Dräger V500 Ventilator

Overview of Modes and Features for NICU Nurses
Objectives

• Discuss the modes of the Dräger V500 that will be used in the NICU
• Display screen shots of each mode
• Display screen shots of different alarms
• Identify differences between the Dräger and the Avea
• Identify differences between pressure ventilation and volume ventilation
Dräger V500

- Touch Screen Monitor
- FiO₂ Analyzer and Measured Ve
- Alarm Silence
- Control Knob
- Inspiratory Limb
- Expiratory Limb
Dräger V500

Flow Sensor

FiO₂ Analyzer and Measured Ve
Screen Overview

- Patient Size
- Waveforms
- Loops
- FiO₂ Adjust
- Mode
- Alarms
- Silence Indicator
- Manual Breath
- Settings
- Measurements

[Diagram of medical screen with various elements labeled]
Pressure Control-Assist Control

Settings

- **Pinsp (PIP)**
- **PEEP**
- **Rate**
- **Inspiratory Time**
- **Trigger**
  - Baby can trigger the ventilator to get a breath.
  - When baby triggers the ventilator it will give a breath at the **set PIP and set I-Time**
- **Alarms**
- **FiO₂**

Measurements

- **Inhaled Tidal Volume**
- **Exhaled Tidal Volume**
- **mL/kg Tidal Volume**
- **Minute Ventilation**
- **Pmean**
- **% Leak**
- **C20/C**
Pressure Control-Assist Control

PIP cmH₂O: 20
VT: 6.8
VT/kg BW: 8.6
RR: 60
% leak: 0
FIO₂ Vol%: 21
Pressure Control-SIMV

Settings
- Pinsp(PIP)
- PEEP
- Rate
- Inspiratory Time
- Trigger
- Pressure Support
  - When patient triggers a breath above the set rate, the ventilator will deliver the breath at the set pressure support level.
- $\text{FiO}_2$

Measurements
- Inhaled Tidal Volume
- Exhaled Tidal Volume
- mL/kg Tidal Volume
- Minute Ventilation
- $P_{mean}$
- % Leak
- C20/C
Pressure Control-SIMV

- PIP cmH2O: 20
- VT: 6.8
- VT/kg BW: 8.5
- RR: 60
- % leak: 0
- FiO2: 21
- Fio2: 0.28
- PEEP: 6.0
- ΔP: 5
- Slope: 0.00
- Paw high: 21
- Apn. Vent.: 25
- Man. insp./hold: Off

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Pressure Control-SIMV

Brown colored waveform indicates a spontaneous breath
Volume Guarantee-Assist Control

Settings

- Tidal Volume
- PEEP
- Rate
- Inspiratory Time
- Trigger
- Pmax
  - Maximum pressure the ventilator will use to deliver the set volume
- FiO₂

Measurements

- PIP
- Inhaled Tidal Volume
- Exhaled Tidal Volume
- mL/kg Tidal Volume
- Minute Ventilation
- Pmean
- % Leak
- C20/C
Volume Guarantee-SIMV

Settings

• Tidal Volume
• PEEP
• Rate
• Inspiratory Time
• Trigger
• Pmax
  – Maximum pressure the ventilator will use to deliver the set volume
• Pressure Support (Delta P)
  – When patient triggers a breath above the set rate, the ventilator will deliver the breath at the set pressure support level.
• FiO₂

Measurements

• PIP
• Inhaled Tidal Volume
• Exhaled Tidal Volume
• mL/kg Tidal Volume
• Minute Ventilation
• Pmean
• % Leak
• C20/C
Volume Guarantee-SIMV

PC-SIMV

VT: 5.0
RR: 41
FiO2: 21

Paw cmH2O: 16
VT/kg BW: 6.3

FiO2: 21

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Nasal CPAP

Settings

- **PEEP (CPAP Level)**
- **FiO₂**
- **PmanInsp**
  - Pressure delivered when manual breath is pressed
- **TmanInsp**
  - Inspiratory time to deliver manual breath

Interfaces

- **Flexi-Trunk**
- **RAM Cannula**
Nasal CPAP
Nasal IMV

Settings
- P inscription (PIP)
- PEEP
- Rate
- Inspiratory Time
- FiO₂

*This is a NON-SYNCHRONIZED mode. (Baby Cannot trigger a breath)*

Interfaces
- Flexi-Trunk
- RAM Cannula
Nasal IMV
HFJV Screen Shot
High Tidal Volume
Medium Priority Alarm

VT high

 VT above alarm limit "VT high".

PC-AC

PIP cmH₂O

Flow L/min

Volume mL

FiO₂ Vol%
Circuit Disconnect
High Priority Alarm
Pressure Limit Alarm while in Volume Guarantee
Airway Obstruction Alarm

PC-AC

09:52:51

Airway obstructed?
MV low

Check neonatal flow sensor.

