
PRANESH: An Automatically Pressurized AMBU Bag

An Economic Healthcare Solution

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A bag valve mask (BVM) is in use for more than fifty years. The apparatus is known by many other names, such as, Ambu Bag [1], manual resuscitator and self-inflating bag. This is a hand-held medical apparatus, which is commonly used to provide positive pressure ventilation to the patients, who suffer from inadequate breathing. A face mask is plugged over the patient's airway and the required amount of oxygen is pumped by squeezing the Ambu bag at a rate of 12 to 16 breaths per minute for adults. The bag can be repeatedly squeezed out and re-inflated rapidly to resuscitate the patients by providing adequate oxygen. **The same Ambu bag can be used to provide assisted ventilation through endotracheal tube to Covid-19 patients.** Assisted ventilation using Ambu Bag requires periodic pressurization of the bag [2].

Generally, this medical apparatus is hand operated by highly skilled health-staff. This manual operation becomes tiresome and demands high workmanship to generate exact ventilation rate. In addition to this, it is not always possible to engage a health-staff for each patient for this activity, when the number of patients is quite high. Also, with the rapid spread of Covid-19, in the present scenario, it is desirable to place the health workers at a safe distance wherever possible to reduce the possibility of infection.

Therefore, the present situation demands automatic pressurization of the Ambu bag and develop an affordable but reliable mechanism for the same.

NIT Durgapur has developed an affordable, plug-and-use and easily maintainable semi-automatic Ambu Bag ventilation system in close collaboration and supervision of clinical physicians. The design is economic, simple and amenable to easy production. A photograph of a design model is shown in Figure 1. The required clinical parameters of Ambu bag pressurization, such as strokes per minute, volume per stroke, etc [3, 4] can be controlled in the present system. Prototypes have been fabricated inside the NIT Durgapur campus itself. Weight of one prototype is around 2Kg and creating minimal noise and vibration. "PRANESH" can easily compete with the similar systems as regards cost and features [5].

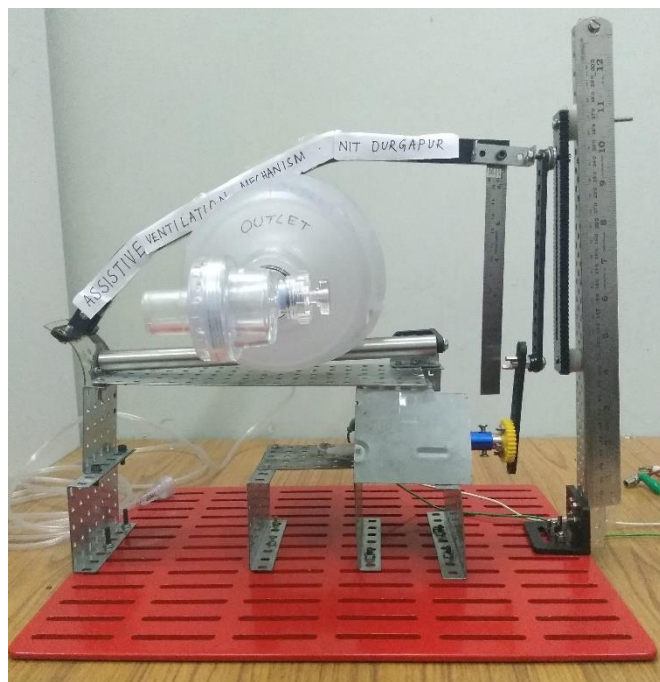


Figure 1: The fundamental design used to developed the actual prototype of a Semi-automatic Pressurization of Ambu Bag: PRANESH

The systems are being clinically tested and and till now have been found satisfactory enough for crisis situations meeting the clinical requirements mentioned above.

It can definitely support the patients in regular scenario, as well as, in the time of urgent crisis such as Covid-19 pandemic. The main usage of this will be

- (a) Bridge between intubation and availability of a standard ventilator
- (b) During ambulatory support
- (c) In case of large number of cases like Covid 19 pandemic, it can supplement a regular ventilator.

The model can also be attached to each ICU bed and ambulances with slight modification.

Although it has been certified by a group of doctors, however, long hours of testing on different patients will prove the efficacy and reliability of the mechanism. The process is going on and NIT Durgapur is determined to make it ready for deployment at the earliest.

References:

- [1] www.ambu.com
- [2] <https://litfl.com/bag-valve-mask-bvm-ventilation/>
- [3] <https://www.carandbike.com/news/mahindra-starts-testing-its-in-house-ventilator-2203133>, accessed on 30th March 2020
- [4] <https://www.cprcertificationonlinehq.com/correct-ventilation-ratio-cpr-adults-children/>
- [5] <https://www.healthline.com/health/normal-respiratory-rate>

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