

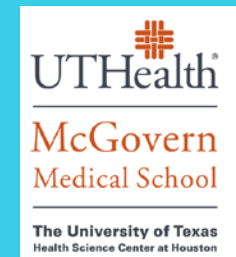


**SCCM**

Society of Critical Care Medicine - Texas Chapter



# Sleepless in the ICU: Lessons learned



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# Disclosures

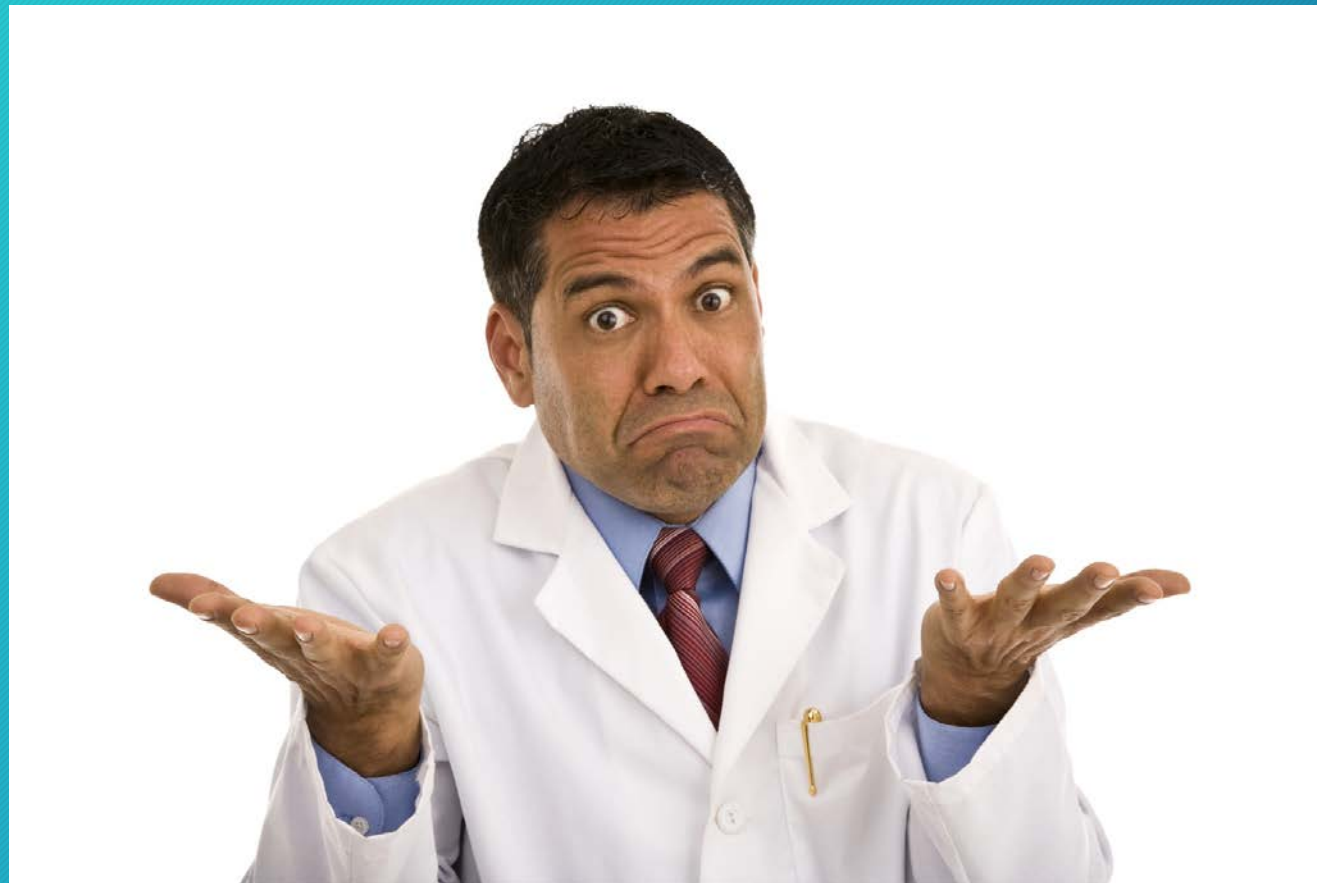
- No conflicts of interest to disclose

# Learning Objectives

1. Recognize reasons for and consequences of adequate sleep for patients in the ICU
2. Identify interventions that can promote sleep in the ICU

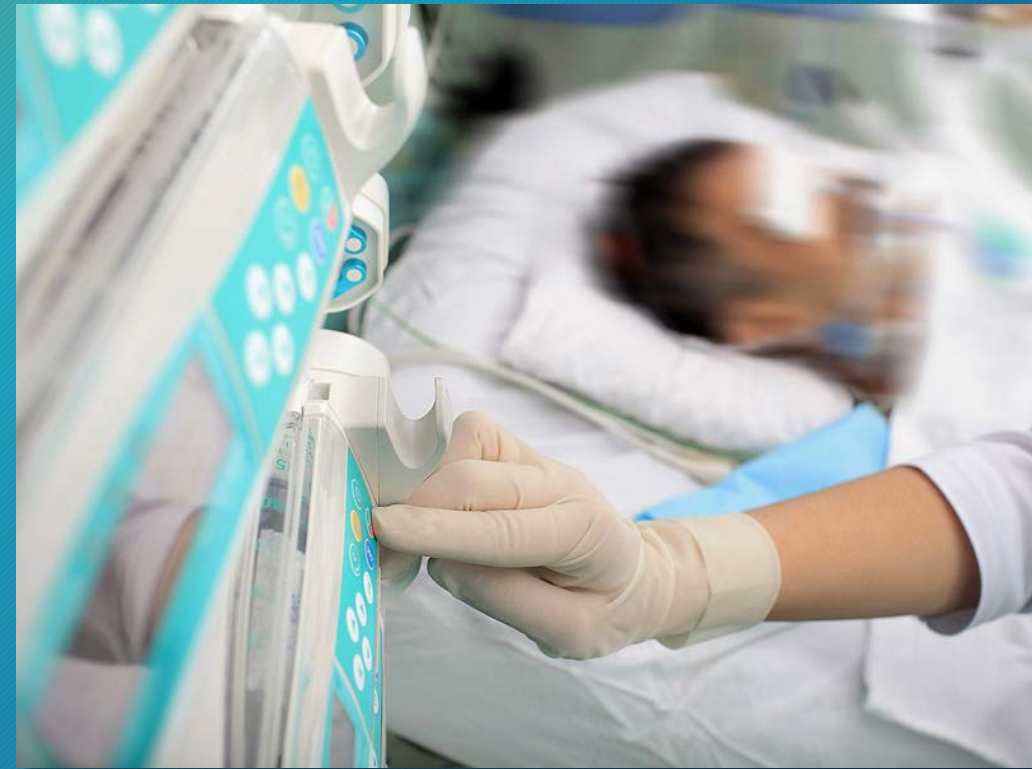


ICU Doctor.....Sleep Doctor.....ICU....Sleep....



