From intelligent ventilation to full-function patient monitoring, GE Healthcare offers the full spectrum of critical care – from your ER, ICU and CCU, to your patient’s home if needed.
Respiratory Care Re-imagined
Tailored therapy. For every patient.

From Hospital to Home.

iSleep Series
series of advanced CPAP/Bilevel devices.

Vivo 30 & 40
Vivo series
Offers invasive & non-invasive Respiratory support, synchronized to patient's breathing patterns, in both home & clinical modes.

iVent 101
iVent 101
portable, easy to use ventilator with flexible touch-screen interface, from infant to adult.

iVent 201
iVent 201 a full-featured ICU ventilator, tailored for multiple applications.

Engstrom Carestation
Engstrom Carestation
an advanced ICU ventilator, expandable solution in the critical care process with integrated aerozen nebulizer, capable from neonatal to adult, metabolic monitoring with dual modes.
Ventilators for the Rural Health Care Provider?

- Why & What Ventilator Parameters Rural Healthcare Provider need to save lives.

Introduction

The healthcare facility in India is divided principally as Primary, Secondary & Tertiary healthcare. While Tertiary Care centers are concentrated in urban areas, the rural areas, semi-urban and small towns are principally catered to by primary & secondary healthcare centers. The disease spectrum in rural India that needs attention is different from that of urban parts. For instance, the major killer disease in rural India among pediatric age group is diarrhea which otherwise is an easily treatable disease. Addressing the healthcare issues that could be controlled at the grass root level is the principal motto of Primary Healthcare Centers which remains the key focus of the Government of India. Only those diseases / disorders that require specialist’s attention are referred by primary centers to secondary or tertiary care centers in the country. With a population of 1.3 billion, the healthcare needs & approach in India differ from that of western world.

Majority of fatalities in rural areas are due to lack of trained manpower and to some extent, non-availability of healthcare technology. While, ensuring the presence of trained manpower in our rural set ups are crucial, we should ensure that this trained manpower is not left unsupported when their patients do not respond to the standard treatment. It is taken as “Gospel truth” that care of critically ill patients must be clustered / concentrated in the “developed” areas in order to optimize the costs as well as the delivery of care. This may be accepted as a principle as long as this concept presupposes/ensures that the peripheral centres i.e. PHCs, CHCs and District Hospitals will be able to transfer the patients as they deteriorate and more importantly, “provide the patient with the needed support” as and when they start deteriorating - till the patient can be delivered (including transport) to the Intensive Care Units for “specialized care”, if most of the patients cannot survive this period - or, reach the ICUs with AVOIDABLE additional organ dysfunction (which might render the patient a potential / or actual burden to Society), the very raison d’etre for concentrating ICUs in developed areas (read Major Towns/ Cities) will be defeated. To reduce / prevent such a scenario becoming commonplace, the health policy planners have no choice, but to ensure that some level of technology to support these patients are in place at the rural level and the medical manpower posted at these places are encouraged to undergo / given a modicum of training to handle such equipment.

This envisages the provision of technology / equipment which are simple enough - but capable enough, to provide the level of care needed for providing organ support for the duration under consideration. The costs should aim at reducing healthcare expenditure by 15% (keeping in mind that increasing morbidity in patients has much more potential to add to total costs to society and family, than the 15% cost increase might indicate) and increasing the availability of technology by 15%. Such an approach will be a promising tool in country like India especially in critical care areas with a strong social commitment. Affordable healthcare equipments that are user friendly with quicker learning curve will be a great boon to rural India. Designing a basic ventilator for such segment will no doubt be a great initiative.

The common conditions that requires ventilator assistance in rural India includes poisoning, snake bites, RTA (road traffic accident), diseases like encephalitis etc. The sad reality is that it is all too common for these patients to be brought to our major hospitals “too late” i.e. at a stage when they have already suffered major organ damage e.g. hypoxic brain damage, etc.

Poisoning

Accidental: Organophosphorus (OP) poisoning in farmers as occupational hazard & in children.

Intentional: OP Poisoning, Yellow Oleandar Poisoning (Cardio toxin), zinc phosphide (rat poison)
Snake bite

Three types of poisonous snakes in India:

• Cobra (Neurotoxin) - needs ventilator as it paralysis respiratory muscles causing arrest.
• Viper (Haemotoxin) - affects coagulation and causes hemolysis as well as cardiac arrest.
• Krait (both neurotoxic & haemotoxic).

Generally Polyvalent ASV (Antisnake venom) is readily available only in government hospitals. At the same time, snake bite victims requiring IPPV often develop complications like septicemia, multiple organ failure requiring dialysis etc. Hence centers that are devoid of required healthcare setup will only observe the cases initially (as 70 - 80% of cases are non-poisonous bite). Once complication arises, they immediately shift to the next higher level hospitals.

It often requires invasive ventilation and probably for long periods (especially if the patients received ASV late - in some instances, patients are on ventilator for about 50 days).

In view of the above, for the rural set ups, it would be rational for the ventilator for use in such rural set ups to have the following specifications:

- Should have CONTROLLED mode, Synchronizes IMV, CPAP & Pressure Support modes
- Should have Inbuilt Turbine / Blower technology as Air Source -keeping in mind that the same ventilator should be capable of being used for transport as well - along with oxygen enrichment facility from “flow-meter -cylinder” set up.
- Should have option to select inspired Oxygen enrichment with Monitoring facility
- Should have suitable Tidal Volume Range for Adult to Pediatric patient
- Should have at least 4 hrs inbuilt rechargeable battery for transport as well
- Should have Non-Invasive ventilation mode with full range of masks and harnesses
- Should have trigger mechanism with open back up mode
- Should have display for exhaled parameters monitor
- Should have alarm monitor with event register facility
- Should have trend facility.

