PEEP WHILE THEY SLEEP: NIV FOR THE COMPLEX PATIENT

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OBJECTIVES

- Review Medicare Criteria for NIV (VENT/BILEVEL) qualifications
- Review Volume Target Settings
- Review case scenarios of 3 common diagnosis codes
NON-INVASIVE VENTILATION QUALIFYING GUIDELINES

Obstructive Lung Disease:

Restrictive Thoracic Disorders:

Neuromuscular Disorders:

COPD, CF, BRONCHIECTASIS, IPF, SARCOIDOSIS, SCOLIOSIS
OBESITY HYPOVENTILATION SYNDROME, ALS, SCI
MUSCULAR DYSTROPHY
## NON-INVASIVE VENTILATION

### VENT
- Volume target w/auto EPAP
- Battery back up
- “Sip and Puff” ventilation
- Invasive and non-invasive ventilation
- RENTAL device

### BILEVEL
- Volume target w/o auto EPAP
- Spontaneous mode “S”
- Spontaneous timed “S/T”
- Auto BIPAP
- CPAP or auto CPAP
- RENT TO OWN
HOW DO WE FIND THESE PATIENTS?

- **Referrals** from Physicians to NIV clinic
- Report in EPIC: "Elevated CO2 report“
  - CO2 > 52
  - Serum bicarbonate: -HCO3 > 35
- **ICU:** "Consult NIV"
OBSTRUCTIVE LUNG DISEASE

- COPD
- Cystic Fibrosis
- Bronchiectasis
Obstructive lung disease such as COPD, Cystic Fibrosis, Bronchiectasis

One of the following:

- FEV1 ≤ 50% predicted
- FVC < 50% predicted
- ABG PaCo2 ≥ 52 mmHg
- PO2 < 70 mmHg
- FEV1 < 40% predicted
- CO2/HCO3 > 31 mmol/L
- ETCO2 ≥ 48 mmHg for 5 min or more test lasting 2 Hr.

OR

One of the following:

- PCO2 48-51 mmHg;
- PO2 < 75 mmHg
- FEV1 ≤ 51-60%
  - AND 2 or more resp. related hospital admissions within 12 months.

Documentation:
smart phrase NIVCOPD

### Bipap

**Bipap with a rate “S/T” and**

**AVAPS**

**ABG** PaCo2 > 52 mmHg w/ prescribed FiO2

and

**Overnight sleep oximetry**

demonstrated oxygen ≤ 88% for > 5 minutes done while breathing oxygen at 2 Lpm or the patients usual FiO2 whichever is higher

and

**CPAP** has been considering and ruled out.

Formal sleep testing is not required if there is sufficient info in the record that the patient does not suffer from some form or sleep apnea as the predominant cause of awake hypercapnea or nocturnal O2 desaturation.

### Situation 1:

- ABG worsens ≥ 7 with original result
- and 2 or more resp. related hospital admissions within 12 months.
- O2 sat ≤ 88% 5 continuous min.
- and PSG w/ O2 sats ≤ 88% on bi-level

### Situation 2:

- ABG ≥ 52
  - and
- O2 sat ≤ 88% on 2Lpm or pt. usual FiO2 whichever is higher
WHAT DEVICE? VENT / BILEVEL

• Severity of disease: Include comorbidities, hospital admissions, and if multiple exacerbations.

• Modes: Auto-EPAP, “Sip and Puff” ventilation.

• Battery: Power outages, decline in health, or severe medical compromise.

