SPECIFICATION OF NEONATAL VENTILATOR MODULES SIMULATOR

1) The simulator should have facilities to train clinicians in understanding lung physiology in health and in disease, assessment of lung function and application of respiratory therapy.
2) The simulator should have a fully autonomous physiological algorithm which reacts by itself to created pathology and responds by itself to any ventilation therapy applied.
3) The simulator should have fully customizable scenarios like MAS, TTN, RDS, PPHTN, weak muscular activity, airway obstruction, pneumothorax.
4) The simulator should include a neonatal autonomous physiological lung simulator in a highly realistic silicone body equivalent to a neonate of weight 4000g or less, length 45-55 cm long.
5) The simulator should have the ability to be programmed for any lung disease of a neonate from 24 weeks of gestation to 42 weeks of gestation, without having to put individual figures to programmable parameters.
6) The simulator should be tetherless, Bluetooth-controlled, and battery-operated (rechargeable). The battery backup should be minimum four hours.
7) The simulator should feature a realistic face to connect to nasal CPAP.
8) The simulator's outcomes should be autonomous based on traceable human physiology to facilitate effective training.
9) The simulator should offer training in non-invasive and invasive ventilation on any ventilator, any mode, any PEEP, as well as application of nCPAP, high-flow oxygen therapy, high-frequency ventilation, effects of surfactant therapy, interpretation of ventilator data, and ventilator alarm setting.
10) It should facilitate interpretation of vital signs.
11) The simulator should allow programming of broad parameters individually, including lung mechanics with programmable parameters such as:

i. Airway resistance
ii. Functional residual capacity
iii. Degree of lung collapse
iv. Pressure volume curves with more than 20 possible configurations
v. Recruitability
vi. Recruitment threshold and time constant,
vii. Lung collapse threshold and time constant, and
viii. Chest wall compliance.

12) The simulator should have programmable respiratory control variables such as:

i. Target PaCO2
ii. Inspiratory Pressures
iii. Inspiratory waveforms
iv. Variation of inspiratory pressures
v. Expiratory waveforms
vi. Respiratory rate
vii. Sigh rate
viii. Apnea rate
ix. Apnea time

13) The simulator should have programmable Gas exchange parameters as:

i. CO_2 production
ii. Airway dead space
iii. DCO_2 for HFV factor
iv. Alveolar dead space
v. O_2 dissociation curve shifts
vi. Fetal hemoglobin percentage
vii. Diffusion limitation
viii. Base excess
ix. Temperature

14) The simulator should have programmable Hemodynamic parameters as:

i. Pulse rate
ii. Pulse variability
iii. Central bradycardia with apnea
iv. Bradycardia of various types
v. Bradycardia critical SpO_2
vi. Systolic BP, diastolic BP and mean BP
vii. Total blood volume
viii. Cardiac output
ix. True shunt percentage
x. Plethysmogram variation percentage

15) The simulator should have programmable special effects parameters as:

i. Leaks
ii. Added dead space
iii. Movement artifacts

16) The simulator should have the ability for complete data recording for later analysis.

17) The simulator should be able to display following parameters on a simulated multipara monitor that respond autonomously without any interference from the trainer as:

i. Pre-ductal SpO_2 and post-ductal SpO_2
ii. Plethysmogram real-time curve
iii. ECG real-time curve and heart rate with trend
iv. Real-time capnograms with end-tidal CO_2 with trend
v. Respiratory rate
vi. Body temperature
vii. Blood pressure

18) The simulator should have the ability to directly measure and display:

i. Tidal volumes
ii. Delivered peak inspiratory pressures
iii. Delivered peak end expiratory pressures
iv. Expected end expiratory volumes that change autonomously with recruitment
v. Shunt fractions that change autonomously with recruitment if there is a collapse or True shunt fractions that do not change with ventilation therapy

19) The simulator should have an instructor control laptop (screen size 15 inch or more) that should be able to display the following:

i. Real-time PV curve autonomous as per the patient's condition and intervention
ii. Real-time curves of tidal volume
iii. Alveolar pressure graphs
iv. Real-time ABG that responds automatically to interventions

20) It should be supplied with multipurpose screen of size 21 inch or more

21) The laptop and multipurpose screen should be able to connect with the simulator through bluetooth and wifi, both.

22) It should be compatible with all available brands and models of neonatal ventilator

23) Free of cost upgradation of software to be provided by supplier during warranty and CMC period within one month of its launch.

24) Should be BIS/ISO certified.

25) Should have Warranty of five years followed by five years of CMC.

26) Demonstration of the equipment should be done whenever requested.

27) Service facility should be available for the equipment within the same city/place of installation.

28) Should have the equipment installed in atleast two other government teaching institutions in past three years.

29) Satisfactory performance certificate of minimum duration one year post installation from atleast one government teaching institution.