# Sleep in the Hospital

- Surveys of ICU survivors have shown that sleep deprivation and the inability to sleep rank among the **top 3 major sources of anxiety and stress during the ICU stay**
- Persistent sleep disturbances in up to **44% of patients** 3 months after discharge



\*Simini B. Patients' perceptions of intensive care. *Lancet*. 1999; 354(9178):571-572

\*Eddleston et al. Survival, morbidity, and quality of life after discharge from intensive care. *Crit Care Med* 2000;28(7):2293-9



Do we have our heads in the sand.....?

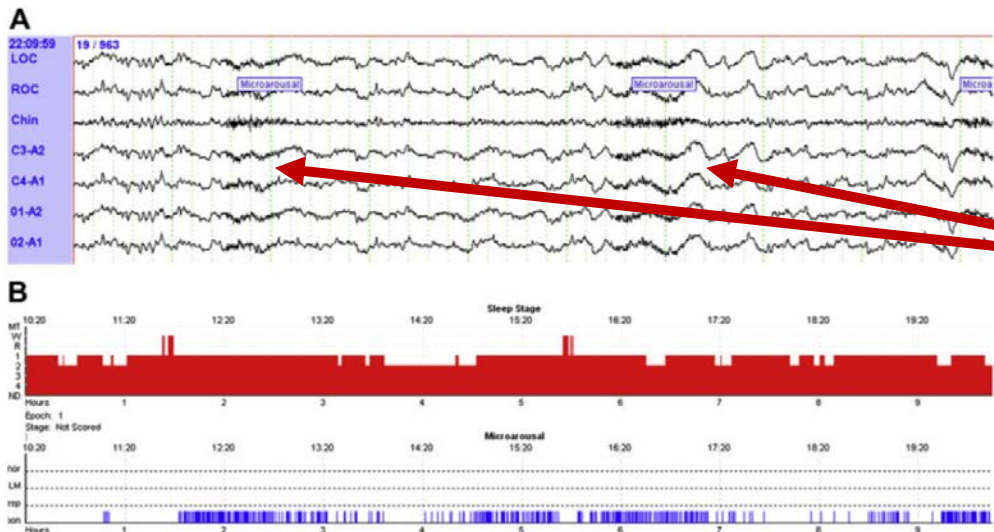


# Sleep in the Hospital

Evidence suggested that sleep disruption is most likely due to a combination of **intrinsic and external factors** which impact differently across patients according to each particular circumstance.



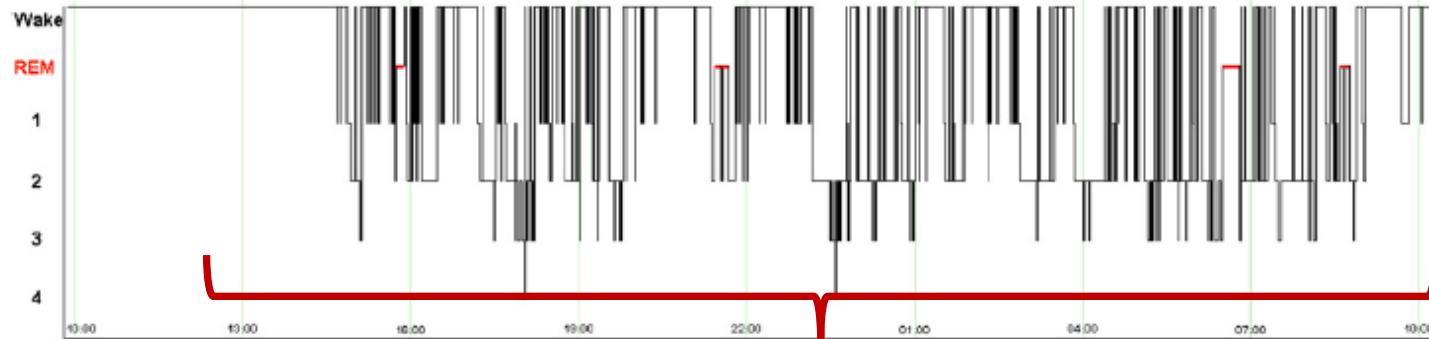




Increased number of arousals and N1 sleep

**Fig. 1.** Sleep in ICU patients is often severely fragmented and characterized by an increase in light sleep and a paucity of slow wave and REM sleep. (A) Polysomnography tracing from a critically ill, sedated patient, demonstrating sleep fragmentation with microarousals noted approximately every 10 s. (B) Sleep histogram from the same patient showing a predominance of stage I sleep with frequent microarousals.

Weinhouse et al. Sedation and Sleep Disturbances in the ICU. Crit Care Clin 25 (2009) 539-549



