IMAGE FUSION CAPTURE SYSTEM FOR INTRINSIC PEEP AND LARYNGEAL APERTURE IN COPD

# Background

## Vision

One of the core vision of the Muscle Lab at The Royal Brompton and Harefield NHS Foundation Trust is ‘We believe that understanding laryngeal physiology better will allow the development of new therapies, and permit optimal application of existing therapies, in particular non-invasive ventilation.’ [thorax paper]

## Vision Development

### Clinical Trial I

**Objective**

**Method**

**Conclusion**

**Future work**

The stated vision led Baz M et al. to research and publish a paper titled : ‘Dynamic Laryngeal narrowing during exercise: a mechanism fron generating intrinsic PEEP in COPD?’ [thorax paper] The key question that inspired the research was ‘What is the role of laryngeal narrowing in the regulation in the regulation of ventilation during exercise in patients with COPD?’ The novelty of the research were

* first study to describe the active role of the larynx in regulating lung emptying and ventilation during exercise
* highlighted potential implications for exercise intolerance in COPD patients

The study concluded by stating ‘Dynamics laryngeal narrowing during expiration is prevalent in patients with COPD and is relating with COPD and is related to disease severity, respiration duty cycle and exercise capacity.’

The authors stated that understanding and establishing the mechanisms underlying glottic narrowing and its relationship with flow limitation and intrinsic PEEP was the next step in the vision development.

### Clinical Trial II

**Objective**

In 2015 as at time of thesis writing , Polkey et al. started a clinical trial on ‘Intrinsic PEEP and Laryngeal Aperture in COPD.’ The aim of the study is to investigate the extent of the narrowing of the vocal cords which causes a positive pressure within the airway with patients with COPD to understand how to improve airflow in the airway and lung function.

The primary objectives of the clinical trial is to measure glottic aperture and compare glottic aperture with different levels of applied EPAP (expiratory positive airway pressure) on glottic opening in the erect and supline positions.

The secondary objectives are to:

1. measure functional lung volumes , inspiratory capacity and functional residual capacity ,and the glottic aperture in the erect and supine positions at different levels of EPAP
2. determine the effect on PEEPi of applied EPAP in the erect and supine positions

**Method**

In order to achieve the objectives of the clinical trials, the following clinical prodecures will be taken:

1. Use an Oesophageal balloon to measure intra-thoracic pressure
2. Do fibre-optic laryngoscopy
3. Do a standard lung function tests
4. Do a variation of mouth pressure with CPAP
5. Do a facemask pneumotachograph

# Problem

One of the major challenging facing the current clinical trial is ‘Data Management’. The data management challenges are:

* 1. Clinical data are independently displayed
  2. Clinical data are independently stored in different systems
  3. Clinical data are independently retrieved for post processing analysis
  4. Clinical data are don’t synchronised in time

# Aim

The aim of this chapter is to propose an ‘IMAGE FUSSION CAPTURE SYSTEM’ for data management in the clinical trial.

# Objectives

The objectives of this chapter are:

1. Describe the current system architecture
2. Design a new system architecture
3. Develop a new system architecture
4. Test the developed system in laboratory environment
5. Test the developed system in clinical enivornment
6. Discuss the test outcomes

# System Architecture

Current system archecture

Current system limitation

Prposed system architecture

Benefits of system architecture

Limitations of prpossed system archecture

# System Implementation

# System Testing

Lab testing

Clinical testing

# Discussion