At the same time - no equipment of this nature should be allowed to be placed in rural set ups without:

- Five year Warranty with Five year CMC (charges payable on yearly basis) - the budgetary provision should be made at the time of purchase so that equipment do not remain out of order due to technical/ financial delays in ordering necessary spares for repairs.
- Adequate Performance Warranty Clauses
- Acceptable Down Time eg. a realistic one week period - with stringent penalty clauses including black-listing (exception - force de majure).

GE Healthcare

Breathe easy* because Vayu™ intuitively knows what patients need. And when.

The Vayu™ Ventilator features an advanced and intuitive Sensitive Triggering system. The system automatically enables synchrony, makes minor adjustments based on the patient’s condition and alerts you when attention is needed. So get the Vayu, and breathe easy!

- Advanced intuitive sensitive patient trigger
- 7 modes of ventilation (Including invasive and non-invasive
- Enables pediatric & adult ventilation
- Displays 3 waveforms
- Built in quiet turbine
- hours battery back-up**

Visit www.gehealthcare.com/vayuventilator to learn more. Or call us at 0000000000 for a demo.

**Conditions apply | Pediatric patients should be 10 kgs and above | Comfort to Patient/ Breathe easy - Helps patients breathe-easy due to adjustable inspiratory and expiratory trigger levels and rise-time to optimize patient synchrony | Smart/ Alert/ Easy-to-use - Easy to move, explain solving alarms, NIV with familiar circuit and mistake minimisation (© Copyrght GE 2011 GE)
Vayu. A ventilator designed with the small peripheral hospital in India in mind.

Hospitals today have several alternatives when choosing an ICU ventilator. The Engstrom Carestation and Engstrom Pro from GE Healthcare are prime examples of the powerful and technically sophisticated units at respective price points being used by Indian clinicians to ventilate patients in some of the most prominent ICUs of the country.

Such ventilators either from GE or any other manufacturer are best choice for hospitals where right infrastructure support is in place whether it is uninterrupted power supply or a pressurized Air/Oxygen supply. Few Questions get raised here are: what about suburban & rural healthcare centers, where it is required to ventilate patients in a suboptimal infrastructure set up. How do they balance their economic value proposition by still having advanced clinical capabilities to meet their patient’s clinical & affordability needs.

GE Healthcare India has designed and recently introduced the Vayu ventilator with these small peripheral healthcare centers in mind. The Vayu ventilator employs modern technology to be able to provide appropriate levels of ventilatory support while being easy to operate, informative and at the same time having a moderate cost to allow access to ventilation for more and more patients in India.

The need is great as India has far fewer ventilators per capita than countries like the USA. As the medical universities and medical colleges educate our capable clinicians and nurses, we are proud to be able to provide a unit like the Vayu ventilator and contribute in the very rapid expansion of intensive Care and be able to treat more and more patients closer to their homes and their loved ones.

From the technical standpoint the Vayu provides flow to ventilate the patient from a built in turbine flow generator removing the need to have pressurized air or noisy and service intensive compressors at the hospital. The Vayu ventilator is also equipped with an innovative internal energy recycling battery system which can keep ventilation going for up to 4 hours* without mains electricity.

The Vayu ventilator offers 7 modes of ventilation to be able to handle patients during the acute phase of their disease and also has the sensitivity and adaptability to assist the clinician as they wean the patient off the ventilator. Vayu can be used invasively and non-invasively with a simple, single patient tube connection to the patient’s mask. Vayu has the ability to display 3 waveforms for pressure, flow and volume to assist the clinician in monitoring and optimizing ventilation at the bedside. It also offers 72 hour trend capability to assist in reviewing patient status when the ICU is less well staffed, for example during the night.

The engineering team that designed and manufactures Vayu in Bangalore is very proud to have been selected as the only ventilator in the Top 9 innovative technology solutions to win “The Grand Challenges for Technologist in India” by the MIT’s Technology Review, India. Vayu is recognized for being innovative affordable solution using modern technology.
The Engström* Carestation* goes beyond traditional ventilators. Its extended capabilities include clinical decision support tools to provide valuable patient insight. Tools like real-time lung volume assessment to help guide respiratory therapy, continuous indirect calorimetry for tailored nutritional support, automated spontaneous breathing trials to help assess extubation readiness and an inline nebulizer to efficiently administer breathing treatments—all in a single platform. And, the Carestation provides one of the lowest total cost of ownership solutions in the market.*

The Carestation’s ability to help manage routine functions and provide detailed patient information simplifies your tasks – enabling you to focus on the needs of your patients rather than managing multiple systems, helping you to provide the best care for your patients – and streamlining workflow for you.

Demand more for your patients...
Demand a Carestation.

*Trademark of General Electric Company.
The impressions on NIV application by the use of critical care ventilator in the pediatric and neonatal post cardiac surgical unit at Amrita Institute (AIMS)

Amrita Institute of Medical Sciences and Research Centre (AIMS) is one of the largest post graduate teaching institute in India with massive infrastructure and over 3000 outpatients daily and almost 54000 annual inpatient registrations. We have a dedicated 10 bedded paediatric cardiac surgical intensive care unit with a step down unit which is having 17 beds. The staff members of the ICU treat over 1200 patients in a year. With the objective of reducing the days to extubation, we implemented an active weaning policy by allowing the babies to regulate their breathing with CPAP. Mr. Jithin, who is in charge Respiratory Therapy Services at AIMS, shares his observations of allowing the babies to regulate respiration by implementation of NIV in both pre-operative and post operative critical care unit at Amrita Institute.

Can you tell the size of your ICU and the staffing pattern in your hospital?

Our dedicated paediatric cardiac intensive care unit has 25 beds in total with 100% occupancy all around the year. We have patients from far off countries like Uganda, Nigeria, Oman and other Middle East countries in addition to those from in and around Kerala. In terms of staffing we have 4 consultant cardiac anaesthesiologists, 5 cardiac anaesthesiologists, 5 Respiratory Therapists, 75 nurses available 24x7. One RT is always on night duty as is the cardiac anaesthesiologists do.

What types of patients do you get frequently?

