Q20 Physical examination measurements

1998-2000

The **measurements** from the physical examination carried out in 1998-2000 were recorded onto a **data collection form**/datasheet (Appendix 1) by a team of three trained research nurses who followed a **measurement procedures protocol** in carrying out the physical examination.

CONTENTS

i. A **list of the measurements** in the order in which these were carried are shown in table below.

The table contains:

a. A description of each measurement
b. The assigned BRHS database variable name
c. Value labels/units for each variable
d. a section reference to the physical examination measurements and procedures protocol which describes in detail how the measurements were made. (BRHS Q20 Physical examination protocol 1998-2000.pdf)
e. Indication whether data access is available for each data variable.

ii. The **measurement procedures** protocol **sections 3.0 – 5.2** (also found in the full physical examination protocol document, BRHS Q20 Physical examination protocol 1998-2000.pdf, describes in detail how each measurement was made.

iii. **Appendices**

1 The **data collection form**/datasheet (BRHS Q20 1998-2000 datasheet.pdf) used to record the data.
2 **The Main 20 year follow-up survey Questionnaire**

(i) LIST OF MEASUREMENTS

Q20 PHYSICAL EXAMINATION 1998-2000

List of measurements in the order these were carried out

(Physical measurements protocol in: BRHS Q20 Physical examination protocol 1998-2000.pdf)

Wording as it appears on the data collection form (data sheet) (BRHS Q20 1998-2000 datasheet.pdf)	Description	Value label/units	BRHS VARIABLE NAME	Measurement procedures section	Data access available
Serial	Participant study ID/identifier		SERIAL		yes
Batch	Participant study batch number		q20BATCHNO		
WORKSTATION 1					
Observer	Research nurse identifier/code		q20OBS		
Height (cm)	Height (cm)	cm	q20HEIGHT	3.2.1	yes
Reading inadequate	Height reading inadequate	1=? 2=inadequate due to posture 3=?	q20READINAD	3.2.1	yes
Ever weight more than present?	Have you ever weight more than present weight?	Yes=1, 2=No, 3=DK	q20WEIGHMOR	3.2.2	yes
Current Weight estimate - stones	Current Weight reported by participant - stones	stones	q20CURWEIGH	3.2.2	yes
Current Weight estimate - pounds	Current Weight reported by participant - lbs	pounds	q20CURWEIG0	3.2.2	yes
Actual weight (kg)	Actual weight - nurse measured (kg)	kilos	q20ACTWEIGH	3.2.2	yes
if yes, maximum weight ever - st/lb - stones - pounds	If ever weighed more than present, what was his maximum ever weight - stones and - pounds	 stones pounds	 q20MAXWEIGH q20MAXWEIG0	3.2.2	yes
weight changed in the last 3 years	Has your weight changed in the last 3 years?	1=No 2=Gained 3=Loss 4=Fluctuated	q20WTCHAN	3.2.2	yes
Was loss intentional	Was weight loss intentional?	1=Yes, 2=No	q20CHANINT	3.2.2	yes
Reason for change	Reason for weight change	1= personal choice 2=doctor advice 3=due to illness 4=change in smoking 5=other	q20REASCHAN	3.2.2	yes

