How to perform patient simulations?

Patient simulation is implemented by following performance verification procedures from medical device manufacturer service manuals. Ideally, a multi-parameter patient simulator is used to test a device in one test sequence, which provides a practical approach to the biomedical technicians. Each parameter has a different method for performance testing.

NIBP measurement principles primarily rely on the oscillometric method. It determines systolic, diastolic and mean arterial values by detecting the vibrations in the arterial wall at various pressure points by means of an inflated cuff. Testing the monitor accuracy involves both static and dynamic pressure simulations at specific values. System leak and over pressure tests are also part of the procedure, executed through the use of a manometer and a built-in pump, to ensure patient safety.

IBP is an invasive form of blood pressure measurement and uses a liquid filled catheter, which is placed in an artery. The arterial pressure is converted by a pressure transducer into an electrical signal. This is typically 5µV/mmHg. Testing the monitor for its linear sensitivity is essential in determining its accuracy. Patient simulation is performed by outputting defined DCV values.

SpO2 estimates the amount of oxygen in the blood by analysing the absorption of light by haemoglobin across two different wavelength LEDs (RED/IR). If more red than infrared light is being absorbed there are less oxygenated blood cells. SpO2 simulation is often implemented using optical simulation “fingers”. These devices provide variable attenuation to

light in the red and IR wavelengths.

ECG measures tiny electrical signals from the heart using ECG leads placed on various parts of the body. These signals are amplified, measured and displayed on a patient monitor. ECG simulations are electrically generated cardiac arrhythmias or performance waveforms with pre-set amplitudes and frequencies.

Respiration utilizes the ECG leads to measure transthoracic impedance. As the thoracic cavity expands during inspiration, the impedance of the chest increases. During expiration the impedance of the chest decreases. Simulating respiration involves set baseline impedances with delta impedances providing respiration rates.

Temperature measurements in patient monitors are primarily carried out using NTC thermistors. This means that when temperature increases the resistance of the thermistor decreases. Temperature simulation is provided through a set number of resistances depending on the type of sensor (YSI400/YSI700).

If you require more help, please contact us at https://www.seaward.com/gb/enquiry/.