Most of our babies are full term or preterm infants with congenital heart defects who are referred from other health care centers and some of them come here already infected. Some among these are very low birth weight babies. If the symptoms are mild to moderate, respiratory distress along with drop in oxygenation, we primarily start with CPAP treatment and intubate only if needed (worsening in the overall clinical status). We use CPAP grossly as a weaning tool for taking off babies from long term ventilator support. In some of the patients we start early elective CPAP therapy to avoid atelectasis and for reducing pulmonary vascular resistance.

Your General experience of using Non-invasive / CPAP therapy?

In my experience, invasive ventilation will highly intensify the treatment as need for more investigations like X-rays, blood gases, dedicated staffing. Ventilator dependency and chances of ventilator associated pneumonia (VAP) are increased. These in itself will increase the length of stay in the ICU and cost incurred during the treatment. I really think the best way to take care of patients with COPD exacerbation is to use non invasive very early in the treatment. We at our centre firmly try to reduce the need for Mechanical Ventilation especially invasive techniques, and I think it is a universally accepted trend.

What all are the general modes you use in your ICU for managing the patient?

Pressure controlled ventilation with volume guarantee (PCV-VG) of GE Engstrom Care Station has been the general mode of choice in the Pediatric ICU for many years. Earlier we faced problems as we needed to change the ventilator for instituting NIV after extubation. After installing the new Engstrom integrated CPAP system in the ICU this difficulty has been resolved and babies are much more comfortable. Because of the better sensitivity and flow generation, the sedation required is less.
How many years have the NIV been used in your department, tell me the different categories of patients?

CPAP has been used here in pediatric patients since 1999. Going with the emerging trends and advances in patient ventilator interaction, the synchrony, comfort and safety that is provided through advanced machines like Engstrom Care Station makes CPAP easy and effective mode of weaning. Our patients range from neonates with congenital cardiac diseases to adults with coronary artery diseases and valvular ailments like mitral stenosis, aortic stenosis etc.

How will you determine Nasal-CPAP is indicated?

We have separate protocol for initiating Nasal-CPAP and we follow certain monitoring parameters to see how the patient is responding to the therapy. We use it for babies who are less than 6 months of age who are essentially nasal breathers. If the patient tolerates NIV well clinically, we continue with it. But on the other hand, if the baby shows signs of respiratory failure with worsening tachypnea and hemodynamics, we prepare for invasive ventilation.

What advantages are you seeing with our integrated CPAP system?

One of the major advantages what I feel is your Mesh-Nebulizer technology and leak compensation, especially when active humidification system is ‘ON’ and patients who are on nebulized antibiotics. It is appreciable that care station performs this very well, and it provides maximum comfort as well as adequate support without any alteration in the flow or pressure.

If you face any leakage problems, how do you address the situation?

The key difference between invasive and non-invasive is that NIV typically involves air leaks. This can be large enough to affect the ventilators triggering and cycling functions and the rate of inspiratory rise time. If your interface is a mask, then the first thing you need to do is to get the appropriate sized mask. But this will be very difficult in case of pediatric patients. You can change to a nasal pillow/prongs that will work very well even in the presence of high leakage. NIV with GE Care Station with leakage compensation also works very well in this situation. An additional feature that I have seen in GE is that we can adjust the cycle off criteria that will limit the continuous flow after a given time. Finally, I agree that selecting an ideal flow triggering sensitivity from the least that is one L/min (Pediatric mode) and in neonatal it is 0.1 L/min. This is the least when compared to other machines. It is mandatory to check that the sensitivity is set at the correct level. A very low & high sensitivity level can always lead to patient ventilator asynchrony and can cause failure of NIV treatment.

Is the rise time setting really effective in pediatric group?

Rise time is the time the ventilator takes to reach the peak pressure. Nobody can tell what the ideal risetime setting should be. Too short a rise time will have the effect like a blast of air on your face which we tend to resist. This can result in reduced tidal volume delivered. If rise time is too slow, it can result in air hunger and increase patient effort. This can also result in cycle asynchrony. Individual setting is mandatory and luckily we have settings ranges from 0 to 500 ms in GE that gives us a wide range of choice.

Something about Bias Flow in NIV.

Setting the bias flow will ensure that the expired gas from the patients breathing is not rebreathed. If it is too low, rebreathing can happen and a very high flow can cause bigger pressure swing which is unfavourable especially for pediatric groups. However a minimum bias flow rate needs to be maintained within the interface. Adjusting the ideal flow will ensure fresh gas delivery and maximize comfort.

How do you train the staff and other health care workers?

All our ICU staff members are trained well in managing non-invasive ventilation, cleaning and sterilization of the equipment and troubleshooting. There are trained ICU technicians and biomedical engineers to take care of the technical aspects. To top it all, we conduct various training sessions in different respiratory care modalities and maneuvers. We are available everytime on the bedside to clarify their doubts. All of them are working closely together with us and having one common motive which is wean the patient off the ventilator as early as possible.
How do you use the advanced monitoring technology?

As per our ICU protocol patient system checks, patient ventilator interactions, mechanical settings, alarms checks should be done hourly and documented. Changes are made accordingly keeping the patients status in mind.

How frequently are you administering CPAP therapy?

It is intended for continuous use and discontinued when the patients clinical condition improves as indicated by successful outcome assessments.

How to choose the right technology?

We still lack robust evidence for choosing ventilators for NIV applications in acute care setting. We are in the process of establishing a decision framework for matching the appropriate technology to a given patient care environment.

What message would you like to pass?

“Our bravery threshold has changed overtime and the continuity of care that ‘Care Station’ provides enables us to focus on patient needs and not equipment. Patients feel safe and supported enough. I should say the new care station is designed with ventilated babies and the respiratory therapist taking care of them, in mind”.

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7. Chatburn RL. Similarities and differences in the management of ALI in neonates (RDS) and in adults (ARDS). Respir Care 1998;33(7):539-553.
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What is the best approach to manage a case with ARDS in TODAY’S ERA?