WORKSTATION 1 /cont.					
Wording on Physical examination data collection form (BRHS Q20 1998-2000 datasheet.pdf)	**Description**	**Value label/units**	**BRHS VARIABLE NAME**	**Measurement procedures protocol**	**Data access possible**
Arm circ (R) cm	Arm circumference (Right arm)	cm	q20ARM	3.2.3	yes
Tricep skinfold (R) 1	Tricep skinfold (Right arm) mm reading 1	mm	q20TRICEPS1	3.24	yes
Subscapular skinfold (R) 1	Subscapular skinfold (Right arm) reading 1	mm	q20SUBSCAP1	3.24	yes
Tricep skinfold (R) 2	Tricep skinfold (Right arm) mm reading 2	mm	q20TRICEPS2	3.24	yes
Subscapular skinfold (R) 2	Subscapular skinfold (Right arm) reading 2	mm	q20SUBSCAP2	3.24	yes
Waist circumference 1	Waist circumference reading 1	cm	q20WAIST1	3.26	yes
Hip circumference 1	Hip circumference reading 1	cm	q20HIP1	3.27	yes
Waist circumference 2	Waist circumference reading 2	cm	q20WAIST2	3.26	yes
Hip circumference 2	Hip circumference reading 2	cm	q20HIP2	3.27	yes
Waist circ Inadequate	Waist circumference reading inadequate/problematic	1=reading inadequate	q20WAISTIN	3.26	yes
Hip circ Inadequate	Hip circumference reading inadequate/problematic	1=reading inadequate	q20HIPIN	3.27	yes
SBP1 - Sitting	SBP1 - Sitting - reading 1	mmHG	q20SBP1	3.1.4, 3.2.5	yes
DBP1 - Sitting	DBP1 - Sitting - reading 1	mmHG	q20DBP1	3.1.4, 3.2.5	yes
MAP1 - Sitting	MAP1 - Sitting - reading 1	mmHG	q20MAP1	3.1.4, 3.2.5	yes
PULSE1 - Sitting	PULSE1 - Sitting - reading 1	per min	q20PULSE1	3.1.4, 3.2.5	yes
SBP2 - Sitting	SBP2 - Sitting - reading 2	mmHG	q20SBP2	3.1.4, 3.2.5	yes
DBP2 - Sitting	DBP2 - Sitting - reading 2	mmHG	q20DBP2	3.1.4, 3.2.5	yes
MAP2 - Sitting	MAP2 - Sitting - reading 2	mmHG	q20MAP2	3.1.4, 3.2.5	yes
PULSE2 - Sitting	PULSE2 - Sitting - reading 2	per min	q20PULSE2	3.1.4, 3.2.5	yes
SBP3 - Standing	SBP3 - Standing - reading 3	mmHG	q20SBP3	3.1.4, 3.2.5	yes
DBP3 - Standing	DBP3 - Standing - reading 3	mmHG	q20DBP3	3.1.4, 3.2.5	yes
MAP3 - Standing	MAP3 - Standing - reading 3	mmHG	q20MAP3	3.1.4, 3.2.5	yes
PULSE3 - Standing	PULSE3 - Standing - reading 3	per min	q20PULSE3	3.1.4, 3.2.5	yes
SBP4 - Standing	SBP4 - Standing - reading 4	mmHG	q20SBP4	3.1.4, 3.2.5	yes
DBP4 - Standing	DBP4 - Standing - reading 4	mmHG	q20DBP4	3.1.4, 3.2.5	yes
MAP4 - Standing	MAP4 - Standing - reading 4	mmHG	q20MAP4	3.1.4, 3.2.5	yes
PULSE4 - Standing	PULSE4 - Standing - reading 4	per min	q20PULSE4	3.1.4, 3.2.5	yes
Cuff	Cuff size used for BP measurements	1= 28-35 cm Adult Cuff 2= < 28 cm Small Adult 3= >35 cm Large Adult	q20CUFF	3.2.5	yes
Instrument	BP Instrument used	1 to 4	q20INSTR	3.1.4, 3.2.5	yes
Temp(c)	Room temperature	Celsius	q20TEMP	3.2.5	

WORKSTATION 1 /cont.					
Wording on Physical examination data collection form (BRHS Q20 1998-2000 datasheet.pdf)	**Description**	**Value label/units**	**BRHS VARIABLE NAME**	**Measurement procedure section**	**Data access possible**
Ethnicity	Ethnicity	1=Caucasian 2=Afro Caribbean 3= Asian 4= Oriental 5=Other	q20ETHNICIT	3.2.5	yes
Alc	Alcohol (Have you drank alcohol today?)	1= Yes	q20ALC	3.2.5	yes
Dementia	Presence of obvious dementia – noted by the nurse	1= Yes	q20DEMENTIA	3.2.5	yes
Faintness on standing	Participant faintness on standing	1= Yes	q20FAINTST	3.2.5	yes
Breathless	Participant breathless - observed by the nurse	1= Yes	q20BREATHL	3.2.5	yes
Instr	Spirometry Instrument	1 to 4	q20SPIROMET	3.1.3, 3.2.8	yes
No. Readings	Number of Readings		q20NOREADIN	3.1.3, 3.2.8	yes
BTV%	Best test Variation - BTV%		q20BESTTEST	3.1.3, 3.2.8	yes
FVC	Forced Vital capacity (FVC)	L	q20FVC	3.1.3, 3.2.8	yes
FEV 0.5	Forced Expiratory Volume in 0.5 Seconds	L	q20FEV05	3.1.3, 3.2.8	yes
FEV 1	Forced expiratory volume in 1 second (FEV 1)	L	q20FEV1	3.1.3, 3.2.8	yes
PEF	Peak expiratory flow (PEF)	L/min	q20PEF	3.1.3, 3.2.8	yes
FEF 25-75	Forced Expiratory Flow between 25% and 75%	L/s	q20FEF2575	3.1.3, 3.2.8	yes
FEF 75-85	Forced Expiratory Flow between 75% and 85%	L/s	q20FEF7585	3.1.3, 3.2.8	yes
FEF 25	Forced Expiratory Flow at 25%	L/s	q20FEF25	3.1.3, 3.2.8	yes
FEF 50	Forced Expiratory Flow at 50%	L/s	q20FEF50	3.1.3, 3.2.8	yes
FEF 75	Forced Expiratory Flow at 75%	L/s	q20FEF75	3.1.3, 3.2.8	yes
Reading Inadequate	Spirometry reading inadequate/problematic	1=inadequate reading	q20READINA0	3.1.3, 3.2.8	yes

