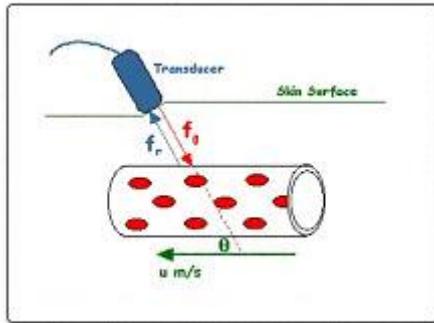


## How to buy Dopplers

The purpose of this guide is to provide background information which will allow you to make an informed choice when selecting your doppler. We also wish to eliminate some of the "jargon" relating to Doppler instruments.

### How dopplers work

During Doppler use, a handheld instrument (the probe: see below) is passed lightly overlying the skin above a blood vessel or over the tummy for foetal heart monitoring in pregnancy. A special ultrasound gel is used to improve transmission from the skin to the probe. The probe sends and receives sound waves which bounce off moving blood cells and are then processed through a microphone (see below) so that they are audible in the instrument's speaker or earphone. The movement of blood cells causes a change in pitch of the reflected sound waves (called the "Doppler effect"). If there is no blood flow there is no audible signal.



**Figure 1 and 2. Doppler transducer or probe overlying a blood vessel with moving blood cells. Signals are sent and received by this probe and amplified within the device which also displays the heart rate.**

Information from the reflected sound waves can also be processed by a computer to provide graphs that represent the flow of blood through the blood vessels. These graphs can be saved for future review or evaluation. Doppler can be combined with ordinary ultrasound (sonography) to assess whether blood is moving towards or away from the probe, and its relative velocity. This is called Doppler ultrasound or sonography.

Dopplers are used in many medical fields, including obstetrics and in vascular surgery where they are used as a cheaper non-invasive method of diagnosing and assessing the severity of peripheral vascular disease and assessing reflux in venous disease.

### Dopplers in foetal heart monitoring: Obstetric Doppler auscultation



**Figure 3 doppler probe being used to detect foetal heart in pregnancy**

A doppler probe can be used to detect the heart beat of a foetus. The Doppler listens to the small, high frequency sound waves that are being reflected off the foetal heart. Since high frequency sound waves do not travel readily through air a special gel is applied to the mother's stomach, allows the Foetal Doppler's probe to detect the sound waves. These signals are picked up by the Fetal Doppler, then processed and amplified so that they are audible in the instrument's speaker or earphone. Some models also display the heart rate in beats per minute. The heart rate of the baby varies between 120-160 BPM (beats per minute) after the 12th week of pregnancy.

Advantages of the Doppler foetal monitor over a foetal stethoscope is the audio output, which allows people other than the user to listen to the heartbeat. Originally intended for use by health care professionals, dopplers are becoming popular for personal use.

### The use of Dopplers in peripheral arterial disease (PAD)

The use of the ankle brachial pressure index (ABPI) forms the cornerstone of diagnosis of PAD. PAD is a condition that affects the circulation outside the heart. It affects up to 16% of the population above the age of 55 and results in many deaths from heart attack and stroke.

Although very common, PAD is highly under diagnosed since many patients do not exhibit the typical symptoms of a poor circulation such as pain on walking (intermittent claudication).



**Figure 4. Doppler probe used to insonate the posterior tibial artery**

Diagnosing patients with PAD allows them to be put on the correct treatment that would reduce deaths from heart attacks etc.

Measuring ABPI involves measuring the blood pressure at the ankle which is compared to the arm using a sphygmomanometer cuff and a Doppler probe whilst the patient is lying down (using an 8 MHz probe). Please refer to our [Doppler resource page](#) for how to measure ABPI.

The ABPI is simply the ratio of the ankle pressure divided by the arm blood pressure. A ratio of  $< 0.9$  is diagnostic of PAD whilst a ratio of less than 0.5 indicates severe PAD. Those who might use Dopplers include vascular technologists, vascular surgeons, vascular lab managers, nurses as well as other allied medical ultrasound professionals. Remember it is not only the absolute ABPI that matters, the waveform is also important. A damped or monophasic waveform indicates severe PVD although the ABPI may be artificially high as in diabetics.

