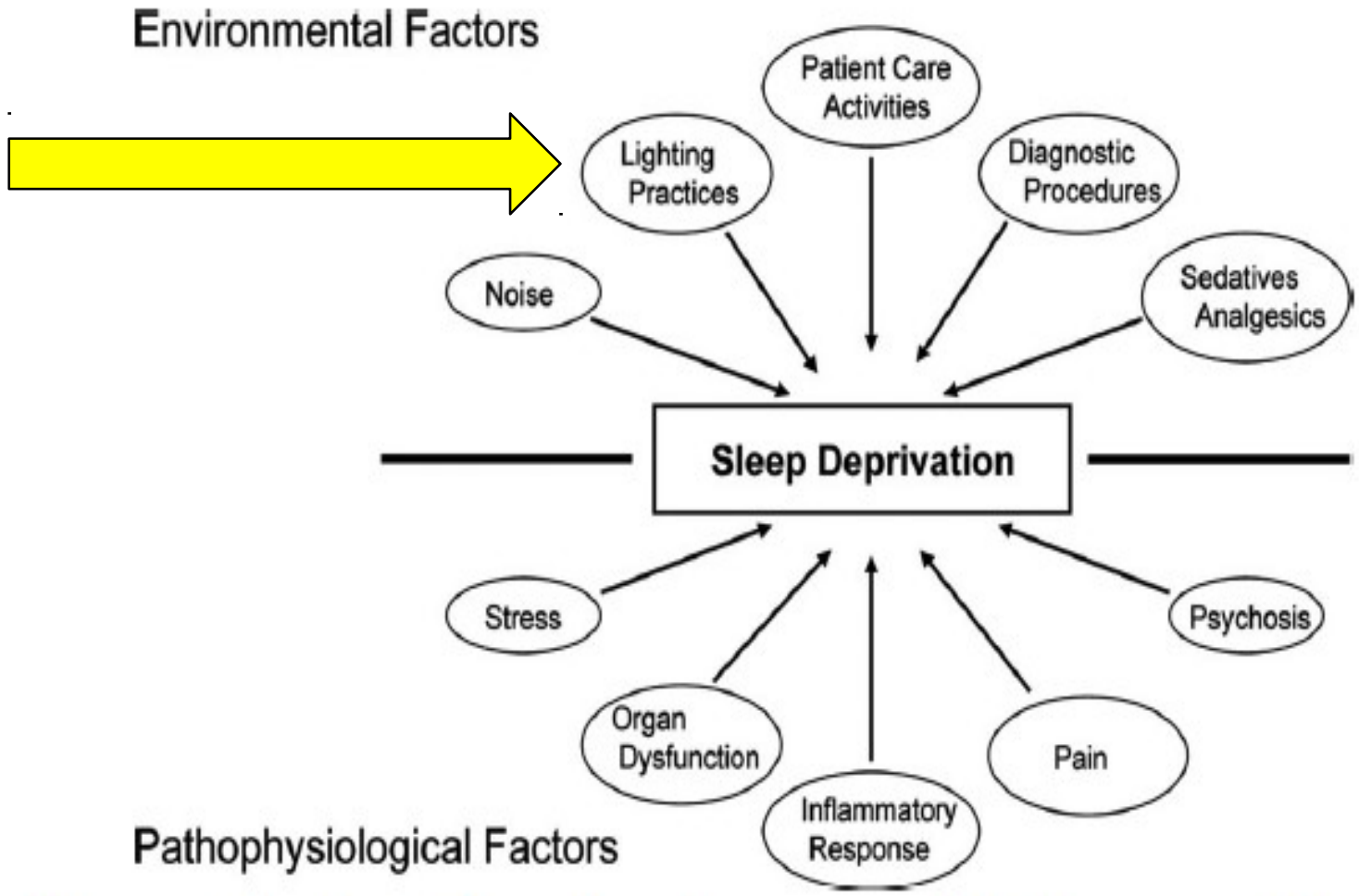