WORKSTATION 2					
Wording on Physical examination data collection form (BRHS Q20 1998-2000 datasheet.pdf)	**Description**	**Value label/units**	**BRHS VARIABLE NAME**	**Measurement procedures section**	**Data access possible**
Station 2 Observer	Station 2 Observer	1 to 5	q20STATION2		
Left Side Ankle oedema	Left Side Ankle oedema	1= Yes, 2=No	q20ANKLE	4.2.3	yes
Right Side Ankle oedema	Right Side Ankle oedema	1= Yes, 2=No	q20ANKLE01	4.2.3	yes
Left Side Leg ulcer	Left Side Leg ulcer	1=Sole, 2=Ankle, 3=Shin	q20LEG	4.2.4	yes
Right Side Leg ulcer	Right Side Leg ulcer	1=Sole, 2=Ankle, 3=Shin	q20LEG01	4.2.4	yes
Left side Leg Pulse Dorsalis Pedis	Left side Leg Pulse Dorsalis Pedis	1= Yes, 2=No	q20DORSALIS	4.2.3	yes
Right Side Leg Pulse Dorsalis Pedis	Right Side Leg Pulse Dorsalis Pedis	1= Yes, 2=No	q20DORSALI0	4.2.3	yes
Left Side Leg Pulse Post Tibial	Left Side Leg Pulse Post Tibial	1= Yes, 2=No	q20POSTIB	4.2.3	yes
Right Side Leg Pulse Post Tibial	Right Side Leg Pulse Post Tibial	1= Yes, 2=No	q20POSTIB01	4.2.3	yes
Pacemaker	Participant fitted with pacemaker?	1= Yes, 2=No	q20PACENAKE	4.2.5	yes
Bioelectrical impedance analysis (BIA) (if no pacemaker)	Impedance value from Bodystat(body fat analyser) BIA	Ohm (Ω)	q20IMPEDANC	4.2.5	yes
ECG	Was an ECG carried out?	1= Yes, 2=No	q20ECG	4.2.2	yes
BLOOD SAMPLING					
BLOOD SAMPLING - Success	BLOOD SAMPLING - Successfully collected blood?	0=No 1=Part successful 2=ALL(tubes were filled)	q20SUCCESS	4.2.6	no
BLOOD SAMPLING - Failure	BLOOD SAMPLING - Reasons for Failure	1=Refusal, 2=No sample	q20FAILURE	4.2.6	no
BLOOD SAMPLING Time Hour/minutes	BLOOD SAMPLING Time sample taken (time:Hour)	hour	q20TIME		no
	BLOOD SAMPLING Time sample taken (time:Minutes)	minutes	q20TIME1		no
BLOOD SAMPLING Tube Missing AE	BLOOD COLLECTION - EDTA Tube Missing AE	1=missing/empty	q20MISSING_TubeAE	4.2.6	no
BLOOD SAMPLING Tube Missing FJ	BLOOD COLLECTION - CITRATE Tube Missing FJ		q20MISSING_TubeFJ	4.2.6	no
BLOOD SAMPLING Tube Missing K	BLOOD COLLECTION - GLUCOSE Tube Missing K		q20MISSING_TubeK	4.2.6	no
BLOOD SAMPLING Tube Missing LP	BLOOD COLLECTION - SERUM Tube Missing LP		q20MISSING_TubeLP	4.2.6	no
BLOOD SAMPLING Tube Missing QR	BLOOD COLLECTION - SERUM Tube Missing QR		q20MISSING_TubeQR	4.2.6	no
BLOOD SAMPLING Tube Missing T	BLOOD COLLECTION - HAEMATOLOGY Tube Missing T		q20MISSING_TubeT	4.2.6	no
BLOOD SAMPLING Tube Missing U	BLOOD COLLECTION - Carboxyhaemoglobin Tube missing U		q20MISSING_TubeU	4.2.6	no

