



NEW TRENDS IN MECHANICAL VENTILATION

By Stephanie Richardson

With the advent of new technology, manufacturers are developing innovative mechanical ventilators that are helping patients and respiratory therapists breathe easier when it comes to administering care. But with new software and functionality upgrades available all the time, what are some of the most recent trends?

Small wonders

Pending clearance by the Food and Drug Administration, two “palmtop” ventilators will be hitting hospitals soon. These two devices promise ICU-level care in any area of a hospital. Weighing in at about the same size as a continuous positive airway pressure device, these ventilators are of the smallest available.

Each palmtop ventilator contains a gas delivery system with active exhalation valve. They provide a complete selection of modes, full graphics and integrated spontaneous breathing trials that simplify weaning. Endotracheal tubes are optional, and each ventilator can provide noninvasive ventilation with automatic leak compensation. Additionally, an internal battery provides up to four hours of power needed during patient moves.

While one of the palmtops is designed for high-acuity applications, the other is a mid-acuity system. The high-acuity palmtop ventilator features a nebulizer and touch screen, and its batteries can be hot swapped without any disruption in patient care. The mid-acuity device uses a simple LED interface to provide patient data and provides external active exhalation.

What’s new for sub-acute care?

Currently, sub-acute care is one of the fastest growing services in health care. While most patients requiring sub-acute care don’t require the intensive procedures associated with the ICU, a ventilator may be needed for certain invasive procedures. However, clinicians have struggled finding a ventilator that can easily move with a patient from room to room and adapt to changing care requirements.

A new device that received FDA clearance in June is enhancing the way respiratory therapists and sub-acute care patients give and receive mechanical ventilation. Providing invasive and noninvasive ventilation, this machine’s flexibility allows RTs to address a wide range of respiratory challenges for adult and pediatric patients.

This machine helps to simplify ventilation with a system that features automatic leak compensation and automatic termination criteria. The ventilator can synchronize ventilation to a patient’s breathing requirements, even in the presence of erratic breathing patterns and mask leaks. A trigger function minimizes the patient’s work of breathing, while an automatic ramp adjustment optimizes the patient’s the inflation pattern to his or her changing comfort levels during care.

Additionally, this ventilator features PC-BIPAP/SIMV, allowing the patient to breathe spontaneously. This helps RTs better tailor ventilation for each patient and increase patient comfort.

Because this ventilator can operate independent of a high-pressure gas system, it is also well-suited for emergency rooms and general hospital wards. It has an integrated oxygen blender for the use of 21-percent to 100-percent oxygen concentrations. In situations where compressed oxygen is not available, the ventilator’s low-pressure oxygen inlet allows it to be connected to an oxygen concentrator or liquid oxygen cylinder.

An added benefit to this sub-acute care ventilator is that it is available in a home edition. For patients leaving sub-acute care and moving to long-term patient care at home, the home version runs quietly and has a small footprint. It also features an extended battery life that gives the patient appropriate ventilation even during power outages. Finally, its similar design gives patients a seamless transition from hospital to home care.

Another new hospital and sub-acute care ventilator can transition from invasive to noninvasive ventilation for adult, pediatric and infant patients. Using dual control adaptive breath management, the ventilator combines volume target pressure control and volume target pressure support. With this



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mode, the ventilator automatically applies the lowest pressure possible within the set pressure limit in order to reach the patient's target tidal volume. Adjustable slope/rise and expiratory threshold controls give RTs the tools to decrease a patient's work of breathing and improve synchrony while expediting the weaning process.

This ventilator also comes with a calculated and trended Rapid Shallow Breathing Index and a measured, imposed work of breathing value to help guide weaning decisions.

Noninvasive ventilation

Another innovation in sub-acute care lies in the realm of noninvasive ventilation. The latest trends in noninvasive ventilation surround bi-level therapy. These simple and versatile systems have been designed to be accurate, reliable and easily upgraded. One ventilator offers a low-cost alternate form of sub-acute therapy for patients and may eliminate the need for intubation in appropriate candidates. The integrated display screen uses real-time graphics in waveforms or bar scale format to provide enhanced monitoring for caregivers. It also ensures optimal sensitivity despite changing breathing patterns or circuit leaks.

CPAP and S/T modes are available for sub-acute care patients that need to maintain airway patency and pressure support ventilation. Additional proportional assist ventilation/timed mode help promote improved patient comfort and enhanced patient-ventilator synchrony. This is due to the independent adjustment of volume and flow assist based on a patient's disease state.

Another noninvasive ventilator has been developed specifically for hospitals to provide ventilatory assistance to stable, lower acuity patients with respiratory insufficiency or failure. The machine ensures optimal triggering and cycle sensitivity during changing breathing patterns and leaks. It also eliminates the need for a perfect seal of the patient interface and constant adjustment while increasing patient-ventilator synchrony.

This bi-level ventilator's integrated back-up battery system maintains patient ventilation in the event of an interruption in power. This safety feature also provides a convenient method for intra-hospital patient transport from one care area to another with uninterrupted ventilator care.

Other innovations

At minimum, the most advanced ventilators on the market operate with proportional solenoid (PSOL) valves. These valves help improve synchrony by taking active control of exhalation, which ensures precision and flexible breath delivery.

Online ventilator systems are also becoming popular as hospitals find the need to centralize patient data. One ventilator on the market contains a web server that can display the ventilator's settings, monitoring, and alarms on computers, hospital networks or the Internet using Windows® software.

Another common problem for ventilator patients also has been addressed by a ventilator manufacturer: speaking. By integrating a speaking mode, this positive pressure ventilator enables speech without the addition of an external one-way speaking valve. An RT only needs to deflate the patient's trach tube cuff and activate the software. The ventilator controls the exhalation valve and forces exhaled gas to the vocal chords to allow speech. The ventilator also responds to occlusions to return to the patient's normal settings.

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