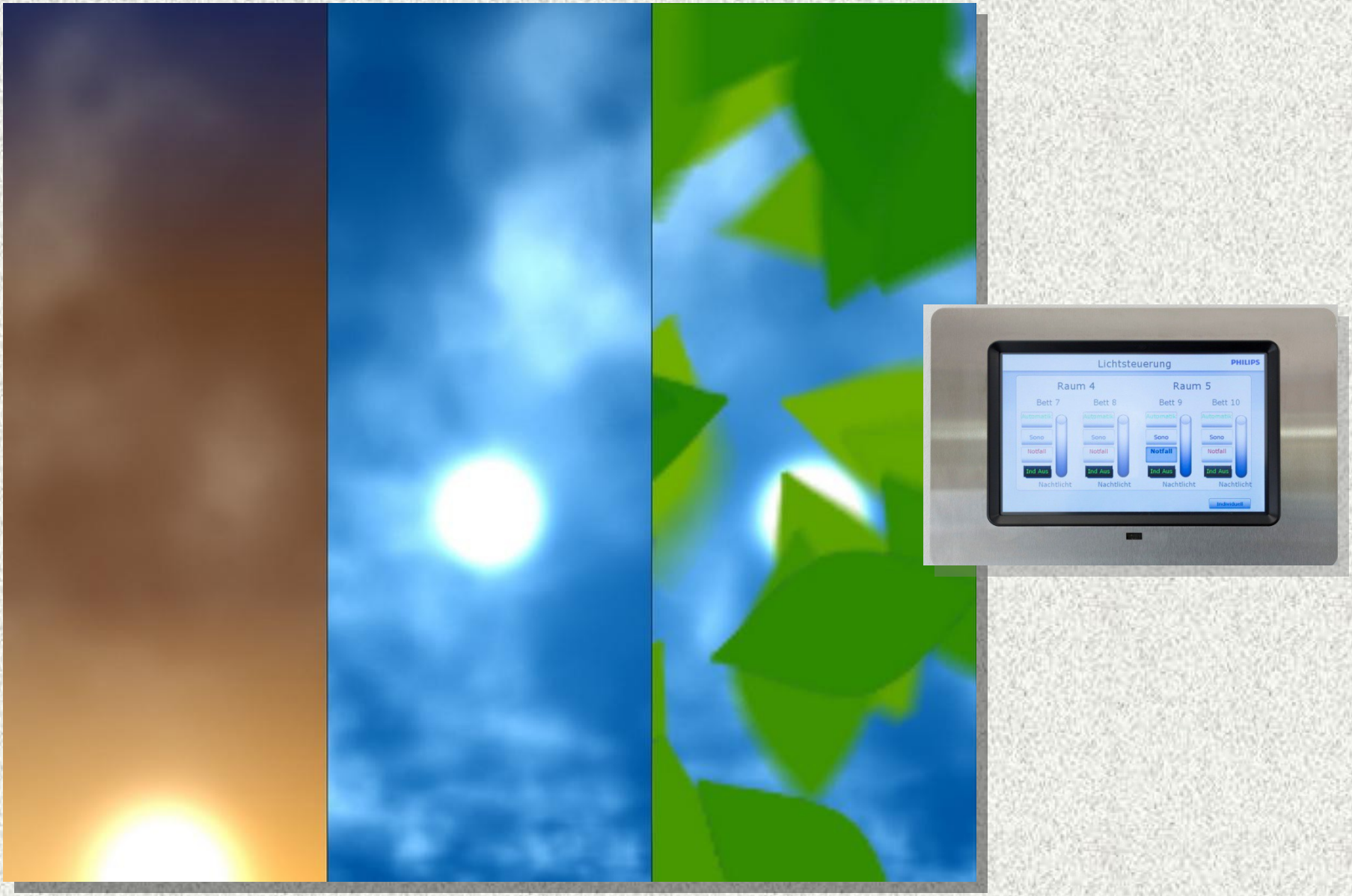