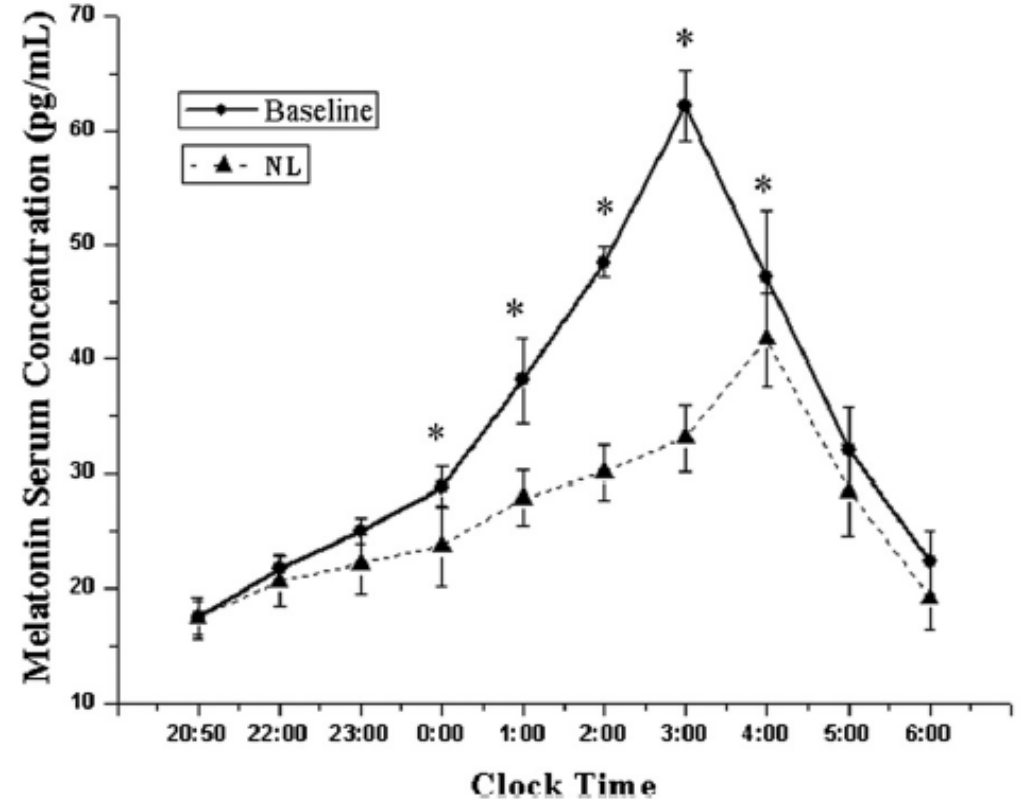
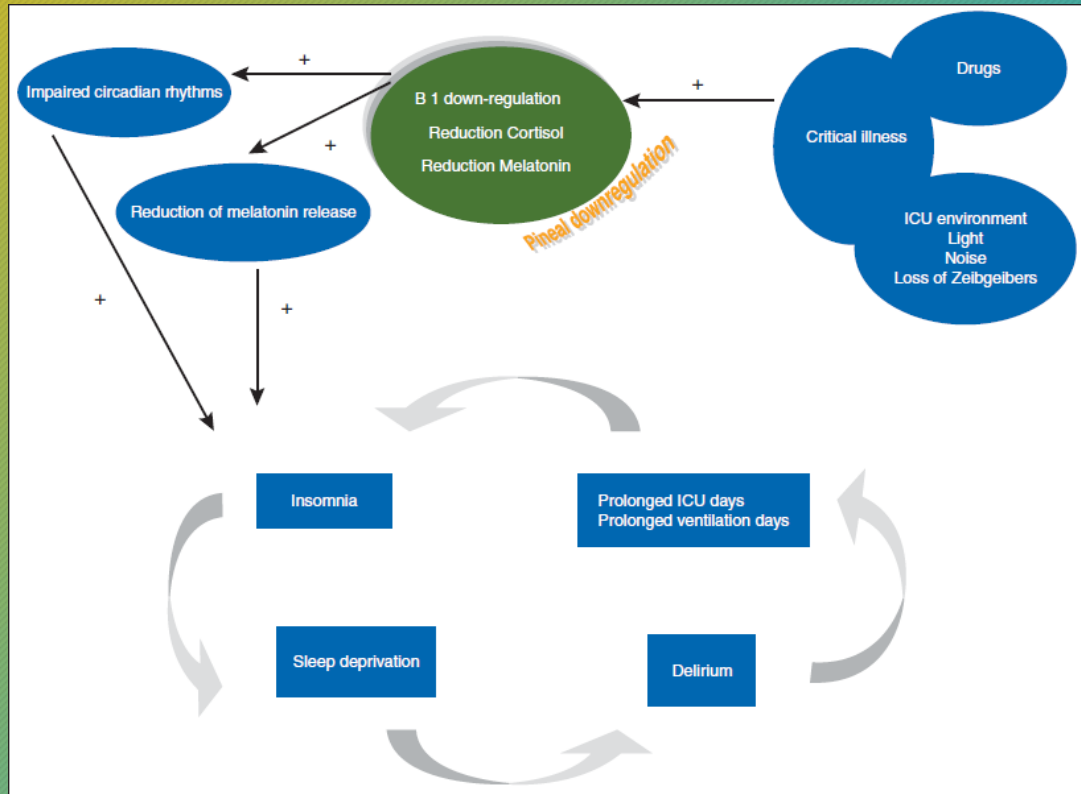
Severe sleep wake disorganization

**Figure 1** A representative hypnogram in an ICU patient. Note the sleep fragmentation, sleep stage changes, and sleep architecture disorganization in this patient on the third ICU day. A large proportion of sleep occurs during the day, with REM sleep in the afternoon. (REM: rapid eye movement sleep; 1, 2, 3, and 4: sleep stages 1, 2, 3, and 4, respectively).

Drouot et al. Sleep in the intensive care unit. Sleep Medicine Reviews (2008) 12,391e403



# Circadian Rhythm?

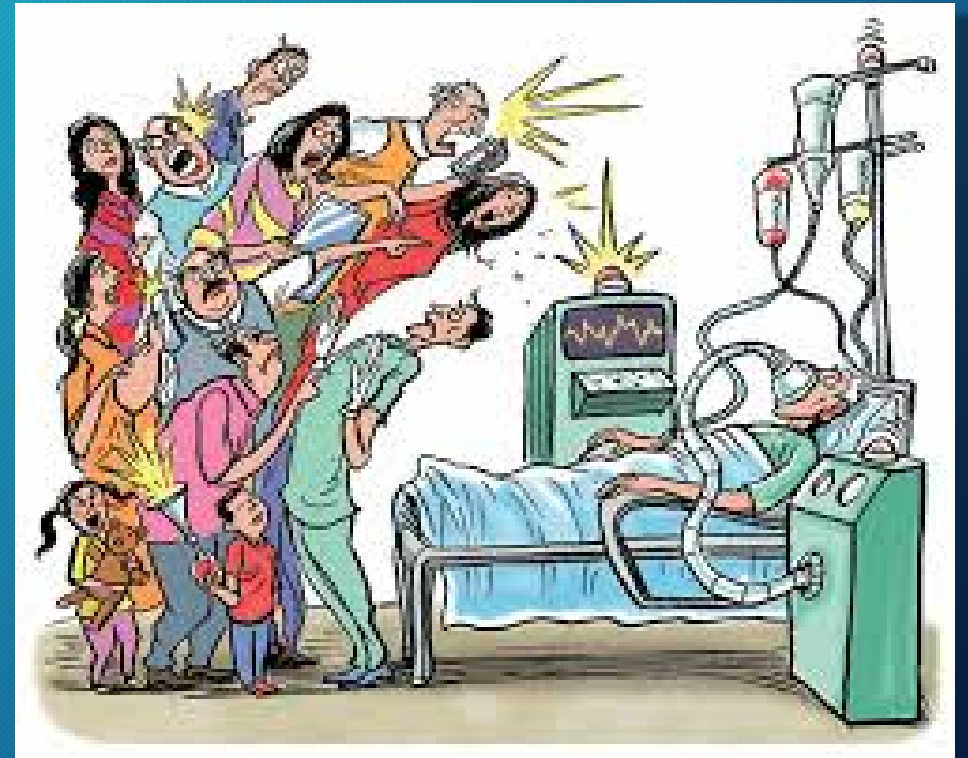


**Figure 2** Melatonin levels in healthy subjects on the baseline night and on the simulated ICU noise and light (NL) night. Serum melatonin levels were measured in all subjects on baseline and NL nights for 9 h from 20:50 to 06:00. The graph depicts the nocturnal serum melatonin concentration. Points represent mean  $\pm$  SD. Solid circles, healthy subjects on the baseline night; solid triangles, healthy subjects on the NL night: \* $P < 0.05$  at 0:00, 01:00, 02:00, 03:00 and 04:00 for comparison of the baseline and the NL night.

