Supplemental Material

Supplemental Table 1. Comparison of baseline clinical and ECG characteristics in participants with abnormal GEH metrics

Characteristics	Normal GEH (n=2,837; 19.5%)	1 abnormal GEH (n=5,290; 36.6%)	2 abnormal GEH (n=4,090; 28%)	3 abnormal GEH (n=1,382; 10%)	4 abnormal GEH (n=555; 4%)	5 abnormal GEH (n=325; 2%)	ANOVA or χ^2 *P*
Age(SD), y	53.4(5.7)	54.0(5.7)	54.3(5.8)	54.8(5.8)	55.1(5.8)	56.8(5.6)	<0.0001
Female, n(%)	2,777(97.9)	2,872(54.3)	1,598(39.1)	527(38.1)	113(20.4)	117(36.0)	<0.0001
White, n(%)	2,189(77.2)	4,075(77.0)	3,159(77.2)	979(70.8)	340(61.3)	193(59.4)	<0.0001
Prevalent cardiovascular disease, n(%)	291(10.3)	572(10.8)	503(12.3)	235(17.0)	126(22.7)	107(32.9)	<0.0001
Body mass index(SD), kg/m^2	27.7(5.6)	27.8(5.3)	27.4(5.0)	27.3(5.2)	26.9(4.6)	27.7(4.9)	0.0001
Waist-to-hip ratio (SD)	0.896(0.081)	0.929(0.077)	0.934(0.075)	0.934(0.077)	0.943(0.069)	0.940(0.070)	<0.0001
Hypertension, n(%)	739(26.1)	1,709(32.3)	1,391(34.0)	569(41.2)	281(50.6)	176(54.2)	<0.0001
Antihypertensive drugs, n(%)	750(26.4)	1,525(28.8)	1,153(28.2)	484(35.0)	230(41.4)	145(44.6)	<0.0001
Systolic blood pressure(SD), mmHg	116.4(16.5)	120.2(17.6)	121.8(18.3)	124.9(20.0)	129.8(24.7)	129.8(23.4)	<0.0001
Diastolic blood pressure(SD), mmHg	70.8(9.9)	73.4(10.6)	74.0(10.8)	74.9(12.4)	78.0(14.6)	77.8(14.7)	<0.0001
eGFR $_{CKD\text{-}EPI}$ (SD), mL/min/1.73 m^2	96.9(14.3)	95.7(15.1)	95.3(14.9)	94.4(16.3)	94.4(17.3)	90.2(18.8)	<0.0001
Diabetes, n(%)	247(8.7)	556(10.5)	477(11.7)	195(14.1)	98(17.7)	64(19.7)	<0.0001
Current tobacco smoker, n(%)	647(22.8)	1,315(24.9)	1,071(26.2)	426(30.8)	186(33.5)	85(26.2)	<0.0001
Current alcohol drinker, n(%)	1,519(53.5)	3,044(57.5)	2,390(58.4)	780(56.4)	313(56.4)	170(52.3)	0.001
Leisure physical activity score(SD)	2.42(0.58)	2.37(0.57)	2.37(0.56)	2.33(0.58)	2.27(0.57)	2.27(0.56)	<0.0001
Total cholesterol(SD), mmol/L	5.66(1.09)	5.54(1.08)	5.50(1.06)	5.51(1.05)	5.55(1.11)	5.53(1.07)	<0.0001
HDL cholesterol(SD), mg/dL	57.2(16.7)	51.3(17.2)	49.8(16.7)	49.7(17.0)	48.3(17.1)	23.2(25.7)	<0.0001