Figure 1. Causes of sleep deprivation in the intensive care unit. Both environmental and pathophysiological factors contribute to sleep deprivation in the intensive care unit.

Friese, Crit Care Med, 2008

Světlo a spánek na ICU
pohled do budoucnosti ?

Fotografie zapůjčeny laskavostí
MUDr. B. Stibora (Baden, Rakousko)


Lichtsteuerung
PHILIPS
Raum 4
Raum 5
Bett 7
Bett 8
Bett 9
Bett 10
Automatik
Sono
Notfall
Ind Aus
Nachtlicht
Individuell

Existuje ideální hypnotikum pro pacienty na ICU ?

Existuje ideální hypnotikum pro pacienty na ICU ?

Bohužel, extrémně málo dat …

… a zatím asi neexistuje

Je propofol ideální látkou pro "navození" spánku na ICU ?

Intensive Care Med (2012) 38:1640–1646
DOI 10.1007/s00134-012-2623-z

ORIGINAL

Eumorfia Kondili
Christina Alexopoulou
Nectaria Xirouchaki
Dimitris Georgopoulos

Effects of propofol on sleep quality in mechanically ventilated critically ill patients: a physiological study

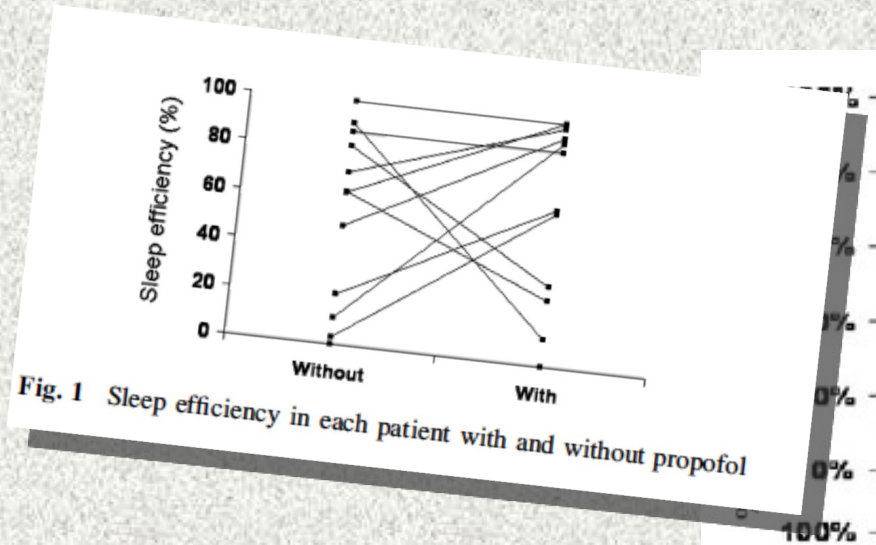


Fig. 1 Sleep efficiency in each patient with and without propofol

Není

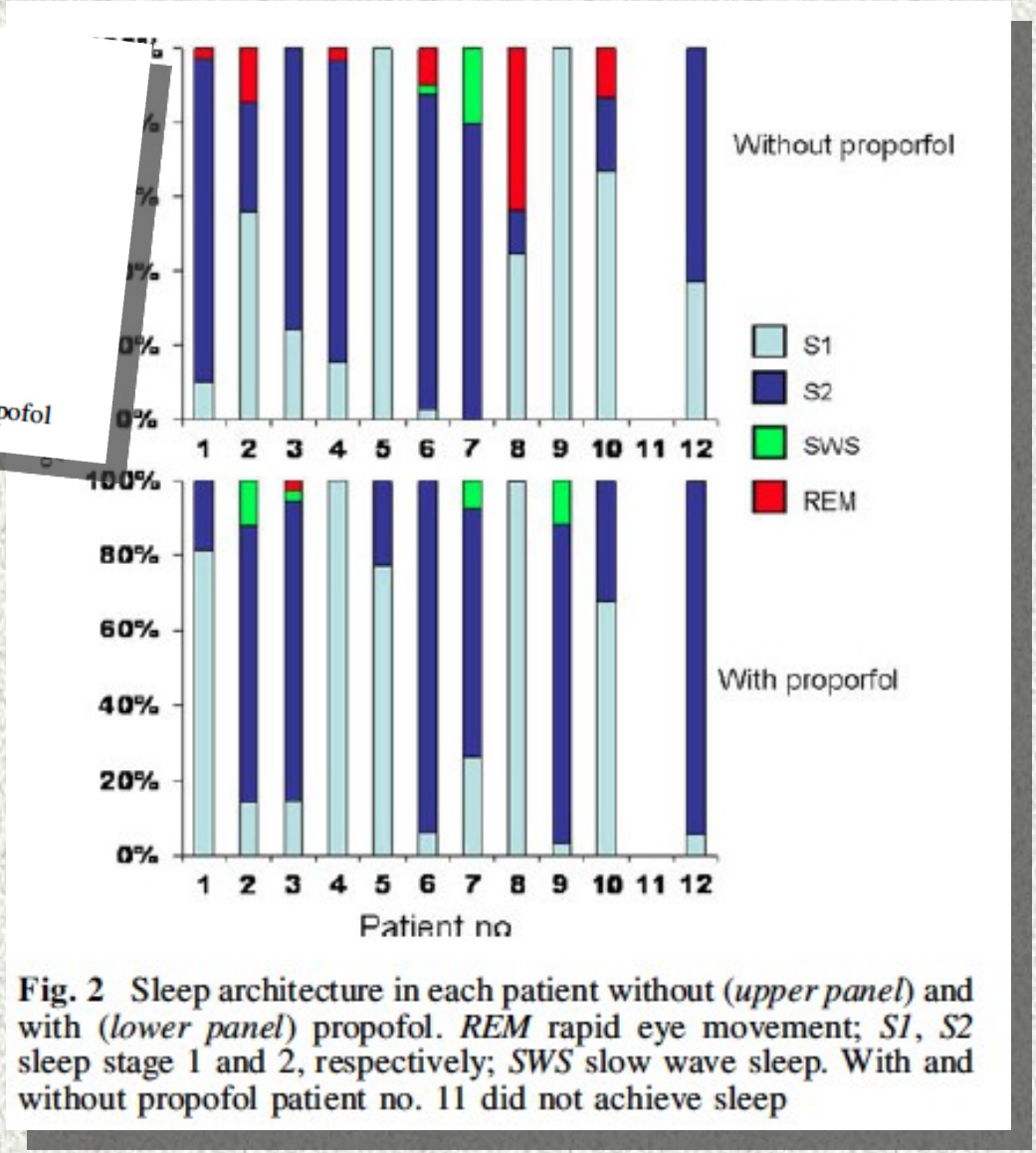


Fig. 2 Sleep architecture in each patient without (*upper panel*) and with (*lower panel*) propofol. *REM* rapid eye movement; *S1*, *S2* sleep stage 1 and 2, respectively; *SWS* slow wave sleep. With and without propofol patient no. 11 did not achieve sleep

Co víme …

- **Propofol, benzodiazepiny** zhoršují architekturu spánku (propofol časně po traumatu – zvýšení rizika deliria, snížení fáze REM spánku, zvýšení posttraumatického stresového syndromu

- **Dexmedetomidin** zlepšuje noční i denní proporci mezi lehkou a hlubokou fází spánku ...

