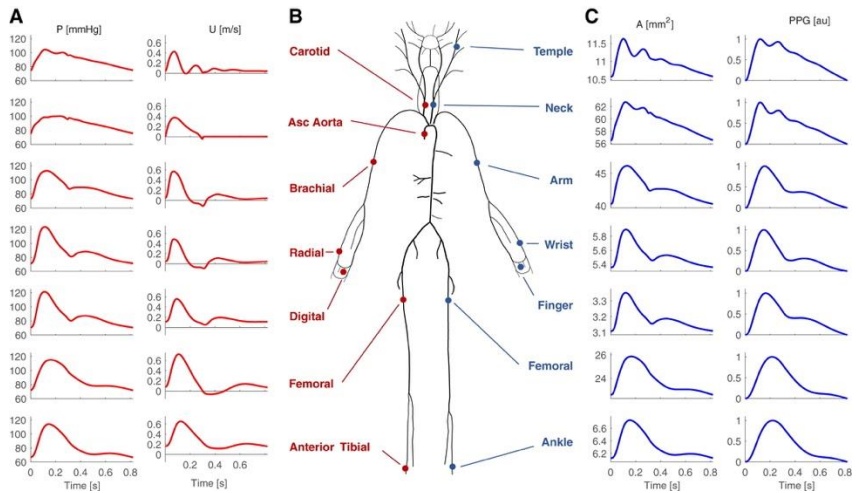


PULSE WAVE

<p>What is it?</p>	<p>The arterial pulse wave is the name given to the change in blood pressure and velocity in the arteries which is caused by the heart beating [Alastruey 2012]. The left ventricle ejects blood into the aorta each heartbeat. This causes blood pressure and velocity to temporarily increase before decreasing back to (approximately) their original levels. These changes propagate as pulse waves from the aorta through the arterial network to the periphery.</p>
<p>Why do we measure it?</p>	<p>One of the most important signs in human life is the pulse. Valuable physiological information can be obtained from manual pulse measurements, including: whether or not the heart is beating; the heart rate; and, the presence of arrhythmia. Additional information can be obtained by using devices to measure and analyse the pulse wave, including: blood pressure, blood flow velocity, and several indices of vascular ageing (see also Augmentation Index, Reflection Index, and Pulse Pressure Amplification).</p>
<p>How can it be measured</p>	<p>The pulse wave can be measured in several different ways. Firstly, it can be measured manually, by palpating an artery. Secondly, the pressure pulse wave can be measured using a blood pressure device, such as: an oscillometric device (which uses an inflatable cuff to measure the pulse wave but usually only outputs systolic, diastolic, and mean pressures); an applanation tonometry device; an invasive blood pressure transducer; and, a volume-clamp finger cuff. Thirdly, the blood velocity pulse wave can be measured through doppler ultrasound. Fourthly, luminal diameter pulse waves can be measured via ultrasound and MRI. Finally, photoplethysmography (the optical sensing technique used in pulse oximeters and smartwatches) can be used to measure the pulse wave, although the exact physiological origins of this measurement remain unclear.</p>
<p>Where is it measured?</p>	<p>The pulse wave is most commonly measured in the limbs: brachial blood pressure cuffs (sited on the upper arm) are used for blood pressure measurement; wrist-worn smartwatches and fitness trackers are used for heart rate monitoring; finger pulse oximeters are used for oxygen saturation monitoring; and other measurement sites such as the upper leg, ankle, and toe are also used for blood pressure measurement in some scenarios (such as pulse wave velocity measurement, ankle-brachial index measurement, and toe blood pressure measurement).</p> <p>The pulse wave changes with propagation through the arterial tree, so the pulse wave differs with measurement site.</p>

Figure

Figure adapted from Wikimedia Commons:



(see [here](#) for high-resolution version)

Blood pressure (P), flow velocity (U), luminal area (A), and photoplethysmogram (PPG) pulse waves at common measurement sites around the body. These pulse waves were simulated for a young, healthy subject.

Charlton PH et al., 'Modeling arterial pulse waves in healthy aging: a database for in silico evaluation of hemodynamics and pulse wave indexes', American Journal of Physiology-Heart and Circulatory Physiology, 317(5), p.H1069. DOI: <https://doi.org/10.1152/ajpheart.00218.2019> . Reproduced under [CC BY 4.0](#)

References

Alastruey, 2012, [no DOI available]: Arterial pulse wave haemodynamics. In Proceedings of the BHR Group - 11th International Conferences on Pressure Surges; Lisbon, Portugal, 2012; pp. 401–443.

FEEDBACK AND SUGGESTIONS FOR THESE DEFINITIONS* CAN BE SUBMITTED AT

<https://vascagenet.eu/feedback-for-official-glossary-of-key-terms>

* These definitions have been downloaded from <https://vascagenet.eu/official-glossary> and were released on 1st April, 2023.