WORKSTATION 3					
Wording on Physical examination data collection form (BRHS Q20 1998-2000 datasheet.pdf)	**Description**	**Value label/units**	**BRHS VARIABLE NAME**	**Measurement procedures section**	**Data access possible**
BLOOD ALIQUOTTING Observer	BLOOD ALIQUOTTING Station 3 Observer	1 to 6, 9	q20STATION3		
BLOOD ALIQUOTTING All tubes filled	BLOOD ALIQUOTTING All tubes filled?	1= Yes, 2=No	q20ALLTUBES	5.2	no
BLOOD ALIQUOTTING Box A	BLOOD ALIQUOTTING Missing Tube A	1=if missing/empty tube	q20MISSING_TubeA	5.2	no
BLOOD ALIQUOTTING Box B	BLOOD ALIQUOTTING Missing Tube B		q20MISSING_TubeB	5.2	no
BLOOD ALIQUOTTING Box C	BLOOD ALIQUOTTING Missing Tube C		q20MISSING_TubeC	5.2	no
BLOOD ALIQUOTTING Box D	BLOOD ALIQUOTTING Missing Tube D		q20MISSING_TubeD	5.2	no
BLOOD ALIQUOTTING Box E	BLOOD ALIQUOTTING Missing Tube E		q20MISSING_TubeE	5.2	no
BLOOD ALIQUOTTING Box F	BLOOD ALIQUOTTING Missing Tube F		q20MISSING_TubeF	5.2	no
BLOOD ALIQUOTTING Box G	BLOOD ALIQUOTTING Missing Tube G		q20MISSING_TubeG	5.2	no
BLOOD ALIQUOTTING Box H	BLOOD ALIQUOTTING Missing Tube H		q20MISSING_TubeH	5.2	no
BLOOD ALIQUOTTING Box I	BLOOD ALIQUOTTING Missing Tube I		q20MISSING_TubeI	5.2	no
BLOOD ALIQUOTTING Box J	BLOOD ALIQUOTTING Missing Tube J		q20MISSING_TubeJ	5.2	no
BLOOD ALIQUOTTING Box K	BLOOD ALIQUOTTING Missing Tube K		q20MISSING_TubeK01	5.2	no
BLOOD ALIQUOTTING Box W	BLOOD ALIQUOTTING Missing Tube W		q20MISSING_TubeW	5.2	no
BLOOD ALIQUOTTING Box L	BLOOD ALIQUOTTING Missing Tube L		q20MISSING_TubeL	5.2	no
BLOOD ALIQUOTTING Box M	BLOOD ALIQUOTTING Missing Tube M		q20MISSING_TubeM	5.2	no
BLOOD ALIQUOTTING Box N	BLOOD ALIQUOTTING Missing Tube N		q20MISSING_TubeN	5.2	no
BLOOD ALIQUOTTING Box O	BLOOD ALIQUOTTING Missing Tube O		q20MISSING_TubeO	5.2	no
BLOOD ALIQUOTTING Box P	BLOOD ALIQUOTTING Missing Tube P		q20MISSING_TubeP	5.2	no
BLOOD ALIQUOTTING Box Q	BLOOD ALIQUOTTING Missing Tube Q		q20MISSING_TubeQ	5.2	no
Extra variable	App = Examination Town	1-24 = BRHS town code 25 = London 26 = London 27 = London 28 = London 29=London	q20app	use Q20examtown in derived variables	no

(ii) MEASUREMENT PROCEDURES PROTOCOL

3.0 Workstation 1 PROCEDURES

Research Nurse for workstation 1 will be responsible for setting up and calibrating measurement equipment for this workstation. (q.v.)

3.1 Calibration and checking of instruments

The following calibration steps should be undertaken every morning:-

3.1.1 Stadiometer - Harpenden stadiometer

Please check recorded height of standard 1 metre ruler once instrument set up, and record result. (This ensures that recorder has not become displaced)

3.1.2 Scales - Soehnle digital electronic scales

The zero setting on the scales should be checked by pressing the reset button with the scales empty. This should be 00.0. The result should be recorded. If there is a problem:-

- check that correct adapter voltage (9.0 volts) is being used
- if persists, please discuss with base at earliest convenience

3.1.3 Spirometer/ Vitalograph

Instrument: Vitalograph Compact II instrument (Vitalograph Ltd, Buckingham, United Kingdom) , with calibration scyringe & printer paper, disposal mouthpieces, milton cleaning solution.

Please ensure that spirometer is turned on early and left to warm up before testing.

- Check paper supply.
- Enter 'set up' mode and go to 1 'accuracy + calibration'. when the machine invites you to blow air through the flowhead to equilibrate temperatures, please blow 3 litres through slowly, then 'continue'.
- Set ambient (room temperature) consulting the electronic thermometer.
- Pump 5 litres of air slowly (each litre must take more than 1 second) through the flowhead to calibrate and then 'exit'.
- Read in 5.00 as reference volume and enter.
- Update calibration if error is 1% or greater.
- 'Retest' by putting a further 5 litres of air through the flowhead. If error is 1% or greater update calibration again and retest one more time.
- If calibration will not settle, raise threshold for correction to 3%.
- When you have finished, move to main menu and to FVC test, and when the machine says 'perform blow', blow 1 litre through calibration syringe and record the result.