Acute respiratory distress syndrome (ARDS) is the catastrophic response of the lung to an injury that results in severe respiratory failure. It has been recognized as a clinical entity in the field of critical care for many years. Many advances and newer methods of managing this difficult entity have come but despite of the same outcomes remains poor many a times. What should be the ideal practices, which should be followed in this current era of evidence based medicines? Remains the ever burning question.

Pathophysiology and clinical features of ARDS

The damage to the lungs in ARDS can occur after a direct insult to the lung pulmonary ARDS, i.e. pneumonia, aspiration of gastric content, inhalation injury, near drowning, reperfusion pulmonary edema) or due to indirect damage through the alveolar epithelium (extra pulmonary ARDS, i.e. sepsis, trauma with shock, massive blood transfusion, acute pancreatitis, Burns, Bypass surgery, DIC, Cranial trauma). Patients with ARDS generally share several constant characteristics that identify the condition. By definition all patient with bilateral infiltrates on front chest radiographs with PaO2/fio2 ratio of less than 200 mm/hg is called as ARDS.

Strategies in management: Evidences say that ventilatory technique can contribute to lung injury and increased mortality. To date, there is no etiologic treatment available that can act on the pathogenic events that underlie the disease. Therefore, the focus of respiratory support by mechanical ventilation in patients with ARDS and acute lung injury (ALI) is to provide acceptable gas exchange while simultaneously minimizing further injury to the lung.

Conventional ventilation: It is a proven fact that ventilation to achieve normal ABG analysis is no longer valid to manage ARDS. Low tidal volume 6ml/kg with plateu pressure of less than or equal to 30, have shown a considerable difference in mortality and overall hospital stay and morbidity as compared to ventilation with 12 ml/kg of tidal volume. PEEP and recruitment strategies plays a major role in management with keeping in mind not to over ventilating better ventilated and less injured alveoli is in order to recruit the badly affected and collapsed alveoli is. So frequent position change along with similar other modalities do play a considerable role in managing such patients so two essential principle remains true are:

- **Lung protection**: low TV and low Pplat ; surrogate of alveolar pressure employing permissive hypercapnia
- **Lung recruitment**: using high pEEP to recruit collapsed alveoli and further avoid swings of volutrauma, many a times called open lung ventilation, i.e. applying high pEEP for a short period of time as recruitmentmanoeuvres.

How much pEEP? ARDS Network, 2007 have shown an excellent result by reducing mortality by 9 percent by using pEEP at 9.4 +/- 3.6 with approximately tidal volume of 6 ml/kg in comparison with the patients which were ventilated with approximately 12 ml/kg of tidal volume and bit lower pEEP of 8.6 +/- 3.6, where mortality were 40 percent with later strategy while it was found less with higher pEEP low tidal volume strategy (31%).

It is worth to remember lung recruitment is a dynamic process of reopening of alveoli through an intentional increase in transpulmonnary pressure.

VOLUME CONTROL Vs Pressure control ventilation:- Data says that volume control ventilation preferably Volume guaranteed and pressure control mode of ventilation is far better than pressure control mode to avoid Ventilation induced lung injury in cases of ARDS.

Adjuncts to ventilation in ARDS

The list is extensive and includes independent lung ventilation, maintaining spontaneous ventilation, high-frequency ventilation, continuous positioning therapy, prone position, extracorporeal membrane oxygenation, inhaled NO (expensive), aerosolized prostacyclin (very expensive), surfactant, and multiple anti-inflammatory drugs and antioxidants among others.

Positions:

Prone ventilation have shown benefits by ventilating better perfused lung in better way and to avoid further atelectasis and also by avoiding chances of ventilator associated pneumonias. It is worth of a not that semi recombinantposition with many a times a more diseased lung.

Lateral positions: it is worth noted it is been shown of considerable good effect while keeping more “diseased lung down” in case of severe haemoptysis and “ good lung down " in cases of refractory hypoxemia where prone ventilation is difficult i.e. bilateral ICD placements and trauma patients. Though this said benefits of course needs a large randomised control trials for further clear benefits.
How much permissible hypercapnia: mean maximal $paco_2$ of 67 and ph of 7.2 reflects a reasonable initial goals, still each patient needs to be prioritized as per individual strategy as many a times $co_2$ induced acidosis may have deleterious effects such as the combined lung and head injury. Secondly rapid hypercapneic acidosis may have adverse hemodynamic effects and increased pulmonary vascular resistance with may add into V/Q mismatch. Remember there is no evidence to support use of bicarbonate as a buffer the hypercapneic acidosis.

Is hfov better mode of ventilation?

Well it is a unique mode of ventilation for this subset however favourable effects of better oxygenation with very very low volume of gas - strategy have not been translated into demonstrable survivable benefits in clinical trials in comparison with lung protective strategy by CMV. In today's era its role remains in rescue situation to overcome phase of severe hypoxemia in ARDS where a clinician feels there are few alternative options left!

Conclusion -

Ventilator strategies that minimize damage to the lung are essential to reducing the morbidity and mortality from ARDS. There is strong evidence that the manner in which ARDS patients are ventilated has a great effect on their mortality. Limiting tidal volumes and inspiratory pressures is a fundamental tenet of lung protection, along with at least low-moderate levels of PEEP. Attempts to open the lung using higher levels of PEEP with or without recruitment maneuvers may be beneficial, but definitive data are lacking. The role of additional adjuncts such as high-frequency ventilation and prone positioning is still unproved and requires further evaluation. High positive end-expiratory pressure, alveolar recruitment maneuvers, and prone positioning may each be useful as rescue therapy in a patient with severe hypoxemia, but these methods of ventilation do not improve survival for the wide population of patients with ARDS. Although not specific to the treatment of ARDS, protocol-driven weaning that utilizes a daily spontaneous breathing trial and ventilation in the semi-recumbent position has proven benefits and should be used in the management of ARDS patients.

