Electrocardiography (ECG)

BRHS 20 year follow-up (Q20)

1998-2000

During the 20-year follow-up physical examination in 1998-2000(Q20) the BRHS participants underwent a resting 12-lead electrocardiogram (ECG) using a Siemens Sicard 460 instrument. The ECG test involved attaching a number of small, sticky sensors called electrodes to the participant's arms, legs and chest. These were connected by wires to an ECG recording machine. The ECG recordings were analysed at the University of Glasgow using the Minnesota Coding Classification system which utilizes a defined set of measurement rules to assign specific numerical codes according to severity of ECG findings. The set of Minnesota codes obtained for each participant are listed in the table in section 1.

NOTE

Derived variables using the ECG Minnesota codes were obtained for Left Ventricular Hypertrophy (LVH), Right Ventricular Hypertrophy (LVH), Conduction defects (CD), MI or Ischaemia grade (MISH), Atrial fibrillation (AF). These derived variables are included in:

BRHSQ20 Derived and adjusted variables data file,

and are listed and described in:

BRHS 1998-2000 (Q20) 20 year follow-up Derived and adjusted variables Data dictionary.xlsx

BRHS 1998-2000 (Q20) 20 year follow-up Derived and adjusted variables Documentation.docx and

Contents

1. Minnesota codes

The ECG recordings were analysed using the Minnesota Coding Classification system which utilizes a defined set of measurement rules to assign specific numerical codes according to severity of ECG findings. The set of Minnesota codes obtained for each participant are listed in the table below.

Description			
Minnesota codes (ECG classification system) Variables	**BRHS Variable name**	**Measurements protocol section**	**Data access**
baseflag	q20ecg_baseflag	4.2.2	
Heart Rate (bpm)	q20ecg_rate		yes
P axis (degree)	q20ecg_p_axis		yes
QRS axis (degree)	q20ecg_qrs_axis		yes
T axis (degree)	q20ecg_t_axis		yes
PR interval (ms)	q20ecg_pr_int		yes
QRS duration (ms)	q20ecg_qrs_dur		yes
QT interval (ms)	q20ecg_qt_int		yes
QTC interval (ms)	q20ecg_qtc_int		yes
Minnesota group1_L	q20ecg_MG1_l		yes
Serial type1_1	q20ecg_st1_1		yes
Minnesota group1_P	q20ecg_mg1_p		yes
Srial type1_2	q20ecg_st1_2		yes
Minnesota group1_A	q20ecg_mg1_a		yes
Serial type1_3	q20ecg_st1_3		yes
Minnesota group2_1	q20ecg_mg2_1		yes
No serial comparison	q20ecg_nsc1		yes
Minnesota group2_2	q20ecg_mg2_2		yes
No serial comparison	q20ecg_nsc2		yes
Snnesota group3	q20ecg_mg3		yes
No serial comparison	q20ecg_nsc3		yes
Minnesota group4_L	q20ecg_mg4_l		yes
Serial type1_4	q20ecg_st1_4		yes
Minnesota group4_P	q20ecg_mg4_p		yes
Serial type1_5	q20ecg_st1_5		yes
Minnesota group4_A	q20ecg_mg4_a		yes
Serial type1_6	q20ecg_st1_6		yes
Minnesota group5_L	q20ecg_mg5_l		yes
Serial type1_7	q20ecg_st1_7		yes
Minnesota group5_P	q20ecg_mg5_p		yes
Serial type1_8	q20ecg_st1_8		yes
Minnesota group5_A	q20ecg_mg5_a		yes
Serial type1_9	q20ecg_st1_9		yes
Minnesota group6	q20ecg_mg6		yes
No serial comparison	q20ecg_nsc4		yes
Minnesota group7_1	q20ecg_mg7_1		yes
Serial type1_10	q20ecg_st1_10		yes
Minnesota group7_2	q20ecg_mg7_2		yes
No serial comparison	q20ecg_nsc5		yes
Minnesota group8_1	q20ecg_mg8_1		yes