Triglycerides(SD), mmol/L	1.39(0.97)	1.50(1.00)	1.50(1.03)	1.53(1.07)	1.53(1.00)	1.55(1.01)	<0.0001
Lipid-lowering drugs, n(%)	78(2.8)	148(2.8)	123(3.0)	46(3.3)	17(3.1)	15(4.6)	0.448
Plaque in any carotid site, n(%)	688(24.3)	1,701(32.2)	1,435(35.1)	533(38.6)	243(43.8)	152(46.8)	<0.0001
Aspirin, n%)	1,389(49.0)	2,466(46.6)	1,905(46.6)	637(46.1)	234(42.2)	147(45.2)	0.054
Anticoagulants, n(%)	2(0.07)	12(0.23)	16(0.39)	11(0.80)	7(1.26)	9(2.77)	<0.0001
Antiarrhythmic drugs, n(%)	293(10.3)	668(12.6)	566(13.8)	253(18.3)	132(23.8)	79(24.3)	<0.0001
Heart rate(SD), bpm	67.7(9.6)	66.1(9.9)	65.2(10.3)	66.3(11.4)	65.5(10.6)	67.3(11.0)	<0.0001

QRS duration(SD), ms	85.7(7.8)	90.4(9.5)	93.8(10.5)	98.7(14.9)	107.7(20.2)	106.5(25.5)	<0.0001
Bazett-corrected QTc(SD), ms	417.8(18.3)	414.7(18.1)	414.3(17.8)	418.2(20.2)	423.1(24.3)	428.3(31.7)	<0.0001
ECG-LVH, n(%)	16(0.6)	109(2.1)	170(4.2)	197(14.3)	195(35.1)	119(36.6)	<0.0001
BBB/IVCD, n(%)	30(1.1)	111(2.1)	146(3.6)	138(10.0)	123(22.2)	60(18.5)	<0.0001
Any visit TD-IBBB, n(%)	16(0.56)	54(1.02)	37(0.90)	9(0.65)	2(0.36)	4(1.23)	0.181
Any visit PVC, n(%)	152(5.4)	402(7.6)	388(9.5)	166(12.0)	61(11.0)	33(10.2)	<0.0001
Any visit PAC, n(%)	202(7.1)	460(8.7)	361(8.8)	129(9.3)	44(7.9)	29(8.9)	0.097
Any visit Atrial Fibrillation, n(%)	472(16.6)	1,136(21.5)	897(21.9)	357(25.8)	128(23.1)	47(14.5)	<0.0001
Abnormal PR interval, n(%)	219(7.7)	447(8.5)	367(9.0)	142(10.3)	80(14.4)	47(14.5)	<0.0001
Abnormal Frontal P axis, n(%)	188(6.6)	399(7.5)	345(8.4)	152(11.0)	67(12.1)	37(11.4)	<0.0001
Abnormal PTF in V1, n(%)	171(6.0)	439(8.3)	440(10.8)	217(15.7)	119(21.4)	60(18.5)	<0.0001
Median beat S or V at any visit, n(%)	44(1.6)	140(2.7)	134(3.3)	63(4.6)	24(4.3)	16(4.9)	<0.0001

HDL=High-density lipoprotein; SD=standard deviation; LVH-left ventricular hypertrophy; BBB=bundle branch block; IVCD=interventricular conduction delay; PVC=premature ventricular complex; PAC=premature atrial complex; PTF=P-terminal force; eGFR= Estimated glomerular filtration rate.

Supplemental Table 2. Association of GEH with incident stroke in Cox models with pure stroke type outcomes.