GE Healthcare

VG-PS Ventilation

Every Breath is a Beautiful Thing

Safety. Synchrony. Simplicity

The Volume Guarantee form of Pressure Support (VG-PS) is a new mode of ventilation tailored to the needs of Neonatal Patients - supporting life in its most fragile state.

VG-PS: A new standard in neonatal ventilation

VG-PS is now a standard mode of ventilation available with the neonatal option of the Engstrom Carestation. With proven accuracy, synchrony, and additional safety, VG-PS allows clinicians to select the optimal level of support - and adapt quickly to meet changing requirements. It offers consistency in volume regardless of the type of breath delivered, and it provides synchrony of both the inspiratory and expiratory phases of a breath.

Designed for the specific needs of neonatal patients, the VG-PS mode is responsive and adaptive to the specific needs of each patient. It provides:

- Precise volume regulation during spontaneous and mechanical ventilation
- Breath-to-breath adjustment of the inspiratory pressure delivered
- Synchrony of both the inspiratory and expiratory phase of a breath
- The ability to control the point at which mandatory mechanical ventilation is initiated
Revolutionizing ventilatory support in critical care

iVent 201
The Intelligent ICU Ventilator

Anytime
Anywhere

Compact, transportable and easy-to-use, the iVent 201 is the first-ever ventilator designed for non-invasive and invasive ventilation. A wide range of standard and advanced features make it one of the most versatile ICU class ventilators available today.

**Special features:**
- Preset Parameters by Patient
- Adaptive Flow*
- Adjustable Rise Time
- Adaptive i-Time*
- Adaptive Bi-Level* for NIV
- Easy Exhale*
- Weight Sigh Breath
- Apnea Backup Ventilation
- 100% O₂ Suction
- Internal PEEP
- MR Conditional

**Standard features:**
- 72 hour trending of all settings and monitored patients data
- Loops with freeze and overlay capability
- Respiratory mechanics (static and dynamic)
- In-built SPO₂

*Trademark of General Electric Company.
GE iVent101 had been in the market for quite some time and had proven to be a rugged ventilator in various care areas. It is known for its small foot print, light weight, silent turbine with all major ventilation modes, simple to use and touch screen display.

The new addition to the already resourceful iVent101 includes:

1. Enhanced Waveforms
2. Alarm history brilliantly combined with new waveforms
3. New ventilation modes
   a. CPAP/PSV/VG *
   b. Adaptive Bi-level VG (in addition to the existing Adaptive Bi-level)
4. Profile feature - allows the clinicians to subscribe dual or triple prescription for the same patient for different needs
5. Settings Conflict Detection - Warns when alarm settings, clinical settings or apnea settings are violated
7. Breath Type Indication - The lung graphic icon will indicate the current type of breath (pink - mandatory breath, green - support breath & yellow - assisted breath). The waveform also indicates similar color display.
8. Patient Disconnect Alarm - with Version 2.0, user can now decide if the ventilator to keep ventilating even after a patient disconnect alarm is raised.
9. Estimated Calculated Settings
10. Leak Display - shown as percentage of total TV or as volume (L/min) in A. Bilevel & A. Bilevel VG
11. Improved Information Screen.
The Pulmonary Function Test (PFT) is used to assess and manage various pulmonary conditions. In a critically ill patient, knowledge of pulmonary functional status is desirable. PFT is generally measured in laboratory with standard equipment and its bedside application on ventilated patient is practically difficult. The current generation ventilator offers applications and solutions to assess the Functional Residual Capacity (FRC) which is the lung’s physiologic reservoir - an important PFT. The FRC keeps the airways and alveoli from collapsing between breaths making the working of breathing easier. The FRC is determined by the compliance of the lung and chest wall and is the volume of gas remaining in the lung at the end of a normal expiration. Calculation of FRC provides the clinicians with information on the lungs’ reservoir before and after lung recruitment maneuvers using which clinicians can directly monitor a patient’s response to therapy and determine the recruited volume and trending of FRC over time for tailored therapy.

However, determination of FRC can be difficult in critically ill patients. Accurate measurement of FRC requires that the patient be conscious and spontaneously breathing which is generally not possible with mechanically ventilated patients.

By the very process of intubation, a person’s FRC is believed to decrease by approximately 25%. Hence a patient who is mechanically ventilated can sustain severe airway collapse that can cause hypoxemia. Applying positive pressure to the airways throughout the respiratory cycle prevents this scenario. The Open Lung Concept (OLC) advocates treating patients with minimal tidal volume and higher PEEP for better oxygenation in cases like ARDS. Selecting an optimal PEEP level without causing further lung damage is very vital for the care of ventilated patients.

Determination of Functional Residual Capacity (FRC) can be performed through washout methods, indicator gas dilution or body plethysmography. Some of these techniques have been adapted for use in intensive care patients whilst being mechanically ventilated. However, most measurement setups are bulky, cumbersome to use and their running costs are high. Hence FRC measurement has not become a routine method in intensive care although it offers considerable advantages in the management of ventilated patients such as the determination of “best PEEP”, the detection of progressive alveolar collapse in the course of acute lung injury and during weaning from mechanical ventilation. Up to now most efforts to improve and simplify FRC measurement were made at the expense of accuracy. An ideal method ought to be accurate, easy to handle and cost-effective. It should supply not only FRC data but also information about intrapulmonary gas distribution and dead space. These demands can be met using modern data acquisition software. A conventional nitrogen washout using emission spectroscopy for measurement of nitrogen concentration gives satisfying exact values for the determination of the parameters mentioned above. The measurement error can be lowered under 5% by special corrections for flow and nitrogen signal (delay and rise times, changes of gas viscosity). For flow measurement a normal pneumotachograph can be used. Using a laptop computer for data acquisition the bedside monitor fulfills most of the demands in intensive care. It is then also possible to measure indices of intrapulmonary gas distribution such as Alveolar Mixing Efficiency and Lung Clearance Index.
Engström Carestation Ventilator

The Engstrom Critical Care Ventilator measures lung volume and pressure with unmatched accuracy to help you improve patient care. New methods in ventilation monitoring help clinicians to provide tailored therapy.

