Rapport Indholdsfortegnelse

# Introduction

# Problem Analysis

**Mechanical Ventilation**

* **Purpose**
  + **Regulation of oxygen levels**
  + **Regulation of CO2 levels**
* **Anatomy of MV**
  + **Functional units**
* **Modes of ventilation**
  + **Assist Mode**
  + **Control Mode**
  + **Assist Control Mode**
* **Cost/Benefit analyse of MV**
  + **Patient benefits of MV**
  + **Side effects of MV**
  + **Clinical complexity of MV settings**
* **Positive Pressure vs. Negative Pressure ventilation**
  + **Historical perspective**
  + **Physiological differences**
  + **Breath waveform differences**

**Equation of motion**

* **Purpose of EOM**
  + **Simplified model of lungs to explain ventilator-patient interactions**
* **Derivation of EOM**
  + **Bioelectrical modelling**
* **Transmural pressures**
  + **Transrespiratory pressure**
  + **Transpulmonary pressure**
  + **Transalveolar pressure**

**Significance of Pleural Pressure**

* **Anatomy of the pleura**
  + **Bilateral symmetry**
  + **Pleura’s attachment points**
  + **Pleural fluid**
  + **Variability of pleural pressure**
* **Calculation of transalveolar pressure**
  + **Pleural pressure necessary for calculation**
  + **Lung protective strategy**
    - **Matching PEEP with Pleural Pressure ensures maximal alveolar recruitment while protecting alveoli**
* **Clinical significance of Pleural Pressure**

**Esophageal Manometry**

* **Historical Aspects**
  + **Used for assisting xxx procedure**
  + **Years of use**
  + **Reintroduction to scientific experiments and clinical practice in 1980’s**
* **Complexity of administering Esophageal Manometry**
  + **Different measuring methods**
    - **Water based**
    - **Electrically based**
    - **Pros/Cons of the two methods**
  + **Infrequency of clinical use**
    - **Not standard measurement**
    - **Requires specialized personnel**
    - **Validation is complex**

**In-sillico experiments**

* **History of In-sillico experiments and increased usage**
* **Cost/benefit analysis of In-Sillico experiments**
  + **Benefits:**
    - **Reduced need for trial subjects**
    - **Reduced resource allocation for experiments**
    - **Enables otherwise impossible experiments (reasons being ethical, material, missing prior knowledge etc.)**
  + **Cons:**
    - **Reduced complexity compared to in vivo/vitro experiments**
    - **Conclusions need clinical verification**
* **Clinical Significance of In-Sillico pleural pressure measurements**
  + **Non-invasive!!!**
  + **Potential for implementation in MV- or hemodynamic measurement device’s engine**
    - **Thus displayed as standard measurement in the UI**

**Cardiopulmonary Interactions**

* **Overview of affected compartments** 
  + **Thoracic Cavity**
  + **Pleural cavity**
  + **Abdomen**
    - **Inferior Vena cava**
  + **Pericardium**
    - **Atria**
    - **Ventricles**
    - **Pulmonary Circulation**
    - **Systemic Circulation**
* **Physiological Interactions**
  + **Cyclical Pressure Variations**
  + **Blood flow**
  + **End-Diastolic Volume**
  + **End-Systolic Volume**
  + **Pulmonary Resistance**
* **Clinical Significance**
  + **Pulse pressure variation**
    - **Fluid Responsiveness**
  + **Caution in Mechanical Ventilatory Settings**
    - **Tradeoff between oxygenation and cardiac effects**

# Methods

# Results

# Discussion