Hospital Readmission Rates

19.6  % Medicare Beneficiaries readmitted within 30 days of discharge

34   % Medicare Beneficiaries readmitted within 90 days of discharge

22.6 % Medicare Beneficiaries readmitted within 30 days of discharge with COPD

12   Billion in expenditures for potentially preventable rehospitalizations reported by Medicare Payment Advisory Commission

Hospital Readmission Reduction Program

• Financial incentive for hospitals to lower readmission rates

• Starting for discharges on October 1, 2012, must establish a program for preventable readmissions for 3 high-volume and/or high-rate conditions.

• Expanded by four or more conditions in FY2015

• Hospitals with excess readmissions will have all payments reduced by an adjustment factor up to
  – 1 percent in FY 2013
  – 2 percent in FY 2014
  – 3 percent in FY 2015 and beyond

Source: 2008 Homecare Provider Survey by Echo Strategies
Hospital Readmission Reduction Program

Initial Diagnosis Impacted in FY2013

Heart Attack
Heart Failure
Pneumonia

Beginning in FY 2015, expand the list of conditions to include chronic obstructive pulmonary disorder and others
Potentially for Savings

NIV Success Rate

“Cost Savings between $1,019,520 and $1,699,200 per year based on a decrease of 60 to 100 ventilator days per month in the ICU.”
What do AVAPS and Auto SV Advanced have in common?

- EASY TO USE…SIMPLE TO OPERATE…
- EASY TO USE…SIMPLE TO OPERATE…
- EASY TO USE…SIMPLE TO OPERATE…
Bi-level with Average Volume Assured Pressure Support (AVAPS)

• Acts primarily as a bi-level pressure support device but is able to provide a constant tidal volume with the AVAPS feature enabled.
  – Can be used with S, S/T, PC or T modes.

• Automatically adjusts the pressure support level to maintain a consistent tidal volume
  – IPAP will automatically increase or decrease to maintain set tidal volume
# Introducing BiPAP AVAPS/ST Noninvasive

<table>
<thead>
<tr>
<th>Feature</th>
<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exclusive AVAPS Algorithm – (BiPAP AVAPS Only)</td>
<td>The Only Way of Ensuring the Delivery of a Target Tidal Volume</td>
</tr>
<tr>
<td>Digital Auto-Trak</td>
<td>Advanced Leak Sensing Technology</td>
</tr>
<tr>
<td>Encore Pro and Encore Anywhere</td>
<td>Easy Access to Patient Data</td>
</tr>
<tr>
<td>Wired, Wireless Modems, SD Card</td>
<td>Flexible Connectivity</td>
</tr>
</tbody>
</table>
Clinical benefits of AVAPS

- Maintains ventilatory support and tidal volume during progressive ventilatory changes of the patient.
- Maintains ventilatory support and tidal volume during positional changes during sleep.
- Provides the assurance of a tidal volume within a bi-level system.
- Alarms to indicate that tidal volume is not being maintained.
AVAPS Algorithm

- Automatically adjusts IPAP to maintain a consistent tidal volume for patients with changing respiratory needs.
Improved Patient Care is Now Automatic

**AVAPS Feature**

- **Why It Matters:**
  - Automatically adapts to disease progression and changing patient needs
  - Improves ventilation efficacy
  - Simplifies the titration process
Volume Assurance with PS is NOT recommended for patients with periodic breathing

- Treatment of periodic breathing requires a variable breath by breath response system so the patients PaCO2 stabilizes quickly
  - Prevents overshooting or undershooting the PaCO2 breath by breath
  - Does not augment the patients tidal volume consistently
- Volume Assurance with PS does not have a quick variable response to changes in tidal volume.
  - It is designed to adjust and maintain a constant tidal volume with each breath over time.
  - This benefit often seen with patients who have slow declines in their ventilatory conditions.
AVAPS Benefits

- Adapt to disease progression
  - Adjusts therapy to meet patients changing needs

- Simplify titration process
  - No trial and error to get the desired tidal volume.
AVAPS Benefits

• Improve patient’s ventilation efficacy
  • Focus is on tidal volume

• Improve patient’s comfort
  • Uses the minimum pressure to achieve the target tidal volume

• Increase safety by guaranteeing a minimum ventilation
  • No guessing if the patient is getting their prescribed therapy.
AVAPS Candidates

• Patients that require a specific tidal volume throughout the progression of their disease
  – Neuromuscular Disorders
  – ALS

• Patients that require a specific tidal volume throughout the night
  – Obesity Hypoventilation

• Patients that require a comfortable breath delivery with the knowledge that their volumes are being met
  – COPD
Which Patients Benefit from BiPAP AVAPS?

