



**BaltAnestIC 2023**

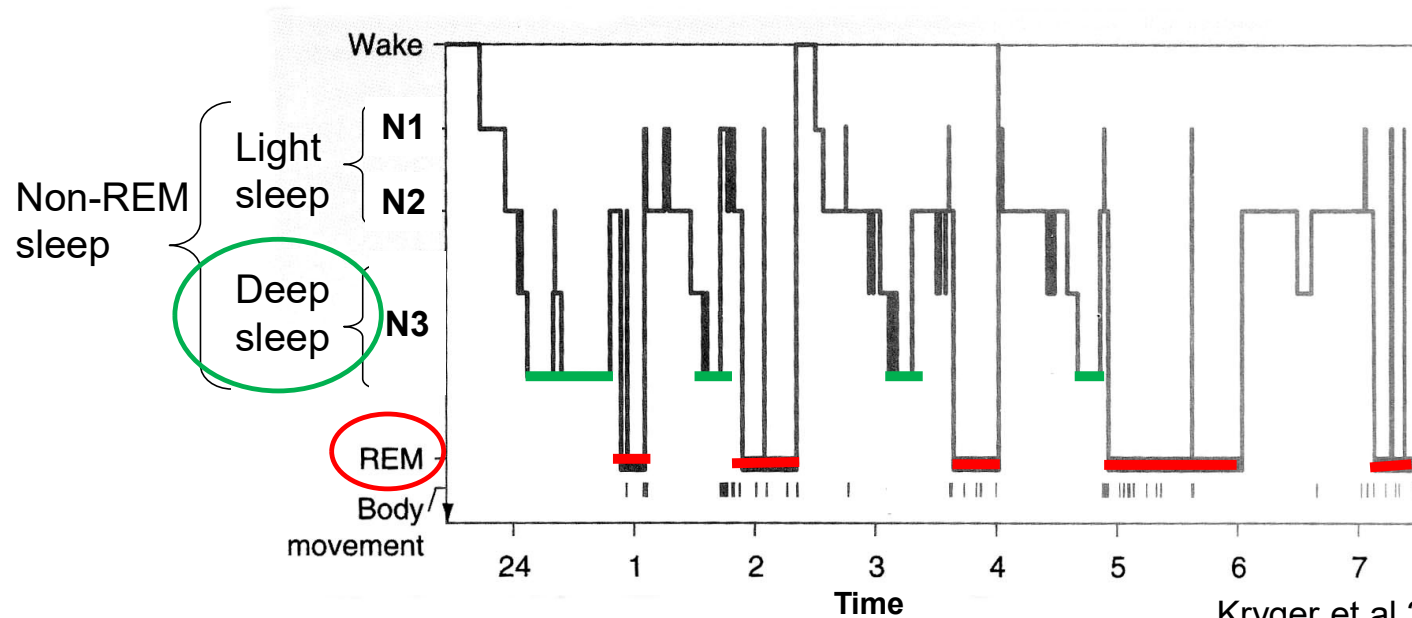
# ICU PATIENTS' SLEEP PROMOTION

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# NORMAL SLEEP



Kryger et al 2011, Rowley 2012 modified

# WHY SLEEP IS IMPORTANT

## Deep sleep (N3)

- energy restored, brain "cleaned"
- growth hormone  $\uparrow$  -> tissue repair  $\uparrow$
- Cortisol secretion  $\uparrow$

## REM sleep

- reorganization of memories
- a factor behind ICU delirium?

## Sleep structure

N1 2-5 %

N2 45-55 %

N3 deep sleep 13-23 %

REM 20-25 %

# SLEEP DEPRIVATION

Acute sleep deprivation causes, e.g.

