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Quantifying Sleep Architecture for Pediatric Hypersomnia Conditions

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Narcolepsy type 1 (NT1), narcolepsy type 2 (NT2), and idiopathic hypersomnia (IH) are all characterized by excessive daytime sleepiness. Adult NT1 patients suffer from disrupted nighttime sleep (DNS) that likely reflects sleep/wake state instability emerging from the setting of orexin/hypocretin loss. However, it is unknown how DNS presents in pediatric NT1 patients or if pediatric NT1 sleep can be distinguished from that of pediatric NT2 and IH. We studied the polysomnograms of 48 controls, 46 NT1, 12 NT2, and 18 IH patients ages 6-18 and analyzed the stability of wake, rapid eye movement (REM), non-REM stage 1 (N1), non-REM stage 2 (N2), and non-REM stage 3 (N3) using the Cox proportional hazards model to adjust for age, sex, and race. We found that wake bouts showed decreased survival in the NT1 group compared to control. In addition, both N2 and REM sleep bouts showed decreased survival in the NT1 group compared to all groups, and notably, the survival of REM sleep decreased in the NT1 group with age by contrast with the increase in survival of REM sleep observed in other groups. Compared to controls, both IH and NT2 patients showed decreased survival of wake bouts and similar survival N3 and REM sleep bouts. Survival of N2 was increased for IH patients and male NT2 patients compared to controls. NT2 patients had increased survival of N1 compared to controls. In contrast, IH patients had decreased survival of this lighter sleep compared to all other groups, though an interaction with age suggests that this change may be reversed in older IH patients. Our results indicate that all CNS hypersomnia patients have inability to sustain wake bouts during the night but poorly consolidated N2 and REM sleep is a distinct sleep pathology of pediatric NT1 patients. In contrast, the sleep phenotype of IH and NT2 patients is defined by increased stability of lighter NREM sleep stages.