Patients With Hypoventilation

Reduced amount of air enters the lungs, resulting in decreased levels of oxygen and increased levels of carbon dioxide in the blood.

Major Causes of Hypoventilation

<table>
<thead>
<tr>
<th>Respiratory Muscle Weakness</th>
<th>ALS, Muscular Dystrophy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Restrictive Disorders</td>
<td>Scoliosis, Obesity Hypoventilation</td>
</tr>
<tr>
<td>Obstructive Lung Disease</td>
<td>COPD, Cystic Fibrosis</td>
</tr>
</tbody>
</table>
Chronic Respiratory Insufficiency

• Results
  – Supine body position demonstrated worse sleep efficiency
    • AVAPS has better sleep efficiency in both body positions during REM
  – Ve was greater with AVAPS regardless of body position or sleep-wakefulness state

• Conclusion
  – AVAPS was comparable to NIV-PS therapy with regards to sleep
  – Ve was statistically greater with AVAPS

Obesity Hypoventilation Syndrome

• Results
  – TcCO₂ decreased significantly during nocturnal BiPAP S/T with AVAPS.
  – Sleep quality was comparable with both therapies

• Conclusions
  – BiPAP S/T improved sleep quality in patients with OHS
  – The addition of AVAPS provides beneficial physiological aspects resulting in a more efficient decrease of PtcCO₂ as compared to BiPAP S/T alone.

Chest Sept 2006, Storre et al., *Average Volume-Assured Pressure Support Ventilation in Obesity Hypoventilation: A Randomized Crossover Trial*
Obesity Hypoventilation Syndrome

• Results
  – TcCO2 was reduced from 45.5 to 42.4 mmHg
  – Vt was increased from 670 to 764 ml
  – Ve was increased from 9.5 to 10.8 L

• Conclusion
  – Vt targeting improves correction of nocturnal hypoventilation in stable patients with OHS treated with NPPV
  – Lower target Vt values may improve tolerance and patient comfort

• Results
  – Baseline CO2 was decreased with both PS and PS with AVAPS
  – Sleep Quality Score was decreased in PS with AVAPS

• Conclusions
  – PS with AVAPS has similar efficacy to PS
  – PS with AVAPS produces better effects on sleep quality

Clini, E; A Pilot study on Efficacy of Nocturnal AVAPS Mask Ventilation in Patients with Hypercapnic COPD
Philips Respironics introduces a complete line of products with the AVAPS algorithm to allow for a continuity of care from the hospital to the home.
Improved Patient Care is Now Automatic

Digital Auto-Trak

• What It Does:
  – Automatically adjusts triggering and cycling
  – Provides Advanced Leak detection

• Why It Matters:
  – Recognizes and compensates for leaks
  – Provides optimum patient/ventilator synchrony
Improved Patient Care is Now Automatic

EncorePro and Encore Anywhere Ventilation Data Management Software

• What it does:
  – Access data such as AHI, leak, clear airway apneas, and minute ventilation
  – Connect to patients via wired and wireless modems plus an SD memory card

• Why it matters:
  – Enables clinicians to monitor patient compliance, evaluate ventilation efficiency and identify trends
Encore Reports

Sleep Event Detection
  – Apneas, hypopneas, clear-airway apneas, exactly as the sleep devices

Wired and Wireless Modems
  – Same as the sleep therapy platform

Oximetry
  – Will bring in info from a Masimo Oximetry module and synchronize the data on an Encore report with other ventilator info
PHILIPS
sense and simplicity

Servo Ventilation Algorithm
Clinical benefits of servo ventilation

• Treatment for complicated breathing patterns such as:
  – Central apnea
  – Complex apnea
  – Periodic breathing such as CSR

• Provides non-invasive ventilatory support to treat adult patients with OSA and respiratory insufficiency caused by central and/or mixed apneas and periodic breathing.
On a breath by breath basis peak flow is captured.

Peak flow is monitored over a moving 4 minute window.

As 1 breath is added, the initial breath falls off.