# Sleep in the Hospital: NOISE

*Honkus, 2003; Drouot et al., 2008*

- Noise is commonly reported by ICU patients as a significant disruptor of sleep and most often is due to staff conversations, alarms, overhead pages, telephones, and televisions
- Environmental Protection Agency recommends maximum hospital noise levels of **45 decibels (dB) during the day** and **35 dB at night**





# Sleep in the Hospital: Nursing and medical procedures

- The lack of knowledge among nurses about the psychological and physical benefits of sleep contributed to nurses disrupting patients' sleep at frequent and awkward hours of the night
- Patients reported that vital sign assessments and phlebotomy were more disruptive than noise





# Sleep in the Hospital: Mechanical Ventilation

- Mechanical ventilation, masks, endotracheal tubes, suctioning, physical restraints, bite blocks and nasogastric tubes also contribute to sleep disturbance
- Depending on the mode of ventilation, mechanical ventilation was one of the factors that negatively impacted on sleep in critically ill patients.





# Sleep in the Hospital: Light

- Continuous lighting in ICU contributes to sleep disruption: nocturnal light intensities vary across ICUs but can exceed 1000 lux
- 100 lux is sufficient to impact melatonin secretion, even if brief



# Consequences of Sleep Deprivation in the ICU

Prolonged failure to experience effective sleep has detrimental effects on almost all body systems. It **hinders the body's normal defense mechanisms** designed to deal with insult from injury or illness as well as **diminishing cognitive capacity** and emotional resilience

Arrhythmias  
Nocturnal high BPs  
Worsening cardiac failure

Weak upper respiratory muscles  
Delayed ventilator weaning  
Apneas and hypopneas  
Decreased hypercapneic and hypoxic respiratory drive

Delayed healing  
Reduced ability to fight infection  
Altered tissue repair

Agitation  
Delirium  
Post Traumatic Stress Syndrome  
Depression  
Continued sleep deprivation  
Reduced tolerance of pain  
Neurocognitive dysfunction



What can I do to improve sleep  
for patients in our ICU?

Sleepless in the ICU:  
Lessons learned.....



# SCCM

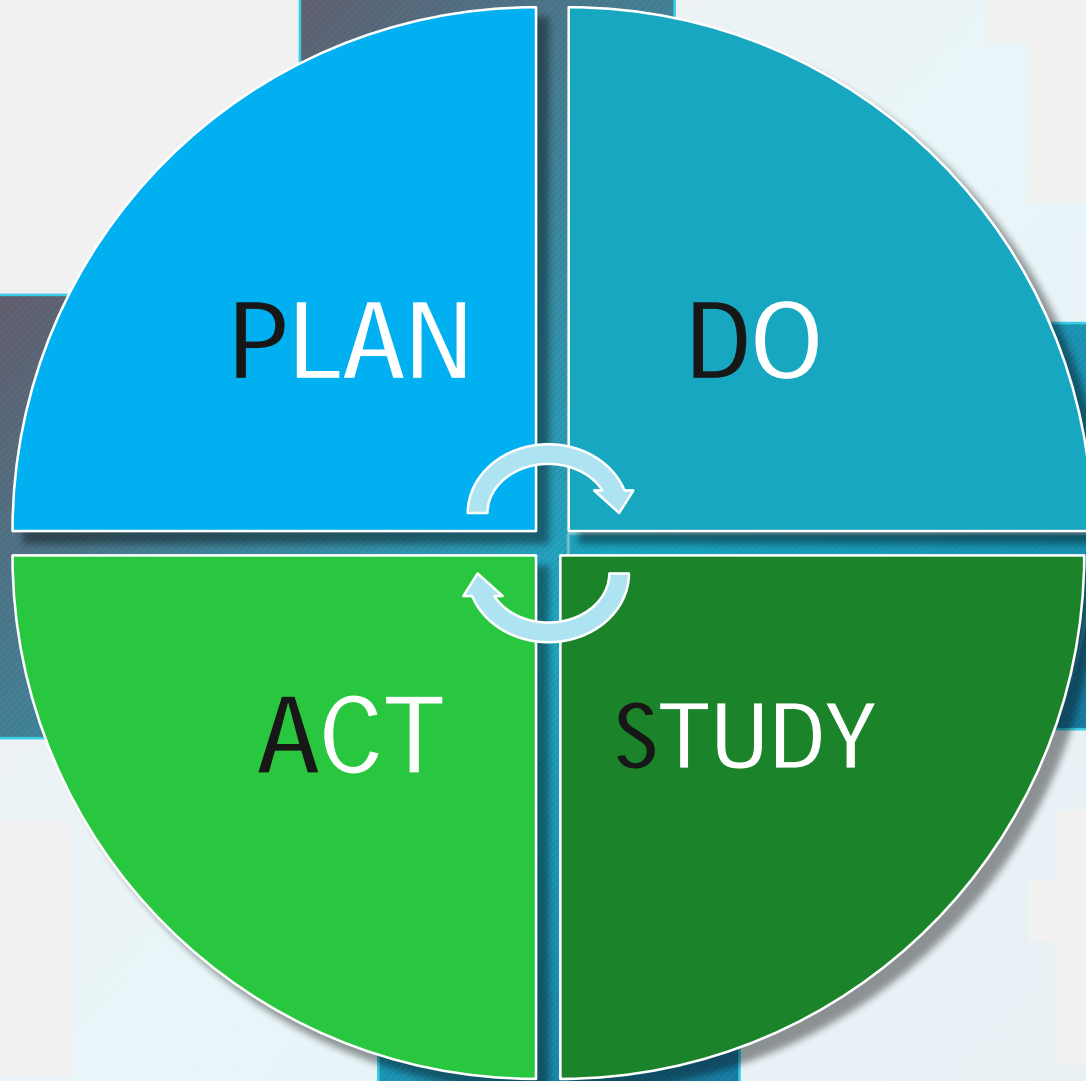
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# Intervention

Sleepless in the ICU:  
Lessons learned













# It takes a village.....

## Nursing

- ✓ Routine Lab Orders: after 4 am
- ✓ Routine nursing care: bathing etc. before 11.30 pm
- ✓ Scheduled Medications: minimize administration between 11:30 pm - 4am

## Other ICU staff

- ✓ Overhead paging: minimized
- ✓ Routine Imaging Orders: CXR/KUB - performed after 4am
- ✓ Respiratory care: adjusted to protect sleep



## Residents

- ✓ Routine Physical Exams: Perform after 4am. Try and wrap up routine mini-rounds before 11:30pm.