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<th>SpiroDynamics:</th>
<th>FRC INview:</th>
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<tr>
<td>Ability to monitor tracheal pressure regardless of ventilator setting</td>
<td>Direct measurement of end expiratory lung volume on mechanically ventilated patients</td>
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<td>Dynostatic curve providing estimated Alveolar pressure</td>
<td>True measurements of the effectiveness of lung recruitment maneuvers</td>
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<td>Inflection points may be visually detected</td>
<td>Calculations based on real-time lung function, without interruption of ventilation therapy</td>
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<td>Enhanced detection of intrinsic PEEP due to ventilation settings or secretions</td>
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In healthcare today, the expanding patient population is leading to increased pressure on scarce resources. At the same time, quality and safety imperatives need to be adhered to while keeping within budget. Our monitors address Clinical Information Logistics* by enabling you to put the right monitoring solution in the right place at the right time for the right cost.

PROCARE Monitors have versatile clinical capabilities to monitor a wide range of patients and can be operated by people of almost all professional levels. They provide reliability that is driven by high-quality GE design and engineering, and the affordability that enables you to provide patients with outstanding monitoring technology while staying within your budget.

With the PROCARE® Monitor B20 from GE Healthcare, there are no compromises. You’ll find what you’re looking for to monitor your patients:

- Versatile clinical capabilities to monitor a wide range of patients
- Ease of operation for all professional levels
- Excellent reliability driven by high quality GE design and engineering
- And, importantly, the affordability that enables you to provide patients with world-class monitoring technology while staying within your budget

We recently launched these monitors across some locations in India including cities like Patna, Vijayawada, Pune and Coimbatore. Here is a brief snapshot of all the launch events:
CARESCAPE Monitor B650

Engineered to help provide better care

- Combines the best of Marquette® Electronics and Datex-Ohmeda® legacies into one platform
- Wide set of clinical measurements are available with advanced parameter modules
- CARESCAPE Patient Data Module provides consistent hemodynamic measurement during intra-hospital transport and also transfers trend data
- Innovative algorithms aid in accurate diagnoses, including GE EK-Pro, GE DINAMAP® non-invasive blood pressure, and 12 SL® diagnostic ECG with direct 2-way MUSE® communication
- User-controlled views, from eight to 14 waveforms with overlays and insets, allow for flexibility and customization, based on caregivers’ and patients’ needs

*Trademark of General Electric Company.
Complete Solutions for Critical Care

**CARESCAPE Monitor B850**

In a critical care unit, multiple data sources, gaps in data and incomplete information can make it challenging to deliver quality care. You are forced to spend time gathering information from multiple systems or trying to find vital records buried in hard to access systems.

**Completely informed weaning assessments**
- Advanced tools, including spirometry with gas exchange, measure airway pressures, volumes, and calculated values at the patient’s airway delivering reliable, accurate measurements to help assess patient readiness for ventilator weaning.
- Unity Network™ ID, when combined with the CARESCAPE Monitor B850, allows for ventilator data integration.

**Dash**

High-acuity mobile Patient monitoring

With the Dash family of monitors, you have the clinical excellence you need and the flexibility you demand to capture, deliver and present relevant patient information at the right time and place. As part of a complete solution for managing Clinical Information Logistics, Dash monitors are an essential component for helping providers perform at the highest levels.

**Dash 2500**

The standard of excellence for lower-acuity monitoring

The Dash 2500 is a full-featured, affordable bedside monitor. Its powerful clinical parameters capture vital patient measurements while unparalleled arrhythmia detection algorithms help to accurately detect lethal arrhythmias. With Dash 2500 by your side, you can spend less time chasing false alarms and more time responding to your patients’ true care needs.

**B30 Patient Monitor**

Flexible, affordable patient monitoring

The B30 Patient Monitor offers an ECG, hemodynamic and CO2 monitoring, for a more complete picture of your patient. Up to six waveforms and four numerical digit fields can be displayed on the bright, large 10.4 inch color screen that gives you a view of patient status at a glance. In addition, you can automatically adjust the displayed data to maximize the size of values and waveforms.
**Carespace V100**

In the general medical/surgical unit, you periodically check patients’ vital signs to monitor their status before and after treatment. A quick, reliable, easy-to-use vital signs monitor is essential in helping you care for many patients with efficiency.

**iCentral**

Comprehensive clinical intelligence

iCentral presents real-time and historical patient information, including up to 72 hours of full disclosure data. Patient monitoring data is also accessible using CARESCAPE Mobile Viewers*, allowing providers to monitor a patient's status while away from the bedside. Clinicians are alerted to critical situations with visual and audible alarming for patients connected to the iCentral. Caregivers can choose from 23 waveforms to display organ-specific views with snapshots on cardiac, circulation, ventilation and neurological waveforms simultaneously. In addition, an integrated web browser enables easy access to external web-based information resources.

**CARESCAPE Mobile Viewers Clinical intelligence on the move**

CARESCAPE Mobile Viewers allow you to review and respond to patient monitoring information from almost anywhere within or outside the hospital. With Mobile Viewers, you can keep a watchful eye on your patients and be ready to take action at a moment's notice.

**APEXPRO Telemetry**

Enterprise-wide telemetry

ApexPro® CH telemetry offers a highly flexible and modern telemetry system to meet the current and future telemetry needs of growing hospitals. ApexPro CH relies on an exceptional networking infrastructure operating in the Wireless Medical Telemetry Service (WMTS) for dependable communication of vital patient information. ApexPro CH works seamlessly with CARESCAPE™ Enterprise Access, giving you the option to unite clinical intelligence across the enterprise under one halo of wireless coverage. This single infrastructure approach gives you expanded coverage area and the flexibility to deploy ApexPro CH telemetry wherever you need it.

