1. Phasic BP assessment

Phasic BP assessment consists of continuous measurement of BP. Continuous-finger-blood pressure measurement is performed with a finometer, a non-invasive beat-to-beat blood pressure device using digital photoplethysmography. This method for BP measurement is capable of assessing beat-to-beat blood pressure with reasonable accuracy and compares favourably with results from intra-arterial BP monitoring. The Finometer received an A/B grading according to the *British Hypertension Society* protocol and satisfied the validation criteria of the *Association for the Advancement of Medical Instrumentation*
(1,2). A brachial cuff is placed on the right upper arm and the finger cuff was placed on the second finger (see figure 1). The finger cuff detects expansive forces in the digital artery caused by systolic BP. It generates an equal and opposite contractile force such that no expansion of the digital artery occurs. By maintaining a constant volume the contractile force will reflect the expansive force. Diastolic BP is measured in a similar way. A brachial sphygmomanometer cuff is also attached and this measures BP using standardised automated methods. Comparison of finger cuff readings with the standard measurements generated from the occlusion of the brachial artery permits calibration of the finometer device. A second internal calibration system exists, known as *Physiocal* (3). *Physiocal* intermittently calibrates the finger arterial size at which finger cuff air pressure equals finger arterial blood pressure. The frequency of correction reflects the quality of the data, such that physiocal calibrations at intervals greater than 40 seconds infer the data is of good quality (4).

During the testing period subjects rest quietly, supine for ten minutes in a temperate, low noise environment. Beat-to-beat data records of DBP, SBP and MAP are collated (see figure

2, 3). The protocol replicated the TILDA (The Irish LongituDinal study of Ageing) protocol to facilitate direct comparison of datasets (5,6).

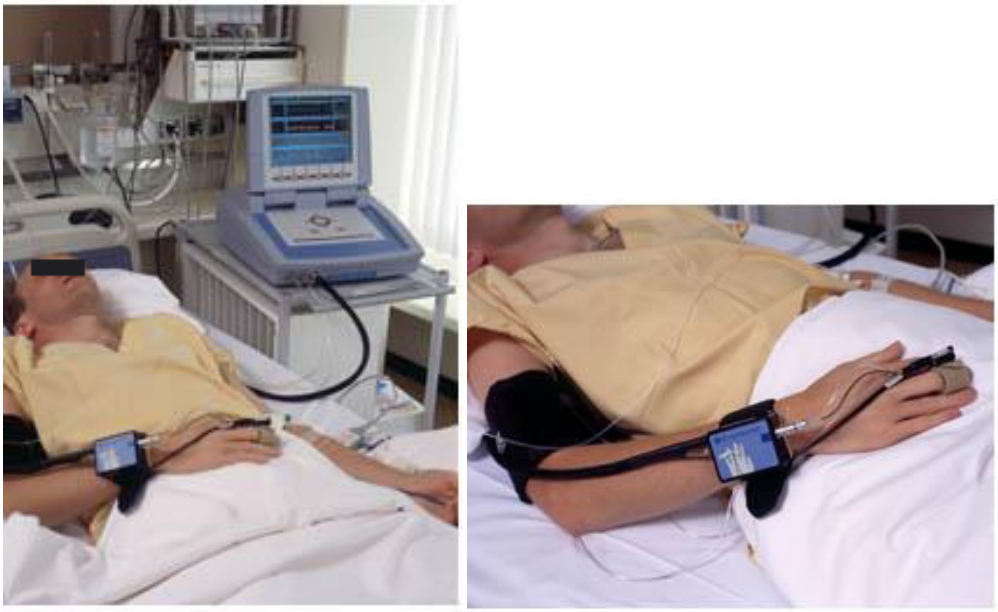

Figure 1: With permission from Scan Medical. An image of a patient in the supine position connected to the *Finopres* finometer device, which assesses phasic blood pressure (7).

