EEG/BIS Monitoring Tips

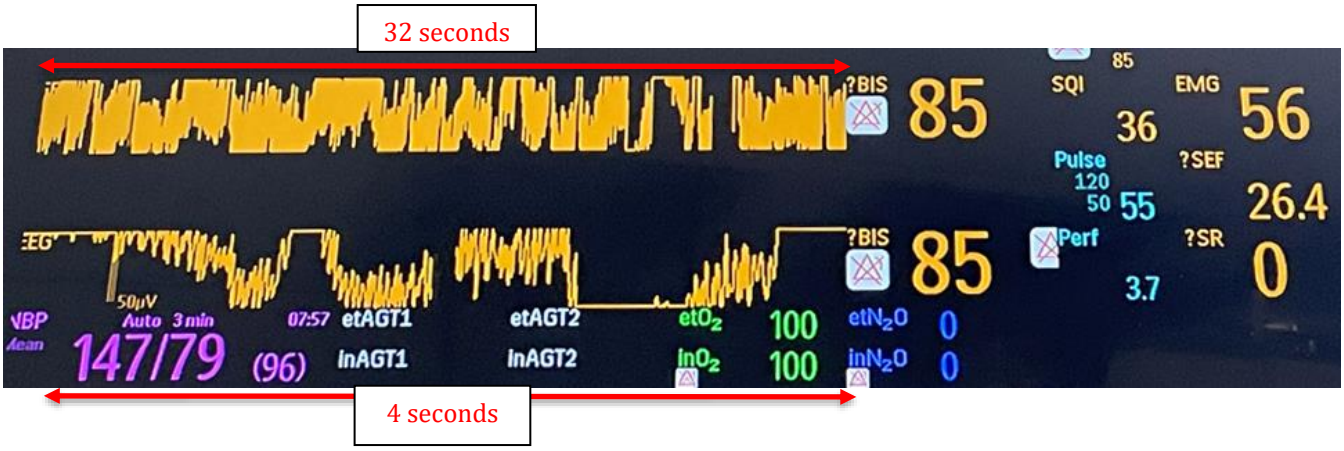
1) **Place the EEG and obtain a waveform prior to induction.**

2) **Phillips Monitor Setup:**
   a. **Display at least 2 channels** dedicated to the EEG so that the waveform can be displayed at 2 speeds:
      i. 6.25 or 12.5 mm/sec are good for visualization of slow waves
      ii. 25 or 50 mm/sec are good for visualization of [theta, alpha, and sigma] spindles
   b. **Set the EEG amplitude scale to 50 µV** (or sometimes 100 µV)
   c. **Turn EEG filter OFF** to prevent low frequency filtering (i.e., delta wave filtering).
   d. **EEG alarms:** BIS alarm range is set to low/high limits of 40/60 by default.
   e. **Turn ON relevant parameters:** The BIS (bispectral index), SQI (signal quality index), SR (suppression ratio), EMG (electromyographic strength), and SEF (spectral edge frequency 95%).

** EEG waveform reflects changes in patients' hypnotic state much more rapidly that processed EEG parameters**

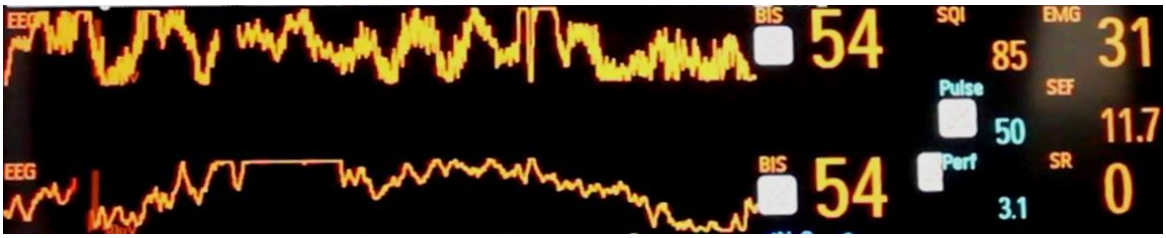
3) **EEG waveform nomenclature and frequency ranges:**
   - **Delta:** 1 - 4 or 0 - 4 Hz; **Slow delta**: <1 Hz
   - **Theta**: 4 - 8 Hz
   - **Alpha**: 8 - 12 Hz (Mu)
   - **Beta**: 12 - 30 Hz (or 14 - 30 Hz); **Low beta**: <20 Hz; **High beta**: 20 - 30 Hz
   - **Gamma**: >30 Hz (to 100s Hz)
   - **Sigma**: 12 - 14 Hz; frequency band for sleep spindles during physiological sleep

4) **EEG of the awake patient:** Dominated by high frequency (i.e., high beta and gamma) activity, usually of low amplitude, producing a fuzzy-appearing wave on the faster 25-50 mm/s tracing. High-frequency, high-amplitude activity (EMG) and periodic high-amplitude deviations (from blinking) may be observed.

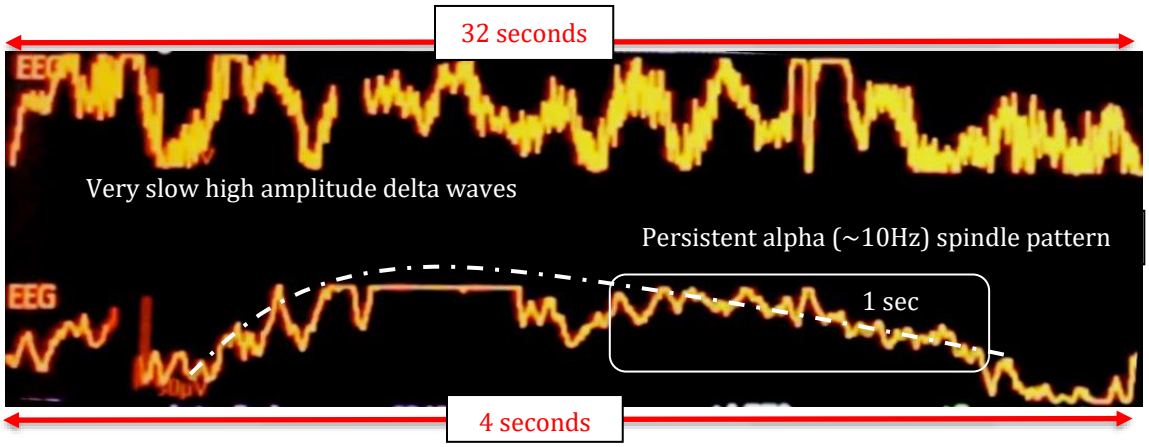


5) **EEG during general anesthesia:** A pattern of slow delta waves (<1 Hz) coupled with alpha spindles (8-12 Hz) is often desired. There should be an absence of high beta (20-30 Hz) waves and absence of any periods of burst suppression.
    - Waves in the alpha (8-12 Hz), theta (4-8 Hz) or low beta (12-20 Hz) frequency ranges, often termed spindles, may not be prominent in older patients with cognitive impairment

EEG waveform demonstrating slow waves in the delta range (~1 Hz) and spindle pattern consistent with general anesthesia:



Same image from above zoomed in: dotted white trace demonstrates waves in the slow delta range (~1Hz):



6) **EEG suppression**: Any flattened interval on the EEG tracing (EEG suppression) indicates excessive anesthetic depth or suggests the presence of other suppressive stimuli (e.g., cerebral ischemia).