

Sleep in Intensive Care Unit

An Essay

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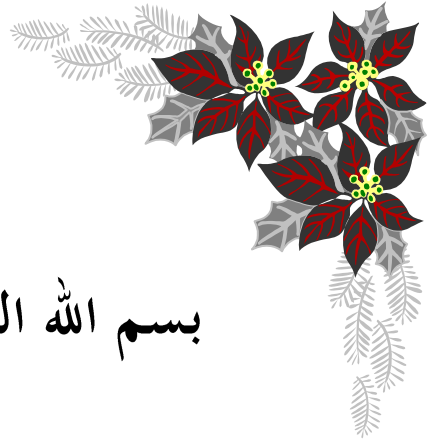
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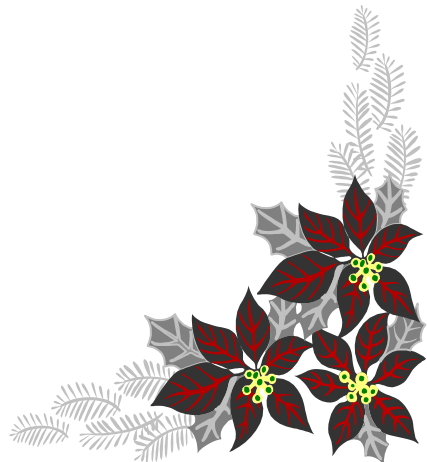


بسم الله الرحمن الرحيم

"قَالُوا سُبْحَانَكَ لَا عِلْمَ لَنَا إِلَّا
مَا عَلَّمْتَنَا إِنَّكَ أَنْتَ الْعَلِيمُ
الْحَكِيمُ"

صدق الله العظيم

(سورة البقرة: 32)





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Abbreviations

AHI	Apnea - hypopnea
APSSV	Adaptive pressure support servo-ventilation
ASD	Acute stress disorder
BMI	Body mass index
BZRA	Benzodiazepine receptor agonists
CHF	Congestive heart failure
CNS	Central nervous system
COPD	Chronic obstructive pulmonary disease
CPAP	Continous positive air way pressure
CRT	Cardiac resynchronization therapy
CSA-CSR	Central sleep apnea with cheyne stokes respiration
DLMO	Dim light melation onset
EEG	Electroencephalogram
EPA	U.S. Environmental protection agency
EPAP	Expiratory positive airway pressure
FDA	The U.S. food and Drug administration
GABA	Gamma amino butyric acid
GHB	Gamma hydroxyl butyrate
ICSD	International classification of sleep disorders
ICU	Intensive care unit
IPAP	Inspiratory positive pressure ventilation
LDT	Lateral dorsal tegmentum
MT	Melation receptor
ND	Nightmare disorder
NIPPV	Noninvasive positive pressure ventilation
NIV	Noninvasive ventilalian
NPPV	Noninvasive positive pressure ventilation
NREM	Non rapid eye movement
OHS	Obesity hypoventilation syndrome
OSA	Obstructive sleep apnea
OSAHS	Obstructive sleep apnea - hypopnea syndrome
OTC	Over the - counter
PAP	Positive airway pressure
PAV	Proportional assist ventilation
PFT	Pulmonary Function test
PLMD	Periodic limb movement disorder
PLMS	Peroiodic Limb movements
PNS	Parasympathetic nervous system
PPT	Pedunculopontinetegmentum
PSC _t	Polysomnography
RBD	Rapid eye movement sleep behavior disorder

RBD	Rapid eye movement sleep behavior disorder
REM	Rapid eye movement
RLS	Restless legs syndrome
SCN	Supra chiasmatic nucleus
SNS	Sympathetic nervous system
SRB	Sleep related bruxism
SSRI _s	Selective serotonin - reuptake inhibitors
SWS	Slow wave sleep
TMP	Transmural pressure

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Introduction



INTRODUCTION

The cyclic repetition of sleep and wakefulness states is essential to the basic functioning of human body. As understanding of the neurobiology of sleep increases, sleep is no longer viewed as a passive state i.e. absence of wakefulness but rather as an active neurobehavioral state that is maintained through a highly organized interaction of neurons and neural circuits in the central nervous system **(Markov and Goldman, 2006)**.

Sleep is characterized by a variety of physiologic behavioral, and Electroencephalogram (EEG) changes and is necessary for restoration of cognitive, mood, and physiologic functions **(McCareley, 2007)**.

Sleep consists of two strikingly different states, rapid-eye- movement (REM) sleep. Non-REM sleep can be subdivided further into four stages. Polysomnography is the "gold standard" technique which simultaneously records the three physiologic measures that define the main stages of sleep and wakefulness. These measures are muscle tone recorded through electromyogram, eye movements recorded through electro-oculogram and brain activity recorded through EEG **(Markov and Goldman, 2006)**.

Patients in the ICU are known to have severely disrupted sleep and some patients manifest unique EEG sleep patterns. The etiology of sleep disruption in the intensive care unit (ICU) includes the inherent nature of the environment, medications, ventilator-patient interaction, and the effect of acute illness **(Friese et al, 2007)**.

Any agent that acts on or through sleep regulatory neurotransmitters, modulators, or their receptors can impact sleep architecture. Abrupt withdrawal from chronic medications, including recreational drugs, can cause sleep

disruption and delirium. In critically ill patients, it is difficult to ascertain a single drug's effect on sleep architecture **(Pandhardipande and Ely, 2006)**.

Studies reveal that sleep deprivation is associated with many derangements in physiologic parameters that could negatively affect the pathophysiology, treatment, and recovery from critical illness; and hence contributes to an increased morbidity and mortality. An integrative approach that includes both pharmacologic and nonpharmacologic strategies should be undertaken to prevent and treat sleep deprivation. An emphasis should be placed on providing an ICU environment that is both diurnal and sleep friendly **(Bourne and Mills, 2004)**.



Aim of the Work



AIM OF THE WORK

This essay aims to provide an overview of neurophysiology and pharmacology of drugs affecting sleep mechanisms and the current knowledge of the causes, effects and management of sleep problems in intensive care units.



CHAPTER (1)

NORMAL SLEEP AND CIRCADIAN PROCESSES

Normal Sleep and Circadian Processes

Sleep is a natural process occurring in animals and human beings. It is a complicated state involving both behavioral and physiological processes. Several brain centers are involved in the production and regulation of sleep using a variety of hormones, neurotransmitters and peptides.

Normal sleep staging

Sleep is an essential physiologic process for most living organisms. Sleep is divided into non rapid eye movement (NREM) sleep and rapid eye movement sleeps (REM). Older sleep staging developed by Rechtschaffen and Kales divided NREM sleep into four stages, numbered 1, 2, 3, and 4 (Rechtschaffen and Kales, 1968) .

According to the newly released American Academy of Sleep Medicine scoring criteria, NREM sleep is now characterized by three stages (N1, N2, N3), with N3 encompassing the older classification of stages 3 and 4. These stages are based on a constellation of physiologic parameters and are defined by electrophysiologic waveforms and frequencies using electroencephalographic (EEG) monitoring (Iber et al., 2007).

Sleep stage 1 (N1) comprises about 2% to 5% of sleep and consists of a low voltage, mixed frequency pattern, usually in the theta