- memory loss, mistakes ↑, hand tremor, slurred speech
- sensitivity to pain ↑, seizure activity ↑
- respiratory muscle strength ↓, FEV<sub>1</sub> ↓, FVC ↓, apneas ↑
- immune function ↓, growth hormone ↓

Chronic sleep deprivation causes

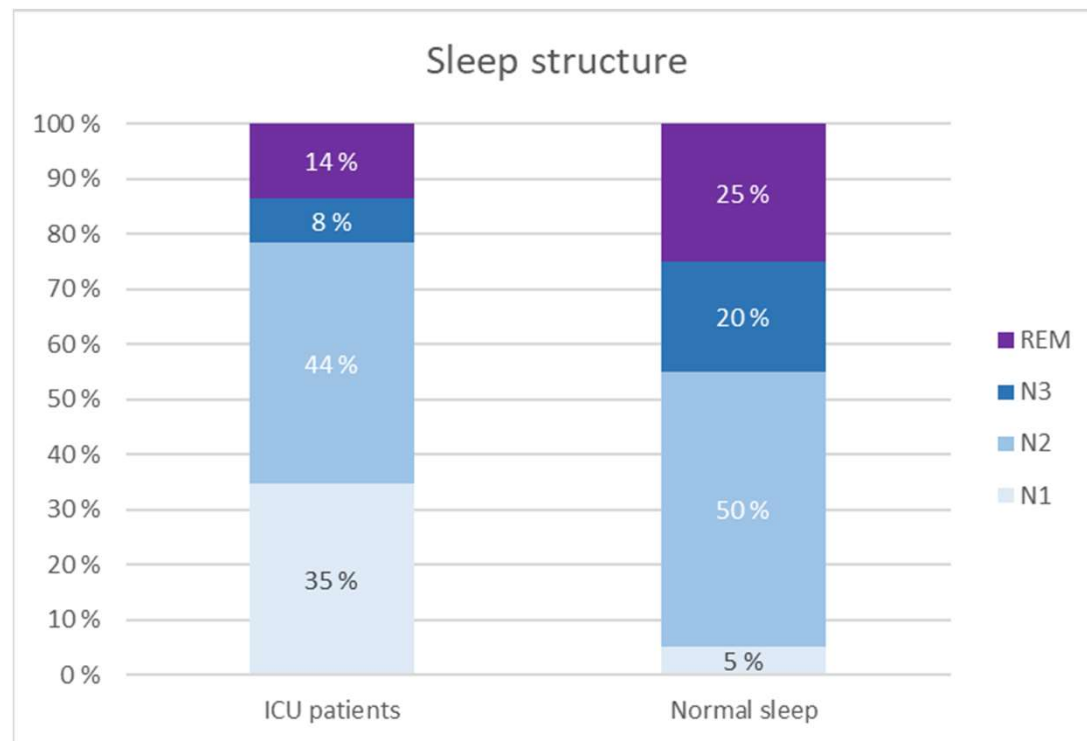
- glucose tolerance ↓
- sympathetic activity ↑

Friese et al. 2008, Kryger et al 2011, Kamdar 2012

# HOW DO PATIENTS SLEEP IN AN ICU?

# SLEEP STRUCTURE – SLEEP IS LIGHT

TST 110 hours



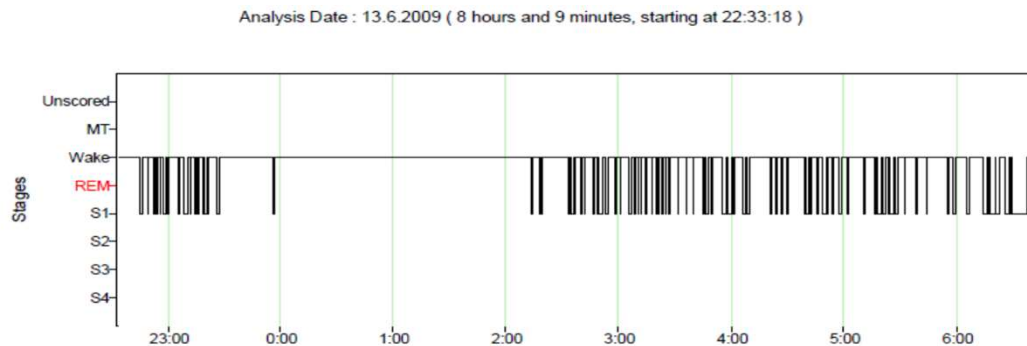
## SLEEP IS FRAGMENTED

n = 21

Sleep	MD	IQR	Min	Max	values
TST min	387	170, 486	0	621	450-510
N1/TST (%)	27	19, 97	1	100	2-5
N2/TST (%)	32	2, 67	0	88	45-55
N3/TST (%)	0	0, 8	0	42	13-23
REM/TST (%)	1	0, 8	0	65	20-25
Arousals/h (n)	12	2, 20	0	69	<1
Awakenings/hr (n)	5	2, 13	0	53	<1
FI (n)	27	15, 39	2	73	