• Insurance:
<table>
<thead>
<tr>
<th><strong>VENT</strong></th>
<th><strong>BILEVEL</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>• Diagnosis code with co-morbidies.</td>
<td>• Elevated PCO2.</td>
</tr>
<tr>
<td>• <strong>Volume targeted mode with AE.</strong></td>
<td>• <strong>Sleep apnea</strong> has been considered and ruled out.</td>
</tr>
<tr>
<td>• Benefits: Decrease WOB and improved pulmonary status.</td>
<td></td>
</tr>
<tr>
<td>• <strong>Battery:</strong> Interruption of ventilation support could <strong>lead to decline in health.</strong></td>
<td></td>
</tr>
</tbody>
</table>
## VOLUME TARGETED

Suggested Volume
Targeted Settings

<table>
<thead>
<tr>
<th></th>
<th>COPD with OSA</th>
<th>COPD no OSA</th>
<th>OHS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max Press</td>
<td>30</td>
<td>20</td>
<td>30</td>
</tr>
<tr>
<td>PS Max</td>
<td>16</td>
<td>15</td>
<td>22</td>
</tr>
<tr>
<td>PS Min</td>
<td>6</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td>EPAP Max</td>
<td>14</td>
<td>5</td>
<td>15</td>
</tr>
<tr>
<td>EPAP Min</td>
<td>4</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td>Breath Rate</td>
<td>AUTO</td>
<td>AUTO</td>
<td>AUTO</td>
</tr>
<tr>
<td>AVAPS Rate</td>
<td>1-3</td>
<td>1-3</td>
<td>1-3</td>
</tr>
<tr>
<td>Target VT</td>
<td>6-8ml/Kg</td>
<td>6-8ml/Kg</td>
<td>6-8ml/Kg</td>
</tr>
<tr>
<td>HEIGHT in.</td>
<td>59</td>
<td>61</td>
<td>63</td>
</tr>
<tr>
<td>-----------</td>
<td>----</td>
<td>----</td>
<td>----</td>
</tr>
<tr>
<td>IDEAL WEIGHT kg</td>
<td>52</td>
<td>55.5</td>
<td>59</td>
</tr>
<tr>
<td>5 ml/kg VT</td>
<td>260 ml</td>
<td>280 ml</td>
<td>300 ml</td>
</tr>
<tr>
<td>6 ml/kg VT</td>
<td>310 ml</td>
<td>330 ml</td>
<td>350 ml</td>
</tr>
<tr>
<td>8 ml/kg VT</td>
<td>420 ml</td>
<td>440 ml</td>
<td>470 ml</td>
</tr>
<tr>
<td>10 ml/kg VT</td>
<td>520 ml</td>
<td>550 ml</td>
<td>590 ml</td>
</tr>
</tbody>
</table>
COPD

- 58-year-old female: 69 in
- Bronchiectasis
- Multiple COPD exacerbations
- Excessive daytime sleepiness
- CO2: 60
- FEV1/FVC: 46%
- + smoker
FINAL SETTINGS

Volume Targeted
Rate: 12
Vt: 420ml (6ml/kg)

PS min: 5
PS max: 10
Auto-EPAP: 4-7
OVERNIGHT OX, CHECK ABG/VBG, DOWNLOAD

- Recheck ABG/VBG
- 1/02/24: 7.35/60
- 4/02/24: 7.34/53

**SpO2 Data**

| Time ≤ 88% | 00:27:48 |
| Time = 89% | 01:18:00 |
| High SpO2 | 94.0% |
| Low SpO2  | 84.0% |
| Basal SpO2| 89.8% |
| Delta SpO2| 00:00:04 |
| Time consecutive ≤ 88% | 00:10:32 |
| Awake SpO2 | 93.0% |
| Artifact events | 00:16:08 |

**SpO2 ODI Data**

- Oxygen Desaturation Events (3%) = 20
- Oxygen Desaturation Index (ODI) = 3

A desaturation event is defined as a decrease in SpO2 ≥ 3 percentage points within a 3 minute window of onset.
• She has had no further COPD exacerbations.
• She reports increase energy.
• She has been cleaning and organizing her house.
• She is down to 7 cigarettes/day and is happy to be saving money to be able to buy things she needs for her house.
• Buying fancy cat food.
Restrictive Thoracic Disorder

- Pulmonary Fibrosis
- Scoliosis
- Obesity Hypoventilation Syndrome

![Image of body silhouettes showing obesity categories]
Restrictive Lung Disease such as Idiopathic Pulmonary Fibrosis, Sarcoidosis, Scoliosis, Obesity Hypoventilation Syndrome

