**Problem**

- Cerebral vascular reactivity (CVR) → assess microvasculature response to vasoactive challenges
- **Hypercapnia** → strong vasodilative stimulus, where there is excess CO₂ in the blood
- Limitations of previous design → failure to maintain hypercapnia for 30 seconds

**Objective:** To design a **portable** and **automated** device for personalized hypercapnia administration

**Design Inputs:**
1. Induce hypercapnia
2. Return to normocapnia
3. Portability

**Impact**

- Personalized, easy to use CVR measurement
- **Safe** for critically-ill
- Paired with neuroimaging techniques

**Future Plans**

- Improve air leakage
- Validate device with expanded demographics and **larger sample population**

**Solution Design**

- Diagram of mechanical revisions including tubing, CO₂ sensor, microcontroller, CO₂ reservoir, piston, valve, and room air opening.

**Testing Results**

- ✓ Induce hypercapnia
- ✓ Return to normocapnia
- ✓ Portable

**Testing Graphs**

- Graphs showing hypercapnia induction and return to normocapnia.