# ICU PATIENTS' SLEEP CHARACTERISTICS

- Total sleep time decreased, 50 % during the daytime
- Light – very little deep sleep and REM sleep
- Fractional – arousals/awakenings up to 73/hour



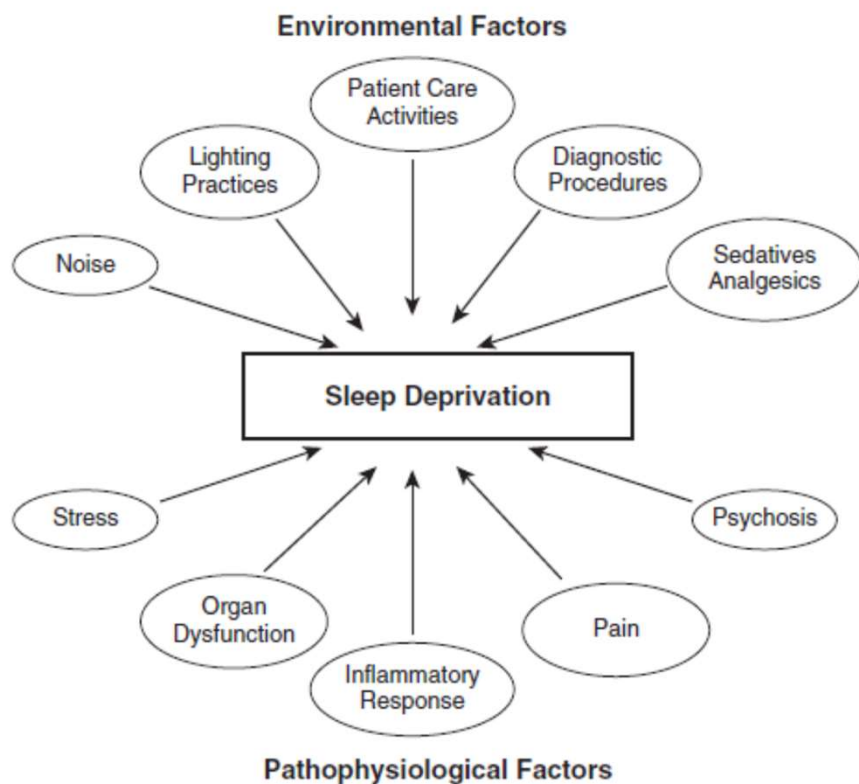
- **Huge differences between individuals**





