Conference or Workshop Item:

The unwritten rules of teaching and learning sleep scoring: practical hints and tips

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INTRODUCTION

- The American Academy of Sleep Medicine's (AASM) manual (Berry et al., 2015) for the scoring of sleep and associated events provides standardised international guidelines for both adult and paediatric sleep scoring.
- This guidance is essential for those who evaluate and interpret polysomnography (PSG) recordings. Unfortunately, other than this manual, there is very limited guidance available for sleep scoring novices.
- The current work follows the experiences of a sleep physiologist with 27 years experience (RK), training a novice (JB) to sleep stage and score arousals. The learning process was documented to enable the authors to reflect on the most effective teaching and learning strategies, the pitfalls and the top tips learnt along the way.

METHODS

- The data analysed were home PSG recordings conducted as part of a case-control study on paediatric narcolepsy using a standard sleep staging montage.
- 43 studies were scored manually according to the AASM (2012) paediatric scoring criteria. 21 recordings were from children with narcolepsy and 22 recordings were from healthy gender and age-matched controls.
- The novice (JB) scored a study independently before watching the sleep physiologist (RK) score the same study so that any discrepancies in the scoring could be discussed and learning goals for the next scoring session set.
- The inter-scorer agreement was calculated by exporting the scoring data from the sleep scoring programme (Embla® RemLogic™ PSG Software) into excel so that 30 second epoch by epoch comparisons and the overall percentage of agreement could be determined.

RESULTS

- The sleep staging agreements are displayed in Figure 1.
- Lack of video, pulse rate and respiratory patterns meant that the scorers were completely reliant on sleep channels when analysing the data.
- Agreement improved over time. The average agreement for the recordings from children with narcolepsy was 77.6% and the average agreement for recordings from healthy gender and age matched controls was 91.2%.
- Low agreement was mainly due to artefactual PSG recordings which were difficult to score. Recordings from healthy control children were easier to score due to their more typical sleep patterns and less artefactual data.
- Throughout the process, learning points were noted (Table 1 & 2).

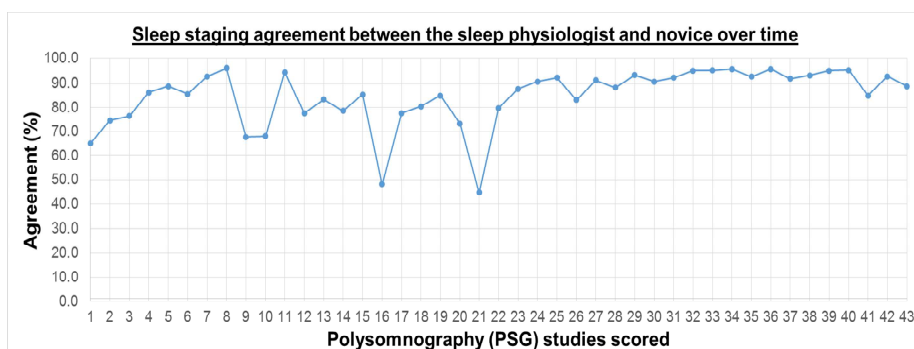**Figure 1. Sleep staging agreement over time**

Sleep staging agreement between the sleep physiologist and novice over time

TABLE 1. THE TRICKY BITS TO TAKE INTO CONSIDERATION
Drowsiness vs N1 sleep
REM vs wakefulness
Vertex sharps vs K complexes
When to start scoring SWS
Diary cards are helpful, but can be inaccurate and mislead the scorer
Wakefulness can look like theta
Alpha not always present
Primary signals 'bleeding' into other channels
Adapting when you have missing channels
Some eyes roll, others not as clearly
Age related differences
Artefacts
Respiratory artefact
ECG artefact
Electrode popping artefact
Electrical interference
Muscle artefact

TABLE 2. TOP TIPS
Before Starting
Familiarity of sleep scoring package
Know expected hypnogram for age
Full understanding of lights on & lights off
Full understanding of reporting calculations (e.g. total sleep time, sleep efficiency)
New to Scoring
Referral letters, previous PSGs
Tune in to the patient's EEG
Start with the easy bits (SWS)
Relook at the transitional bits at the end
Getting Better at Scoring
Learn artefacts
Learn age related differences
Learn fragmented studies due to sleep disorders
Learn to score arousals
Maintaining Scoring Competency
Regular but random inter-rater scoring
Encourage sleep centres to keep examples that are good for teaching
Designate a person to be AASM updates champion to disseminate to others

CONCLUSIONS AND SUGGESTIONS FOR FUTURE WORK

- We recommend that it takes a novice approximately 6 months to learn to sleep stage and score arousals.
- Learning to score sleep accurately requires close expert supervision, hands on scoring experience and regular reflection on the learning process.
- Setting small manageable learning goals for the next scoring session improved performance and monitoring progress increased the confidence of the learner.
- There is a need for the development of more resources to help with scoring "real life" data (for example data collected from home PSG recordings).
- There is also a need for the development of UK wide support and inter-rater scoring for those working in isolation.

REFERENCE Berry, R. B., Brooks, R., Garnaldo, C. E., Harding, S. M., Lloyd, R. M., Marcus, C. L., & Vaughn, B. V. (2015). The AASM manual for the scoring of sleep and associated events: rules, terminology and technical specifications, version 2.2. *American Association of Sleep Medicine*.