

COMMENTARY

Overnight Pulse Oximetry Unwoven

Commentary on Ayache and Strohl. High interrater reliability of overnight pulse oximetry interpretation among inexperienced physicians using a structured template. *J Clin Sleep Med*. 2018;14(4):541–548.

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Pulse oximetry was probably first described in the 1930s by the Germans and initially applied to patients in Japan in the 1970s.^{1,2} This “novelty” did not come into a more regular clinical event until utilized as a monitoring and management tool primarily for the anesthesiologist in the early 1980s. It then quickly moved into the position of a standard of practice in the operating room, recovery area, and other areas of the hospital.³ The widespread availability of technology and reduced cost of oximetry has now allowed near universal access even for patient use in the home. Indeed, the intuitive value evident to the uninitiated layperson has further contributed to the broad use of this device. Despite the apparent simplicity of operation and presumed self-taught capability of this utility, there is more than meets the eye to the better informed. The tendency to focus on “just a number” can result in misuse and overlook more comprehensive and perhaps crucial information available.

A systematic approach to interpretation of oximetry data can avoid the pitfalls evident in another common diagnostic test such as an electrocardiogram. When a rapid observation of an EKG draws an operator’s eye to ectopic beats or even ST elevation, the omission of a disciplined systematic review of all the information presented may result in a potentially disastrous oversight of a simultaneously present complete heart block. Although the authors do not offer patient outcome data from their investigation, they do provide a simple, verifiable, teachable template for interpretation to perhaps benchmark future adjustments of the pulse oximetry interpretive process.

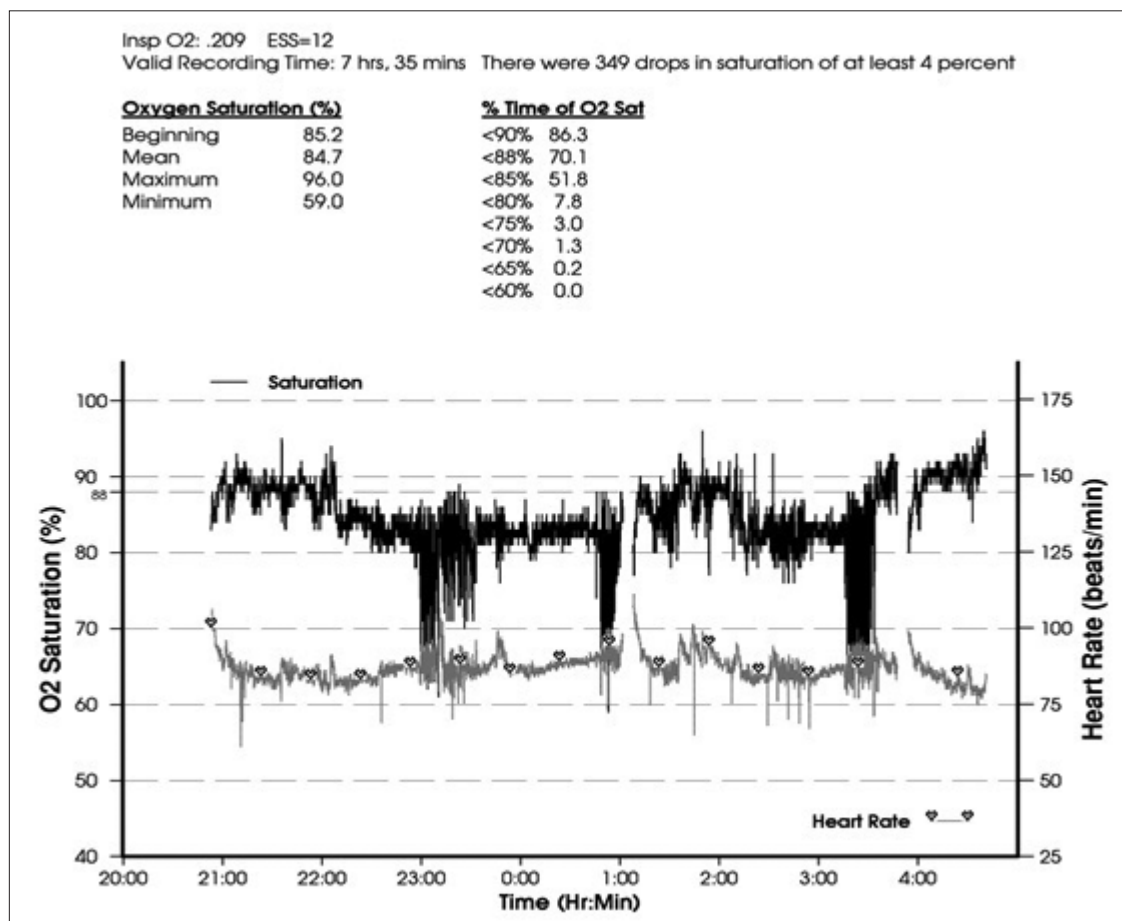
Overnight pulse oximetry has been used in the field of sleep medicine for years and falls into the class of type 4 monitoring devices with well described accuracy, sensitivity, specificity, and limitations.^{4,5} The low cost, simplicity, and rapid turnover of oximetry data has made the procedure a common screening or “case-finding” test used by many care providers primarily to urge further subspecialty evaluation of sleep disorders or even direct home sleep testing.