## Family

- ✓ Family members to be educated about sleep/quiet sleep time also



Dear Family Member/Loved One:

Here at Memorial Hermann Hospital, we are committed to providing the best available care to our patients in the Medical Intensive Care Unit (MICU).

Part of this care includes ensuring that our patients have a **good opportunity to sleep.**

To help your loved one **sleep between the hours of 11:30 p.m. to 4:00 a.m.** we would like to request the following:

- 1. Please refrain from loud conversation or sounds
- 2. Please do not turn on the television or lights
- 3. Please minimize the number of visitors in the room
- 4. Please minimize the number of times you enter or exit the ICU

Thank you so much for your cooperation and we sincerely hope for the fast recovery of your loved one!

Best Wishes,  
MHH TMC MICU



Let us help your loved ones....

**SLEEP**

Try not to disturb

**11.30 p.m. - 4 a.m.**



The University of Texas  
Health Science Center at Houston



# Intervention = SLEEP BUNDLE

- Consolidate sleep time **11.30 pm to 4 am** mandatory lights off
- “Bundled” nursing/respiratory care
- House staff/physicians patient interactions
- Melatonin 6mg at 8pm
- White noise machines installed in patient rooms
- Eye masks/ear plugs (when appropriate)
- Family education/visitation
- Activity/interaction/orientation/lights on during the day

# SLEEP BUNDLE: Intervention

- Intervention on **“SHORT SIDE” ONLY** (beds 11-17)
- “Long side” (beds 1-10) serving as controls (usual care)
- ✓ This will entail practices that promote sleep and minimize disturbance at night
- ✓ Also to maintain activity during the day, light on and blinds open



# Outcome Measurement Tool

## Confusion Assessment Method for the ICU (CAM-ICU) Flowsheet

### 1. Acute Change or Fluctuating Course of Mental Status:

- Is there an acute change from mental status baseline? OR
- Has the patient's mental status fluctuated during the past 24 hours?

NO

CAM-ICU negative  
NO DELIRIUM

YES

### 2. Inattention:

- "Squeeze my hand when I say the letter 'A'."  
Read the following sequence of letters:  
SAVEAHAART or CASABLANCA or ABADBADAAY  
**ERRORS:** No squeeze with 'A' & Squeeze on letter other than 'A'
- If unable to complete Letters → Pictures

0 - 2  
Errors

CAM-ICU negative  
NO DELIRIUM

> 2 Errors

### 3. Altered Level of Consciousness Current RASS level

RASS other  
than zero

CAM-ICU positive  
DELIRIUM Present

RASS = zero

### 4. Disorganized Thinking:

1. Will a stone float on water?
2. Are there fish in the sea?
3. Does one pound weigh more than two?
4. Can you use a hammer to pound a nail?

**Command:** "Hold up this many fingers" (Hold up 2 fingers)  
"Now do the same thing with the other hand" (Do not demonstrate)  
OR "Add one more finger" (If patient unable to move both arms)

> 1 Error

0 - 1  
Error

CAM-ICU negative  
NO DELIRIUM

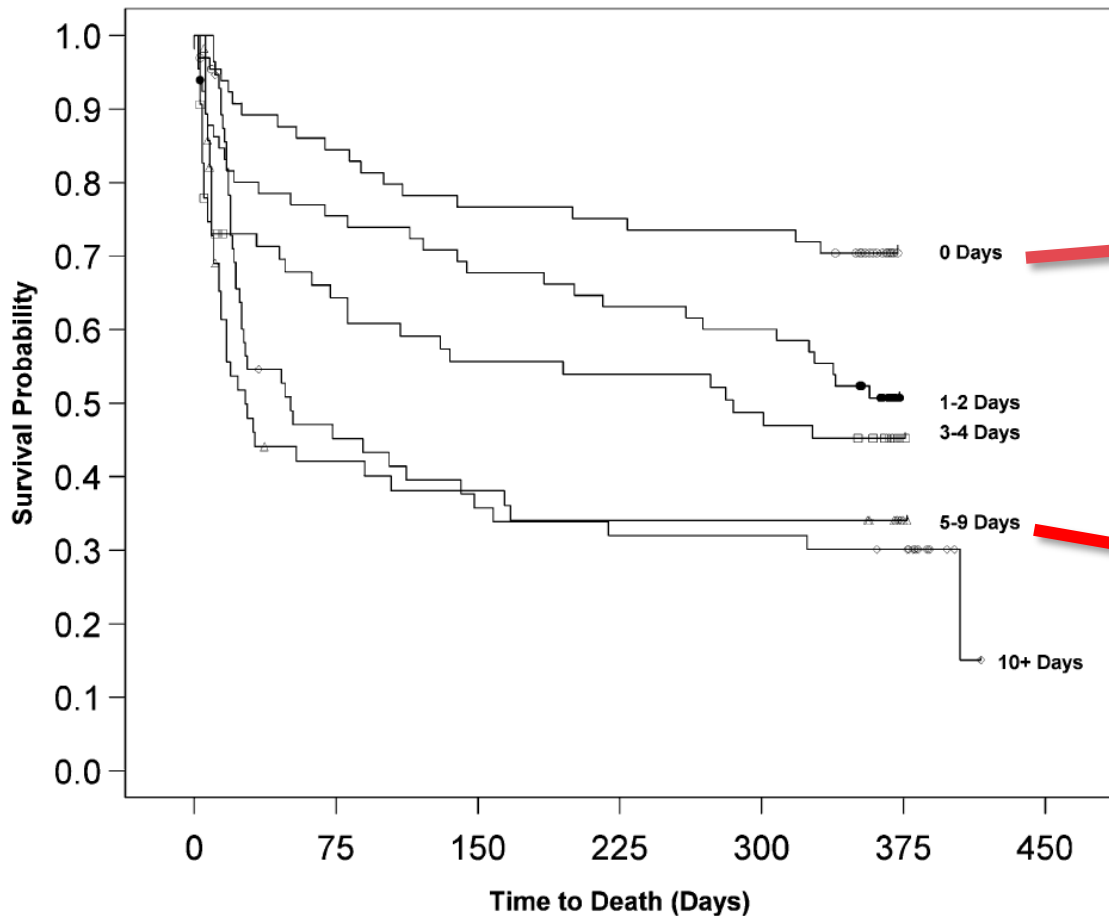


CAM-ICU + POSITIVE

CAM-ICU - NEGATIVE

# Why Delirium?

Pisani et al. Days of Delirium Are Associated with 1-Year Mortality in an Older Intensive Care Unit Population *Am J Respir Crit Care Med* Vol 180. pp 1092-1097, 2009.