Effects of Dexmedetomidine on Sleep Quality in Critically Ill Patients

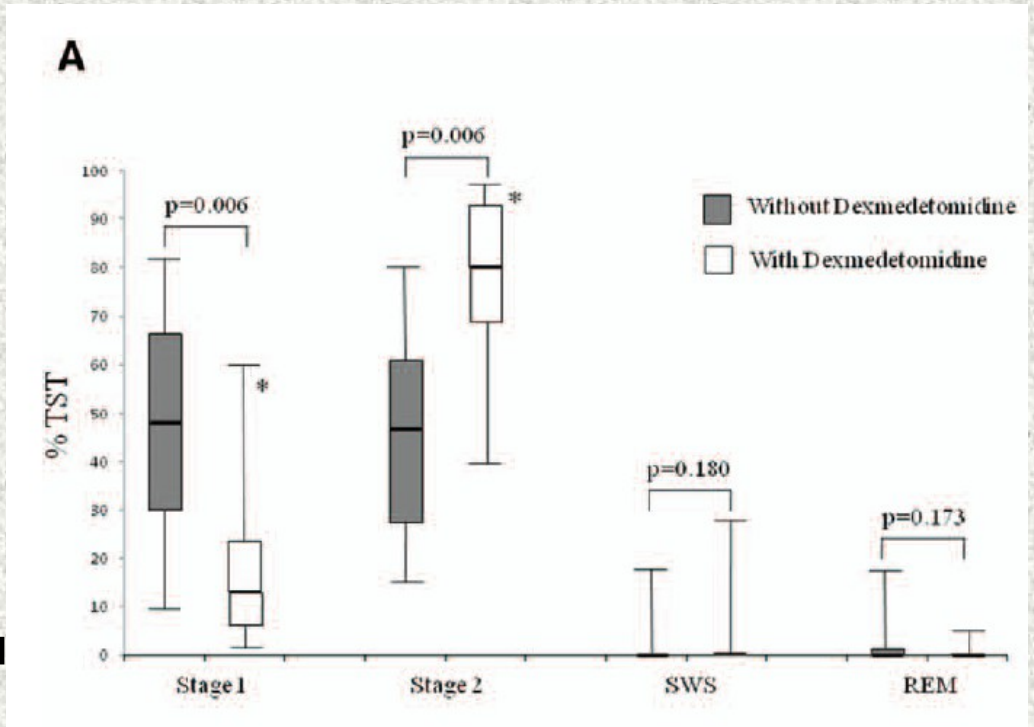
A Pilot Study

(ANESTHESIOLOGY 2014; 121:801-7)

Christina Alexopoulou, M.D., Eumorfia Kondili, M.D., Eleni Diamantaki, M.D., Charalambos Psarologakis, M.D., Sofia Kokkini, M.D., Maria Bolaki, M.D., Dimitris Georgopoulos, M.D., Ph.D.

In conclusion, this pilot study shows that night-time dexmedetomidine administration to achieve the recommended level of sedation in highly selected critically ill patients increases sleep efficiency and improves sleep quality by reducing the sleep fragmentation and shifting the sleep from stage 1 to stage 2. In addition, dexmedetomidine modifies the 24-h sleep pattern by shifting sleep mainly to the night, partly restoring normal circadian rhythm.

Lepší kvalita spánku
Nižší fragmentace spánku
Obnovení cirkadiánního rytmu



… ale existují i práce s opačnými výsledky

Intensive Care Med (2012) 38:1982–1989
DOI 10.1007/s00134-012-2685-y

ORIGINAL

Jun Oto
Katsunori Yamamoto
Shigefumi Koike
Mutsuo Onodera
Hideaki Imanaka
Masaji Nishimura

Sleep quality of mechanically ventilated patients sedated with dexmedetomidine

3–19.5/h). *Conclusions:* In mechanically ventilated patients, nighttime infusion of dexmedetomidine preserved the day-night cycle of sleep but induced severely disturbed sleep architecture without evidence of SWS or REM sleep.