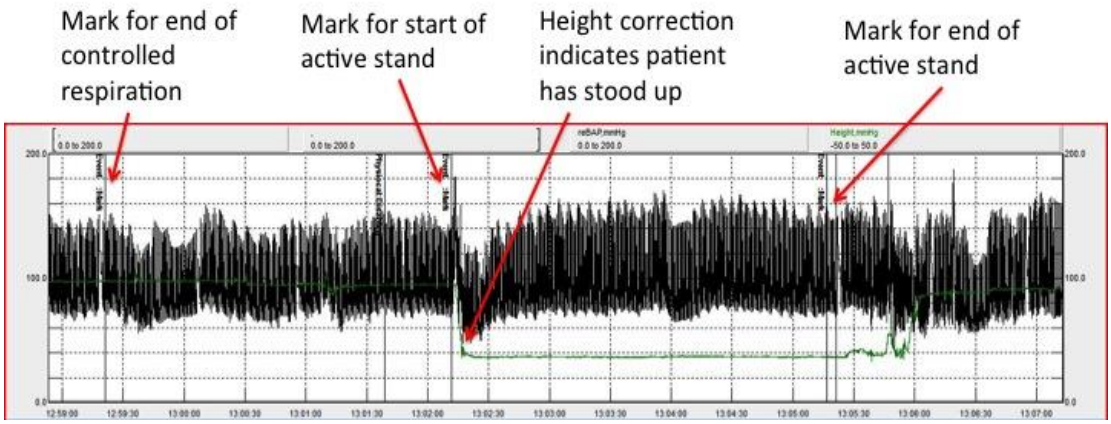

Figure 2: This diagram demonstrates the output parameters generated by the *Finopress Pro* during the active stand period. The y-axis represents blood pressure (mmHg). The x-axis represents time. The total time for this recording is approximately 8 minutes. The interpretation is as follows (i) A mark signifies the end of 5-minute controlled respiration (ii) The beginning of the active stand (iii) The height correction facility recognises and demonstrates that the patient has stood up at that point (iv) 180 seconds later the active stand is complete.

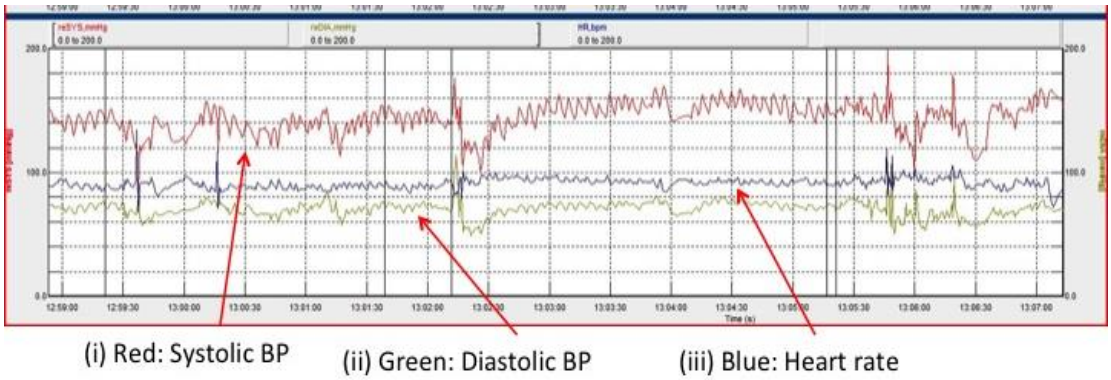

Figure 3: The output parameters generated by *Finopress pro* from the above recording (active stand period). Again the x-axis denotes time while the y-axis represents blood pressure in mmHg and heart rate in beats per minute. (i) Systolic BP is represented by the red line (ii) diastolic BP is represented by the olive green line and (iii) heart rate is represented by the blue line.

2. Analysis of phasic BP data from active stand

The active stand data first underwent (i) data quality screening (ii) 5-second averaging of BP and heart rate data (iii) data manipulation to extract values.

A) Screening:

The data was anonymised and screened manually by an expert in waveform analysis to identify artefact and poor quality recordings. The assessor was blind to the patient's infarct location.

B) Filtering:

The data was exported to Microsoft excel from Beatscope software 1.1a *(Finometer Pro; Philips Medical).* Data was exported in a filtered format, which averaged the recordings of BP and heart rate, placing them into 5-second bins. The five-second averages method was

chosen as it is the most validated method and a previous Finometer- based study demonstrated that this time average (as compared to beat-to-beat and 1, 10, 15) showed the best association between OH and history of falls (8). This process was used for estimation of baseline values and recovery values but not nadir BP. Nadir BP and time to nadir was extracted from Beatscope in an unfiltered format as it was felt unfiltered format would more accurately detect the actual nadir result. It was thought that 5-second averaging would render less accurate the nadir BP (9).