No serial comparison	q20ecg_nsc6	4.2.2	yes
Minnesota group8_2	q20ecg_mg8_2		yes
No serial comparison	q20ecg_nsc7		yes
Minnesota group8_3	q20ecg_mg8_3		yes
No serial comparison	q20ecg_nsc8		yes
Minnesota group8_4	q20ecg_mg8_4		yes
No serial comparison	q20ecg_nsc9		yes
Minnesota group9_L	q20ecg_mg9_l		yes
Serial type1_11	q20ecg_st1_11		yes
Minnesota group9_P	q20ecg_mg9_p		yes
Serial type1_12	q20ecg_st1_12		yes
Minnesota group9_A	q20ecg_mg9_a		yes
Serial type1_13	q20ecg_st1_13		yes
Minnesota group9m_1	q20ecg_mg9m_1		yes
No serial comparison	q20ecg_nsc10		yes
Minnesota group9m_2	q20ecg_mg9m_2		yes
No serial comparison	q20ecg_nsc11		yes

2. Derived variables using ECG Minnesota codes

NOTE: These variables are included in the BRHSQ20 Derived and adjusted variables data file and described in BRHS 1998-2000 (Q20) 20 year follow-up Derived and adjusted variables Documentation.docx and BRHS 1998-2000 (Q20) 20 year follow-up Derived and adjusted variables Data dictionary.xlsx

	Derived variables using SAS code[1] **Description**	**Value label**	**BRHS Variable name**	**Derivation SAS code**	**Data access**
1	MI or Ischaemia grade Classified using Minnesota codes from ECG	1='definite MI - acute' 2='definite MI' 3='probable MI' 4='definite ischaemia' 5='probable ischaemia' 6='possible ischaemia'	q20ecg_mish	SAS code[1] (3.1)	yes
2	Left Ventricular Hypertrophy Classified using Minnesota codes from ECG	1 = definite LVH 2 = probable LVH 3 = possible LVH	q20ecg_lvh	SAS code[1] (3.1)	yes
3	Right Ventricular Hypertrophy Classified using Minnesota codes from ECG	1 = definite RVH 2 = probable RVH 3 = possible RVH	q20ecg_rvh	SAS code[1] (3.1)	yes
4	Conduction defects based on Minnesota codes LBBB = Left Bundle Branch Block RBBB = Right Bundle Branch Block CHB = Complete Heart Block WPW= Wolff Parkinson White syndrome	1 = LBBB 2 = RBBB 3 = CHB 4 = WPW 5 = LBBB and WPW 6 = RBBB and CHB	q20ecg_cd	SAS code[1] (3.1)	yes
5	Atrial Fibrillation Classified using Minnesota codes from ECG	1=yes, 2=no	q20AtriFib	SAS code[2] (3.2)	Yes

3.1 Derivation SAS code (Appendix 3.1)

SAS code[1] deriving:-

Left Ventricular Hypertrophy (LVH)
Right Ventricular Hypertrophy (LVH)
Conduction defects (CD)
MI or Ischaemia grade (MISH)

```
ecg=1;
if p_axis lt -327 then p_axis = .;
if qrs_axis lt -327 then qrs_axis= .;
if t_axis lt -327 then t_axis= .;
/*   to remove certain LBBBs         */
if ((mg1_l ge 110 and mg1_l le 119) or  (mg1_p ge 110 and mg1_p le 119)  or  (mg1_a ge 110 and mg1_a le 119)) or
((mg1_l ge 121 and mg1_l le 126)  or  (mg1_p ge 121 and mg1_p le 126)  or  (mg1_a ge 121 and mg1_a le 126))
and  mg7_1=711 then mg7_1=740;
```

*** CREATE Left Ventricular Hypertrophy using Minnesota codes * (LVH) ;**

```
if ecg=1 then lvh=0;
if (mg3 = 310 or mg3 = 330) and (mg4_l = 412 or mg4_l = 420 or mg4_p = 412   or mg4_p = 420 or mg4_a = 412
or mg4_a = 420 or mg4_a=411   or mg5_l = 510 or mg5_l = 520 or mg5_p = 510   or mg5_p = 520 or mg5_a = 510
or mg5_a = 520) then lvh=1;
if mg3 = 310 and lvh ne 1 then lvh = 2;
if mg3 = 330 and lvh ne 1 then lvh = 3;
```