Pt. needs to meet criteria A & B and either C or D

A. An initial ABG PaCO2 ≥ 45mmHg done while awake and using prescribed FiO2 &

B. PFT showing FEV1/FVC ≥ 70

AND either C or D

C. (for hypoventilation only) 2cd ABG performed during sleep or immediately upon awaking and using prescribed FiO2. CO2 level should be higher than initial ABG (above 7 mm HG) or

OR

D. Overnight pulse oximetry on pt.'s prescribed FiO2 showing 5 mins of saturations < 88% with a recording time of 2 hours, cumulative and is not caused by an Obstructive event.

AND

COPD does not contribute to the patient's pulmonary limitations

Device used for Life support

Tried and failed Bipap therapy

Documentation:

Smart phrase: NIVRESPOHS, NIVOHS PulmonaryHyt

Bipap is in use and failing:

Bipap w/ rate "S/T" and "AVAPS"

Device used for Life support

Tried and failed Bipap therapy
OVERNIGHT OXIMETRY: QUALIFY BILEVEL / NIV

Minimum recording time = 2 hours

SpO2 ≤ 88% on 2 liters or prescribed O2 (whichever is higher)

5 minutes of desaturation to qualify
SUPPORTING DOCUMENTATION:
RESTRICTIVE THORACIC DISORDER

• Diagnosis code with co-morbidities.
• BILEVEL has failed.
• Targeted Volume mode with Auto EPAP.
• Battery, life-threatening consequence, decline in health.
• Improve quality of life and decrease hypercapnia.
OBESITY HYPOVENTILATION SYNDROME

28-Year-old male
BMI 54%, 67in
411 Lbs
CO2: 73
PFTs show severe mixed obstruction and restriction.
FEV1/FVC: 66%

Problem List
- Obesity hypoventilation syndrome (HCC-CMS)
- Acute hypoxic respiratory failure (HCC-CMS)
- Class 3 severe obesity in adult (HCC-CMS)
- HTN (hypertension)
- Lower extremity edema
- OSA (obstructive sleep apnea)
- Leukocytosis
- Alcohol use disorder
- Biventricular failure (HCC-CMS)
- Chronic respiratory failure with hypoxia and hypercapnia (HCC-CMS)
- Counseling and coordination of care
ADMITTED TO ICU

Arrived: Hypoxic Resp failure, OHS, HTN, OSA, ETOH disorder.
Home auto-BIPAP: 25/12,
PS min: 4
(not tolerating).
Day 1: V60: S/T mode: 18/6, Rate: 4, 35%
Hi flow: 50L/ 55%
Changed S/T: 22/18, Rate: 14, 40%
Day 2: Oxymizer: 7-10L
Continues S/T: 22/18, Rate: 14, 40%
Day 3: NIV consult ***, AVAPS-AE, 0 rate
Day 4: Needed a backup rate
PFT ordered
Day 8: Failed home BIPAP
Day 18: Failed overnight oximetry test (70%)
Day 19: Discharged AVAPS-AE
<table>
<thead>
<tr>
<th><strong>FINAL SETTINGS</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Volume Target</strong></td>
</tr>
<tr>
<td>AUTO-EPAP</td>
</tr>
<tr>
<td>Vt: 450 mls</td>
</tr>
<tr>
<td>PS min/max: 8 / 15</td>
</tr>
<tr>
<td>Rate: 10</td>
</tr>
<tr>
<td>10-liter bleed in</td>
</tr>
</tbody>
</table>
OXYGEN QUALIFICATIONS

10 liters
Titrate up like any other home O2 eval.
Titrate down until the O2 drops < 88%

Night shift
Catch them asleep
Turn off/down O2
Add note

2 liters  69%
4 liters  72%
6 liters  80%
8 liters  84%
10 liters 90%
FOLLOW UP

• 4/11/24:  7.50/ 32

• Weight drop 315 lbs!  
  (411 lbs)

