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Opinion

Sleep in Intensive Care Unit (ICU): Very Less We Know, Way to Go!!!

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Sleep is seen as an essential biological function to maintain physiological and emotional wellbeing. It provides necessary restorative, protective and energy-conserving functions [1]. However, sleep in intensive care units (ICU) is disturbed, distorted and highly fragmented [2-5] and the pattern has not changed despite of improvement in the designing of the ICUs and the advancement of the techniques and devices used in ICUs [3]. Survivors of critical illness reported their sleep in the ICU was of poor quality and a major stressor associated with their admission [6]. Despite of this, measures to monitor and improve sleep quality and architecture have never got similar attention like other parameters in ICUs viz hemodynamic monitoring, glycemic control, pressure sore prophylaxis etc. Intensivists, critical care physicians and health care professionals are yet to be sensitized enough to consider sleep as an important concern and domain in the management of critically ill patients.

Sleep in critically ill patients in ICU remains qualitatively and quantitatively poor [3]. Their total sleep time (TST) is often normal (7 - 9 hrs) but sleep is highly fragmented with patients experiencing more than 6 - 7 awakenings per hour and median duration of sleep without awakening is just 3 minutes [3,5,7] with almost 50% of patient's TST occurring during daylight hours [5,8]. Majority of their sleep period is spent in stages N1 and N2 which is perceived to be 'light sleep' with limited restorative benefits with reduction of the rapid eye movement (REM) sleep and slow wave sleep (SWS) [8,9]. Hilton., *et al.* [10] reported that sleep quality was very poor and fragmented in ICU and after almost three decades later studies by Freedman., *et al.* [8] and Elliott., *et al.* [3] reported the similar findings that patients' sleep was predominantly light sleep (N1 and N2 stage) with decreased slow wave sleep and REM sleep and high number of arousal index. It's alarming as the advancement in ICU design, monitoring system and ICU care guidelines has not been able to provide good quality sleep to the patients.

Sleep cycles which traverse both day and night perpetuate the phase shifting of circadian rhythms with sleep disturbance that persist months after discharge from the ICUs [11]. Several hypotheses and factors have been put forward for poor sleep in ICUs (Figure 1): severity of the illness, environmental noise, light intensity, types and modes of mechanical ventilation, and drugs [4,5,12,13]. Importance of light as a disruptive factor in ICU has been postulated and proposed by many studies [14-17]. Experimental studies showed that illuminance level of 100-500 lux is at least required to suppress the melatonin suppression [14,18]. Both American college of critical care medicine (ACCM) [19] and Indian society of critical care medicine (ISCCM) [20] guidelines on ICU design and planning recommends that high intensity natural light in the ICU for better patient outcome and sleep quality and decrease incidence of delirium and depression. Several studies have shown that the average sound level in ICU is in the range of 55- 75 dBA with peaks ranging to 85 dBA [3,4,8,21]. According to World health organization (WHO) standards of hospitals, continuous equivalent sound pressure level (Leq) should not exceed 35 dBA in patient areas [22] while the United states Environmental Protection Agency (EPA) recommends maximum hospital noise levels of 45 decibels (dB) during the day and 35 dB at night [23]. Lee., *et al.* [24] reported that up to 14% of nocturnal nursing care interactions could be safely avoided which reduce the disturbances to patients. Mechanical ventilation has also been cited as an important cause of sleep fragmentation and disruption in ICU [3,25-27].

Figure 1: *Factors implicated in poor sleep in ICUs.*

Oftenly, patients admitted to an ICU are not discharged directly home but transferred to a high dependency unit (HDU) or step down unit (SDU). The transfer from ICU to SDU is mainly based upon clinical parameters such as arterial blood gases, level of consciousness, hemodynamic stability, and the need for invasive monitoring, while little or no attention has been given to the problem of sleep that has been shown to be associated with poor outcome [28]. Sleep data on patients admitted to HDUs or similar environments are limited and scattered [21,29]. Aaron., *et al.* [29] demonstrated increased number of arousals associated with noise in an intermediate respiratory care unit (IRCU) during night time polysomnography. Thus, Sleep research in the ICU environment is in its infancy and further assessment and studies are needed to minimize the negative consequences of sleep disturbance in critically ill patients.

Are we doing enough for a sound sleep to our patients in ICUs? The implicated factors has ben assessed in several studies. Hu., *et al.* [17] studied the effect of non-invasive, nonpharmacological interventions of ear plugs and eye masks on ICU patients undergoing PSG sleep monitoring and they found that these interventions resulted in an increase in recorded REM sleep, a reduction in REM latency with less arousals and an elevation in melatonin levels. Designing of ICUs by following the norms set for ambient light, noise and other environmental factors set by the guidelines [19,20,22,23], sensitising the physicians and staff about sleep as vital parameter of patient wellbeing and following sleep promoting protocols (use of eye masks, earplugs, dimming of light at night and minimum nursing care interactions at night) should be the key to minimize the architectural distortion of sleep. Alteration of the modifiable factors like environmental factors (noise and light) and objective assessment of sleep in ICU using 24 hour- polysomnography is desired in addition to subjective perception of sleep quality as it would delineate the pattern of sleep and sleep architecture in ICU environment. Further research on sleep disruption in this vulnerable patient population and how sleep recovers during patient's recovery from the critical care illness is desired.

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