Activity Monitoring in patients with Alzheimer's Disease (AD) and Irregular Sleep-Wake-Rhythm Disorder (ISWRD): How Many Days are needed for reliable measures?

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Methodological Question

How many days of actigraphy data are needed for reliable measures of sleep-wake patterns in patients with AD and ISWRD?

Introduction

When sleep is not consolidated at night but rather distributed in irregular sleep bouts across the 24-hour period, this condition is referred to as Irregular Sleep-Wake Rhythm Disorder (ISWRD) and often appears early in the course of Alzheimer's Disease (AD). To obtain reliable information about a patient's sleep-wake rhythm, multiple 24-hour periods must be investigated. With actigraphy this is possible. For children and adolescents, it is recommended[1] to record at least one week of actigraphy data to provide an adequate information. However, it is still unclear how many days of actigraphy data are needed for determining reliable measures of sleep-wake patterns in patients with AD and ISWRD.

Methods

A retrospective analysis of data from 121 subjects (aged 60 – 90 years) with a diagnosis of mild to moderate Alzheimer's Disease, a Mini–Mental State Examination score between 10-26 and complaints of difficulties with both staying asleep during night and staying awake during day occurring at least 3 times per week for at least 3 months was performed. Additionally, patients had to meet the criteria for ISWRD based on DSM-5 criteria for Circadian Rhythm Disorder, Irregular Sleep-Wake Type.

Actigraphy devices (MotionWatch8, CamNtech, Cambridge, UK) were worn on the wrist of the non-dominant arm for 13 consecutive days. Additionally, a sleep log including information about bed and wake times were completed on a daily basis by a caregiver. Actigraphy data were transformed into Sleep-Wake scores using validated computerized algorithms[2]. The calculated target variables included Sleep efficiency (SE) and Wake efficiency (WE).

For each subject, the mean over all available days served as a "gold standard" reference for both variables. The differences from this reference were then calculated for the means over all shorter

observation windows starting from one day up to 12 days. These differences were then averaged over all subjects. For the smallest such difference, i.e. the one between the 12 and the 13-day observation period, a 95% confidence interval (CI) was calculated. If the mean difference value for any of the other observation periods was within the CI, the corresponding measure was considered as 'reliable'.

Results

For SE, all mean differences for observation periods longer than 5 days of recording were within the 95%-CI (-0,161 - +0,082). Regarding WE, all mean differences for periods longer than 3 days of recording, except the ones for days 1-8 (-0,197) and for days 1-9 (-0,144), fulfilled this requirement (CI: -0,099 - +0,131).

Conclusions

Our findings suggest that regarding SE, 6 days of recording are sufficient to collect reliable information. This could not be shown for WE, indicating that this variable is less stable for detecting a subject's sleep-wake-patterns. A reason for this could be found in the algorithm employed, which had been designed for sleep during the night (time in bed), which reflects a more homogeneous setting and activity as compared to daytime.

Disclosures

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References

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