Somnolyzer 24x7

Addressing cost pressures in the sleep lab

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Introduction

In times of ever-increasing cost pressures in the sleep laboratory, any measure for cutting time of valuable labor and thus cutting costs is seen as a welcome relief. Computer-supported scoring, especially if using Philips Respironics' Somnolyzer 24x7, is a perfect example of such a contributor to time savings. While Somnolyzer 24x7 has been validated to provide performance in the same ranges as skilled visual scoring, Somnolyzer 24x7 also cuts down the time needed for a single PSG study and overall scoring costs.

Somnolyzer 24x7

Somnolyzer 24x7 is our unique computer-supported scoring solution that has been proven to be equivalent to expert visual scoring[1], provided the autoscoring process is complemented by a visual "expert review" process.

This expert review is a structured and thus very efficient process, allowing the detection of potential signal quality problems that might impede the validity of scoring. Somnolyzer 24x7 encompasses sleep staging, arousal detection, respiratory event detection (apneas, hypopneas, RERAs, desaturations) and leg movement detection, all according to the latest AASM scoring standards.[2,3]

Cutting time spent on one study – a nationwide analysis

A recently conducted validation study on Somnolyzer 24x7 revealed the large savings that are possible when using Somnolyzer with the expert review procedure.

A total of 96 PSG studies from three different US sleep centers – evenly divided by diagnostic, split-night and titration studies – were scored by four different scorers (skilled RPSGTs). There was a scorer from the center itself, a scorer from each of the other centers, and a fourth independent scorer (scorer 4). In addition, another sleep center performed the expert review of all studies scored by Somnolyzer 24x7. For all scorings except the first one performed at the originating center, the timing was measured from start to end of scoring stages, respiratory events, arousals and leg movements.

Figure 1 depicts the average time (in minutes), plus the standard deviation, needed for scoring the studies. Scorer 1 through 3 each scored the studies from the other two sites, scorer 4 and Somnolyzer scored all studies from all three sites.

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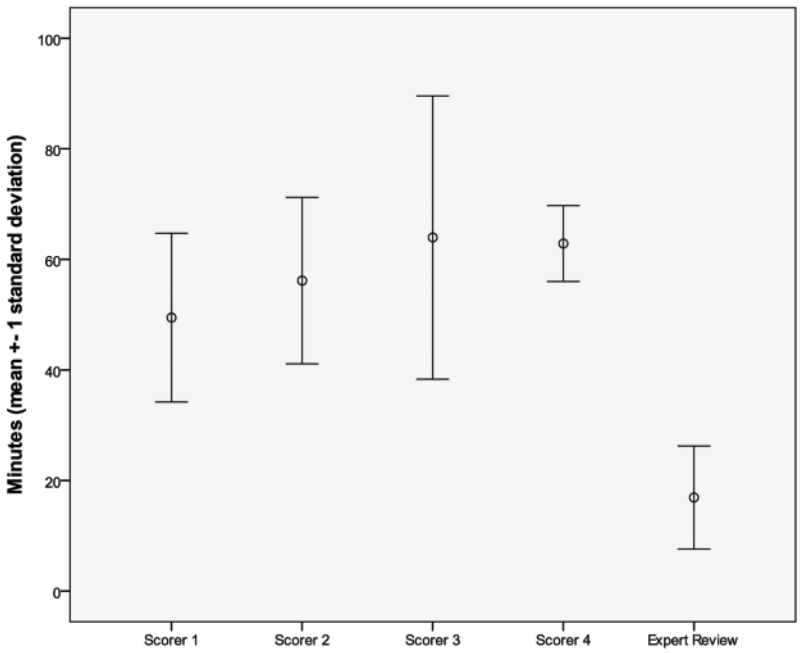

Fig. 1: Average scoring times for four different expert scorers and Somnolyzer 24x7 expert review in comparison, on a set of 96 PSG studies from three different sleep centers. Mean and standard deviation are depicted.

While there is some variability in scoring time between the different scorers (or scoring teams in some cases), average times range from 49 minutes for scorers at site 1 to 64 minutes for scorers at site 3. Expert review of the Somnolyzer 24x7 results took significantly less time.

On average, expert review took about 17 minutes, which is roughly a third of the fastest scorers and about a fourth of the slower scorers. In other words, Somnolyzer 24x7 and its efficient expert review procedure helped increase the number of studies one scorer could attend to between three- to four-fold.

Of course, this substantial time savings would not be worth much if the quality of the final scoring suffered. This, however, is clearly not the case and is where Somnolyzer's validity comes into play. Figure 2 shows scatter plots of AHI values calculated from scorings from each of the three sites. It also shows expert-reviewed Somnolyzer plotted against the corresponding AHI values from scorer 4.

The fourth scoring was chosen as a reference for these plots mainly because it was independent with respect to all data-originating sites and included all studies. Similar plots, however, could be drawn between all pairs of scorers.