# WHAT DISTURBS ICU PATIENTS' SLEEP?

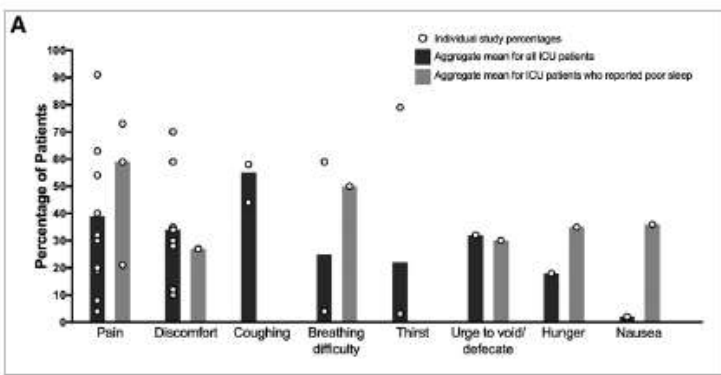
# SLEEP DISTURBING FACTORS IN AN ICU



**Figure 1.** Factors related to sleep deprivation in critically ill patients.

Pisani ym. 2015



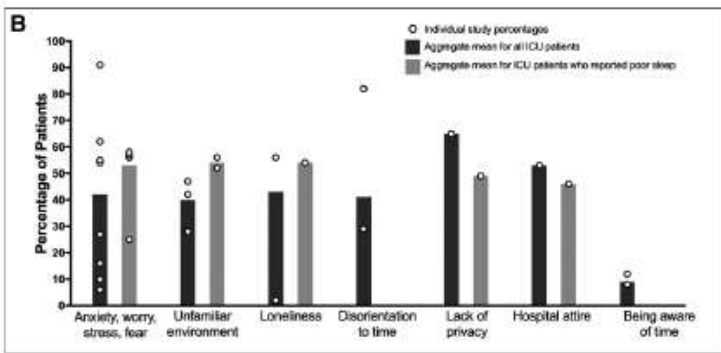


Physiological risk factors

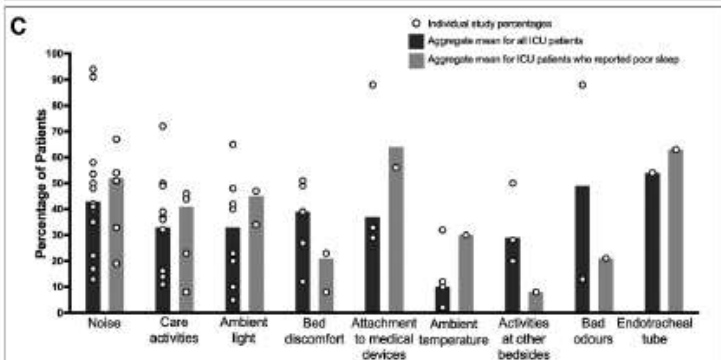
## A Systematic Review of Risk Factors for Sleep Disruption in Critically Ill Adults

Kimia Honarmand, MSc, MD, FRCPC<sup>1,2</sup>; Hammad Rafay, MD<sup>1,2</sup>; Jamie Le, MD, FRCPC<sup>3</sup>; Sindu Mohan, MD, FRCPC<sup>4</sup>; Bram Rochweg, MD, MSc, FRCPC<sup>5,6</sup>; John W. Devlin, PharmD, MCCM<sup>7,8</sup>; Yoanna Skrobik, MD, MSc, FRCPC<sup>8</sup>; Gerald L. Weinhouse, MD<sup>9</sup>; Xavier Drouot, MD, PhD<sup>10</sup>; Paula L. Watson, MD<sup>11</sup>; Sharon McKinley, PhD, RN<sup>12</sup>; Karen J. Bosma, MD, FRCPC<sup>1,2</sup>

Crit Care Med 2020; 48:1066–1074  
62 articles



Psychological risk factors



ICU-related risk factors

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Figure 2. Patient-reported risk factors for sleep disruption. Patient-reported (A) physiologic, (B) psychologic, and (C) ICU-related risk factors for sleep disruption in ICU.

