



COSMIC Medical

Collective Open Source Medical Innovation for Covid-19, Formerly UBC SOS eVent

Weekly Report 6-7

[June 21st – July 4th, 2020]

Data as received by COSMIC Medical by 6 pm on Saturday, June 21st, 2020

Highlights

Snorkel mask delivers the physical product on ground in Brazil as a part of collaborative effort.

Bubble Helmet open-source package is now available on GitHub.

Manuscript of the research papers for the bubble helmet and snorkel mask is done

COSMIC welcomes Dr. Dodek to the team. He will be connecting COSMIC with his connections in ICUs across Nepal and Thailand

COSMIC initiates a new project to develop low-resource setting oxygen concentrators to tackle the demand for medical oxygen.

Mr. Dan Andrews creates the next prototype of Fluidic BiPAP valve that is close to the final version.

Outreach Efforts

COSMIC Medical is motivated to not only develop innovative medical devices but also take these innovations to places that are severely affected. The “Outreach” team is keen to reach out to the healthcare workers, medical device manufacturers and decision-makers affected countries. The team is also keen to make connections for collaborations for further research.

1. Completed summary document for clinical contacts and a pitch deck for others
2. Surveying regions to target along with matching personnel needs

PR+Fundraising Efforts

1. Received more coverage in local Chinese Canadian media outlets
2. Working on national and international coverage
3. Working on volunteering opportunity posts for the Canada Student Services Grant

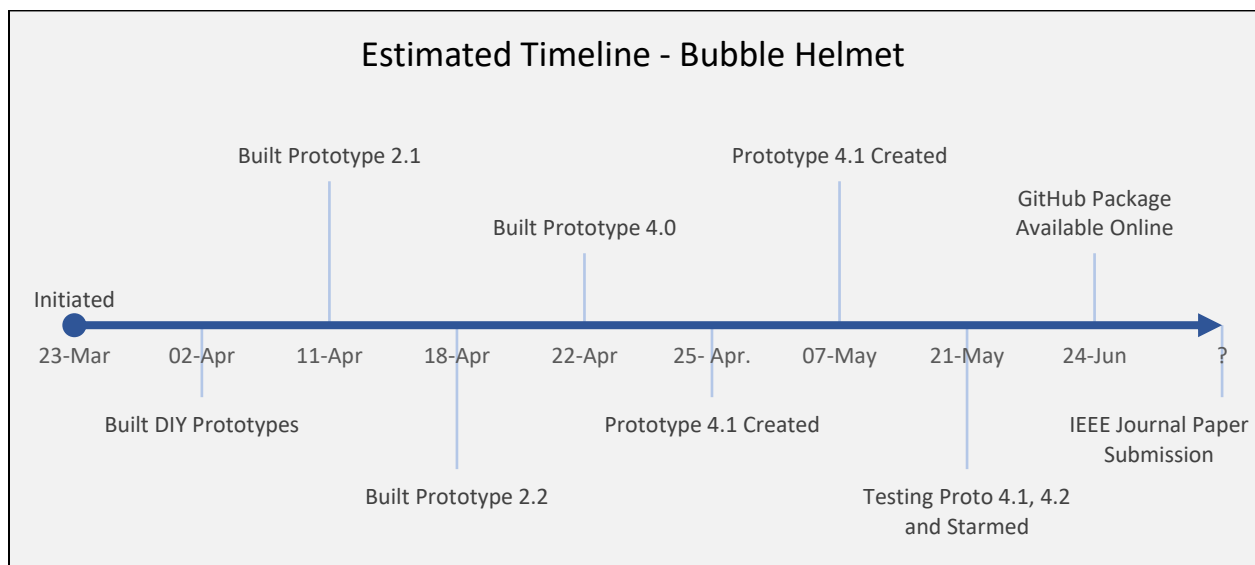
Project Bubble Helmet

The bubble helmet is a safe and comfortable method of non-invasive positive pressure ventilation (NIPPV) that delivers oxygen via a helmet as an intermediate step to delay or even prevent intubation in COVID-19 patients while mitigating aerosolization risks. Our design is simple to manufacture, can interface with high-flow hospital oxygen and mechanical ventilators, and provides the opportunity for quality-of-life add-ons such as anti asphyxiation valves and auxiliary nutrition valves.