*Trademark of General Electric Company.*
Breas Medical - A Division of GE healthcare manufacture one of the worlds best CPAP, BiPAP machines and non-invasive ventilators, a Life saving Medical Device that is used by individuals at home & Hospitals to help them breathe non invasively when in distress.

The obstructive sleep apnea (OSA) is increasingly being recognized as a disorder associated with adverse effects on quality of life by excessive daytime sleepiness, depression and impairments in both mental and physical performance.

Over time there is an increased risk for mycardial infarction and development of cerebrovascular diseases. The sleep disorder is characterized by repetitive episodes of upper airway obstruction during sleep, associated with varying degrees of oxygen desaturation. These apneas are terminated by arousals, resulting in autonomic activation and sleep fragmentation. Sleep disorders have also been linked to premature deaths. Ref http://sg.news.yahoo.com/afp/20090818/tts-health-disease-sleep-apnea-c1b2fc3.html

The quality of life of the person affected by a Sleep disorder (and their partner) is impaired on a significant scale by:
- Lack of sleep
- Irritability
- Disruptions to concentration
- Headaches
- Effects on the immune system
- Impotence (erectile dysfunction)
- Night sweating
- Impaired daytime performance
- Personality changes
- Memory impairment
- Depression
- GER gastro-esophageal reflux causing heartburn
- Other complications

This disorder is diagnosed by subjecting the patient to a Sleep Study and the patients found suffering from Sleep Apnea are prescribed a CPAP/ BiPAP

Enjoying everyday life

iSleep 20
Standard CPAP

iSleep 20+
High-end CPAP

iSleep 20i
Auto CPAP

iSleep 22
Bilevel

iSleep 25
Bilevel time

Vivo 30
NIV

Vivo 40
NIV-VG
The importance of data is nowhere more significant than in patient care. A patient’s wellbeing can be greatly influenced by a clinician’s ability to obtain data that accurately reflects a patient’s condition. Too often, some of the most important indicators of a change in a patient’s status can occur quickly, and then be lost forever in the past. The ability to recreate the past has become an expectation in the monitoring of a patient’s heart rate and other vital signs, should we not have the same expectation of the data provided by the ventilator?

EView™ is a device that captures all the output data from Engström Ventilator (EV) which is then available to the clinician for downloading and viewing at any given time. EView allows looking back the data as far as 7 days for evaluation and review of patient information at breath-to-breath level. This may also guide a clinician in developing specialized solutions to meet individual and unique patient requirements.

EView™ allows for the transmission of patient data at anytime, anywhere with the simple insertion of a USB flash drive or a SD card. With this, the ability to retrieve and view data is no longer restricted to a specific viewing station or monitor.

- The detail of the medical documentation provided by EView™ is enhanced by the advanced monitoring capabilities (FRC, Spirodynamics, metabolics, etc) available within the Engström Carestation Ventilator.
- All data from EView™ is available in a format that is easily accessible from pre-existing PC software in your laptop or desktop.
- USB or SD Card compatible.
- EView™ is both mobile and modular (hence seamless data capture is possible in all care areas where patient is moved along with EV).
- Available for use with Engström Carestation and Engström PRO.
- Full data capture when away from ICU or network.
INview Vent Calcs

Blood work and gas exchange measurements provide plenty of data about patients with respiratory and ventilation issues. But transforming these raw data into meaningful information can be a complex and time-consuming task.

¢ INview™ Vent Calcs provides a fast, simple, non-invasive way for clinicians to draw a deeper insight into the needs of a patient from the measurements taken directly at the patient’s airway.

¢ Calculations are performed by combining data collected by the Engström Carestation® ventilator and the E-COVX compact airway module with common lab values.

¢ In addition, it can calculate cardiac output non-invasively, allowing clinicians to trend values to assist in identifying possible suboptimal or inappropriate ventilator settings.

Simply put, INview™ Vent Calcs allow the clinician to monitor trends, understand the impact of adjusting various ventilator settings and gain new insights into the patient’s specific respiratory issues from collected data.

The Calculated Parameters includes:
- PAO2 - Alveolar Partial pressure of Oxygen
- AaDO2 - Alveolar to Arterial Oxygen difference
- Pa/FiO2 - P/F ratio
- PaO2/PAO2 - Alveolar to Arterial Oxygen pressure ratio
- CO - Cardiac Output
- Vd/Vt - Dead space ventilation to tidal volume ratio
- Vd - Dead space volume
- VA - Alveolar ventilation
GE Healthcare

When seconds count. Count on it.

When timing is critical, you can count on it for a clear image. Have you tried the Venue*40 yet?

an innovation of healthymagination

*Trademark of General Electric Company.
The Vision of point of care Ultrasound

A simple yet sophisticated technology that puts the power of Ultrasound in the hands of Intensivists at the point of care.

We listened to your needs. We built it to empower you. We made it affordable.

Imagine the possibilities
A Variety of Solutions and Services...

Console
Cart-based
CoAmpact
Pocket-sized

Plus services...

Data Management & Connectivity
Applications & Training
Financial & Operational Services
Transducers & Accessories
LOGIQ BOOK

imagination at work
GE Healthcare's Vscan Named "Best Of What's New" Grand Award Winner For Health By Popular Science

Pocket-Sized Visualization Tool Recognized among the Year's Top Innovations

WAUWATOSA, WI -- Nov. 17, 2010 (BUSINESS WIRE) -- GE Healthcare today announced that its Vscan pocket-sized visualization tool has been named the Grand Award winner for Health in Popular Science magazine's 23rd annual "Best of What's New" issue. Commercially available earlier this year, Vscan provides physicians powerful imaging technology at their fingertips - to take a quick look at what is happening inside a patient's body.

"Vscan was designed to help enhance patient care by providing access to high-quality imaging at point-of-care, to help detect disease and complications earlier," said Agnes Berzsenyi, General Manager, Global Primary Care - Ultrasound, GE Healthcare. "We are honored to be recognized by Popular Science for this advancement to the field of healthcare."

