Identifying Ventilator Dyssynchronies via Waveform Assessment

Tim France BS, RRT
Hamilton Medical Inc.
Clinical Applications Specialist, USA
Disclosures

• Currently an employee of Hamilton Medical Inc.
Objectives

• Explain Importance of ventilator synchrony
• Identify common synchrony issues via waveform
• Define Synchrony vs Dyssynchrony
• Learn how to make basic vent changes to marry the vent to the patient
Why is synchrony important

- Patient comfort
- Less sedation
- Less time on the vent
- Less alarms
Definitions for ventilator/patient interactions

• Synchrony- vent and patient are in phase working together

• Dyssynchrony- vent and patient not in phase. Typically vent is not responding to changes in patient conditions
Pulmonary Mechanics

- **P0.1** - Pressure at the first .1 seconds of a breath. Measures a patient’s central drive to breath. The more negative the number the higher the drive.
- **Compliance**
  - Chest wall vs Lung
- **Resistance**
  - Inspiratory- measures force prior to lower airways (Asthma)
  - Expiratory- measure force during exhalation. Collapsed airways (COPD)
- **RC_{exp}** Expiratory time constants
  - Longer for COPD
  - Shorter for ARDS
Missed inspiratory attempts

- Assess
  - P0.1
  - Pt effort
  - Trigger setting
  - Autopeep
- Intervention
  - ↓ trigger setting
  - ↑ PEEP to match or decrease VE
Inadvertent Triggering (leak)

- **Assess**
  - Patient effort, check P0.1, circuit integrity

- **Intervention**
  - Increase Trigger setting
  - Fix leak
Inadvertent Triggering

- **Assessment**
  - Assess drive, check P0.1,

- **Causes**
  - Heart Rate
  - External Device
    - Pacemaker

- **Intervention**
  - Increase trigger setting
  - Manipulate external device
CMV No patient effort
Flow Starvation in Flow Controlled modes

- Assess P0.1, Pminimum

- Actions
  - ↑ PF
  - Switch to Flow variable mode (PCV, Spont)
Increased Patient work in Pressure Targeted modes

• Assess P0.1

• Actions
  • ↑ support until flow waveform decelerates if significant patient work is observed
Increased Patient work Spontaneous mode

- Check flow waveform for full deceleration
- Assess P0.1
- Actions
  - ↑ support until flow waveform decelerates if significant patient work is observed
CMV No patient effort
Paw Increase because of compliance changes

Paw increase at end inspiration
- ARDS
- Fibrotic
- Chest wall compliance issues

Actions
- Increase PEEP (if early ARDS or chest wall issues)
- Check Tidal volume
Plateau and Peak are the same

- Perform inspiratory hold
**Paw** increase because of airway resistance

- **Paw** increase is in the beginning of Inspiration
- **Causes:**
  - COPD, Asthma, small ET tube
- **Interventions**
  - Bronchodilator
  - Heliox
  - Consider larger tube
  - Increase PEEP
Plateau with increase in Resistance

- Plateau is significantly less than Paw
ETS (Expiratory Trigger Sensitivity)

- ETS 5%
- Once flow decelerates to 5% of initial flow exhalation starts
- If PF is 100 lpm once flow decelerates to 5 lpm exhalation starts
- I-time is longer
- Vt is larger
ETS 70%

- Once flow decelerates to 70% of initial flow exhalation starts.
- I-time is shorter
- Vt is lower
Pramp (Pressure Ramp)

- How fast pressure setting is reached
  - Pramp of 5 ms
    - Initial flow is higher
    - Vt is higher
  - Pramp of 200
    - Initial flow is lower
    - Vt is lower
    - Paw max is delayed
Pramp to Aggressive

- Assess
  - Look for spike at beginning of inspiration
  - Patient comfort
  - ET tube size
- Intervention
  - Increase Pramp setting till spike goes away
Late cycling

- Assess
  - I-time setting
  - ETS if in spont mode

- Intervention
  - Decrease I-time till bump goes away
  - Increase ETS setting
  - Place in spont mode to assess spontaneous I-time
Early cycling

- Assess
  - I-time
  - ETS if in spontaneous mode

- Intervention
  - Increase I-time till double breaths stop
  - Decrease ETS %
  - Place patient in spont mode to find spontaneous I-time
Oscillations in the respiratory circuitry

- Causes
  - Secretions
  - Condensate

- Intervention
  - Suction
  - Clear Circuit
Conclusion

- Assess waveforms for synchrony
- Assess waveforms to tweak vent settings
Thank You For Your Time

Tim France BS, RRT
Clinical Applications Specialist
Tim.France@hamiltonmedical.net

Hamilton Medical AG
Via Crusch 8, 7402 Bonaduz, Switzerland
☎ +41 58 610 10 20
info@hamilton-medical.com
www.hamilton-medical.com