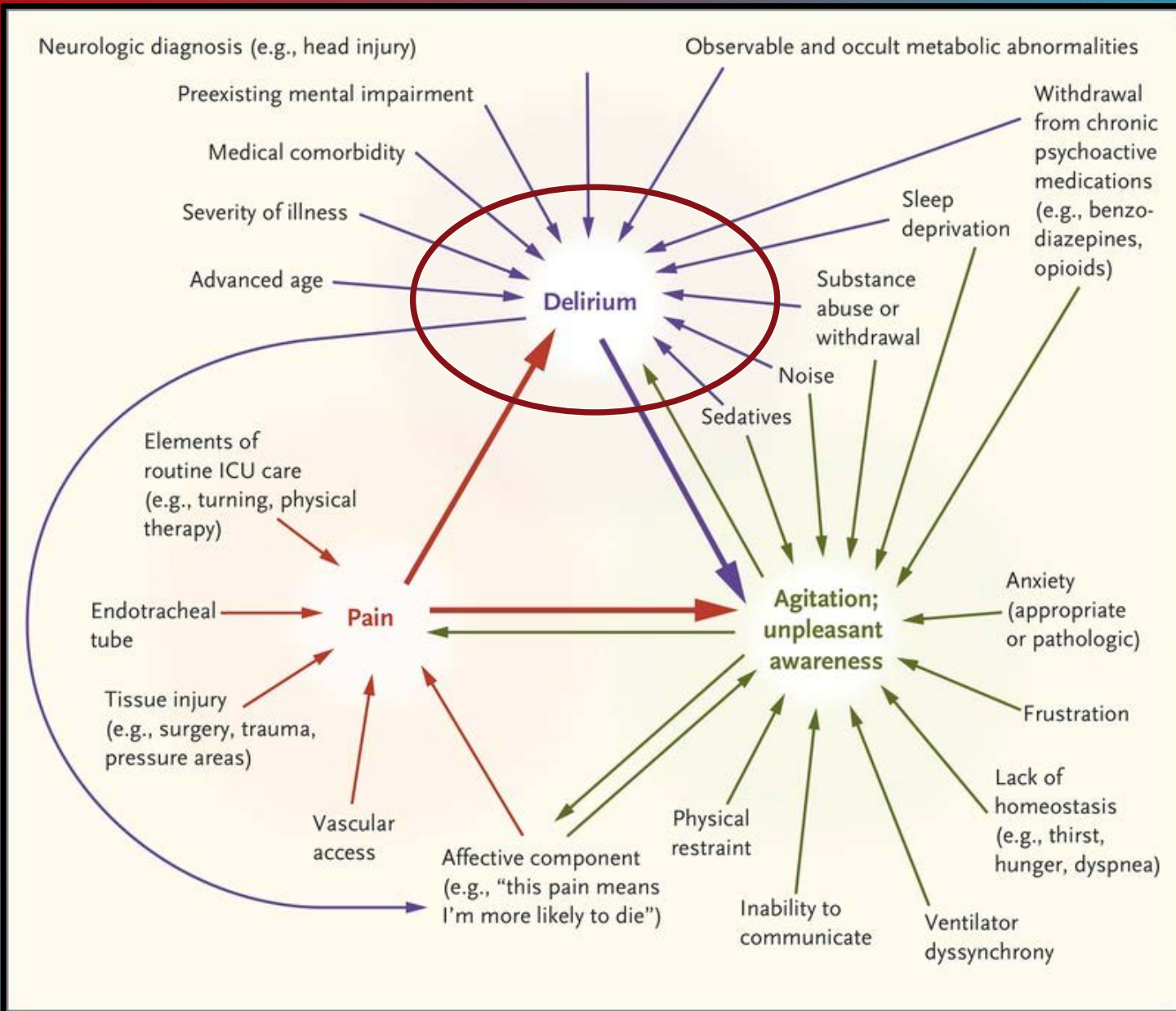
Delirium = 0 days

Figure 2. Kaplan-Meier survival curve for 1-year mortality post-intensive care unit (ICU) admission (ICU delirium days predictor). Log-rank chi-square statistic = 28.3; degrees of freedom = 3;  $P < .001$ .

Delirium = 6-8 days

Number of days of ICU delirium was associated with higher 1-year mortality after adjustment for relevant covariates in an older ICU population





## Exclusion criteria

- ✓ ETOH intoxication
- ✓ Substance abuse/withdrawal
- ✓ Hepatic encephalopathy
- ✓ Anoxic brain injury
- ✓ Hypothermia protocol
- ✓ Known dementia

## Documentation

- ✓ Age
- ✓ Diagnoses
- ✓ Mechanical ventilation
- ✓ Medications

*Sedation and Delirium in the Intensive Care Unit.  
N Engl J Med 2014;370:444-54.*

# Delirium

Compared rates of delirium in the 2 groups

Grp 1 WITH SLEEP BUNDLE

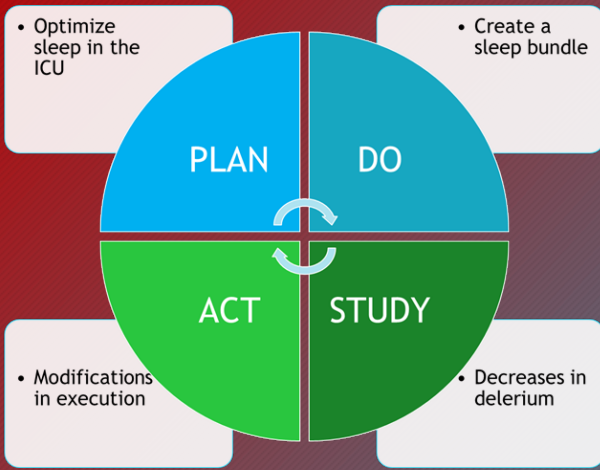
Grp 2 WITHOUT SLEEP BUNDLE





Then we turned the lights out.....





Follow up.....

