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FOR WHAT'S VITAL

Common Blood Pressure Measurement Techniques

COMMON BP MEASUREMENT TECHNIQUES

Blood pressure can be measured in a variety of ways. Common measurement techniques include auscultatory and oscillometric methods.

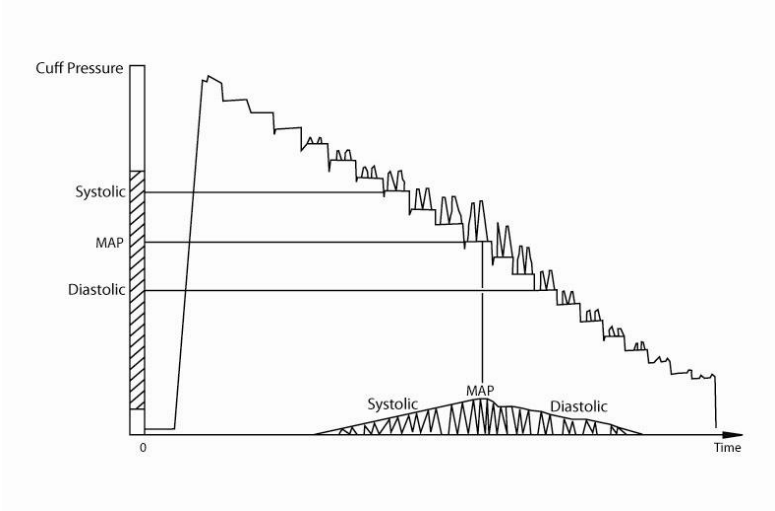
The ascultatory method works by sound. The detection and interpretation of the sounds can be accomplished by human examiners or by automated blood pressure devices.[2] The manual, or traditional auscultatory method is a technique in which a blood pressure cuff is used to occlude blood flow to the limb until flow is completely blocked. As air pressure in the cuff is released, systolic blood pressure can be determined, using a stethoscope, by the detection of first audible (Korotkoff) arterial wall sounds. Diastolic pressure is detected when audible sounds fade and disappear as air pressure in the cuff drops below the diastolic blood pressure and blood flow returns to normal.[1] The examiner records the values seen on a mercury column or gauge associated with the appearance and disappearance of Korotkoff sounds.[1] For the automated reading, manufacturers typically place a microphone in a little pocket at the edge of the cuff. Automated devices process the microphone signal using analog, digital or hybrid methods.[2]

However, most automatic machines today do not use the auscultatory principle, but rather the oscillometric method, as do most automatic clinical instruments outside of special application areas like stress testing.[2]

Oscillometric instruments have neither a stethoscope nor a microphone and don't need the quiet environment necessary to detect the auscultatory sounds. They work on the principle that when the artery opens during a portion of the pressure cycle, an oscillation is superimposed on the pressure inside the cuff due to a tiny enlargement of the circumference of the limb caused by the surge of blood under the cuff.[2]

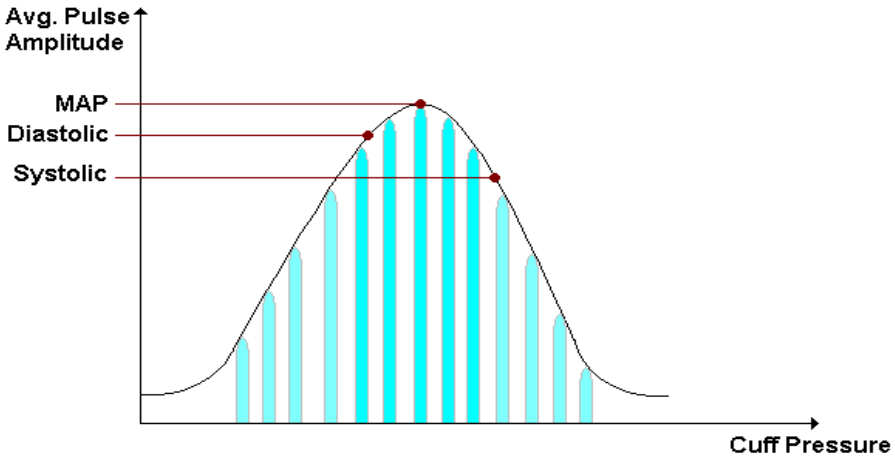
The amplitude of the oscillometric signals change over the course of the deflation of the cuff. Oscillometric devices look for oscillation amplitude of certain percentages of the maximum amplitude at mean arterial pressure (MAP), defining one percentage as the systolic point and another as the diastolic point. Alternatively, a combination of the amplitude, slope of the increase or decrease, and some other complex factors are used to find these points. Further, several methods may be used and the results selected from the method that best meets the integrity checks established by the manufacturer.[2]

The CASMED MAXNIBP® device utilizes an oscillometric step deflation method. Unlike continuous deflation or linear bleed methods, step deflation qualifies each stage of the pressure envelope for accuracy. In the stepped deflation method, as the pressure in the cuff is released, pulsatile changes in the arterial walls are detected at decreasing cuff pressures and an oscillometric envelope is formed (see figure below).



The inflation pressure is held at each stepped decrease in pressure while the monitor matches the pulses to qualify the pulse amplitude. After the pulse amplitude is determined at the current pressure step, the monitor releases additional pressure and steps down to the next level, repeating the process of qualifying the pulse amplitude and timing. Non-matching pulses are rejected. When pulse amplitude data has been captured over a range of cuff pressures sufficient for the measurement of a subject's blood pressure, the cuff is fully deflated.

MAP is determined by measuring the point at which the matching pulse amplitude is largest. Systolic and diastolic are calculated based upon MAP and specific points on the pulse amplitude envelope.



1. *Auscultatory Method - Methods of Blood Pressure Measurement.* SevereHypertension.net [Online] [Cited February 19, 2010] http://www.severehypertension.net/hbp/more/auscultatory-method/

2. *Guest Commentary: How blood-pressure devices work.* EDN.com [Online] [Cited: February 19, 2010] http://www.edn.com/article/CA511468.html