

Non-Invasive Blood Pressure Monitoring of Morbidly Obese Patients

Technicuff's blood pressure cuff was designed as a **transducer**. Its monitoring function is to accurately convert expansion and contractions at the surface of the arm resulting from brachial artery, capillary and venous return diameter change, to a proportional dynamic pressure change within the cuff bladder assembly. The resulting signal within the bladder assembly is an oscillometric waveform.

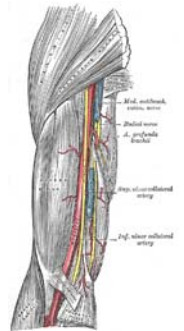
The oscillometric waveform is a low frequency acoustical signal, similar in period, shape and frequency to direct arterial waveforms. The cuff bladder assembly must be damped to eliminate distortions related to under or overshoot of waveform amplitude. In addition, acoustical impedances of the cuff-bladder assembly must be matched to the hose assembly for maximum signal transfer from the blood pressure cuff to the monitoring system. The transduced oscillometric signal must pass from the bladder assembly through the hose connecting to the monitor with minimum losses to maintain consistency of blood pressure determination. **Each change of impedance and flows along the transmission path attenuates the amplitude and fidelity of the signal arriving at the monitor.**

Early in Technicuff's development cycle, it was determined that the **attenuation of oscillometric waveforms was significantly greater with single tube cuffs than with dual tube designs**. Testing and analysis indicated the energy of the sensor source (bladder) could be efficiently improved if the hose to bladder used an exponential seal. The use of dual tubes allowed a closer impedance match between the bladder assembly and the monitor hose resulting in greater oscillometric signal reaching the monitor. Imbalances common to conventional blood pressure cuff designs result in standing waves, degradation of oscillometric fidelity, lower signal to noise ratios and significant attenuation of available signal to the monitoring system.

Armed with this knowledge, Technicuff took the position of manufacturing dual hose cuffs. Using our knowledge of acoustics, we developed an acoustical coupling, allowing single tube non-invasive blood pressure machines to experience the benefit of Technicuff.

Technicuff's design criteria **provides the monitoring system with a high-fidelity, low noise, high amplitude signal, with minimum distortion.**

Technicuff is unique in transducing the oscillometric signal 360° around the patient's arm. The uniform cuff pressure improves patient compliance by reducing pinching, bruising and cutting of patient's arms. Technicuff's design provides an absolute fixed outside diameter which does not change with cuff pressure or oscillometric signal resulting in efficient conversion of arm diameter changes to cuff bladder pressure changes. The unique design of the closure system **maintains a constant bladder width throughout the cuffs range**. Compression of the limb 360° eliminates errors associated with improper indexing while providing high oscillometric signal quality.



Now that you know some of the basic design criteria, I would like to address using Technicuff Blood Pressure Cuff Transducers on morbidly obese bariatric patients.

Attempting to take non-invasive pressures on a morbidly obese bariatric patient is extremely difficult under the best of circumstances. The preponderance of tissue between the major systems and the surface of the arm significantly lowers detectable arm expansion.

If absolute accuracy is required for monitoring of morbidly obese bariatric patients, invasive blood pressure determination is the only reliable answer.

Technicuff Blood Pressure Cuff Transducers were specifically designed with the realization that monitoring of bariatric and morbidly obese bariatric patients was a reality and that conventional blood pressure cuff technology had not kept pace with the need to monitor these patients. The conventional wisdom has been to use a blood pressure cuff designed for use on a thigh wrapped

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around a patient's upper arm. **Using a conventional thigh range of cuff on a patient's upper arm will yield blood pressure determinations that are inconsistent**, if any pressure determination can be made.

When invasive pressures are not indicated by qualified medical staff, non-invasive determination of systemic blood pressure can be reasonably achieved by using the UT-3962 (39 to 62 cm) if the patient is a tall adult that has a long upper arm length such that **the blood pressure cuff does not extend to the elbow**.

Unfortunately, the majority of morbidly obese patients' arm length will be too short to use the UT-3962 blood pressure cuff. Technicuff's unique 360° bladder system was designed to allow cascading of two (2) UA-1745 universal adult blood pressure cuffs extending the circumference range from 45 to 90. This allows Technicuff Adult blood pressure cuff transducers to work with morbidly obese patients with upper arm lengths too short for utilization of the UT-3962 cuff. Brachial artery indexing in the cascaded configuration is automatic, consistent with utilization of all Technicuff blood pressure cuff transducers. **Cascading requires the utilization of Technicuff's TEC-CAS-A adapter to allow inflation of both cascaded cuff bladders with in phase transmission of oscillometric waveforms from each cuff to the monitoring system.**



The cascaded system is connected such that the morbidly obese bariatric patient's arm is uniformly compressed 360 degrees and oscillometric waveforms are sensed 360 degrees around the arm. This technique continues Technicuff's design to reduce injury to the patient's arm from pinching, bruising and cutting. **The resulting pressure determination, although not being absolute, is a good indicator of how systemic values are changing and can be trended to aid in diagnosis and treatment of morbidly obese bariatric patients.**

Use of Technicuff's UA-1745 Blood Pressure Cuff Transducers in a cascaded configuration allows monitoring of morbidly obese bariatric patients that previously was unobtainable or unreliable, at best.

Always keep in perspective that non-invasive monitoring of morbidly obese bariatric patients is very difficult and that if **accuracy is critical for diagnosing and treating your morbidly obese bariatric patients, invasive blood pressure determination is the only reliable answer.**

Caution: Cascading of conventional blood pressure cuffs can and will result in enormous errors in blood pressure determination and consistency of data. Conventional blood pressure cuffs are not designed to be cascaded. They may physically injure patients through pinching, cutting and bruising if cascading is attempted.