		Model 1		Model 2		Model 3		Model 4		Model 5	
	Predictor, per 1 SD	HR(95%CI)	P-value	HR(95%CI)	P-value	HR(95%CI)	P-value	HR(95%CI)	P-value	HR(95%CI)	P-value
Embolic stroke (n=335)	Peak QRS-T angle	**1.27(1.15-1.39)#**	**<0.0001**	**1.19(1.08-1.31)**	**0.001**	**1.12(1.01-1.24)**	**0.027**	1.11(0.99-1.23)	0.067	1.10(0.99-1.22)#	0.074
	Area QRS-T angle	**1.29(1.16-1.43)#**	**<0.0001**	**1.23(1.11-1.37)#**	**<0.0001**	**1.15(1.03-1.28)#**	**0.014**	**1.13(1.01-1.27)#**	**0.040**	**1.12(1.01-1.25)#**	**0.036**
	Peak SVG elevation	**1.13(1.01-1.25)#**	**0.031**	1.07(0.95-1.20)	0.259	1.05(0.94-1.17)	0.404	1.04(0.92-1.17)	0.525	1.00(0.89-1.12)	0.956
	Area SVG elevation	**1.11(1.00-1.22)**	**0.055**	1.05(0.95-1.17)	0.348	1.03(0.93-1.15)	0.545	1.02(0.92-1.14)	0.681	1.00(0.90-1.12)	0.934
	Peak SVG azimuth	**1.12(1.02-1.24)**	**0.019**	1.08(0.98-1.19)	0.137	1.04(0.93-1.15)	0.505	1.02(0.91-1.13)	0.758	0.98(0.89-1.09)#	0.760
	Area SVG azimuth	1.04(0.93-1.16)#	0.472	1.01(0.91-1.13)	0.814	0.98(0.88-1.09)	0.693	0.94(0.84-1.05)	0.274	0.99(0.90-1.09)	0.881
	Peak SVG magnitude	1.08(0.97-1.21)	0.171	1.08(0.96-1.21)	0.179	**1.13(1.01-1.27)**	**0.038**	1.11(0.99-1.25)	0.068	**1.17(1.05-1.31)**	**0.006**
	Area SVG magnitude	1.06(0.94-1.18)	0.335	1.09(0.97-1.22)	0.167	**1.13(1.00-1.27)**	**0.047**	1.11(0.99-1.25)	0.083	**1.23(1.11-1.38)**	**<0.0001**
	SAIQRST	**1.20(1.09-1.31)**	**<0.0001**	**1.21(1.10-1.33)**	**<0.0001**	**1.20(1.09-1.32)**	**<0.0001**	**1.23(1.09-1.39)**	**0.001**	**1.16(1.05-1.28)**	**0.003**
	Bazett's QTc	**1.14(1.04-1.24)#**	**0.004**	1.07(0.97-1.18)	0.187	1.00(0.90-1.12)	0.963	0.99(0.88-1.12)	0.893	0.99(0.90-1.09)	0.865
	QRS duration	1.07(0.96-1.19)	0.215	1.03(0.92-1.15)	0.604	1.02(0.91-1.14)	0.733	0.99(0.85-1.15)	0.880	1.00(0.90-1.10)	0.948
	PVC	**2.23(1.28-3.89)**	**0.005**	**2.25(1.29-3.94)**	**0.004**	**1.76(1.00-3.09)**	**0.050**	1.73(0.98-3.06)	0.058	1.43(0.92-2.21)	0.110
	TD-IBBB	0.72(0.18-2.91)	0.648	0.69(0.17-2.77)	0.601	0.59(0.15-2.37)	0.456	0.58(0.14-2.33)	0.441	0.92(0.13-6.63)	0.938
	BBB/IVCD	0.96(0.57-1.62)	0.887	0.92(0.55-1.55)	0.751	0.80(0.47-1.35)	0.400	0.69(0.38-1.28)	0.240	0.74(0.46-1.19)	0.209
	ECG-LVH	**2.03(1.41-2.92)#**	**<0.0001**	**1.71(1.18-2.48)#**	**0.004**	**1.52(1.04-2.22)**	**0.030**	**1.55(1.00-2.41)**	**0.048**	1.22(0.85-1.76)	0.279