# SLEEP DISTURBING FACTORS IN AN ICU

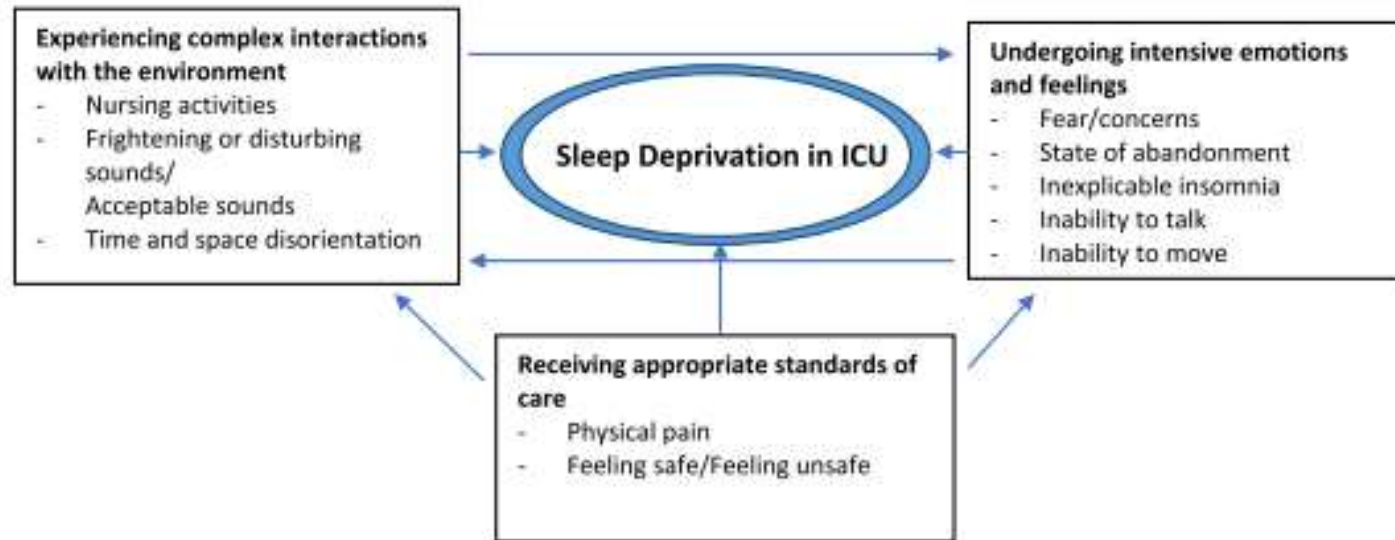
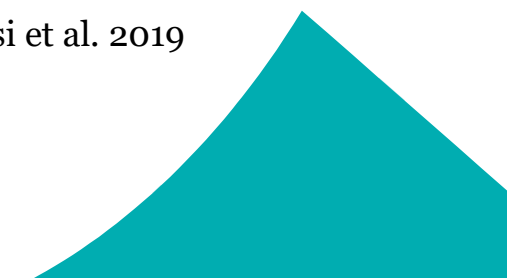


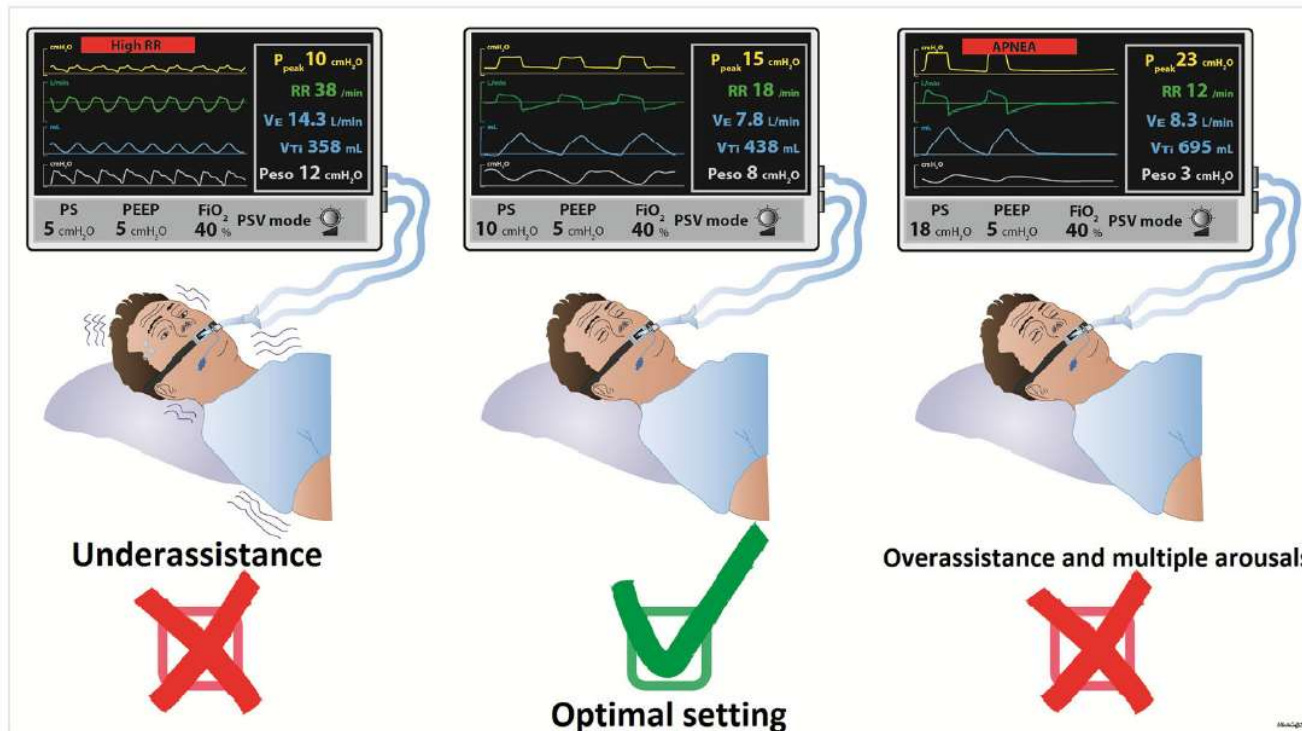
Fig. 2. Determinants of sleep deprivation in ICU according to the experience of patients. ICU, Intensive Care Unit.

