termination of care on this basis alone. Applied in this manner, ICU scoring systems are neither specific enough to sanction their use nor sensitive enough to be practical. This study, and that of Lee et al, highlight the "dilemma of distributive justice" in intensive care: owing to the probabilistic nature of these databases, no objective system of mortality prediction is capable of removing this difficult decision from the subjective, imperfect hands of the clinician in conjunction with patients or their surrogates.

Watts and Knaus acknowledge, "prognostic systems will never be able to predict outcome with 100% specificity, and high severity scores therefore never will be indicative of absolute irreversibility of disease or impossibility of survival." Although potentially aided by ICU scoring systems the decision to withdraw intensive care support, like the decisions to admit and discharge patients, remains the domain of the clinician. Additional studies, showing clinical benefit actually using these tools to make decisions would be required to justify otherwise.

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The Disruptive ICU
An Issue To Lose Sleep Over?

Although mortality and morbidity remain excessive among critically ill patients, the modern ICU epitomizes perhaps more than any other single environment the technologic and scientific strides that medicine has made toward sustaining life. However, have certain important basics of general medical care been forgotten, or even adversely affected, by undue emphasis on such sophisticated and complex interventions into critical illness?

Certainly one important component of basic medical care, that of adequate nutrition, has been anything but overlooked in critical care medicine. In fact, most modern ICUs have entire teams of physicians and nutritionists dedicated to assuring adequate nutritional support of these patients. Sleep and its related physiologic changes take up, on average, one third of an individual’s life. Moreover, many vital physiologic processes are defined in terms of a circadian rhythm and are thus intimately tied to the sleep state. Sleep is therefore also basic to human survival, and yet up to now it has assumed far less attention in the care of patients in the ICU.

An excellent review in this issue of CHEST (see page 1713) on sleep physiology in the setting of the ICU brings into focus the importance of sleep as an overlooked basic aspect in the care of the critically ill. Krachman and colleagues concisely summarize the normal physiology of sleep, document evidence showing that significant derangement of sleep is very prevalent among patients in the ICU, and detail many of the factors contributing to such sleep fragmentation and deprivation. This review should hopefully raise awareness of the profound disruption of sleep that likely occurs among many critically ill patients, as a function of both the ongoing acute illness as well as by the ICU environment itself. Such
knowledge, however, raises only more questions. How important is obtaining an adequate quantity and quality of sleep to recovery from significant illness? The authors themselves acknowledge the uncertainty of the answer to this question. Does sleep fragmentation and deprivation to the degree seen in the ICU impact on the function of other organ systems other than leading to the neuropsychiatric consequences of the “ICU syndrome”? For example, the possible repercussions of sleep disruption in the ICU on respiratory function could actually be extremely relevant in this group of patients and are only briefly commented on in the current review.

Evidence does exist that sleep fragmentation/disruption may actually affect many aspects of respiratory physiology. Sleep deprivation can lead to upper airway musculature dysfunction, whether documented electrophysiologically or in terms of airway collapsibility. In the intubated patient, this is of little concern. However, after extubation this potential effect may play a much more significant role in determining eventual reintubation, especially in patients whose skeletal musculature may already be compromised from nutritional deficiencies and from the possible effects of previous neuromuscular paralysis. Indeed, a recent study actually suggests that edema or hypotonia or both of velopharyngeal and oropharyngeal tissues may be responsible for an increased work of breathing in newly extubated patients. The purported effects of sleep deprivation and fragmentation on upper airway musculature assume even greater clinical importance in light of these findings.

Gas exchange may also be adversely affected by sleep deprivation. Several studies have found that hypercapnic and hypoxic ventilatory responsiveness may be blunted by sleep deprivation, which could conceivably prolong or even prevent weaning in marginal patients. Even respiratory muscle function itself may be affected by sleep deprivation. Although most studies have shown little impact of acute sleep loss on brief maximal bursts of respiratory muscle activity such as spirometry and static strength measurements, more sustained respiratory muscle activity and endurance may be adversely affected.

Although these studies are intriguing, extrapolating the results to critically ill patients suffering the effects of sleep deprivation should be made cautiously. These studies were all performed on normal subjects and usually involved only 24 to 30 h of sleep deprivation or only one night of fragmented sleep. Additionally, the effects of sleeplessness on any measurable physiologic parameters may be confounded by subject motivation and effort; certainly, no such potential lack of motivation to breathe exists for critically ill patients in varied stages of respiratory failure.

This review offers certain treatment options designed to help consolidate sleep for patients in the ICU. Health-care professionals should be aware of how the modern ICU environment contributes to sleep deprivation/fragmentation, and make efforts to correct these factors. This may even include revising the use of medications commonly used in the ICU, many of which may have unsuspected effects on sleep, as detailed by Krachman and associates. Unfortunately, such attempts may be limited by the reality of the acuity of illness seen in these patients, with the subsequent need for interventions and activity during both diurnal and nocturnal shifts.

The focus may therefore need to be shifted toward the justification of ICU admission for certain borderline patients in the first place. Only further studies concentrating on this particular group of patients, as opposed to normal volunteers, will determine if the constant and aggressive attention of the intensive care unit is outweighed by the adverse effects on sleep created by this same extreme level of intervention.

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