* Do we want to remove the inspiratory pressure sensors? **Yes**
* Digital Interface to control valves - use stepper motor w bluetooth

PIP and PEEP

* PIP **Peak inspiratory pressure** (**PIP**) is the highest level of pressure applied to the [lungs](https://en.wikipedia.org/wiki/Lung) during [inhalation](https://en.wikipedia.org/wiki/Inhalation).[[1]](https://en.wikipedia.org/wiki/Peak_inspiratory_pressure#cite_note-pmid20378369-1) In [mechanical ventilation](https://en.wikipedia.org/wiki/Mechanical_ventilation) the number reflects a positive pressure in centimeters of water pressure (cmH2O). In normal breathing, it may sometimes be referred to as the [maximal inspiratory pressure](https://en.wikipedia.org/wiki/Maximal_inspiratory_pressure) (MIPO), which is a negative value.[[2]](https://en.wikipedia.org/wiki/Peak_inspiratory_pressure#cite_note-pmid17394934-2)

Peak inspiratory pressure increases with any airway resistance. Things that may increase PIP could be increased secretions, bronchospasm, biting down on ventilation tubing, and decreased lung compliance. PIP should never be chronically higher than 40(cmH2O) unless the patient has acute respiratory distress syndrome.[[*citation needed*](https://en.wikipedia.org/wiki/Wikipedia:Citation_needed)]

* Positive end expiratory pressure (PEEP), is a pressure applied by the ventilator at the end of each breath to ensure that the alveoli are not so prone to collapse. This ‘recruits’ the closed alveoli in the sick lung and improves oxygenation (<https://www.criticalcarepractitioner.co.uk/mechanical-ventilation-peep-positive-end-expiratory-pressure/>)

Valve Videos:

<https://www.youtube.com/watch?v=Fl0hSNKozWg>

<https://www.youtube.com/watch?v=dNHtxO3MuQ0>

Tasks:

1. Annie: Figure out power source and finalize how tidal volume/pressure works in regulating valves
   1. Effective PIP for a patient = PIP set on ventilator minus pressure gated valve setting on inspiratory limb of circuit supplying patient
   2. Effective PEEP is sum of PEEP on ventilator and setting on pressure gated valve on expiratory limb of patient’s circuit
   3. Based on the Patient Care section, it seems like they set the values for PEEP/PIP to a constant after measuring tidal volumes?
   4. How do we know what the PEEP/PIP constants are? Something doctors can figure out?
   5. Power Source: Do we know what the power requirements are of all the other components? It’s probably better to use a USB/ wall power than batteries since it’ll be running for a while
2. Jacob: Look into stepper motor (how to make + materials) yeth
3. Emily: figure out alarm system and how we want to implement ours (what parameters to look at)
4. Karan/AbhisheK : bluetooth

DIY Motor Valve:

Stepper Motor prices:

5 - $12.07

Servo motor prices:

2 - $6.99

10- $17.99

Differences:

[Diff between the 2 motors](https://www.motioncontrolonline.org/blog-article.cfm/Servo-Motors-vs-Stepper-Motors-in-Motion-Control-How-to-Choose-the-Right-One-for-Your-Application/34)

* Servo is def better

Videos and tutorials::

[Linear actuator](https://www.youtube.com/watch?v=2vAoOYF3m8U) Video: 3D printed: simple and easy, fast too

Needs to be modified but shouldn’t be too difficult

<https://www.stlfinder.com/3dmodels/servo-valve/>

* List of many 3D parts, useful website in general, searches everything for 3D part files

Alarm System

Minimum:

* **Independent** Tidal Volume, Minute Ventilation, Volume delivered by ventilator per breath
* Disconnects & Occlusions
* PIP and PEEP for each patient
* End-tidal CO2
  + Arterial blood gas analysis, capnography, or combo
  + Doesn’t need to be part of our device
* Standard ICU measurements
  + Doesn’t need to be part of our device