*** CREATE Conduction defects using Minnesota codes * (CD);**

```
cd=.;
if mg7_1 = 711 then cd=1;
if mg7_1 = 721 then cd=2;
if mg6 = 610 then cd=3;
if mg6 = 641 then cd=4;
if mg7_1 = 711 and mg6 = 641 then cd=5;
if mg7_1 = 721 and mg6 = 610 then cd=6;
```

*** CREATE MI or Ischaemia grade using Minnsesota codes * (MISH);**

```
if ecg = 1 then mish=0;
if (mg4_l ge 430 and mg4_l le 439) or  (mg4_p ge 430 and mg4_p le 439) or  (mg4_a ge 430 and mg4_a le 439)
or (mg5_l ge 530 and mg5_l le 549) or  (mg5_p ge 530 and mg5_p le 549) or  (mg5_a ge 530 and mg5_a le 549)
then mish=6;
if (mg4_l ge 420 and mg4_l le 429) or  (mg4_p ge 420 and mg4_p le 429) or  (mg4_a ge 420 and mg4_a le 429)
or (mg5_l ge 520 and mg5_l le 529) or  (mg5_p ge 520 and mg5_p le 529) or  (mg5_a ge 520 and mg5_a le 529)
then mish=5;
if (mg4_l ge 410 and mg4_l le 419) or  (mg4_p ge 410 and mg4_p le 419) or  (mg4_a ge 410 and mg4_a le 419)
or (mg5_l ge 510 and mg5_l le 519) or  (mg5_p ge 510 and mg5_p le 519) or  (mg5_a ge 510 and mg5_a le 519)
then mish=4;
if (mg1_l ge 121 and mg1_l le 127) or  (mg1_p ge 121 and mg1_p le 127) or  (mg1_a ge 121 and mg1_a le 127)
then mish=3;
if ((mg1_l ge 110 and mg1_l le 119) or  (mg1_p ge 110 and mg1_p le 119)  or  (mg1_a ge 110 and mg1_a le 119))
or ((mg1_l ge 121 and mg1_l le 127)  or (mg1_p ge 121 and mg1_p le 127)   or (mg1_a ge 121 and mg1_a le 127))
and ((mg5_l ge 510 and mg5_l le 539) or (mg5_p ge 510 and mg5_p le 539)  or (mg5_a ge 510 and mg5_a le 539))
then mish=2;
if ((mg1_l ge 110 and mg1_l le 119) or  (mg1_p ge 110 and mg1_p le 119)  or  (mg1_a ge 110 and mg1_a le 119))
or ((mg1_l ge 121 and mg1_l le 127)  or (mg1_p ge 121 and mg1_p le 127)   or (mg1_a ge 121 and mg1_a le 127))
and ((mg9_l ge 920 and mg9_l le 929) or (mg9_p ge 920 and mg9_p le 929)  or (mg9_a ge 920 and mg9_a le 929))
then mish=2;
if ((mg9_l ge 920 and mg9_l le 929) or (mg9_p ge 920 and mg9_p le 929)  or (mg9_a ge 920 and mg9_a le 929))
and mish=2 then mish=1;
if ecg ne 1 then mish = .;
```

```
* CREATE Right Ventricular Hypertrophy using Minnesota codes * (RVH);
if ecg=1 then rvh=0;
if mg3=320 then rvh=3;
if mg3=320 and (mg4_l = 420 or mg4_p = 420 or mg4_a = 420  or mg5_l = 520 or mg5_p = 520 or mg5_a = 520) then rvh = 2;
if mg3=320 and (mg4_l = 412 or mg4_p = 412 or mg4_a = 412 or mg4_a = 411 or mg5_l = 510 or mg5_p = 510 or mg5_a = 510) then rvh = 1;

* DERIVED ECG VARIABLES FOR Q20: *;
q20ecg_mish=mish;
q20ecg_lvh=lvh;
q20ecg_rvh=rvh;
q20ecg_cd=cd;
*END*;
```

3.2 Derivation SAS code (Appendix 3.2)

SAS code[2]: deriving Atrial fibrillation(AF)

```
*AF was defined according to Minnesota codes:;

if (mg8_1=831 or mg8_1=832 or mg8_2=831) then a q20AtriFib=1;else q20AtriFib =2;
```

q20AtriFib:

1= with atrial fibrillation

2= with no atrial fibrillation