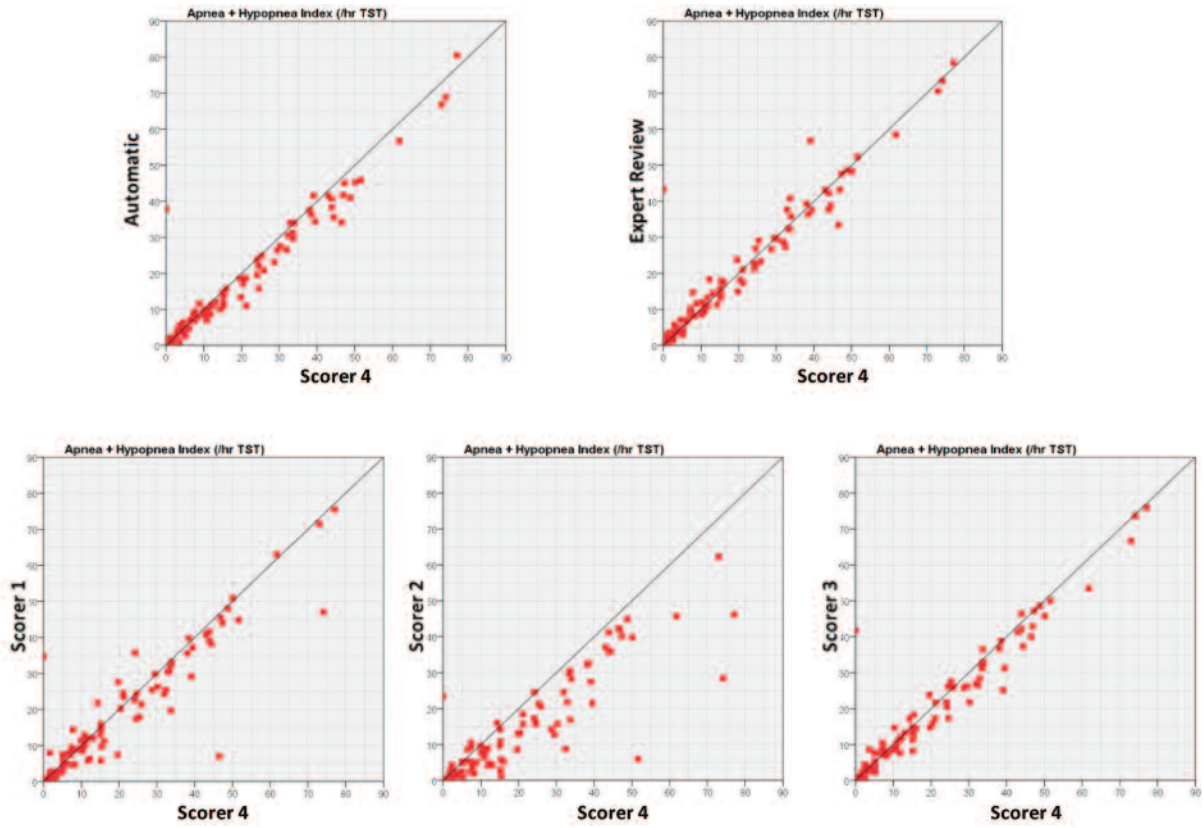

Fig. 2: Scatter plots of AHI values for all studies from Somnolyzer 24x7 before and after expert review (top) and scorers from the three sites (bottom) plotted (on the y-axis) against corresponding AHI values from scorer 4 (x-axis).

Figure 2 conveys that there is no visible difference between expert-reviewed Somnolyzer 24x7 scorings and any of the visual scorers. Each of the latter shows at least the same degree of variability against the reference scorer 4 as Somnolyzer. In other words, AHI as calculated from Somnolyzer 24x7 after expert review is indistinguishable and thus as valid as any expert scoring used in this study. Visible discrepancies between Somnolyzer and scorer 4 are well within the range of discrepancies between expert scorings.

Figure 2 also shows that the difference between Somnolyzer 24x7 scorings before and after expert review is relatively small (top two graphs). This fact – that raw, fully automatic, Somnolyzer scorings are already very close to the final output – is another reflection of the efficiency and thus achievable time savings behind expert review.

Improving quality – a case study

Looking at data reflecting Somnolyzer's use at the WellNecessities sleep centers in Louisiana and Texas, which became a Philips Respironics customer almost two years ago, sheds some light on the relationship between Somnolyzer 24x7 expert review and data quality. Figure 3 depicts average expert review times in dependence on the original PSG signal quality, rated from "unacceptable" (0) to "excellent" (6). Average expert review time clearly decreases from about 28 minutes for the studies with the worst data to about 14 minutes for the best quality data. This highlights the fact that expert review is mainly a signal quality review requiring main interaction when signal quality is insufficient.