- **Recalibrate the Vitalograph as before for the afternoon Session.**

3.1.4 Dinamap blood pressure recorder

Instrument: Dinamap 1846 oscillometric blood pressure recorder & selection of BP cuffs, printer roll Insertion tape (CMS Ltd, London, United Kingdom).

- check paper supply in the printer
- put machine in auto mode and use set button to set interval between readings at one minute

The calibration procedure is as follows:-

- Set up the instrument with the adult cuff to be used in place. Insert the calibration kit on one of the cuff connector leads. Turn the instrument on with the SET button held in. The CYCLE display should show 88, and will continue to do so while the instrument is in calibration mode. The machine is now in calibration mode 1.
  Display read:- CYCLE 88

  MAP 0

  All others blank

- Inflate the cuff until the mercury column reads 200mm Hg (top of the mercury meniscus). RECORD the MAP result. Check that there are no leaks (pressure remains above 190mmHg for at least 10 seconds).
- Check MAP readings at 150, 100, 50, 0mmHg on the mercury column, RECORDING the result each time.
- If leaks in system:-
  - try replacing cuff with reserve
  - try replacing blue cable with spare

  If problem not solved discuss instrument servicing/replacement with Lead investigator Peter Whincup at earliest opportunity

3.2 Measurements

Procedures with each participant will be as follows:-

- Research nurse will greet participant, checking identity on arrival and taking the clipboard with questionnaire and data sheet.
- participants should be asked to remove shoes and to remove any heavy or bulky item from pockets and place in a receptacle (bowl)

The measurements will be taken in order as follows:-

3.2.1 Height

Participants will be asked to stand on the stadiometer (on the feet placement card). The Research Nurse should check for the following points:-

- FEET: ankles should be together and resting on the bar at the back,
- ARMS: should be resting by sides, not behind or in front,
- HEAD: participant should be looking straight ahead (i.e. lower edge of orbit is in line with external auditory meatus [earhole])

Taking the measurement:

- The index fingers of both hands should then be placed below the mastoid process on each side. During inspiration the increase in height should be maintained and during expiration gentle stretch should be applied. The measurement is recorded at the end of expiration. Care is needed to ensure that the participant does not stand on tiptoe.
- Record any problems which the participant has which may lead to underestimation of height in the `problem with height' box
- Reasons may include problem with **balance/standing OR problem with posture**

3.2.2 Weight

- Before standing on the scales ask participant for his estimate of his current weight, if known.
- Weight is recorded on the Soehnle digital electronic scales. Press button before asking participant to step on.
- Participant should stand reasonably straight if possible - leaning to one side (or forwards) can affect the weight recorded
- If the weight registered is between two 0.1 kg marks, take the lower one.

Then ask

- whether weight has changed in the past 3 years

If has changed, record

- whether change was intentional
- specific reasons for change
- what is the most that the participant has ever weighed?

3.2.3 Arm circumference (right arm)

- With the participant's right arm flexed to 90^{o}, identify the acromial process and the lower tip of the olecranon.
- Using the Holtain steel tape measure, identify the midpoint of the upper arm and mark with a felt tip pen.
- With the arm hanging loosely at the side the arm circumference should be measured at this point to the last completed millimetre.

3.2.4 Skinfold thicknesses (right side) using calipers

- Explain that you want to measure the thickness of the tissue behind the arm and shoulder.
- Measure the **triceps skinfold** at the midpoint of the upper arm as marked above. Measure the **subscapular skinfold** immediately below the tip of the scapula.
- In each case grasp the skinfold firmly (not too firmly!) and apply calipers immediately below fingers. Record reading as soon as caliper reading stabilizes.
- Record first measurements in each site and then repeat procedure.

3.2.5 Blood Pressure (right arm)

The participant should sit down at the measurement table and rest their right arm on the table. This will ensure that the participant is sitting with their upper arm at chest level.

- **Select the cuff size** in accordance with the measured arm circumference. Between 28.0 and 35.0cm use standard adult cuff. Less than 28.0 use small adult cuff, more than 35.0 use large adult cuff. The cuff should be placed around the upper arm with the bladder centre over the artery.

