ICU
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Transport Equipment

The average intensive care unit (ICU) room is approximately 400 square feet. This space often seems quite small when filled with monitoring devices, beds, ventilators, and pumps necessary for proper patient care. In the transport environment, space is often a fraction of that of a hospital. Ambulances of all types must be configured to transport patients that require all of the devices that are being used in the ICU, but in a much smaller space. The limited space requires transport agencies to seek equipment that is compact, lightweight, and capable of performing the required functions that are necessary based on mission type and patient acuity.

Equipment used on board transport vehicles whether air, sea, or land, must be both durable and functional. The rigors of the transport environment necessitate that the equipment be reinforced to withstand drops, vibration, and other stressors that are not typically seen in the in hospital environment. Battery life, ease of use, and other factors also play a large role in equipment choice.

Many items are used in the transport environment. In this article we will focus specifically on ventilators and patient monitoring devices, as these are often two of the most costly purchases that must be made when outfitting a transport vehicle with medical equipment.

In recent years, the available choices of both ventilators and monitors have increased drastically. Gone are the days of one manufacturer who dominates the market. Decision makers must spend countless hours doing due diligence to ensure that purchases will allow the transport crew to be well prepared for years to come. A hasty purchase today may result in the acquisition of an outdated or obsolete system. It is common knowledge that technology changes from day to day. Today's cutting edge product can be tomorrow's antiquated dinosaur.

The transport ventilator has made great progress since its inception. Gone are the days of having a machine that just uses pressure to push air into the lungs at an oxygen concentration of 21 percent or 100 percent. Today, many ventilators allow for precise delivery of a prescribed oxygen concentration. This is of particular interest to transport providers that transport patients that have been "weaned" from 100% oxygen down to the lowest percentage of oxygen possible while maintaining haemodynamic stability. Having a ventilator that will exactly mimic the hospital's settings can mean a great deal to the patients wellbeing. In fact, placing a patient on a higher concentration of oxygen than required simply because of ventilator limitations, can result in the patient having a longer hospital stay due to the "loss of ground" that potentially occurs when oxygen settings are manipulated unnecessarily.

Oxygen concentration is not the only differentiator when evaluating possible options. Weight, oxygen consumption and battery life are also three important factors. In particular these can become a huge issue when transport distances are long or the transport vehicle has limited space. Additionally of great importance are the operating modes of the ventilator. Is the ventilator powered by gas, electricity, or both? Can it deliver positive end expiratory pressure (PEEP) and pressure support? Is it capable of delivering continuous positive airway pressure (CPAP)? Ventilators that can also do non-invasive ventilation may actually save a transport provider from buying a CPAP unit and a ventilator. Choosing an "all in one" ventilator will cover both uses with one purchase.

There are numerous ventilators to choose from in the current ECRI product comparison chart, ranging widely in price depending on the features that are included. Some are very advanced, offering many modes to choose, while others are more basic. Some of the ventilators are uniquely suited for the transport environment, touting long battery life, low oxygen consumption, and ease of use as selling points.

As previously mentioned, ventilators and monitors are two of the most costly pieces of equipment to consider when outfitting any type of transport vehicle. Monitors are unique, due in large part to their wide variance in capabilities. As with any purchase, the mission profile of the agency must be evaluated prior to purchasing a monitor. Many monitors can be configured in an "a la carte" manner. This means that the external portion of the monitor may look the same, but the internal part of the machine may not be fully capable of performing all of the monitoring capabilities seen in a "fully loaded" or maximally configured device.

Some transport agencies have a mission profile that requires basic monitoring. Electrocardiogram (ECG) and non-invasive blood pressure monitoring (NIBP) are two pieces of data required by most agencies. This allows for monitoring of patient status by most any member of the transport team, from first responder to physician.

Specialty care transport agencies may require a monitoring device that is far more advanced. In addition to pulse oximetry, ECG and NIBP monitoring, the ability to monitor invasive pressures such as central venous pressure (CVP), intra-cranial pressure (ICP), intra- arterial pressure

(IA), and even pulmonary artery pressures (PA) may be necessary. In addition to these pressure readings, temperature, and the ability to acquire and transmit a 12 lead electrocardiogram may be options that are required for patient care.

Manufacturers of both ventilators and monitors are constantly researching and evaluating ways to improve their ability to assist in the care of patients. As we look at devices, it is imperative that we not only look at what we need in a device today, but that we also look at our needs in the future. With due diligence in the evaluation and research stages, we can ensure that we make a well informed decision resulting in our patients receiving the best possible care regardless of the environment.

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