RESULTS:

- Phase 1 — The positive predictive value of irregular respiration to detect the transition from sleep to wake was 0.89 and 0.98 for wake and arousal combined.
- Phase 2 — The positive predictive value of irregular respiration identified by the ANN was 0.86 for wake and arousal combined.

KEY FINDINGS:

- It is possible to manually identify the transition from sleep to wake from the flow signal alone.
- It is possible to automatically identify the transition from sleep to wake from the flow signal alone.
- This study describes the development of SensAwake™, which automatically senses the transition from the sleep state to wake state and promptly reduces the delivered pressure to facilitate the return to sleep.

AIM:

- To examine the ability to detect transitions from sleep to wakefulness using the Continuous Positive Airway Pressure (CPAP) flow signal alone and to automate this recognition.

METHODS:

PHASE 1 — Evaluation of the relationship between the visual onset of irregularity and EEG:

- 20 sleep apnea patients (Respiratory Disturbance Index (RDI) 13-119/hr) underwent full nocturnal polysomnography (PSG).
- Periods of irregular respiration were manually identified from the flow signal alone while the scorers were blinded to sleep staging.
- Sleep and arousals (as defined by the American Association of Sleep Medicine (AASM)) were manually scored using traditional PSG measures (EEG, EOG and EMG).
- Results from manually marked periods of irregular respiration were compared to scored sleep.

PHASE 2 — Automated detection of irregular respiration:

- 50 PSG studies were scored manually for periods of irregular respiration from the flow signal alone, and were used to train an Artificial Neural Network (ANN).
- The trained ANN was then tested for accuracy using the flow signals from 24 different PSG studies.
- Results from the ANN were compared to EEG defined wake and arousals (as defined by the AASM).

RESULTS:

CONCLUSIONS:

- The presence of an irregular respiratory pattern was highly predictive of the transition from sleep to wake.
- Detection of irregular respiration can be automated with an ANN.