- **Check that the participant is familiar** with having his blood pressure taken (he should have had it done once!). Explain that:
    - you plan to take 4 measurements one minute apart, the first two sitting and the second two standing
    - the cuff will inflate and slowly deflate automatically
    - encourage the participant to keep the arm still and not to talk during measurement

- The Dinamap should have been set to take repeated measurements at one minute intervals. To take two measurements at one minute intervals, switch the AUTO/MANUAL switch to AUTO. The machine will immediately inflate the cuff and the first reading will begin.
- Once the cuff is deflating the participant should be warned that the machine will make a funny noise as it prints out the results.
- The second measurement will be made after a one minute interval on the Dinamap's automatic cycle. While waiting for the second measurement, the first result should be recorded and entries on
    - 'room temperature',
    - ethnic origin should be made, with a note on the
    - presence of alcohol and
    - presence of obvious dementia where appropriate.
- Once the second reading is complete, ask the participant to stand up, allowing the right arm to rest loosely by his side. Allow the instrument to continue with two additional measurements, and proceed with waist and hip measurements while these are being done.

3.2.6 Waist circumference

This should be measured with the participant standing with feet one foot apart on a marked template.

- The waist should be identified as the mid point between the iliac crest below and the lower edge of the ribs above, i.e. measured at the sides.
- Pass the tape around the waist (for large participants, ask them to help passing the tape around) and reinsert at front, positioning level at the waist.
- Ask participant to breathe out gently and record measurement at the end of expiration to the last completed millimetre.
- If you are not satisfied about the accuracy of your measurement, record a 1 in the appropriate coding box.
- Repeat the measurement

3.2.7 Hip circumference

This is measured by placing the tape measure around the hips at the point of maximum circumference.

- The tape should be horizontal and the gluteal muscles not contracted. Record to the last completed millimetre.
- If you are not satisfied about the accuracy of your measurement, record a 1 in the appropriate coding box.
- Repeat the measurement

3.2.8 Spirometry

- Preliminary explanation to participant. "This machine measures the size of the lungs. What I want you to do is to take a very big breath in and to blow out as hard and as long as you can, until your lungs are empty. Watch me."
- (Demonstration by nurse)
- Participant then practices: ensure that:-
    - full breath in
    - lips tightly around mouthpiece
    - long hard blow right to the end
- Before measurements made check about participant's use of inhaler and about the time of previous inhaler use.
- Before starting the test enter the participant's 6 digit serial number and press the 'enter' key in order to proceed.
- On the main menu press 'FVC test'. The machine will then say 'perform test', indicating that it is ready for the first blow.
- We want to record three definitive blows.
- Please ensure that you encourage the participant during the blow, particularly towards the end, by saying `blow...blow...blow' (or other agreed text).
- After each blow, press 'end test' to expedite results and then 'retest' to go on to the next test.
- The machine takes a short period to calculate results, after which FVC, FEVI and PEF figures will then be displayed on the screen. Once the results of each of the first two blows are displayed press 'retest' and the machine will display 'perform test' to indicate readiness for the next reading.
- Once the result of the third reading is recorded, check the `best test variation' which is recorded on the screen. If best test variation is more than 5% after 3 readings, please take an additional reading by pressing 'retest' again.
- If you are not satisfied that the participant has done an adequate blow on at least one of the readings, please enter 1 in the `problem' box.
- Once the 3 (4) readings are complete, press 'end test' to return to the main menu. Press 'print' and then 'selected' to print out the results. The printed output should be stapled onto the front of the data sheet in the space provided. Then press the 'new patient' category and agree to delete old patient's results. This will leave the machine waiting for the next participant's serial number to be entered in due course.

3.2.8.1 **In the event of Vitalograph printer failure**

Please record the number of readings and the best test variation directly from the screen before leaving the test screen. Then on main menu press option 5, display results and write down the other parameters on the data sheet.

3.2.9 Completion

- Participant should remain in dressing gown and proceed to Research Nurse 2
- Ensure that any possessions are restored or stored for collection later.
- Medicines/records should be taken through to Research Nurse 2.

3.2.10 At end of day

- General clearing-up
- Coding of questionnaires

4.0 Workstation 2 PROCEDURES

Research Nurse 2 will be responsible for setting up this station

4.1 Preparation

Research nurse on arrival to:

- Set up relevant equipment
- Prepare blood syringes and collection tubes for the morning and (if possible) afternoon session, following the appointment list for the day

4.2 Measurements

Research Nurse 2 will greet the participant, checking his identity on arrival and taking the data sheet and questionnaire.

4.2.1 Questionnaire (Main 20 year follow-up survey questionnaire (Blue)) (Appendix 2)

- Ask the participant whether he had any problems filling in the questionnaire; check any specific items.
- Ask the participant to provide their medicines etc and to remove dressing gown and lie on the couch.
- Nurse will record medicine list on the questionnaire (question 18.0, 18.2) (**Appendix 2**) while the participant is undressing and will check the indications for medicines
- Final questions including time of last meal will also be recorded on the questionnaire (question 20.0) (**Appendix 2**) at this point.
- For the next stages the participant should lie as flat as is possible on the couch, though a pillow is quite acceptable.