At every point within this 4 minute period an Average Peak Flow is calculated.

The Peak flow target is established around that average and is based on the patient’s needs.
Servo ventilation algorithm – normal breathing

IF: Peak flow is at target
THEN: autoSV Advanced delivers CPAP pressure
IF: Peak flow falls below target
THEN: autoSV Advanced increases pressure support
At the core is the proven REMstar Auto algorithm

#1 Goal: Normalize sleep (AHI, arousals, etc.)

#2 Goal: Minimize pressure
Let’s take a look at these terms graphically

Auto EPAP - *Looks like Auto CPAP!*

Max pressure

EPAPmax

PSmax 10 cm H$_2$O

PSmin 3 cm H$_2$O

EPAPmin

Auto EPAP
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BiPAP autoSV Advanced

Auto backup rate
**Features**

**Auto EPAP**

**Benefits**

- Less titration time and expertise needed
- Better therapy acceptance
  - Lower mean pressure
  - Optimal pressure (Sleep stage or position dependant OSA)
  - Adapts to changing conditions (allergy, alcohol abuse, weight, altitude, etc..)
- Guarantees minimum average pressure for all patients

**More ADAPTIVE to meet Your Patient’s Changing Needs**
Popt – No Improvement

Stable Breathing

10.0 to 11.5 to 10.0
Obstructed Airway Apnea

The BiPAP autoSV ADVANCED establishes a patient flow baseline using a moving flow signal window.

An obstructed airway apnea is recorded when there is an **80% reduction in flow lasting at least 10 seconds**

**AND**

limited or no response from the flow signal with the introduction of a backup breath
Event classified as an **Obstructed Airway Apnea**

EPAP Pressure increased (after 2-OA’s)

**No Flow Response!**

**Backup Breaths**
Obstructed Airway Apnea

12.5 to 13.5
A clear airway apnea is recorded when there is an **80% reduction in flow lasting at least 10 seconds**

AND

there is a *response in the flow signal* with the introduction of a backup breath
Event classified as an **Clear Airway Apnea**

**EPAP Pressure NOT increased**

- **Flow Response!**
- **Backup Breaths**
Clear Airway Apnea
A hypopnea is recorded when there is an **40% reduction in flow lasting at least 10 seconds**

**NOTE:** EPAP increase in response to a hypopnea that shows obstructive characteristics,

**ALSO,** the Servo Ventilation algorithm (Breath by breath adjustment of Pressure Support), will attempt to ‘fix’ the hypopnea as the peak flow decreases
During the time of decreased peak flow, the Servo Ventilation algorithm, will attempt to ‘fix’ the hypopnea.
Hypopnea

Attempts to ‘fix’ hypopnea

10.0 to 11.0
The BiPAP autoSV ADVANCED identifies vibratory snores by means of an internal pressure sensor.

Vibratory snores differ from audible snores … Vibratory snores are airway pressure vibrations.
Flow Limitation Review

Flow Limitation

Flow Limitations are identified as any change in inspiratory parameters.

2 of the four parameters must fall out of trend to be considered Flow Limitation.
## Features

**Enhanced Auto Backup Rate**

## Benefits

- More aggressive and effective treatment for
  - Periodic Breathing (CSR) patients
  - Complex Apnea patients
  - Pain management patients

- Designed for clinical effectiveness across all patient classes
Advanced Auto backup rate

Objectives:

1. Determine clear vs. obstructed airway
2. Find the best back up rate
   - Do not overdrive the patient
   - Spontaneous breathing is encouraged
3. Synchronize each breath to patient’s breathing patterns
   - Do not deliver timed breaths when patient is still moving air
   - Backup breaths are delivered in sync with patient’s previous spontaneous breathing pattern and most recent attempts so the rate may vary breath by breath.
4. Work with autoSV algorithms to meet breath by breath peak flow targets.
5. Utilize auto EPAP algorithms to maintain optimal airway patency.
Objectives:

1. Find the best back up rate
   - Do not overdrive the patient
   - Spontaneous breathing is encouraged

2. Synchronize the breath to patient
   - Do not deliver timed breaths when patient is still moving air
• Backup Breaths are delivered proportional to patient’s spontaneous rate
• Old algorithm used time constants
• Typically delivered between 10-15 BPM
TO PREVENT ANY CONFUSION:

• MULTI LAYERS are all part of Auto Backup Rate

• Algorithm determines how aggressive to be on each breath

• NOT different clinician settings – CLINICIAN CHOOSES AUTO RATE

Backup Breaths
BiPAP autoSV Advanced

Features & Benefits

Features

Digital Auto-Trak

Benefits

• Best patient synchronization

• Provides better comfort to the patient

• Better leak compensation → easier for HCP

• Enables accurate peak flow targeting for ASV algorithm
Evaluate your patient type

- Complex Patients - Sensitive to pressure increases
- CHF - may be more likely to have Cheyne Stokes and/or central events, but may have strong obstructive component as well.
- Opioid users - May be more likely to have Cheyne Stokes or Centrals.
- COPD, hypoventilation
What do you see?
What do you see?
What do you see?
What do you see?

Note square wave pattern of OSA recovery breathing. Different from CSR. Note difference in oximetry pattern.
What do you see?

Centrally mediated events tend to improve during REM sleep. Obstructive events get worse.

SDB goes away in REM. Is this pattern more likely OSA or CSR?
Periodic breathing (CSR)  Polysomnography

Oximetry

REM Sleep
Central or obstructive hypopnea? Likely response to CPAP?
Central sleep apnea (CSA) is defined as:

1. An apnea hypopnea index (AHI) > 5; and
2. Central apneas/hypopneas > 50% of the total apneas/hypopneas; and
3. Central apneas or hypopneas ≥ 5 times per hour; and
4. Symptoms of either excessive sleepiness or disrupted sleep.

Complex sleep apnea (CompSA) is a form of central apnea specifically identified by the persistence or emergence of central apneas or hypopneas upon exposure to CPAP or an E0470 device when obstructive events have disappeared. These patients have predominately obstructive or mixed apneas during the diagnostic sleep study occurring at greater than or equal to 5 times per hour. With use of a CPAP or E0470, they show a pattern of apneas and hypopneas that meets the definition of CSA described above.
autoSV acclimation zone

GOAL: Adjust user-set parameters for optimal efficacy and adherence

Set mode to BiPAP autoSV Advanced

- Establish initial settings as indicated below or as ordered by physician
- Ensure proper mask fit to allow algorithm to work effectively
- Have patient breathe on autoSV Advanced at basic settings below
- Adjust EPAP_{min}, Bi-Flex and PS_{min} settings to patient comfort

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>EPAP_{min}</td>
<td>4 cm H_{2}O</td>
</tr>
<tr>
<td>EPAP_{max}</td>
<td>15 cm H_{2}O</td>
</tr>
<tr>
<td>PS_{min}</td>
<td>0 cm H_{2}O</td>
</tr>
<tr>
<td>PS_{max}</td>
<td>20 cm H_{2}O</td>
</tr>
</tbody>
</table>

- If patient has known CPAP pressure of < 10 set EPAP_{min} at 4 cm H_{2}O or patient comfort
- If patient has known CPAP pressure of > 10 set EPAP_{min} at 6-8 cm H_{2}O or patient comfort
PC Direct
Trilogy Lab Titration
Why not use auto servo ventilation for a neuromuscular diseased patient?

- Would continually reset it’s baseline, worsening the hypoventilation
- Normal target continues to decrease – continues to under ventilate patient as the night progresses
Why not use volume assured pressure support for Periodic Breathing such as Cheyne Stokes?

- Volume assurance with PS does not respond fast enough – event would be over before reaching needed pressure

- Length of event vs. time of response
BiPAP Auto SV Advanced

• Auto SV Advanced
  – Periodic Breathing (Cheyne-Stokes)
  – Central Apnea
  – Complex Sleep Apnea
AVAPS

• AVAPS – Average Volume Assured Pressure Support
  – Trilogy and BiPAP S/T
    • Trilogy
      – Chronic Respiratory Failure
    • Hypoventilation Disorders
      – COPD
      – Restrictive Lung Diseases
      – Obesity Hypoventilation
  – Don’t have to worry about the deadspace the device won’t account for or an estimated minute ventilation
  – Uses a proven algorithm for ventilation
  – Delivers a **Specific VT** for the changing needs of both the stable and unstable patients
Just to remind you…

Both AVAPS and Auto SV Advanced are…….

• EASY TO USE…SIMPLE TO OPERATE…
PHILIPS

sense and simplicity

Questions?