Roughly the size of a smartphone, Vscan houses powerful ultrasound technology that provides clinicians with an immediate, non-invasive method to help secure visual information about what is happening inside the body. Vscan may prove invaluable for physicians in today's busy practice environment - including primary care physicians and those specializing in cardiology, critical care and women's health, as well as hospitalists. Vscan is available in countries around the globe including the U.S., Canada, Europe and India.

"For 23 years, Popular Science has honored the innovations that surprise and amaze us - those that make a positive impact on our world today and challenge our views of what's possible in the future," said Mark Jannot, Editor-in-Chief, of Popular Science. "The Best of What's New Award is the magazine's top honor, and the winners - chosen from the thousands of entrants - represent the highest level of achievement in their fields."

About Best of What's New

Each year, the editors of Popular Science review thousands of products in search of the top 100 tech innovations of the year; breakthrough products and technologies that represent a significant leap in their categories. The winners - the Best of What's New - are awarded inclusion in the much-anticipated December issue of Popular Science, the most widely read issue of the year since the debut of Best of What's New in 1987. Best of What's New awards are presented to 100 new products and technologies in 11 categories: Automotive, Aviation & Space, Computing, Engineering, Gadgets, Green Tech, Home Entertainment, Security, Home Tech, Personal Health and Recreation.

About Popular Science

Founded in 1872, Popular Science (www.popsci.com) is the world's largest science and technology magazine, with a circulation of 1.3 million and 6.8 million monthly readers. Each month, Popular Science reports on the intersection of science and everyday life, with an eye toward what's new and why it matters. Popular Science is published by Bonnier Active Media, a subsidiary of Bonnier Corporation.

About GE Healthcare

GE Healthcare provides transformational medical technologies and services that are shaping a new age of patient care. Our broad expertise in medical imaging and information technologies, medical diagnostics, patient monitoring systems, drug discovery, biopharmaceutical manufacturing technologies, performance improvement and performance solutions services help our customers to deliver better care to more people around the world at a lower cost. In addition, we partner with healthcare leaders, striving to leverage the global policy change necessary to implement a successful shift to sustainable healthcare systems.

Our “healthymagination” vision for the future invites the world to join us on our journey as we continuously develop innovations focused on reducing costs, increasing access and improving quality and efficiency around the world. Headquartered in the United Kingdom, GE Healthcare is a $16 billion unit of General Electric Company (NYSE: GE). Worldwide, GE Healthcare employs more than 46,000 people committed to serving healthcare professionals and their patients in more than 100 countries.

For our latest news, please visit http://newsroom.gehealthcare.com

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Pocket-sized ultrasound helps provide fast answers in urgent situations.

GE Healthcare’s new visualization tool puts the power of ultrasound in the palm of your hand. Ultrasound is now easily accessible, and can help you make quick decisions in urgent care situations.

This easy-to-use device provides a non-invasive look inside the body to assist with immediate triage and rapid intervention. With ultrasound readily available, you can quickly gather the information you need to help determine the course of treatment. And by helping to speed diagnosis, you can improve workflow and reduce patient wait times.

Having this tool in your pocket and ready to use to a moment’s notice not only helps you make faster decisions, but provides your patients a sense of confidence in decisions related to their care.

Potential applications

Vscan is cleared for:
- FAST
- Abdomen
- Cardiac
- Urinary bladder
- OB/GYN
- Pediatric
- Thoracic/pleural fluid and motion detection

For more information, visit us at https://vscan.gehealthcare.com.

Trademark of General Electric Company.
Recently GE released the latest software version 7.x for the Engström ventilator. With this release, touch screen navigation is now possible in all new Engström Carestation and Engström Pro ventilators. The Engström hybrid screen offers the flexibility to use either the touch screen display or the conventional com wheel to negotiate with the ventilator depending on user preference.

**NAVIGATION SIMPLIFIED**

The New Release Will Introduce:
- Hybrid screen - with touch screen as well as conventional com wheel interface for navigation.
- Favorites, which are hyperlinks to commonly used features in Engström.
- Simplification of the main screen layout.
- Intelligent and simplified alarm management capabilities.

**Engström Carestation Favorites**
- 23 optional hyperlink solutions to choose from in the “Favorites Setup”.
- 7 selectable hyperlink favorites can be displayed in the “Favorites” bar.
- The “Favorites” bar features and daily activities are hyperlinked, simplifying navigation.
- Through the use of the “Favorites Setup” menu, clinicians can simplify daily navigation by choosing hyperlink short-cuts shown in the “Favorites” bar.

GE has flattened the navigation path for advanced monitoring, routine activities and alarm management with the introduction of hyperlinks to the Engström. The use of hyperlinks decreases the training requirements for daily use, leaving more time for focused patient care. With the introduction of hyperlinks you will need to decide - What’s your new “Favorite” part of the Engström Carestation?
We are making a new commitment to health.

By 2015, our goal is to:

**Reduce Costs**
Reduce by 15 percent the cost of procedures and processes with GE technologies and services.

**Increase Access**
Increase by 15 percent people’s access to services and technologies essential for health, reaching 100 million more people every year.

**Improve Quality**
Improve quality and efficiency by 15 percent for customers through simplifying and refining health care procedures and standards of care.

healthy imagination
Respiratory Care Re-imagined
Tailored therapy. For every patient.

From Hospital to Home.

iSleep Series
series of advanced CPAP/Bilevel devices.

Vivo series
Offers invasive & non-invasive Respiratory support, Synchronized to patient's breathing patterns, in both home & clinical modes.

iVent 101
portable, easy to use ventilator with flexible touch-screen interface, from infant to adult.

iVent 201
a full-featured ICU ventilator, tailored for multiple applications.

Engstrom Carestation
an advanced ICU ventilator, expandable solution in the critical care process with integrated aerozen nebulizer, capable from neonatal to adult, metabolic monitoring with dual modes.
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