• Goal  250 lbs

---

SpO2 Data

| Time ≤ 88% | 00:00:03 |
| Time ≥ 89% | 00:00:19 |
| High SpO2  | 100.0%   |
| Low SpO2   | 88.0%    |
| Basal SpO2 | 96.8%    |
| Delta SpO2 | 00:03:11 |
| Time consecutive ≤ 88% | 00:00:02 |
| Awake SpO2  | 0.0%     |
| Artifact events | 03:25:00 |

SpO2 ODI Data

| Oxygen Desaturation Events (3%) | 22 |
| Oxygen Desaturation Index (ODI)  | 3  |

A desaturation event is defined as a decrease in SpO₂ ≥ 3 percentage points within a 3 minute window of onset.
NEUROMUSCULAR DISORDERS

ALS
Muscular Dystrophy
Spinal cord injuries
Polio
# Neuromuscular Disease such as ALS, Muscular Dystrophy, Quadriplegia

<table>
<thead>
<tr>
<th>NIV</th>
<th>VENT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Documentation of Neuromuscular disease</strong></td>
<td></td>
</tr>
</tbody>
</table>

One of the following:

- Mip/Nif : < 60
- FVC < 50% predicted
- SVC < 50% define SVC

**Documentation:**

smart phrase  **NIVALS**

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<th>BILEVEL</th>
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</table>

**Documentation of Neuromuscular disease and**

One of the following:

1. **ABG:** ≥ 45
2. **Sleep oximetry:** demonstrated oxygen sat ≤ 88% for 5 min. while breathing prescribed Oxygen
3. Mip/Nif : < 60 or FVC < 50% predicted and

COPD does not contribute significantly to pt. pulm. Limitations.

**Bipap w/rate "S or S/T" and "AVAPS"**
SUPPORTING DOCUMENTATION: NEUROMUSCULAR DISORDERS

VENT
Medical history and respiratory ailments
Disease progression
Battery backup
Usage >12 hours/day

BILEVEL
COPD does not contribute significantly to the pulmonary limitations.
POST POLIO  SEVERE SCOLIOSIS

- Malignant neoplasm of right male breast (HCC-CMS)
- Diarrhea
- Acute poliomyelitis
- Anemia
- Aortoiliac occlusive disease (HCC-CMS)
- Coronary artery disease involving native coronary artery of native heart without angina pectoris
- Hyperlipidemia associated with type 2 diabetes mellitus (HCC-CMS)
- Essential hypertension
- Iron deficiency anemia due to chronic blood loss
- Pseudophakia of both eyes
- Renal artery stenosis (HCC-CMS)
- Type 2 diabetes mellitus, without long-term current use of insulin (HCC-CMS)
- Urinary tract infection with hematuria
- Gross hematuria
- Acute blood loss anemia
- Nodule of lower lobe of right lung
- Stage 2 chronic kidney disease
- Type 2 diabetes mellitus with hyperglycemia (HCC-CMS)
- Normal anion gap metabolic acidosis
- Acute diastolic heart failure (HCC-CMS)
- Chronic respiratory failure with hypoxia and hypercapnia (HCC-CMS)

- 79 male
- ICU, 1-liter nasal cannula
- RR: 30
- Barely arousable
- Accessory muscle use at rest
- Bedsores, could not lie flat
- FVC: 18%, CO2: 70
• Height: 60in.

• EPAP min/max: 6 / 6

• PS min/max: 13 / 16

• Target rate: 0

• Target Vt: 350 mls
• 7/9/23: 7.23 / 70

• 10/23/23: 7.41 / 40
## TAKE AWAYS

<table>
<thead>
<tr>
<th>Identifying</th>
<th>Hypercanic patients who could benefit from NIV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Criteria</td>
<td>NIV Medicare Guidelines</td>
</tr>
<tr>
<td>Supporting</td>
<td>Document, document, document!</td>
</tr>
</tbody>
</table>
QUESTIONS