Ambulatory Blood Pressure No: 002D

1. Introduction

Blood pressure (BP) measurement provides an assessment of the overall cardiovascular status of an individual. Ambulatory blood pressure (ABP) monitoring offers a measure of BP over prolonged periods, incorporating many physical and psychological circumstances experienced away from the medical environment. It provides three different types of detail, all of which have prognostic value. These include: blood pressure level, amplitude of diurnal variation and short-term BP variability.

The subject may experience some tightening of their arm and subsequent arm discomfort as a result of this procedure.

2. Responsibilities

Research nurses trained in the method are responsible for teaching subjects how the ABP monitor operates and how their data can be collected efficiently.

3. Equipment

- Ambulatory blood pressure monitor (Spacelab model 90207)
- ABP cuffs (regular and large)
- ABP carrier pouch
- Belt/shoulder strap (optional)
- 4AA rechargeable batteries (2 sets)
- Battery charger
- Subject activity diary
- Tape measure

4. Method

The ABP monitor should be initialised using the computer software program, see initialisation/downloading SOP.

On initialisation, the ABP monitor will be pre-programmed with time intervals for blood pressure (BP) measurements. The time intervals will be the same for each subject and should **not be** altered.

4.1 Preparation of subject

- Explain to the subject the importance of the readings and the need for their compliance in wearing the ABP cuff and monitor. It is important to explain to the subject that during the readings they may feel some discomfort in their arm. It is also vital that they complete the 24 hour activity diary.

- Settle the subject in a chair and provide them with enough information to enable them to relax (as much as possible). Answer any questions or queries they may have regarding the procedure.

- Ask the subject which is their dominant arm and then, due to the inconvenience of the cuff, use the non-dominant arm. Measure the arm circumference (upper arm, widest section) using the tape measure and choose the correct cuff size. The appropriate cuff size to arm circumference is illustrated in figure 1.

  Figure 1:

Cuff	Arm Circumference	Bladder Size
Regular	24-32cm	11 x 22cm
Large	32-42cm	14 x 31cm
X-Large	38-50cm	15x 32cm

Gross error in blood pressure recording will arise as a result of poor measurement and inappropriate cuffs (bladders) being used.

The American Heart Association recommends that the width of the bladder should be 40% of the circumference of the midpoint of the arm and that the length should be 80% of the arm circumference. It is therefore vital that accurate measurement is taken to prevent error in recordings (1)**.**

- A material casing surrounds the bladder, this should be secured around the non-dominant arm by the velcro fastenings. The cuff (depending on subject size) should then encircle the arm; for some subjects this may be several times. Position the centre of the bladder over the brachial artery, with the rubber inflation tube running down the inner elbow and in line with the middle finger. The cuff displays an arrow and the wording "**ART**" to aid this process.

- Position the lower edge of the cuff so it sits 2-3cm above the pulse point of the brachial artery. The rest of the cuff should occupy the remaining 80% of the upper arm. It should sit comfortably on the arm; not so tight that it impairs blood circulation or so loose that it twists around or drops out of alignment.

- Be sure to instruct the subject how to apply and align the cuff. This will enable the subject to reposition the cuff at home if it becomes misaligned.

- Instruct the subject to wear the cuff for the entire 24 hour period, if possible. However, some subjects may wish to shower/bathe and so should be instructed, by the nurse, on how to remove the monitor briefly. This involves removing and reapplying the cuff, as well as pausing the recording period for the duration of their personal hygiene requirements. Removing the cuff should be actively discouraged in order that a more realistic blood pressure profile can be gained.

4.2 Preparation of equipment

- Ensure the monitor has been initialised using the computer ABP software program (see initialisation/downloading SOP 003 for more detail).

- Ensure the monitor has 4AA previously charged batteries installed for each new subject.

As rechargeable batteries have a pre-determined lifespan, each time they are recharged, the event should be recorded in the battery record book. Always carry a spare set of batteries in case of failure.

- Activate the monitor by sliding the **ON**/**OFF** switch located on the base of the monitor. After activation the correct time will be displayed in the small viewfinder, this is located opposite the **ON**/**OFF** switch.

- Attach the rubber tubing from the cuff onto the luer lock attachment on the monitor. Place the remaining tubing comfortably around the back of the subject's neck.

- Place the monitor in the small outer casing pouch. Attach the pouch to the subject's belt or use the shoulder strap (whichever preferred by the subject) to ensure the monitor is securely attached to the subject. The opposite side of the body to the cuff has been suggested to be the most comfortable place for it to sit. It can also be discretely hidden under personal clothing. The weight of the monitor is approximately 14oz.

- After installing both the cuff and monitor, the recordings can commence. Press the blue **ON**/**OFF** button next to the time display. This activates the monitor to give the first reading and will commence the start of the 24 hour recording. This time is noted in the subject diary as the **START** time. 24 hours later, at this time, it will be the **FINISH** time. The first reading will be displayed for a few seconds in the viewfinder instead of the time. This enables both the subject and installer to be aware that the monitor has been applied correctly.

- Instruct the subject that during monitoring the cuff arm should remain still. Unnecessary movement will impair readings. Instruct the subject that measurements will be taken according to the pre-programmed time intervals. Explain the noises of the monitor to the subject, so they are not alarmed by them during each recording.

- Instruct the subject to record their daily activities in the subject diary. These should include times when they went to bed, took medication, watched television and travelled to work (for examples). The analysis of the readings can then be compared to the activities.

- If the monitor is unable to take a reading due to excess movement or bathing it will repeat the process 60 seconds later. All data is stored in the monitor memory and cannot be accessed by the subject. Subjects wishing to know their blood pressure results, will be provided with a blood pressure profile by the nurse. A full report with interpretation will be provided to each participating GP for information.

- After 24 hours, instruct the subject to switch off the monitor using the blue **ON**/**OFF** button. The time must be **EXACTLY** the same time as the **START** time 24 hours previously. · Instruct the subject to remove the cuff and monitor and return it as soon as possible to their research centre. Their activity diary should also be submitted with the returned monitor. This completes the subject's part in the procedure.

- Connect the monitor to the computer ABP program and download the recordings. Guidelines for this procedure can be followed by reading the ABP initialisation/downloading SOP 003.

5. Additional Information

- During monitoring, if the subject suffers undue discomfort, instruct them to deflate the cuff by pressing the blue **ON**/**OFF** button. However, instruct the subject that this should only be done in extreme discomfort. Advise the subject to first check the cuff has not slipped or become misaligned - giving rise to the discomfort.

- For the most reliable results, instruct the subject to keep their arm as still as possible during the monitor recordings.

- Like most battery operated machines it is crucial not to get the monitor wet, as this may damage both the ABP readings taken and the monitor.

- Poor readings are usually a result of incorrect cuff size, malpositioning of cuff or unnecessary movement. The likelihood of these should be minimised.

- Ensure the subject is given a contact number in case of any concerns or problems with the monitor (or its return).

6. Reference Documents

1. O`Brien E.T et al (1995) ABC of Hypertension, BMJ Publishing group, London, 1-34.
2. Pickering T.G et al (1994) Ambulatory blood pressure and prognosis, Journal of Hypertension 12, (supp18): S29-S33.
3. Padfield P.L et al (1995) Ambulatory blood pressure monitoring: from research to clinical practice, Journal of Human Hypertension 9, 413-416.
4. Foster C et al (1993) Ambulatory blood pressure monitoring, Nursing times, January 6, Vol 89, No 1, 33-34.
5. O'Brien E et al (1995) State of the market, A review of ambulatory blood pressure monitoring devices, Hypertension, Vol 26, No 5, 835-842.