Data was exported from Beatscope 1.1a software to Microsoft Excel 2007 to derive the following values, then analysed in Stata 12 (10):

(1) Baseline BP and heart rate- The average value of BP and heart rate between 60 seconds and 30 seconds from standing (filtered data)

(2) T0, point of standing- First point of sustained change in the height correction measurement (unfiltered data).

(3) Nadir- The point of the lowest systolic BP recorded within the 3 minutes after standing and the diastolic BP and heart rate values at that point (unfiltered data).

(4) Delta systolic BP, Delta diastolic BP and delta heart rate- Change in BP and heart rate on standing for each 5 second time point from T0- The baseline BP and heart rate values minus the nadir BP and heart rate values (filtered data).

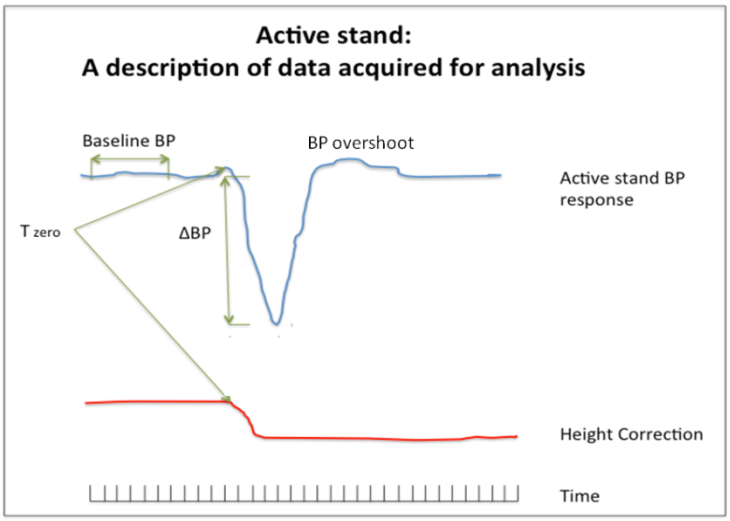

Figure Error! No text of specified style in document.**: A description of the data acquired for analysis in relation to the components of the blood pressure response to active stand**

References:

1. Fan CW, Savva GM, Finucane C, Cronin H, O'Regan C, Kenny RA. Factors affecting continuous beat-to-beat orthostatic blood pressure response in community-dwelling older adults. Blood pressure monitoring. 2012;17(4):160-3.

2. Schutte AE, Huisman HW, van Rooyen JM, Malan NT, Schutte R. Validation of the Finometer device for measurement of blood pressure in black women. Journal of human hypertension. 2004;18(2):79-84.

3. FMS. Physiocal. 2007. http://www.finapres.com/customers/physiocal.php.

4. Wieling W. Laboratory assessment of disturbances in cardiovascular control. In: Kenny RA, editor. Syncope in the older patient: causes, investigations and consequences of syncope and falls. London: Chapman & Hall Medical; 1996. p. 47-71.

5. Kearney PM, Cronin H, O'Regan C, Kamiya Y et al. Cohort Profile: The Irish Longitudinal Study on Ageing. International Journal of Epidemiology. 2011;40(4):877-84.

6. Finucane C, O'Connell MD, Fan CW, Savva GM et al. Age-related normative changes in phasic orthostatic blood pressure in a large population study: findings from The Irish Longitudinal Study on Ageing (TILDA). Circulation. 2014 Nov 11;130(20):1780-9.

7. http://www.smartmedical.co.uk.

8. van der Velde N, van den Meiracker AH, Stricker BH, van der Cammen TJ. Measuring orthostatic hypotension with the Finometer device: is a blood pressure drop of one heartbeat clinically relevant? Blood pressure monitoring. 2007;12(3):167-71.

9. Wieling W, Krediet CT, van Dijk N, Linzer M et al. Initial orthostatic hypotension: review of a forgotten condition. Clin Sci (Lond). 2007 Feb;112(3):157-65.

10. Romero-Ortuno R1, Cogan L, Foran T, Kenny RA, Fan CW. Continuous noninvasive orthostatic blood pressure measurements and their relationship with orthostatic intolerance, falls, and frailty in older people. J Am Geriatr Soc. 2011 Apr;59(4):655-65.