4.2.2 Electrocardiogram

Instrument: ECG, Siemens Sicard 460- 12 lead ECG(crododile clips, electrodes, printer paper).

ECG computer interpreted - University of Glasgow ECG core laboratory based at Glasgow Royal Infirmary. Analyzed and coded in accordance with Minnesota Coding definitions.

- Place ECG electrodes and record electrocardiogram (separate instructions will be required via PMacF).
- Remove the ECG electrodes and the local anaesthetic patch, to allow time for any local oedema to subside before blood taking.

Other measurements **taken while participant is lying down on the couch.**

4.2.3 Ankle oedema

- Check for presence of **ankle oedema** and for presence/absence of all four foot pulses.

4.2.4 Venous ulcers

- Check for presence of **venous ulcers** on the shin/above ankles

4.2.5 Bioelectrical impedance analysis (BIA)

Check whether participant has pacemaker

- If not, participant lies with legs, arms uncrossed, forearms pronated for **measurement of bioimpedance** as shown on instruction sheet (Bodystat).
- Nurse to **record coefficient(impedance value) only.**
- Bioelectrical impedance analysis (BIA) is a method for measuring body composition based on the rate at which an electrical **current** travels through the body measured in Ohms (Ω). Body fat (adipose tissue) causes greater resistance (impedance) than fat-free mass and slows the rate at which the current travels.
- Fat-free mass was determined by bioelectrical impedance analysis (BIA) using a Bodystat 500 (Bodystat Ltd, Douglas, uk) and the Deurenberg et al equation **https://link.springer.com/content/pdf/10.1007/s12603-013-0336-9.pdf**

4.2.6 Blood sampling

- The blood sample will be taken at the end of the examination, after the electrocardiogram is completed.
- The blood sample should be taken with the participant lying down.
- Check whether the participant has had previous problems with blood sampling.
- Alcohol swabs will be provided for skin cleaning - allow to dry after use.
- A tourniquet may be used throughout. Wear the rubber gloves provided for taking the sample. A 21 gauge butterfly needle (or Sarsted needle) should generally be used; a small supply of 23 gauge needles will also be supplied for exceptional use.
- If blood is not obtained at the first attempt, a single further attempt may be made in the opposite arm if the participant consents. No further attempt to obtain blood should be made.
- Each participant's blood collection tubes will be prepared in advance by the nurse in a polythene bag with an identification label on the front and individual tube labels throughout. Please check the label against the data sheet. The tube labels will have the participant's batch number and the full serial number for identification.

The first priority tubes are:-

green	citrate tube	code AE	9.0 ml
red	EDTA tube	code FJ	9.0 ml
yellow	fluoride tube	code K	2.7 ml
white	serum tube	code WN	9.0 ml

The second priority tubes are:

red	EDTA small	code T	2.7 ml
yellow	fluoride	code U	1.2 ml
white	serum tube	code OQ	9.0 ml

After venepuncture, raise participant's arm and encourage participant to press firmly on cotton wool pad to avoid bruising. Plasters are provided. Please check for elastoplast allergy - if present, use cotton wool and tape.

After venepuncture the tubes should be gently agitated and placed in a rack.

Please record:-

- the time of venepuncture
- the full success/partial success/failure of sampling
- if partial success, which of the `primary' collection tubes have no blood in them

- Samples can then be passed directly to Research Nurse 3 with the data sheet .

4.2.7 Written consent to follow-up study

- Nurse 2 should then take the participant through the consent procedure. (consent to follow-up participant's future health through his health records, passing on test result information to his G.P. and consent to storing his blood sample for future use). The consent form is contained in **question 21.0** of the **Main 20 year follow-up survey Questionnaire (blue questionnaire*). (Appendix 2).**

4.2.8 Participant expenses

- If the participant is a `migrant' (ie no longer registered at the original study General Practice), Nurse 2 should confirm travel expenses and reimburse as required.

4.2.9 Recruiting to the Repeatability/Variability Study

- If the participant is a non-migrant (i.e. registered at original study General Practice) seen during the first week of the study, she should ask whether he would be prepared to return for a further check during the second week of the study (measurements only, no questionnaire).

Possible text

"I wonder whether you would be willing to help us with our quality control procedures and return next week for a repeat measurement. This helps us to find out how much the measurements we are doing vary from day to day and helps us to assess how important the different factors are in relation to heart disease. Is there any possibility that you would be prepared to come back next week for a repeat check up (measurements and blood test, but no questionnaire)?"