Mattiussi et al. 2019

## Sleep hygiene



# MECHANICAL VENTILATION



**Fig. 2** Effect of pressure support ventilation on sleep in the ICU. Level of pressure support should be set according to the patient's demand to avoid underassistance (which may increase patient effort) and to avoid hyperventilation (leading to central apnea)

30.9.2023

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Rittayamai N. et al. Positive and negative effects of mechanical ventilation on sleep in the ICU: a review with clinical recommendations, *Intensive Care Med* (2016) 42:531–541

# PHARMACOTHERAPY

Opioids, sedation decrease sleep quality

**Table 2** Effect of common sedative medications on sleep in critically ill patients

Medication	Class of medication	Elimination half-life	Effect on sleep architecture
Midazolam	Benzodiazepine	2–6 h	↓ SWS = deep sleep ↓ REM sleep
Propofol	GABA <sub>A</sub> agonist	30–60 min	↓ SWS ↓ REM sleep
Dexmedetomidine	Alpha-2 agonist	2 h	Preserve circadian rhythm ↑ Sleep efficiency ↓ Sleep fragmentation

Rittayamai N. *ym.* Intensive Care Med (2016) 42:531–541

# HOW CAN WE HELP ICU PATIENTS TO SLEEP?

# SINGLE SLEEP SUPPORT INTERVENTIONS

- Earplugs, eye mask
- White noise, music
- Aromatherapy
- Massage
- Acupressure
- Light intensity
- Quiet Time
- Minimizing nursing care

Jun et al. 2021

Subjective sleep improvement

Evidence weak



# COMBINATION OF INTERVENTIONS

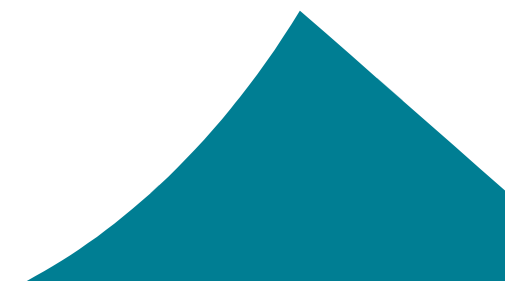
- Sleep guidelines (Elliott & McKinley 2014)
- Sleep promotion bundle (Louzon et al. 2022; Edvardsen & Hetmann 2020; Patel et al. 2014)
- Quality improvement interventions (Tonna et al. 2021; Kamdar et al. 2013)
- Naptime protocol (Knauert et al. 2019)

**Target different  
disturbing factors**  
**Evidence of the  
effect minimal**

# AIM

To improve ICU patients' sleep quality by developing a sleep support intervention that includes

- an assessment of ICU patients' sleep related habits (interview)
- an individualized sleep support care plan based on the interview
- universal sleep support practices produced by ICU nurses



# DEVELOPMENT OF THE SLEEP SUPPORT INTERVENTION

**Survey** to home sleepers (n=114)

- What is done an hour before going to sleep?
- What supports sleep?
- What disturbs sleep?