Thrombotic stroke (n=819)	Peak QRS-T angle	**1.16(1.08-1.23)#**	**<0.0001**	1.04(0.97-1.11)#	0.278	1.04(0.97-1.11)#	0.272	1.00(0.93-1.08)	0.925	1.04(0.97-1.11)#	0.272
	Area QRS-T angle	**1.16(1.09-1.25)#**	**<0.0001**	**1.08(1.00-1.15)#**	**0.041**	**1.08(1.00-1.16)**	**0.043**	1.04(0.96-1.12)	0.359	1.00(0.93-1.07)#	0.958
	Peak SVG elevation	0.99(0.94-1.07)#	0.866	0.95(0.88-1.02)	0.189	0.97(0.90-1.04)	0.392	0.94(0.87-1.01)	0.101	0.96(0.89-1.04)	0.310
	Area SVG elevation	1.02(0.95-1.09)#	0.608	0.98(0.91-1.05)	0.514	0.99(0.92-1.06)	0.814	0.97(0.90-1.04)	0.396	0.98(0.91-1.05)	0.539
	Peak SVG azimuth	1.01(0.94-1.08)#	0.778	0.95(0.88-1.02)#	0.127	0.95(0.88-1.02)	0.134	**0.91(0.85-0.99)**	**0.018**	0.94(0.88-1.00)#	0.068
	Area SVG azimuth	**1.08(1.01-1.16)#**	**0.034**	1.03(0.96-1.10)	0.385	1.03(0.96-1.10)	0.481	1.01(0.94-1.08)	0.883	0.97(0.91-1.03)	0.266
	Peak SVG magnitude	1.05(0.97-1.12)	0.218	1.06(0.98-1.14)	0.124	1.06(0.99-1.14)	0.096	1.06(0.98-1.14)	0.142	**1.12(1.04-1.20)**	**0.002**
	Area SVG magnitude	1.03(0.96-1.11)	0.349	1.06(0.98-1.14)	0.130	1.06(0.99-1.15)	0.109	1.05(0.98-1.14)	0.175	**1.11(1.03-1.19)**	**0.004**
	SAIQRST	**1.09(1.02-1.17)**	**0.008**	**1.08(1.01-1.15)**	**0.020**	**1.10(1.03-1.18)**	**0.004**	1.05(0.97-1.13)	0.240	**1.07(1.00-1.15)**	**0.045**
	Bazett's QTc	**1.16(1.10-1.22)#**	**<0.0001**	**1.09(1.02-1.15)#**	**0.006**	**1.09(1.03-1.16)#**	**0.005**	1.06(0.99-1.14)#	0.087	**1.08(1.01-1.15)**	**0.030**
	QRS duration	**1.10(1.03-1.17)**	**0.004**	**1.08(1.01-1.15)**	**0.022**	**1.11(1.03-1.18)**	**0.003**	1.06(0.97-1.16)	0.212	1.00(0.91-1.10)	0.995
	PVC	**1.56(1.03-2.37)**	**0.034**	**1.48(0.98-2.25)**	**0.065**	**1.46(0.96-2.23)**	**0.076**	1.43(0.94-2.19)	0.093	0.86(0.58-1.28)	0.468
	TD-IBBB	0.98(0.47-2.07)	0.960	0.92(0.44-1.94)	0.828	0.93(0.44-1.97)	0.859	0.95(0.45-2.00)	0.891	0.62(0.15-2.50)	0.500
	BBB/IVCD	1.15(0.84-1.58)	0.368	1.12(0.82-1.54)	0.466	1.19(0.87-1.62)	0.286	0.87(0.60-1.28)	0.487	0.79(0.57-1.11)	0.173
	ECG-LVH	**1.65(1.30-2.09)#**	**<0.0001**	**1.39(1.09-1.77)**	**0.008**	**1.43(1.12-1.83)**	**0.004**	1.24(0.93-1.65)	0.138	1.13(0.89-1.44)	0.303

SVG=spatial ventricular gradient; SAIQRST=sum absolute QRST integral; LVH-left ventricular hypertrophy; BBB=bundle branch block; IVCD=interventricular conduction delay; PVC=premature ventricular complex.

Supplemental Table 3. Association of ECG-ventricular substrate with competing other-than-stroke death in cause-specific Cox models.