Updates from the last week

1. Completed the open-source package and is available on GitHub.
2. Applied for the Joule Innovation Grant
3. New Helmets from Avicam Technologies, London, Ontario arrived and test results with the new venturi valve are promising

Estimated Timeline and Milestones



Project 2: Snorkel Mask

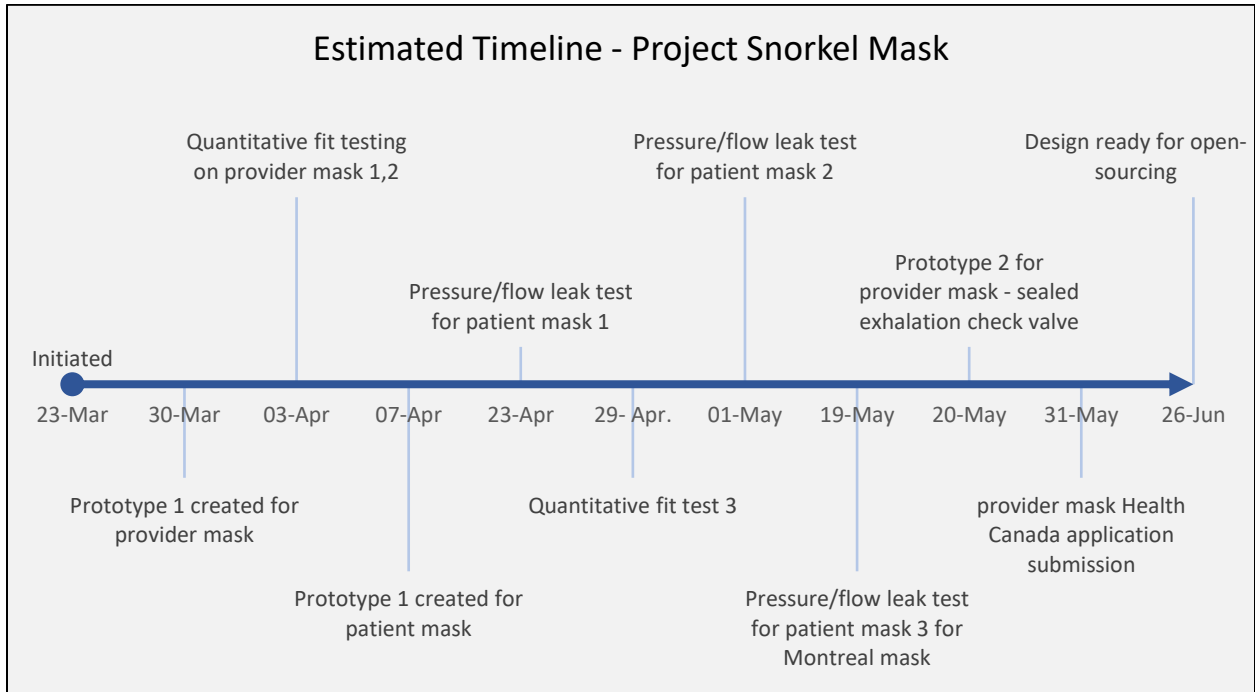
Project Snorkel mask is aimed towards exploring, testing, and validating the use of snorkel masks for these two cases:

1. Non-Invasive Positive Pressure Ventilation (NIPPV, such as CPAP or BiPAP)
2. An alternative form of PPE for healthcare providers

Updates from the last week

1. Simulation trial of snorkel mask at Vancouver Trauma Centre
2. Sent snorkel mask prototype to Brazil
3. Further safety evaluation of snorkel mask before open sourcing

