Subcutaneous EEG can be reliably used for sleep monitoring of epilepsy patients

A proof-of-concept study

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Introduction

Gaining insight into the **daily sleep structure** of an epilepsy patient can aid **individualized treatment** of both the epilepsy, sleep and the interaction between the two. As the first, we show a proof-of-concept for **sleep monitoring** using a **subcutaneous implant** measuring the EEG in epilepsy patients.

Methods

- Four patients with temporal lobe epilepsy were enrolled in the EMU.
- Monitored with both long term video-EEG and 2-channel subcutaneous EEG.
- 11 nights were recorded.
- Scored according to AASM guidelines.
- Subcutaneous EEG used to train a Random Forest classifier

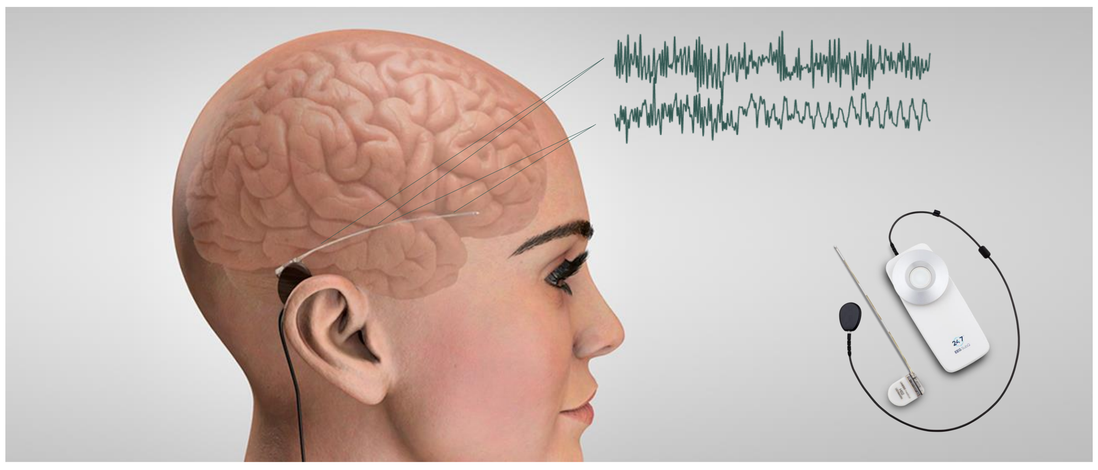

Figure 1 Illustration of the subcutaneous implant used in the study, the 24/7 EEG™ SUBQ (UNEEG medical A/S, Lynge, Denmark).

Results

- Mean Cohen's Kappa value of 0.78 across recordings for five classes and 0.85 for two classes.
- Sleep vs. wake:
  - Sensitivity of 94.8 %.
  - Specificity of 96.6 %