Results analysed in a **focus group** of 7 ICU nurses

- Feasibility of supporting patients' sleep habits in the ICU

A **questionnaire** was developed to interview patient/next-of-kin

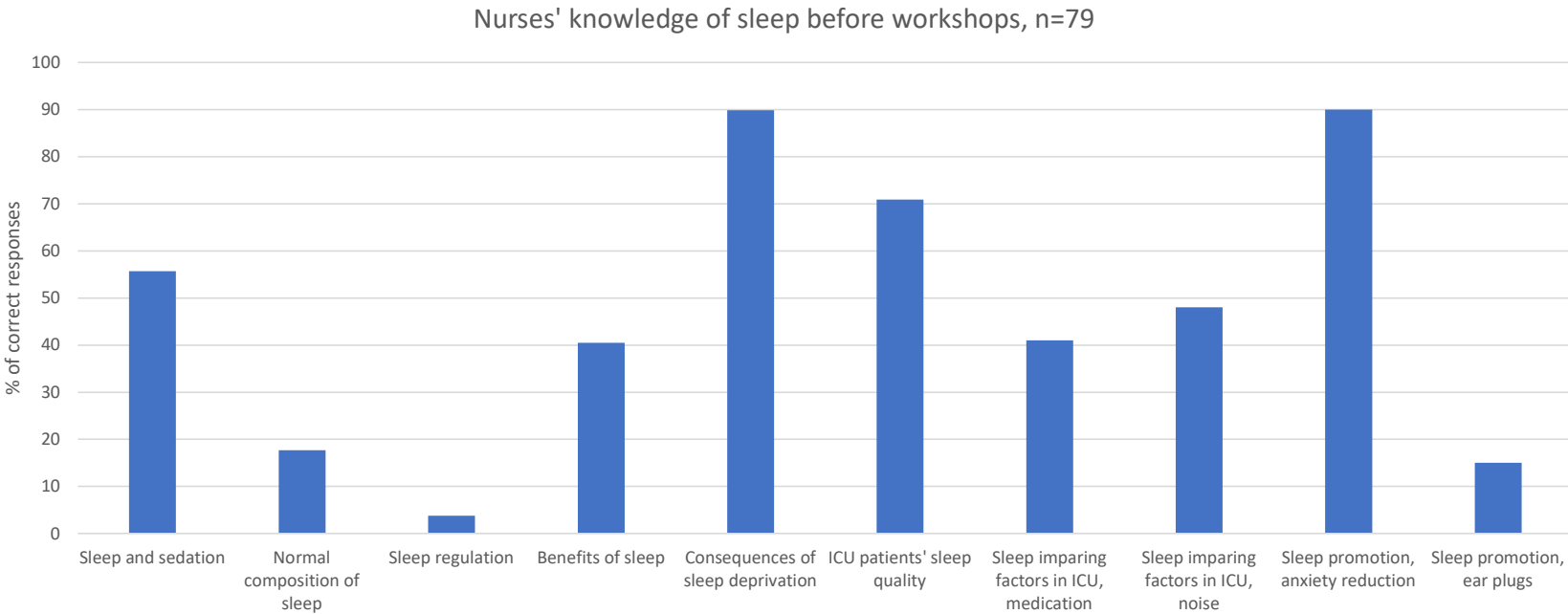
-> **care plan** formulated, executed, and documented

14 **Work shops** for ICU nurses (n=82)

- Lecture about importance, ICU patients' sleep, support methods
- Development of general sleep support guidelines
- Testing the sleep questionnaire and the care plan



# HOW MUCH NURSES KNOW ABOUT SLEEP



## TAKE HOME MESSAGE

- Patients sleep poorly in the ICU
- Nurses are in the key position to support patients' sleep – education!
- Control the ICU environment and unnecessary disturbances, help patients to feel safe
- The patient-centered approach in the development of Sleep Habit Home Interview and sleep support care plan is expected to improve patients' sleep quality in ICU
- Nurses' involvement in the development process is expected to help to adapt the intervention into daily ICU nursing care



# THANK YOU!

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Okay, relax and we'll  
let you fall asleep like  
normal....



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