Name of Policy:	Clinical guidelines for manual titration of positive airway pressure using bilevel spontaneous timed (BPAP-ST)	THE UNIVERSITY OF TOLEDO
Policy Number:	3364-171-07-03	
Department:	Sleep Disorders	
Approving Officer:	Senior Hospital Administrator	
Responsible Agent:	Director, Sleep Disorders	
Scope:	The University of Toledo Medical Center Pulmonary Services Department	Effective Date: 3/17/2023 Initial Effective Date: 3/17/2023
X New policy proposal Minor/technical revision of existing policy Major revision of existing policy Reaffirmation of existing policy		

(A) Policy Statement

All qualified and trained Polysomnographic Technologists will be able to set-up and titrate patients using bilevel positive airway pressure therapy in a spontaneous timed mode (BPAP-ST).

(B) Purpose of Policy

Bilevel positive airway pressure (BPAP) therapy in a spontaneous timed (ST) mode targeted to normalize the apnea-hypopnea index (AHI) may be considered for the treatment of central sleep apnea (CSA) syndromes in the following scenarios:

- 1. If the patient has central apneas on CPAP or BPAP (or BPAP in spontaneous mode, BPAP-S).
- 2. If adaptive servoventilation (ASV) is contraindicated because ejection fraction $\leq 45\%$.
- 3. If the patient is unable to tolerate ASV.

BPAP-ST may also be considered for the treatment of stable chronic alveolar hypoventilation syndromes.

(C) Overview

In the Spontaneous/Timed (ST) Mode, any breathing efforts initiated by the patient are supported just as in the Spontaneous (S) Mode. In addition, a minimum breathing rate may be set by using the Breaths Per Minute (BPM) control. If the patient fails to make an inspiratory effort within the interval set by the BPM control, the machine will cycle to the pressure support level to deliver the breath to the patient based on the BPM control setting.

For example, if the technician selects a minimum breathing rate of 10 breaths per minute for the patient, the breathing interval is 6 seconds ($60 \sec/10 \text{ BPM} = 6 \sec$ onds). If 6 seconds pass from the initiation of the last inspiration, the BPM timer will cause the device to switch to the IPAP pressure causing inspiration to be delivered to the patient. The pressure support breath is initiated by the timer, and the breath is ended in the same manner as a spontaneously triggered breath. As the inspiratory flow tapers towards the end of inspiration the machine drops the breathing circuit pressure to the baseline level allowing the patient to exhale.

(D) Procedure

When a patient is diagnosed with CSA, after receiving an order for BPAP-ST, the Sleep Lab staff will schedule a Polysomnograpm (PSG) to be performed using BPAP-ST. Pressures will be adjusted throughout the PSG to determine optimal pressures for maintaining upper airway patency.

3364-171-07-03 Clinical guidelines for manual titration of positive airway pressure using bilevel spontaneous timed (BPAP-ST) Page 2

American Academy of Sleep Medicine (AASM) definitions for optimal, good, adequate, and unacceptable titration:

- 1. Optimal titration reduces the Apnea Hypopnea Index (AHI) < 5 for at least 15 minutes' duration and should include supine Rapid Eye Movement (REM) sleep at the selected pressure that is not continually interrupted by spontaneous arousals or awakenings.
- 2. A good titration reduces the AHI<10 or by 50% if the baseline AHI is <15 and should include supine REM that is not continually interrupted by spontaneous arousals or awakenings at the selected pressure.
- 3. An adequate titration does not reduce the $AHI \le 10$ but reduces the AHI by 75% from baseline (especially in severe OSA patients) or one in which the titration grading criteria for optimal or good are met with the exception that Supine REM did not occur at the selected pressure.
- 4. An unacceptable titration is one that does not meet any of the above definitions.

Training – If the patient has been on CPAP or BPAP, then it is up to the technician to assess whether BPAP-ST training is necessary, although generally it is recommended. Patients with a poor prior experience will typically benefit from training. Patient education and BPAP-ST training shall be performed in the same manner as specified by the **CPAP Titration Procedure**. During training, the EPAP setting shall be maintained at its lowest level (i.e. 4 cm H₂O), while IPAP pressure shall begin at 8 cm H₂O, and be gradually increased to 10 cm H₂O at the end of the training session.

Workflow

- 1. Explain test/expectations to the patient.
- 2. Fit the patient with an interface and headgear.
- 3. Allow patient to test/feel pressure prior to starting hook-up.
- 4. Back-up rate is 2-4 breaths per minute (bpm) below the resting respiratory rate.
- 5. Refer to the attached algorithm, AASM Bi-Level titration for patients greater than or equal to 12 years of age.
 - Recommended minimum starting IPAP should be 8 centimeters of water pressure (cm/H2O)
 - Recommended minimum starting pressure EPAP should be 4 cm/H2O
 - Recommended maximum IPAP 30 cm/H2O
 - Recommended minimum IPAP-EPAP differential is 4 cm/H2O with the maximum differential being 10 cm/H2O
- 6. If oxygen saturation levels are still low despite pressure support and respiratory rate having been optimized:
 - If the room air baseline SpO2 is ≤88% for a cumulative 10 minutes in the absence of sleep disordered breathing events (including snoring), increase EPAP and/or IPAP pressure by 1 cm H2O every ≥ 5 minutes until SpO2 ≥ 90% is achieved. Pressure increases to improve baseline SpO2 levels may be performed twice during the titration process and should be guided by the technician's assessment of the patient's ability to tolerate the increased pressure.
 - If PAP pressure increase of 1 or 2 cm H₂O does not sufficiently improve the baseline SpO2 level, gradually return the pressure to the levels that controlled the obstructive and central events, and apply oxygen. Refer to the Sleep Lab policy titled Oxygen Administration.
- 7. If the patient complains that the pressure is too high, reduce the pressure, choosing a pressure that will allow the patient to fall back asleep.

3364-171-07-03

Clinical guidelines for manual titration of positive airway pressure using bilevel spontaneous timed (BPAP-ST) Page 3

Components:

- 1. Patient education
- 2. Patient hook-up
 - a. International 10-20 hook-up
 - b. Chin Electromyograph (EMG)
 - c. Eye Electrooculogram (EOG)
 - d. Anterior Tibialis leads right and left
 - e. Chest Respiratory Inductance Plethysmography (RIP) belts
 - f. Abdomen RIP belt
 - g. Oximeter
 - h. Snore microphone
- 3. Patient to bed
- 4. Lights out
- 5. Impedance check
- 6. Machine calibration
- 7. Patient calibration
- 8. Machine calibration
- 9. Lights on
- 10. Disassemble PAP device and remove all electrodes and process each for disinfection or disposal per policy.

Reference:

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See Procedure Clinical Guidelines for Manual Titration of Positive Airway Pressure using Bilevel Spontaneous Timed (BPAP-ST)

3364-171-07-03 Clinical guidelines for manual titration of positive airway pressure using bilevel spontaneous timed (BPAP-ST) Page 4

Approved by:		Review/Revision Date: 03/23
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Review/Revision Completed By: Director, Sleep Disorders Center		Next Review Date: 03/26
Policies Superseded by This Policy:		

It is the responsibility of the reader to verify with the responsible agent that this is the most current version of the policy.