		Model 1		Model 2		Model 3		Model 4		Model 5	
	Predictor, per 1 SD	HR(95%CI)	P-value	HR(95%CI)	P-value	HR(95%CI)	P-value	HR(95%CI)	P-value	HR(95%CI)	P-value
Other-than-ES death (n=4,877)	Peak QRS-T angle	**1.26(1.23-1.29)**	**<0.0001**	**1.15(1.12-1.18)**	**<0.0001**	**1.13(1.10-1.16)**	**<0.0001**	**1.11(1.08-1.14)**	**<0.0001**	**1.12(1.08-1.15)**	**<0.0001**
	Area QRS-T angle	**1.23(1.20-1.27)**	**<0.0001**	**1.15(1.12-1.19)**	**<0.0001**	**1.13(1.10-1.16)**	**<0.0001**	**1.11(1.08-1.14)**	**<0.0001**	**1.04(1.01-1.07)**	**0.012**
	Peak SVG elevation	1.03(0.996-1.06)&	0.091	1.01(0.98-1.04)	0.424	1.02(0.99-1.05)	0.118	1.00(0.97-1.03)	0.847	**0.90(0.88-0.93)**	**<0.0001**
	Area SVG elevation	**1.04(1.01-1.07)**	**0.004**	1.02(0.99-1.05)	0.169	1.03(0.99-1.06)	0.051	1.01(0.98-1.04)	0.654	**0.95(0.92-0.98)**	**0.001**
	Peak SVG azimuth	**1.15(1.12-1.17)**	**<0.0001**	**1.08(1.05-1.11)**	**<0.0001**	**1.06(1.04-1.09)**	**<0.0001**	**1.05(1.02-1.07)**	**0.001**	**1.07(1.04-1.10)**	**<0.0001**
	Area SVG azimuth	**1.14(1.11-1.17)**	**<0.0001**	**1.08(1.05-1.11)**	**<0.0001**	**1.06(1.03-1.09)**	**<0.0001**	**1.04(1.02-1.07)**	**0.003**	**1.10(1.07-1.13)**	**<0.0001**
	Peak SVG magnitude	**0.91(0.89-0.94)&**	**<0.0001**	**0.95(0.92-0.98)**	**<0.0001**	**0.96(0.94-0.99)&**	**0.020**	**0.95(0.95-0.99)&**	**0.008**	1.01(0.98-1.04)	0.448
	Area SVG magnitude	**0.96(0.93-0.98)**	**0.003**	0.99(0.96-1.02)	0.406	1.005(0.97-1.04)	0.767	1.00(0.97-1.03)	0.969	**1.08(1.04-1.11)**	**<0.0001**
	SAIQRST	**1.07(1.04-1.10)**	**<0.0001**	**1.07(1.04-1.10)**	**<0.0001**	**1.09(1.06-1.13)**	**<0.0001**	**1.06(1.02-1.09)&**	**0.001**	**1.09(1.06-1.12)**	**<0.0001**
	Bazett's QTc	**1.17(1.14-1.19)**	**<0.0001**	**1.09(1.07-1.12)**	**<0.0001**	**1.08(1.05-1.10)**	**<0.0001**	**1.05(1.03-1.09)**	**<0.0001**	**0.96(0.93-0.99)**	**0.012**
	QRS duration	**1.07(1.04-1.10)**	**<0.0001**	**1.05(1.03-1.08)**	**<0.0001**	**1.07(1.04-1.10)**	**<0.0001**	1.00(0.97-1.04)	0.949	**1.07(1.03-1.12)**	**0.001**
	PVC	**1.60(1.36-1.89)**	**<0.0001**	**1.50(1.27-1.78)**	**<0.0001**	**1.42(1.20-1.68)**	**<0.0001**	**1.38(1.17-1.64)**	**<0.0001**	0.97(0.83-1.14)	0.743
	TD-IBBB	0.92(0.68-1.26)	0.618	0.90(0.66-1.23)	0.510	0.89(0.65-1.22)	0.467	0.90(0.66-1.23)	0.507	**0.45(0.21-0.95)**	**0.036**
	BBB/IVCD	**1.23(1.09-1.39)**	**0.001**	**1.16(1.03-1.31)**	**0.014**	**1.18(1.05-1.33)**	**0.008**	0.98(0.84-1.13)	0.760	**0.82(0.71-0.94)**	**0.005**