Estimated Timeline and Milestones



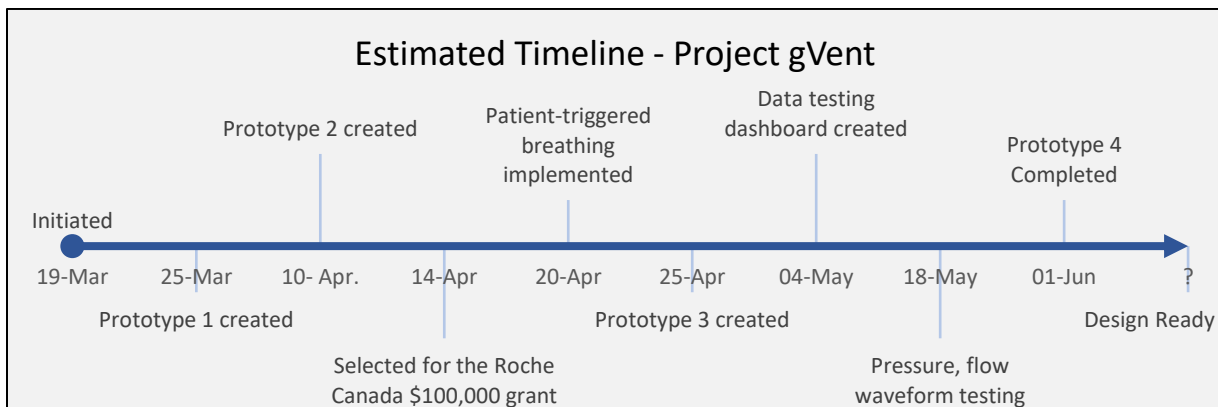
Project 3: gVent

The gVent is a novel, low-cost ventilator design that uses the concepts of water seals and water columns to deliver constant-pressure ventilation to patients with ARDS. The gVent was designed with simple components in mind which keep its cost low (<\$1000) and makes it easy to produce. It can achieve respiratory rates, pressures and tidal volumes that are appropriate for covid-19 induced ARDS patients. It is also capable of providing assisted breathing with patient-triggered breaths.

Updates from the last week (Project gVent)

Open source package for gVent is now available on GitHub

Estimated Timeline and Milestones



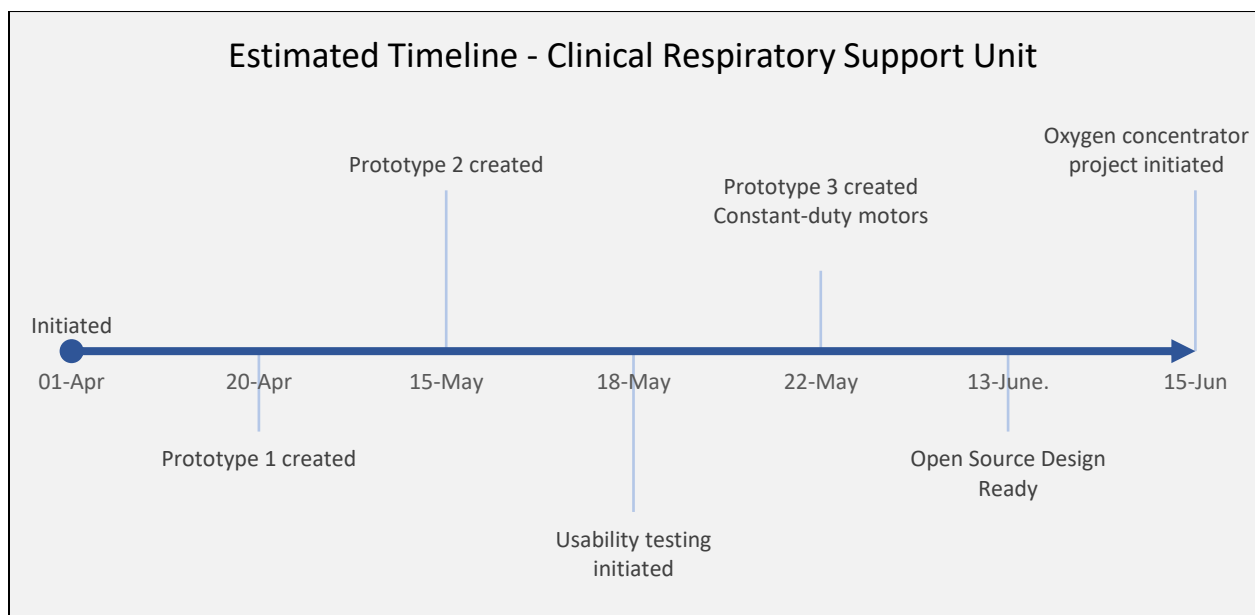
Project 4: Clinical Respiratory Support (CRS) Unit

The clinical respiratory support unit is an easily deployable solution which combines a HEPA-filtered air supply with exhalation containment and sterilization, meant to be used in non-conventional hospital settings. Originally designed to provide CPAP therapy to 20+ bed unit (at 10cmH₂O PEEP with 32+ lpm flow), this uses off-the-shelf components with basic modifications, storable, and assembled within a day. The exhalation containment system also minimizes aerosolization of viral particles and does not rely on filters to operate (but can do so optionally). An aim was to achieve all these parameters without relying on supplies typically constrained in the areas with COVID-19 outbreaks.