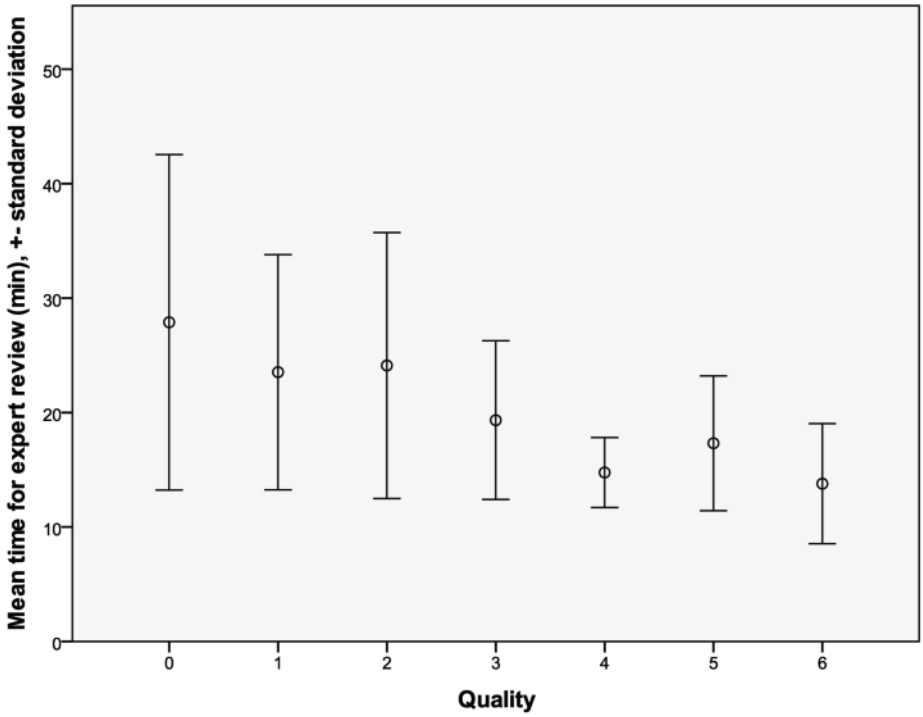

Fig. 3: Mean expert review time (depicted with standard deviation) depending on PSG signal quality ranging from worse (0 = unacceptable) to best (6 = excellent).

The dependency between data quality and time spent with each study also works in the other direction. As bad quality data requires more work by the RPSGT for expert review, this creates pressure on the night techs to attend more to signal quality.

Figure 4 shows improved quality in the sleep center over time. It depicts the distribution of data quality categories (again from 0 to 6) over the first 12 months of Somnolyzer 24x7 use. A clear shift over time toward more high-quality recordings is visible.

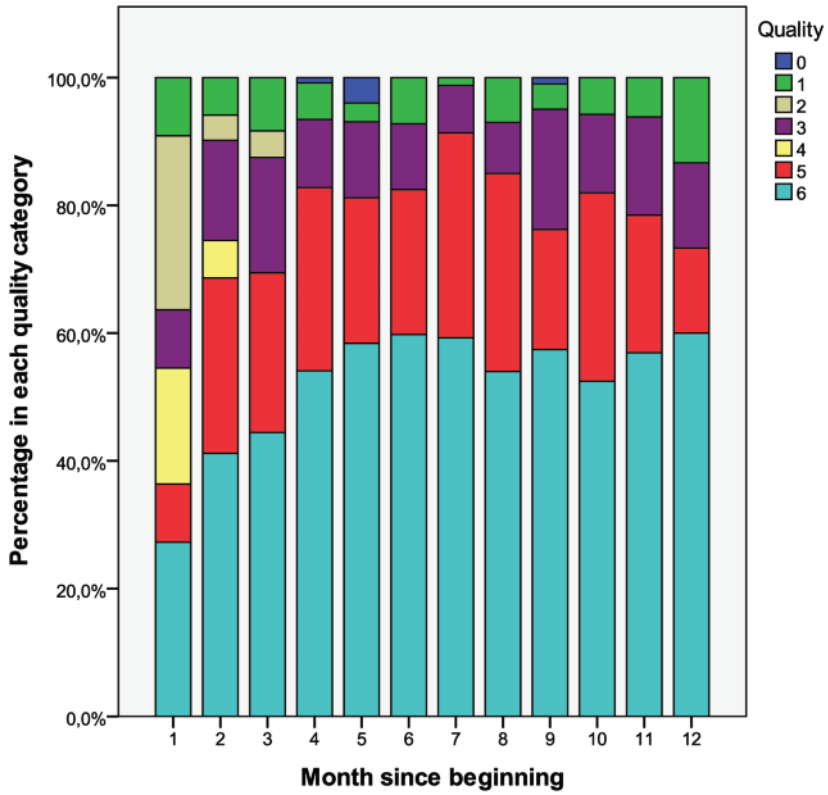

Fig. 4: Distribution of quality of PSG studies over time (in months from the beginning of Somnolyzer 24x7 use). Best quality (6) is depicted at the bottom, worst quality (0) at the top.

Conclusion

The data presented in this paper (particularly figures 1, 3 and 4) show clear evidence for time savings in sleep scoring that can be achieved by the use of a computer-supported scoring system like Somnolyzer 24x7. On one hand, the capacity of an RPSGT can be increased three- or four-fold. On the other hand, feedback from expert review can lead to an increase in recording signal quality, which leads to further time savings.

For the WellNecessities sleep center, based on the data shown in the previous section, the total savings in scoring costs were approximately 20%. And this does not take into account indirect savings through more consistent and thus improved scoring quality, faster turn-around times, and other important factors around scoring.

References

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