As part of our ongoing commitment to education, Breas Medical were proud to sponsor two symposia at the 2018 JIVD conference in Lyon.

It is our belief that innovation stems from understanding the real-world problems in treating respiratory disorders. Through our continued support to provide free education to respiratory clinicians, Breas aims to improve outcomes for patients from hospital to home.

New technology now makes it possible to monitor your patients that receive home mechanical ventilation. This symposium gave insight into the causes and impact of patient-ventilator asynchrony (PVA). Additionally, delegates learned how to use standard and advanced monitoring tools that are included in the newest generation of ventilators to detect, classify and correct the different types of PVA. Furthermore, the symposium covered the current and future role of telemonitoring that may help to reinforce the way that monitoring is likely to change the organisation of care.

Classification and Clinical Impact of Patient Ventilator Asynchrony: Annalisa Carlucci, Pavia, Italy

In her lecture, Annalisa Carlucci told us that good interaction between patient and ventilator occurs when the patient and the ventilator start a breath at the same time and the breath lasts the same amount of time.

Current evidence tells us that 25% of patients receiving invasive ventilation experience major patient-ventilator asynchrony of >10% of their respiratory efforts (Arnaud et al. 2006) and that asynchronies during mechanical ventilation are linked to ICU and hospital mortality (Blanch et al. 2015).

Dr Carlucci went on to talk about asynchrony in non-invasive ventilation and stated that there are links between reduced quality of life and patient/ventilator asynchrony. Furthermore, there are proven links between morning dyspnoea in COPD patients and patient-ventilator asynchrony and by improving patient/ventilator synchrony, it is possible to reduce morning dyspnoea (Alder 2012). Sleep, arousals and SaO₂ are also improved with improved patient-ventilator asynchrony as shown by Fanfulla and co-workers in 2005.

In some studies, over 50% of patients are not well ventilated during nocturnal NIV. And this poor ventilation with asynchronies may:
• Reduce tolerance and adherence to therapy  
• Worsen the quality of sleep  
• Cause persistence of alteration or further worsening of nocturnal gas exchange  
• Effect long-term outcomes in a subgroup of patients

Dr Carlucci outlined a proposal for a systematic analysis of polygraphy for identifying asynchrony during non-invasive ventilation put forward by an international consensus group called the SOMNONIV Group. The proposal (free download from SPLF: https://bit.ly/2xhI0eC) is to use a combined measure of flow, pressure as well as abdominal and chest movement combined with an algorithm to identify patient/ventilator asynchrony.

**Solutions to detect patient ventilator asynchrony; Pay attention to the screen:**  
Jean-Michel Arnal, Toulon, France

Dr Arnal began by outlining how to detect patient-ventilator asynchronies in an easy and general way:

• Observe the patient  
• Listen to the ventilator  
• Feel the respiratory muscles  
• Ask simple questions  
• Interpret ventilator waveforms for  
  - Unintentional leaks  
  - Upper airway obstruction  
  - Patient ventilator synchrony

He went on and gave some tips & tricks on how to use the ventilator software while looking for asynchronies.

1. **Where to look?**  
Different asynchronies can be identified at different spots on the ventilator waveform. Inspiratory trigger delay, ineffective effort and autotriggering can be seen at the start of inspiration, flow starvation and overshoot occur during the inspiratory phase while premature cycling, double triggering and delayed cycling can be identified at the end of inspiration. He went on and gave some tips & tricks on how to use the ventilator software while looking for asynchronies.

2. **Use the Time Scale**  
• Use the overview of the full session to identify leaks  
• Use a 5-min scale to look for upper airway obstructions  
• Zoom in to a 1-min scale when you suspect patient-ventilator asynchrony

3. **Use available sources of information**  
It can be useful to check the mask information, this describes the expected level of intentional leak based on the prescribed pressures. Check if the value is greater than it should be according to the mask information – this would suggest the presence of unintentional leak.

Dr Arnal also detailed several setting changes that can help to improve certain patient-ventilator asynchronies when they occur:

1. **Too much effort needed or ineffective effort to trigger**  
Increase the inspiratory trigger sensitivity.  
Increase PEEP (if a COPD patient then consider intrinsic PEEP).  
Decrease the pressure support.

2. **Auto triggering**  
Check for unintentional leak.  
Decrease the inspiratory trigger sensitivity.

3. **Early Cycling**  
Prolong the expiratory trigger sensitivity.  
Increase Ti Max.

4. **Double triggering**  
Prolong the expiratory trigger sensitivity.  
Increase Ti Max.

5. **Delayed cycling**  
Shorten the expiratory trigger sensitivity.  
Decrease Ti max.

6. **Flow overshoot**  
Decrease the pressure rise time

7. **Flow too low/Flow starvation**  
Increase the pressure support.

Dr Arnal concluded that often patient-ventilator asynchronies can be detected using waveforms. It has the advantage that it is a non-invasive tool to assess the quality of ventilation. It is however limited as the amount of patient effort is not assessed within the waveforms.

The lecture from Dr Lujan began by pointing out that there are limitations in built-in ventilator software alone to identify patient-ventilator asynchrony as the information on the patient effort is very limited or even absent. The usage of thoracoabdominal effort belts sup-
plies the clinician with additional and accurate information about the patient’s effort. The basis of inductance plethysmography technique combines Faraday’s and Lenz’s law to create a tracing that reflects the patient’s effort.

So, abdominal and thoracic effort belts reflect the patient’s breathing, whereas inbuilt ventilator software only shows what the ventilator is doing. It is suggested as an additional tool to add to the patient assessment when exploring treatment outcomes. Information from the ventilator built in software is based only on pressure and flow and therefore has limitations when patients have upper airway events or more complex asynchronies.

Dr Lujan show a comprehensive overview on how the effort belts can add to the differential diagnosis in case a periodic flow reduction is noticed:

The use of effort belts offers more information about what is actually happening with the patient during events and asynchronies. Additionally, effort belts can provide an assessment of thoracoabdominal synchrony.

### Phase identification with belts

<table>
<thead>
<tr>
<th>Type</th>
<th>Site(s)</th>
<th>Belts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper airway obstruction with effort</td>
<td>Oropharynx (AHS) - Fixed anatomical structure - Mask induced</td>
<td>Efforts. Belts out of phase Controlled cycles and efforts are not coincidental</td>
</tr>
<tr>
<td>Upper airway obstruction without effort</td>
<td>Glottic closure</td>
<td>Silence</td>
</tr>
<tr>
<td>Decrease in ventilatory command</td>
<td>No obstruction</td>
<td>Controlled cycles and belts movements are synchronous</td>
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</tbody>
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