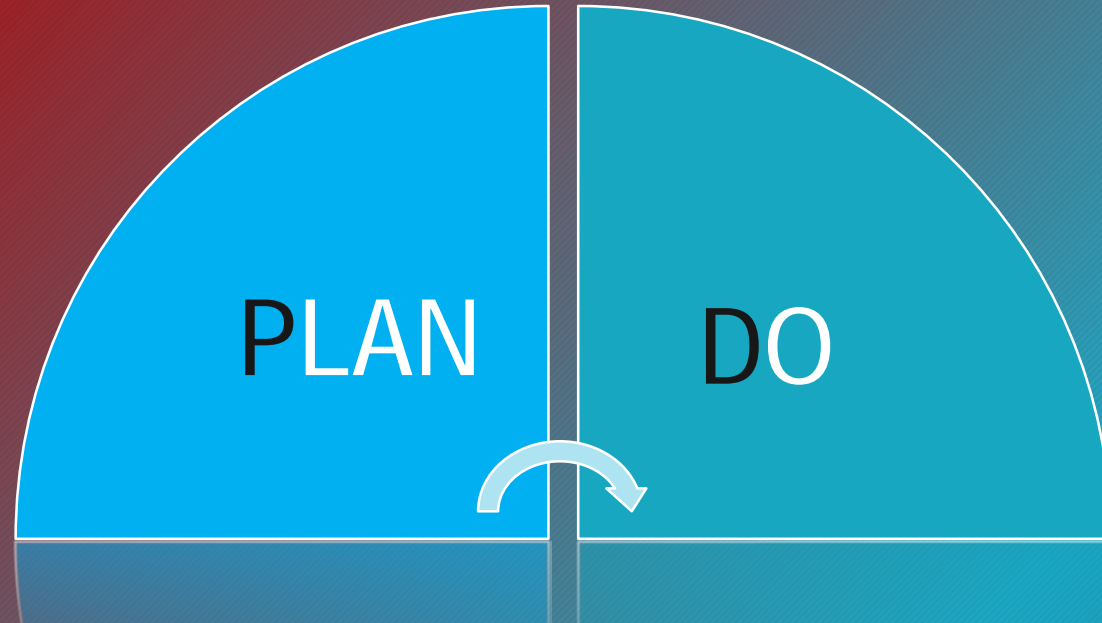
ACT



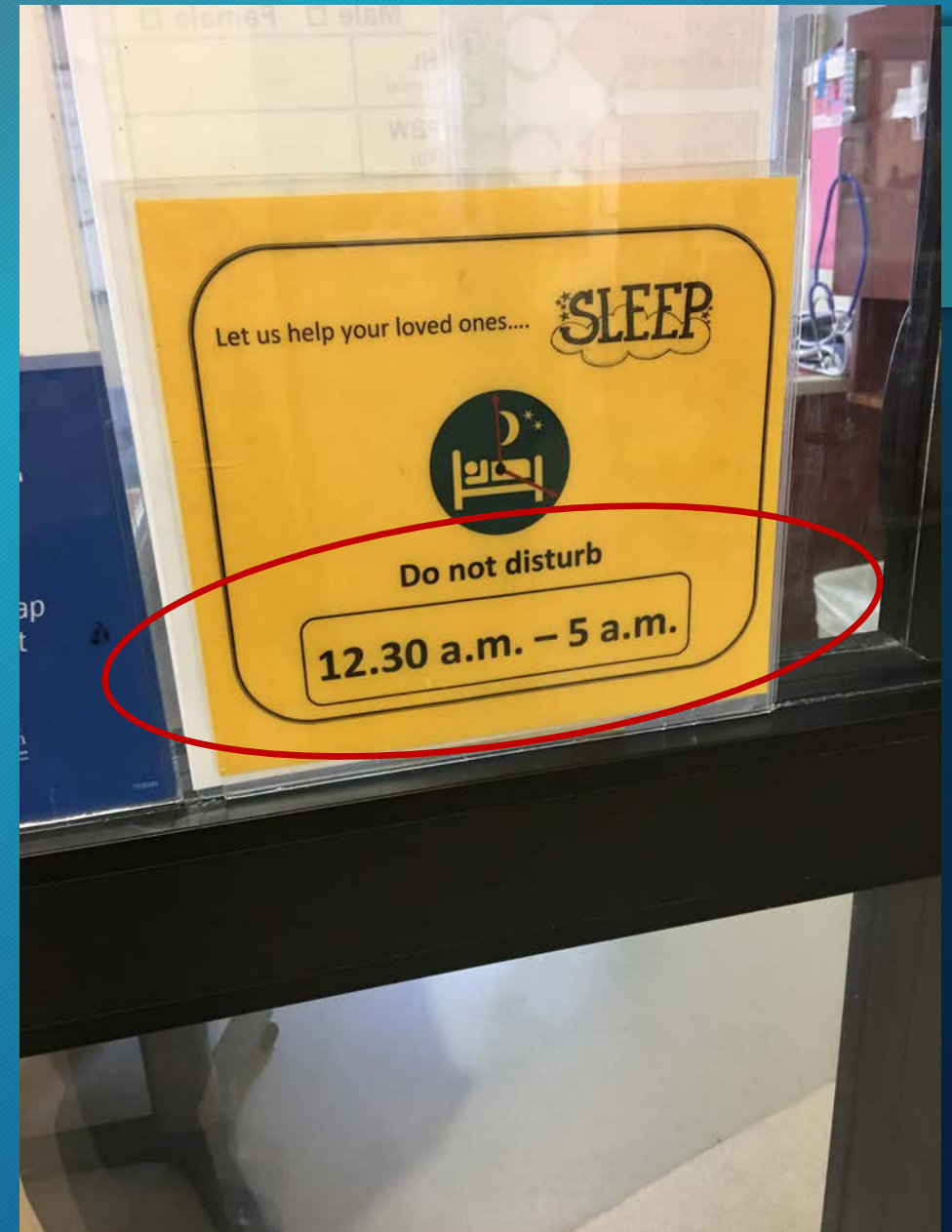
# Sleepless in the ICU: obstacles...

- *Resistance to a change in culture - nursing and house staff*
- *Inability to finish nursing tasks*
- *Disturbances in the surrounding patient care area*
- *Over head pages*
- *Resident examinations (at night)*
- *Breathing trials (at night)*
- *White noise machines “torn” from the wall*
- *Data collection lapses*
- *Failure to order melatonin*

ACT



1. Daily data collection sheet
2. Modification of the sleep times to 12.30 am-5 am
3. Resident and nursing reeducation
4. Addition of faculty advocates and nursing champions







Then we turned the lights out.....again..





"Sorry to be a nuisance, but I think my phone charger got mixed up in here somehow."