“Dex” narušuje spánkovou architekturu

5.6.2014

DOPORUČENÝ POSTUP

ANALGEZIE A SEDACE DOSPĚLÝCH PACIENTŮ V INTENZIVNÍ PÉČI

3.4. Spánek u pacientů v IP

- Absence spánku přiměřené kvality a délky je významným faktorem rozvoje deliria a mozkové kognitivní dysfunkce i po propuštění z pracoviště IP
- Dosažení a udržení spánku s využitím všech možných organizačních opatření (světelná pohoda, kontrola hluku, minimalizace intervencí apod.) by mělo být nedílnou součástí komplexního postupu u všech pacientů v IP
- Přiměřená a formalizovaná organizační opatření pro noční chod pracoviště IP jsou považována za vhodná
- V současnosti používaná farmaka k sedaci (benzodiazepiny, propofol) nezajistí dosažení fyziologických vzorců spánkové aktivity
- Současný stav poznání neumožňuje formulovat doporučení pro volbu farmaka/lékové skupiny k navození spánku u pacientů v IP
- Benzodiazepiny nejsou doporučeny jako farmaka první volby k navození spánku u pacientů v IP (–2B)[§]

Pregabalin jako ideální hypnotikum ?

1. J Clin Sleep Med. 2014 May;10(5):545-50. doi: 10.5664/jcsm.3708.

Effects of pregabalin in patients with hypnotic-dependent insomnia.

Cho YW(1), Song ML(2).

Efficacy and safety of pregabalin for treating painful diabetic peripheral neuropathy: a meta-analysis

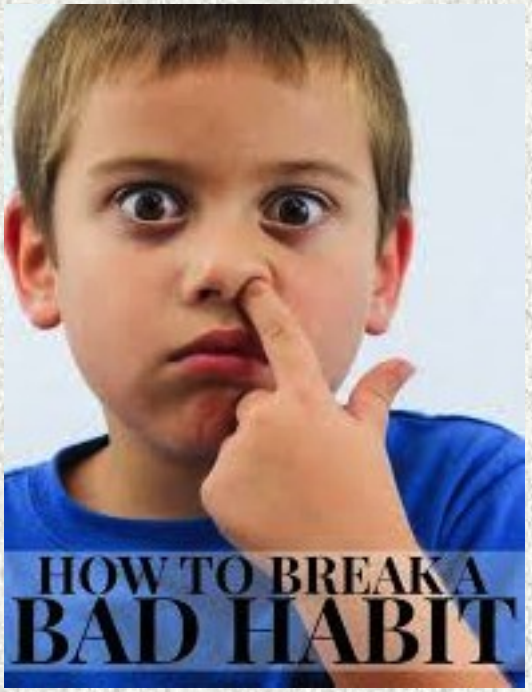
S.-S. Zhang[1]*, Z. Wu[2]*, L.-C. Zhang[3]*, Z. Zhang[1], R.-P. Chen[1], Y.-H. Huang[4] and H. Chen[1]

[1]Department of Endocrinology, Zhujiang Hospital, Southern Medical University, Guangzhou, China
[2]Department of Neurology, Nanfang Hospital, Southern Medical University, Guangzhou, China
[3]Department of Anorectal Surgery, The Affiliated Hospital of Jiangxi University of Traditional Chinese Medicine, Nanchang, China
[4]Department of Colorectal and Anal Surgery, First Affiliated Hospital, Guangxi Medical University, Nanning, Guangxi, China

Acta Anaesth Scand, 2014

Závěr

1. Poruchy spánku jsou časté a ovlivňují klinický výsledek pacientů v IP
2. Dosažení spánku by mělo být jedním z cílů naší léčby a denní otázkou během vizity
3. Ideální hypnotikum NEEXISTUJE
4. Nefarmakologické postupy (tj. změna fungování pracoviště IP) mají klíčovou roli



ICU Culture Change Necessary …

Děkuji za pozornost