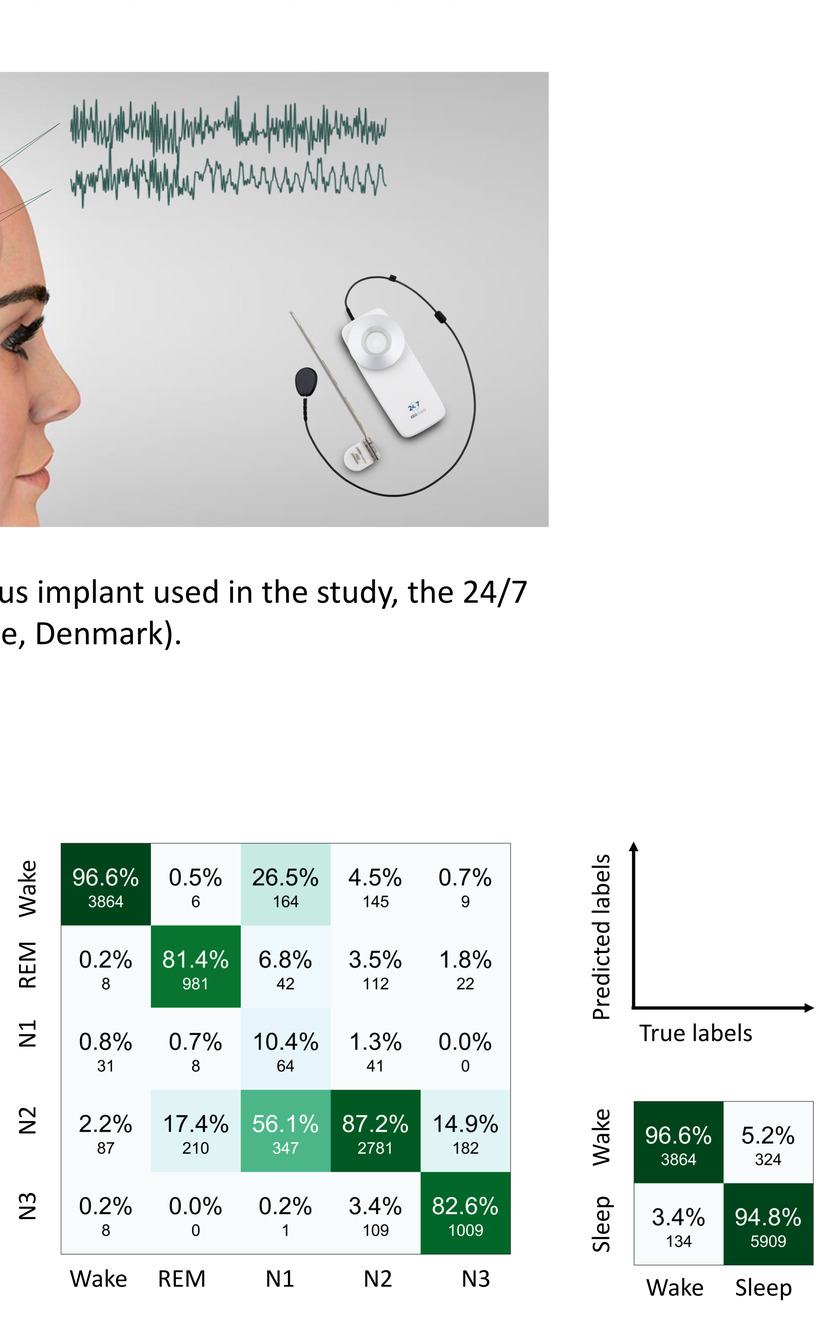

Figure 2 Confusion matrices for the sleep scoring algorithm.

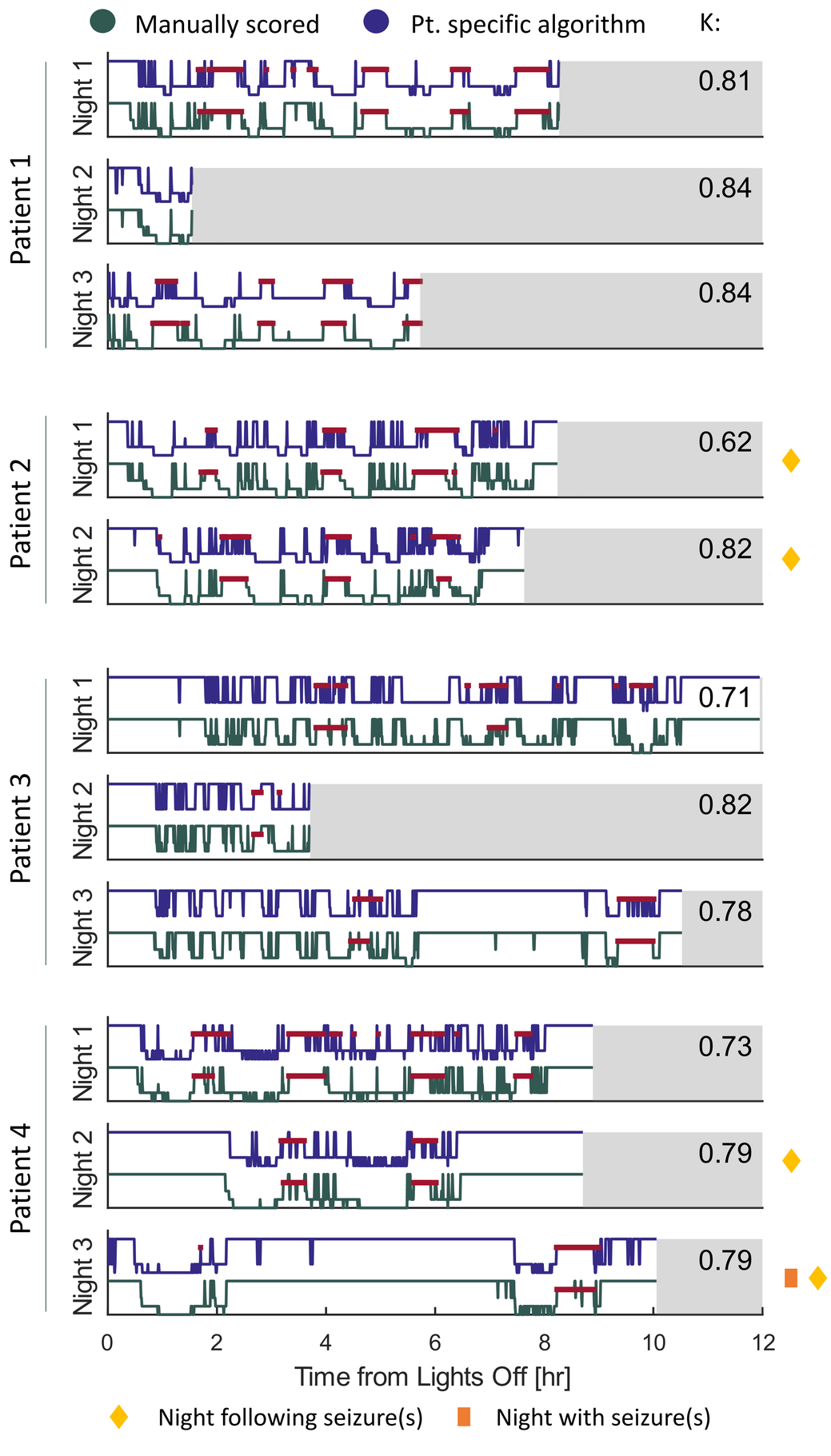

Figure 3 Overview of the 11 nights in the dataset together with the ground truth hypnograms (blue) and the predicted hypnograms (green), and the corresponding Cohen's kappa-values (K).

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