Evidence that overnight oximetry suffered from interpreter disparity was previously identified by Ayache et al.⁶ and presumably provoked the study by Ayache and Strohl in this issue of *Journal of Clinical Sleep Medicine*.⁷ The latter study’s laudable aim was “to assess the interrater reliability and accuracy of overnight pulse oximetry (OPO) interpretations by pulmonary

fellows using a comprehensive structured template and after a brief educational session.”⁷ The authors provide results regarding the overall interrater reliability for final recommendations given by raters in regards to sleep apnea suspicion, presence of cardiopulmonary disease, and oxygen prescription. The authors evaluated overnight oximetry in several contexts including diagnostic, continuous titration, and split-night studies and concluded that the overall interrater reliability for final recommendations was high. As a result of this initial protocol effort, there was good agreement with a cardiopulmonary diagnostic evaluation and suspicion of sleep apnea and their interrater reliability of oxygen prescription was in an excellent range.

If the exclusive goal of this testing is to produce high sensitivity for detection of an apnea-hypopnea index > 15 events/h, then this tool can likely provide clinicians with an answer to the question of whether there is more to address with regard to the patient’s suboptimally treated sleep-disordered breathing. However, herein we are made aware of “the rest of the story.” The saturation waveform pattern is certainly the most qualitative and variable aspect of pulse oximetry interpretation but has potentially very valuable teaching and treatment insight. For example, when reviewing an actual oximetry tracing, recognition of the known relationship between REM sleep stage and the occurrence of multiple clustered episodes of deep desaturations—icicles from the rooftop—may alert the clinician to the presence of neuromuscular disease and other severe REM sleep-susceptible sleep disease phenotypes. Similarly, time under 90%, minimum, and mean saturation may clue the clinician into the simultaneous existence of pulmonary hypertension, heart failure, and hypoventilation/hypercapnia (**Figure 1**). Program curricula might well benefit from an atlas of some of these more classic waveform patterns for optimal teaching and further useful interpretation. The final oximetry interpretation should include a statement of simple available demographics, valid recording time (and actual clock time), and the condition of the testing including equipment used (or not), quality of sleep, and any sedative or narcotic medications utilized. At the very least to move forward for future refinement of generalizable reporting, overnight pulse oximetry interpretation would best be served by utilizing a standardized and easily teachable template as offered from this study.

Figure 1—Overnight oximetry tracing.



This overnight oximetry tracing was done on room air with the patient reporting a typical night's sleep on room air with no sedative medications or alcohol consumed. The reduced mean saturation (84.7%) and prolonged time < 90% oxygen saturation (86.3% of recording time) are as expected for the patient's known moderate chronic obstructive pulmonary disease and right heart failure with pulmonary hypertension. Also note the clustered episodes of deep desaturations down to the minimum of 59% ("icicles from the rooftop") which are consistent with the findings of REM sleep stage hypoventilation common in obese patients with chronic obstructive pulmonary disease as was later found during this patient's polysomnography study.

CITATION

Gay PC. Overnight pulse oximetry unwoven. *J Clin Sleep Med*. 2018;14(4):497–498.

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DISCLOSURE STATEMENT

The author reports no conflicts of interest.