	ECG-LVH	**1.51(1.36-1.68)**	**<0.0001**	**1.39(1.25-1.55)**	**<0.0001**	**1.38(1.24-1.54)**	**<0.0001**	**1.22(1.08-1.38)**	**0.001**	1.06(0.95-1.18)	0.277
Other-than TS-death (n=4,637)	Peak QRS-T angle	**1.26(1.22-1.29)**	**<0.0001**	**1.15(1.12-1.18)**	**<0.0001**	**1.12(1.10-1.16)**	**<0.0001**	**1.11(1.08-1.14)**	**<0.0001**	**1.12(1.09-1.15)**	**<0.0001**
	Area QRS-T angle	**1.23(1.19-1.26)**	**<0.0001**	**1.15(1.12-1.18)**	**<0.0001**	**1.13(1.09-1.16)**	**<0.0001**	**1.11(1.07-1.14)**	**<0.0001**	**1.05(1.01-1.08)**	**0.005**
	Peak SVG elevation	1.02(0.99-1.05)	0.170	1.01(0.98-1.04)	0.592	1.02(0.99-1.05)	0.227	0.99(0.96-1.03)	0.733	**0.91(0.88-0.94)**	**<0.0001**
	Area SVG elevation	1.03(1.01-1.07)	0.015	1.02(0.99-1.04)	0.295	1.02(0.996-1.05)	0.097	1.01(0.98-1.04)	0.707	**0.95(0.92-0.98)**	**0.001**
	Peak SVG azimuth	**1.15(1.12-1.18)**	**<0.0001**	**1.08(1.05-1.11)**	**<0.0001**	**1.07(1.04-1.10)**	**<0.0001**	**1.05(1.02-1.08)**	**<0.0001**	**1.07(1.05-1.10)**	**<0.0001**
	Area SVG azimuth	**1.15(1.11-1.18)**	**<0.0001**	**1.09(1.06-1.12)**	**<0.0001**	**1.08(1.04-1.10)**	**<0.0001**	**1.05(1.02-1.08)**	**0.001**	**1.11(1.07-1.14)**	**<0.0001**
	Peak SVG magnitude	**0.91(0.88-0.94)**	**<0.0001**	**0.95(0.92-0.98)**	**<0.0001**	**0.96(0.93-0.99)**	**0.021**	**0.96(0.93-0.99)**	**0.008**	1.01(0.98-1.05)	0.388
	Area SVG magnitude	**0.96(0.93-0.99)**	**0.004**	0.99(0.96-1.02)	0.461	1.01(0.97-1.04)	0.696	1.00(0.97-1.03)	0.934	**1.09(1.05-1.12)**	**<0.0001**
	SAIQRST	**1.07(1.04-1.10)**	**<0.0001**	**1.07(1.04-1.11)**	**<0.0001**	**1.10(1.06-1.13)**	**<0.0001**	**1.07(1.03-1.10)**	**<0.0001**	**1.10(1.06-1.13)**	**<0.0001**
	Bazett's QTc	**1.16(1.14-1.19)**	**<0.0001**	**1.09(1.06-1.12)**	**<0.0001**	**1.07(1.04-1.10)**	**<0.0001**	**1.05(1.02-1.08)**	**<0.0001**	**0.97(0.93-0.997)**	**0.043**
	QRS duration	**1.07(1.04-1.10)**	**<0.0001**	**1.05(1.02-1.08)**	**<0.0001**	**1.06(1.03-1.09)**	**<0.0001**	0.99(0.96-1.04)	0.878	**1.09(1.05-1.14)**	**<0.0001**
	PVC	**1.56(1.31-1.85)**	**<0.0001**	**1.45(1.22-1.72)**	**<0.0001**	**1.36(1.14-1.62)**	**0.001**	**1.33(1.11-1.59)**	**0.002**	1.00(0.85-1.17)	0.981
	TD-IBBB	0.92(0.67-1.27)	0.617	0.89(0.65-1.23)	0.493	0.89(0.64-1.22)	0.459	0.89(0.65-1.23)	0.486	0.57(0.29-1.11)	0.099
	BBB/IVCD	**1.22(1.07-1.38)**	**0.002**	**1.15(1.02-1.31)**	**0.025**	**1.15(1.02-1.31)**	**0.025**	0.96(0.82-1.12)	0.595	**0.68(0.58-0.79)**	**<0.0001**
	ECG-LVH	**1.50(1.35-1.67)**	**<0.0001**	**1.37(1.23-1.52)**	**<0.0001**	**1.36(1.22-1.52)**	**<0.0001**	**1.19(1.05-1.36)**	**0.006**	1.11(0.996-1.24)	0.058