Updates from the last week

1. Open sourcing completed. Project documents are on the GitHub.
2. Oxygen concentrator project has initiated
3. Timeline may change to include oxygen concentrator project once the idea evolves.

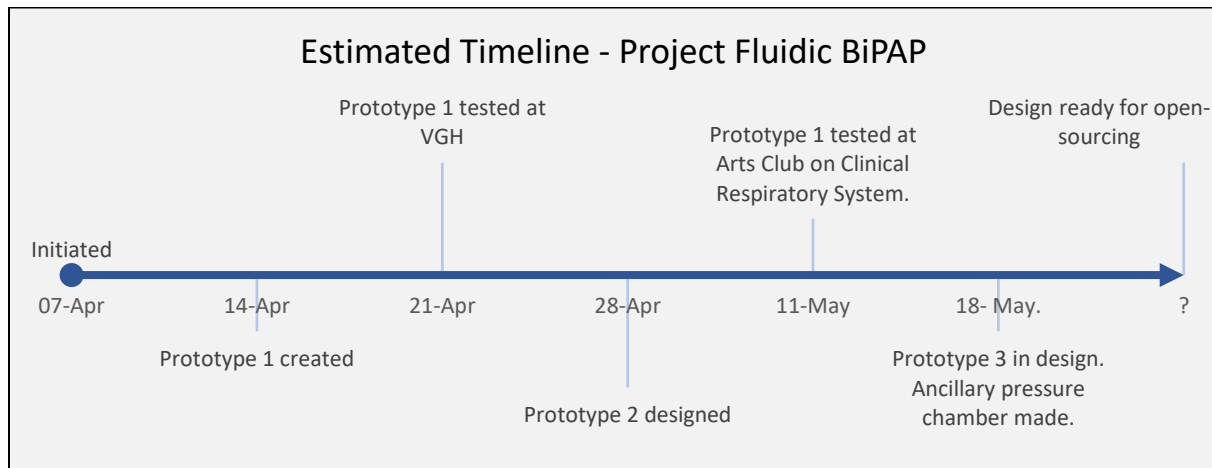
Estimated Timeline and Milestones



Project 5: Fluidic BiPAP

The intent of this project is to create a low cost 3D printed fluidic valve (a valve with no moving parts) to work in conjunction with a hospital air supply or a system like the Clinical Respiratory Support that will create a patient triggered BiPAP system.

Estimated Timeline and Milestones



Updates from the last week

1. Test of the Fluidic BiPAP valve with Clinical Respiratory Support Unit using a rubber bladder as a lung has been carried out. Results are underway.

Current Challenges

1. Bubble Helmet team is currently looking for a local (to British Columbia) manufacturer with the ISO 13485 certification.
2. The Clinical Respiratory Support (CRS) team is currently looking for sourcing an inline PEEP valve with an adjustable pressure control as opposed to the one with a fixed pressure control provision.
3. CRS team is currently working on new designs for oxygen concentrator. The team is looking for a chemical engineering expert with related experience with oxygen concentrators.
4. CRS team may benefit from someone taking on admin responsibilities from Ryan, who is willing to guide them in the transition.
5. gVent team is currently looking to hire a P.eng. to help finalize development of controls system and testing before releasing design open source by the end of summer
6. Fluidic BiPAP team is looking for an access to a reliable 3-D printer to produce prototypes.
7. The COVID-19 pandemic is getting severe in many countries. COSMIC Medical is seeking collaborations from these places so these devices could be used to alleviate the severity of the crisis.

Resources

1. COSMIC Website - <https://cosmicmedical.ca/>
2. GitHub packages for gVent, Bubble Helmet, Clinical Respiratory Support and Snorkel Mask - <https://github.com/COSMIC-medical>
3. COMIC Project Showcase - <https://www.youtube.com/watch?v=Gaq3EzTgagQ&t=83s>
4. COSMIC Project Showcase (extended version) - https://www.youtube.com/watch?v=Cg_-1Oxaq5o&t=9s



Queries

If you have a solution, suggestion to any of the challenges that are posted in this report, looking for a collaborative work, or have any other query regarding this report please feel free to contact our project manager, **Abhijit Pandhari** at **pandhari [at] alumni.ubc.ca**.