PIP cmH2O

31

VT

2.2

VT/kg BW

2.7

RR

39

% leak

0

FiO2 Vol% 21

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Differences in Increase $O_2$ or $O_2$ Suction

- **Increase $O_2$ Function**
  - Avea: $FiO_2$ increases by 10%
    - Increase $FiO_2$ Button
  - Dräger: $FiO_2$ increases by 1.3 times the set $FiO_2$
    - Example 1: Set $FiO_2$ is 25%. $O_2$ Suction is activated, $FiO_2$ will increase to 33%
    - Example 2: Set $FiO_2$ is 60%. $O_2$ Suction is activated, $FiO_2$ will increase to 78%
  - $O_2$ Suction Button
    - Push $O_2$ Suction on screen
    - Confirm by pushing control knob
  - 180 seconds of oxygen increase
Differences in Set PIP

- **Avea:**
  - Total PIP = Insp pressure + PEEP

- **Dräger:**
  - Total PIP = Pinsp
Differences in Manual Breath Function

• Avea:
  - Manual breath function delivers set pressure/volume and I time

• Dräger:
  - Man Insp/hold function
    - Pressing and releasing will deliver set pressure and set I time.
    - Pressing and holding will deliver sustained inflation
Differences in Manual Breath Function

• **Avea:**
  - Manual breath function delivers set pressure/volume and I time

• **Dräger:**
  - Man Insp/hold function
    - In PC will deliver set pressure and set I time.
      - Function can deliver prolonged I time if desired
    - In VG will deliver breath at the set Pmax level
      - This could result in a larger tidal volume than what is currently set.
What is Pressure Ventilation?

- **Pressure ventilation or PC is a mode in which the ventilator will deliver a set pressure**
  - Tidal volume will vary depending on the patient’s compliance and resistance
- **Tidal volume will increase:**
  - Improved lung compliance
  - Decreased resistance
- **Tidal volume will decrease:**
  - Decreased lung compliance
  - Increased resistance
  - Air leak
  - Pneumothorax
What is Volume Guarantee?

- Volume ventilation is a mode in which the ventilator will deliver a set volume
  - Peak inspiratory pressures will vary depending on patient’s compliance and resistance
  - Peak inspiratory pressures can be limited for safety

- Peak inspiratory pressure will increase:
  - Decreased compliance
    - Surfactant deficiency
    - Inflammation/imaturity
  - Increased resistance
    - Secretions
    - Kinked ET tube
    - Pneumothorax

- Peak inspiratory pressure will decrease:
  - Increased compliance
    - Surfactant administration
  - Decreased resistance
    - ET tube suctioned and secretions removed
    - Bronchodilator given
Compliance

**Increased**
- **Causes**
  - Surfactant administration
  - Decreased inflammation
  - Increased lung maturity
- **Pressure Control**
  - Increased Tidal Volume
- **Volume Guarantee**
  - Decreased PIP

**Decreased**
- **Causes**
  - Surfactant deficiency
  - Inflammation
  - Structural immaturity
  - Infection
- **Pressure Control**
  - Decreased Tidal Volume
- **Volume Guarantee**
  - Increased PIP
Resistance

Increased
• **Causes**
  − Bronchospasm
  − Secretions
  − Kinked ETT
• **Pressure Control**
  − Decreased Tidal Volume
• **Volume Guarantee**
  − Increased PIP

Decreased
• **Causes**
  − Bronchodilator administration
  − Suctioning
  − Air leak
• **Pressure Control**
  − Increased Tidal Volume
• **Volume Guarantee**
  − Decreased PIP
Why is Volume Ventilation Preferred?

• In Pressure Control ventilation, the patient’s tidal volumes change depending on compliance and resistance.
  − Because of this, the patient does not receive a consistent minute ventilation
    ▪ Ve = Vt x Respiratory Rate
  − Excessive tidal volume (volutrauma) is a primary cause of lung injury

• In Volume Guarantee, the volume is set and PIP will change depending on compliance and resistance.
  − In this mode the patient receives a consistent minute ventilation, while being protected from harmful airway pressures and potential for excessive tidal volumes.
Why is consistent minute ventilation important?

- Alveolar minute ventilation affects carbon dioxide removal and PaCO2.
  - \( \text{PaCO}_2 = \frac{\text{CO}_2 \text{ Production}}{\text{Alveolar minute ventilation}} \)
- Consistent minute ventilation can aid in keeping a normal acid/base balance.
- Severe hypocarbia or severe hypercarbia can cause rapid changes in cerebral blood flow.
- Rapid changes in cerebral blood flow can cause:
  - IVH
  - PVL
Questions?

• Please contact Ryan Sura or Alicia Rummel with any questions or concerns that you may have.

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