In addition to diagnosing PAD, Dopplers are commonly used by vascular surgeons to assess reflux in venous disease, particularly varicose veins.

#### **Model Designs**

Dopplers are available in different formats including the popular Hand Held and Table Top varieties; alternatively, they can be incorporated into a comprehensive vascular system.

#### **Hand Held Dopplers**



**Figure 5. An obstetric probe, notice the wider flatter probe design**

The simplest and most portable is the Hand Held Doppler which is ideal for the professional on the move such as community nurses, tissue viability nurses, practice nurses and GPs. They are also the most popular model for the outpatient and ward setting due to portability and ease of use.

These models are battery powered using single use or rechargeable batteries. You may wish to consider a model with digital display showing direction of blood flow, pulse rate and battery status. There are a variety of probes available.

For vascular surgery, a 8 MHz probe is ideal for general use whilst a 5 MHz probe is suitable for deeper vessels. In obstetrics the 2 and 3 MHz probes are most popular.

#### **Table Top Dopplers**

Table Top Doppler systems are sturdier, have better audio capabilities than Hand Held Dopplers and have additional features such as PC docking which allow increased functionality. They sit on a table or can be transported on an optional stand.



**Figure 6: Table top doppler**

### ABI/Vascular systems

These are comprehensive non invasive vascular systems which incorporate bi directional Doppler, PVR (pulse volume recording) waveform recording modality and arterial PPG (Photoplethysmography).

These combined modalities make the ABI and other arterial exams faster and easier to conduct, interpret and document, as they have an optional PC software package for integration with EMR systems.

Additional features include automated cuff inflation/deflation, built-in printer, and graphic waveform display with step-by-step ABI instructions.

#### Probe choice

It is vital to use the correct probe for the task.

Probes come in different shapes and sizes depending on the application. For superficial vessels, a pencil type probe is ideal for accurate localisation of blood vessels beneath the skin. For obstetric applications a broader probe is utilized. Some probes are designed to be inserted into body cavities such as trans-vaginal probes (inserted through the vagina). These are useful in obese women in whom it is difficult to localise the baby's heart through the tummy. Another consideration is whether to choose a waterproof probes, this is especially useful for obstetric probes.

In vascular applications an important consideration is whether to choose a mono directional or bi-directional system. In most situations where the Doppler will be used to measure ABPI (see above), mono directional systems are more than sufficient. However bi-directional systems are useful in situations where direction flow is important for example to detect reflux in venous disease.

**Probe frequency.** The 2 and 3 MHz probes are ideal for obstetric use although in some situations a transvaginal 5 Mhz probe is useful. In vascular surgery the 5 and 8 Mhz probes are ideal. Here is a list of probes and their application in more detail.

Probe	Task
2MHz	Optimized for deep penetration and third trimester pregnancy.
3MHz	<b>*The best general purpose obstetrical probe.*</b> Optimized for early foetal heart detection and designed for use during the entire pregnancy
5MHz trans vaginal Probe	Optimized for earlier foetal heart detection and ideal for retroverted and obese patients. It is used when transvaginal imaging is too costly or inconvenient.
4MHz	Designed to ease location of blood vessels. The broad, wide-angle beam has internally tilted crystals that are optimized for quickly locating vessels.
5 Mhz probe	Designed to ease location of deeper vessels. The medium width beam and pencil-style shape provides optimum sensitivity and ease of use.
8MHz Probe	<b>*The best general purpose vascular probe.*</b> Designed to ease location of surface vessels. The narrow beam and pencil-style shape provides optimum sensitivity and ease of use.

## **Conclusion**

When purchasing a suitable Doppler system, you need a high quality, high performance system that offers value for money. We supply superior diagnostic products from Summit Doppler - a leading brand Doppler systems manufacturer, offering you the most advanced obstetrical and vascular Doppler systems available today. Most important is the high level of backup service which comes with these products.

These are just a few of the facts and product features of Doppler systems. We retail a full range, plus accessories, online. Please go to [SJT Doppler pages](#) for full details of our product range and to purchase products. Alternatively, if you would like to speak to someone about our Doppler systems, please [contact us](#) directly on Tel : 0844 272 1918.