## Sleepless in the ICU: Lessons learned

# RESULTS



# RESULTS

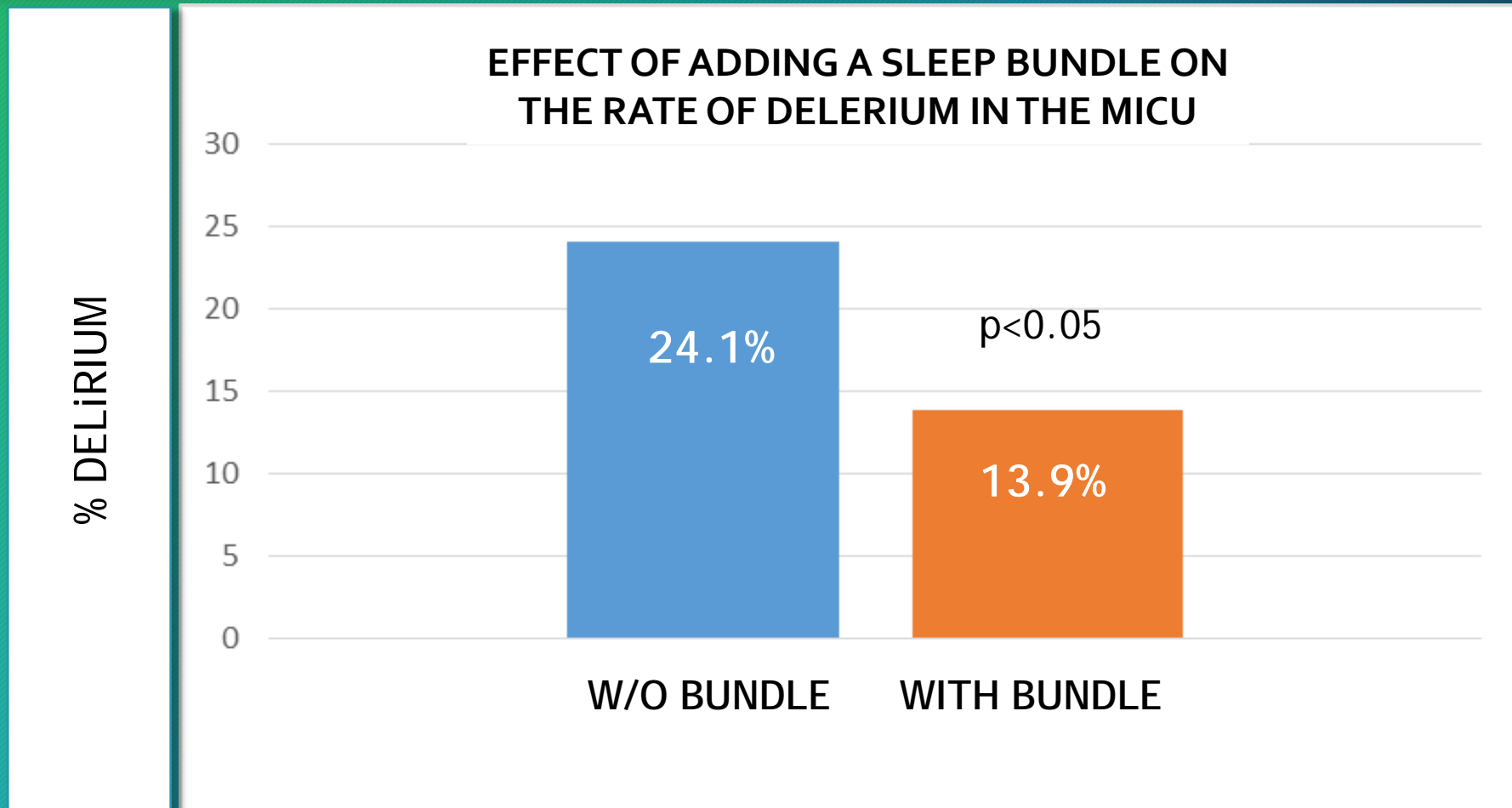
- First round of data collected: December 2017-March 2018
- Total of 155 patients included in the study
  - GROUP 1 (WITHOUT BUNDLE) : 83 patients
  - GROUP 2 (WITH BUNDLE) : 72 patients

# RESULTS: Demographics

	WITH BUNDLE (n=72)	WITHOUT BUNDLE (n=83)	p value
Age (years)	58 +/- 23	60 +/- 20	0.52
Gender (%male)	56%	45%	0.75
Number Comorbidities	3.2 +/- 4	4.5 +/- 3	0.34
% Ventilated	48%	52%	0.64
% Sedation	55%	50%	0.89



# Results: Delirium in the ICU



# Lessons learned.....

- Change the perception that “not sleeping well” in the hospital is okay
- Involvement of hospital leadership and healthcare staff in pursuit of a healthcare model that prioritizes restorative sleep
- Change practices = “change habits” and “build momentum”
- Challenges will be unique to each unit: one size may not fit all?
- Many factors that are not “modifiable” and “intrinsic” to the illness



# Lessons learned.....

Designing such protocols may seem straightforward, but it requires dedicated ICU champions, a multidisciplinary stakeholder team, effective implementation methods to achieve staff buy-in and alter practice, with a mechanisms for regular auditing

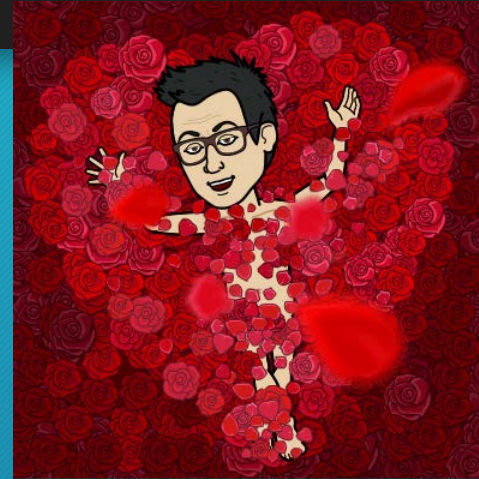
# Acknowledgments....."Team ICU SLEEP"



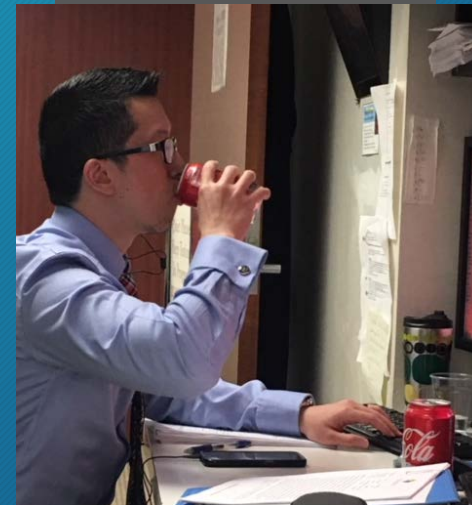
Sonam Jaggi



Jennifer Cortez



Justin Wong





A consequence of sleep deprivation and disturbance in the ICU include:

- A. Delirium
- B. Lower pain tolerance
- C. Delayed ventilator weaning
- D. All of the above

Sleep disturbances in the ICU can persist in almost half of patients after being discharged from the hospital?

- A. True
- B. False