Nurse 2 will mark on her appointment list those participants invited for repeat and whether they agree. If the Participant agrees, Nurse 2 will give him a card to take to the receptionist. The receptionist will record the name of each participant in the log book and provide a new appointment card with fasting time recorded.

A maximum of 12 participants per town should be recruited.

4.2.10 Research Nurse 2 tasks at the end of day

- Transmit ECGs to Glasgow

5.0 Workstation 3. Procedures

Equipment and consumables required:

BOC Dry Ice, Aliquot tubes & Caps, Electronic pipettes, manual pipettes, centrifuge, mini freezer, TNT courier labels, Camlab aliquot boxes, metaphosphoric acid.

Research Nurse 3 will be responsible for setting up this station. Research Nurse 3 will have sole responsibility for the organization and handling of blood samples. Gloves and aprons will be provided. Where necessary, she will assist the receptionist in placing local anaesthetic cream.

5.1 Prepare the blood aliquots

At the start of the day

Before the first samples come through there should be time:-

- to label sample tubes for the day
- to prime tube F with metaphosphoric acid. 1 ml of metaphosphoric acid is placed in the tube, using the accurate manual pipette. (The mixture is made up fresh each town, 10 grams of metaphosphoric acid to 100 ml of deionized water). By the end of the study this was made up weekly by the nurses.
- to collect dry ice for use during the day

5.2 Handling of blood samples for each Participant

5.2.1 Tubes T and U

- Tubes T and U will be set aside, as these are whole blood samples which do not require additional preparation. They should be stored in batch number order in a cool place (**not** frozen!) for TNT collection later in the day to be delivery overnight to Whittington Hospital.

5.2.2 Citrate tube (A-E), EDTA tube (F-J)

- Special priority should be given to the handling of the citrate tube (A-E), which is for coagulation factors. However, the handling of the EDTA tube (F-J) and the glucose tube (K) can take place alongside this one.

Centrifuging

After each pair of participants, the citrate tubes (A-E), the EDTA tube (F-J) and the glucose tube (K) should be spun at 3500 rpm for 5 minutes and then aliquotted. Ideally this will be completed within an hour of collection.

Aliquotting

Citrate tube A-E is aliquotted as follows:
Into 5 equal 1 ml aliquots A 1.0 ml, B 1.0 ml, C 1.0 ml, D 1.0 ml, E 1.0 ml [any extra to tube E] (use electronic pipette, discard pipette after use). Take particular care with this tube to ensure the buffy coat layer is untouched.

EDTA tube F-J is aliquotted as follows:-
Into F 0.5 ml using accurate manual pipette
Into G 0.5 ml, H 0.5 ml, I 2.0 ml, J 1.5 ml [any extra to tube J] (using electronic pipette, discard pipette after use)

Freezing
These aliquot tubes should be snap-frozen in dry ice once separated. Once snap frozen, they can then be placed in the separate boxes labelled A-J in the -20^{o}C freezers in batch number order.

Residues
The cell residues of the original citrate tube A-E and the EDTA tube F-J should be kept and placed in the freezer at convenience in bags of seven.

5.2.3 Glucose tube (K)

- The glucose tube K should be aliquotted using the hand bulb pipette into tube K (1.2 ml or so - tube slightly more than half full).
- They can then be transferred twice daily to the boxes labelled K in the -20^{o}C freezer in batch number order; no snap freezing is needed.
- The residue of the first tube K can be discarded.

5.2.4 Serum tubes W-N and O-Q

- As time permits, the serum tubes W-N and O-Q should be dealt with.
- They should be allowed a minimum of 30 minutes to settle before centrifuging.

Centrifuging
They should be centrifuged at 3500 rpm for 10 minutes. A small number of tubes may not separate well and require recentrifuging at 4000 rpm for a further 5-10 minutes.

Aliquotting
After centrifugation they should be sorted into pairs for each individual; each pair should be aliqotted in turn. The allocation of the two tubes should be sorted in order as follows; do W-N tube first, and aliquot as far as it will go. Serum from W-N and O-Q is interchangeable - can be used for top ups if needed. Both of these can be done with one electronic pipette.

- Tube W 1.5 ml, L 0.5 ml, M 0.5 ml, N 0.5 ml
- Tube O 1.0 ml, P 1.0ml, Q 1.0ml [any extra to tube Q].

Freezing
These aliquots should be transferred into the appropriate boxes L to O and placed in the -20 freezer and placed in batch number order; there is no need to snap freeze the samples.

Residues
The cell residues of the serum tubes L-N and O-Q can be discarded.