Other-than ICH-death (n=4963	Peak QRS-T angle	**1.27(1.24-1.30)**	**<0.0001**	**1.15(1.12-1.18)**	**<0.0001**	**1.13(1.10-1.16)**	**<0.0001**	**1.11(1.08-1.14)**	**<0.0001**	**1.17(1.14-1.20)**	**<0.0001**
	Area QRS-T angle	**1.24(1.21-1.27)**	**<0.0001**	**1.16(1.13-1.19)**	**<0.0001**	**1.13(1.10-1.16)**	**<0.0001**	**1.11(1.08-1.15)**	**<0.0001**	**1.10(1.07-1.13)**	**<0.0001**
	Peak SVG elevation	1.03(0.997-1.06)	0.076	1.01(0.98-1.04)	0.414	1.02(0.99-1.05)	0.139	0.995(0.97-1.03)	0.742	**0.86(0.83-0.89)**	**<0.0001**
	Area SVG elevation	**1.04(1.01-1.07)**	**0.003**	1.02(0.99-1.05)	0.145	1.03(0.999-1.06)	0.051	1.01(0.98-1.03)	0.680	**0.93(0.90-0.95)**	**<0.0001**
	Peak SVG azimuth	**1.15(1.12-1.18)**	**<0.0001**	**1.08(1.05-1.11)**	**<0.0001**	**1.06(1.04-1.09)**	**<0.0001**	**1.05(1.02-1.07)**	**0.001**	**1.11(1.08-1.14)**	**<0.0001**
	Area SVG azimuth	**1.14(1.11-1.17)**	**<0.0001**	**1.08(1.05-1.11)**	**<0.0001**	**1.06(1.03-1.09)**	**<0.0001**	**1.04(1.01-1.07)**	**0.004**	**1.15(1.12-1.18)**	**<0.0001**
	Peak SVG magnitude	**0.92(0.89-0.94)**	**<0.0001**	**0.95(0.92-0.98)**	**0.001**	**0.97(0.94-0.998)**	**0.037**	**0.96(0.93-0.99)**	**0.015**	0.98(0.95-1.01)	0.171

Area SVG magnitude	**0.96(0.93-0.99)**	**0.004**	0.99(0.96-1.02)	0.574	1.01(0.98-1.04)	0.569	1.00(0.97-1.04)	0.805	**1.07(1.04-1.10)**	**<0.0001**
SAIQRST	**1.07(1.04-1.10)**	**<0.0001**	**1.08(1.05-1.11)**	**<0.0001**	**1.10(1.07-1.13)**	**<0.0001**	**1.07(1.03-1.10)**	**<0.0001**	**1.10(1.07-1.13)**	**<0.0001**
Bazett's QTc	**1.17(1.15-1.20)**	**<0.0001**	**1.10(1.07-1.12)**	**<0.0001**	**1.08(1.05-1.10)**	**<0.0001**	**1.06(1.03-1.09)**	**<0.0001**	0.99(0.96-1.02)	0.551
QRS duration	**1.07(1.04-1.10)**	**<0.0001**	**1.06(1.03-1.08)**	**<0.0001**	**1.07(1.04-1.10)**	**<0.0001**	0.998(0.96-1.03)	0.916	**1.06(1.02-1.11)**	**0.005**
PVC	**1.58(1.34-1.87)**	**<0.0001**	**1.49(1.26-1.76)**	**<0.0001**	**1.41(1.19-1.66)**	**<0.0001**	**1.36(1.15-1.61)**	**0.001**	0.98(0.84-1.14)	0.769
TD-IBBB	0.83(0.60-1.15)	0.267	0.81(0.59-1.12)	0.203	0.80(0.58-1.10)	0.171	0.81(0.58-1.12)	0.193	0.62(0.31-1.24)	0.175
BBB/IVCD	**1.24(1.10-1.40)**	**<0.0001**	**1.18(1.04-1.33)**	**0.008**	**1.18(1.05-1.33)**	**0.007**	0.98(0.85-1.13)	0.783	**0.76(0.66-0.87)**	**<0.0001**
ECG-LVH	**1.53(1.38-1.69)**	**<0.0001**	**1.40(1.27-1.55)**	**<0.0001**	**1.38(1.25-1.54)**	**<0.0001**	**1.22(1.08-1.38)**	**0.001**	**1.16(1.04-1.29)**	**0.006**

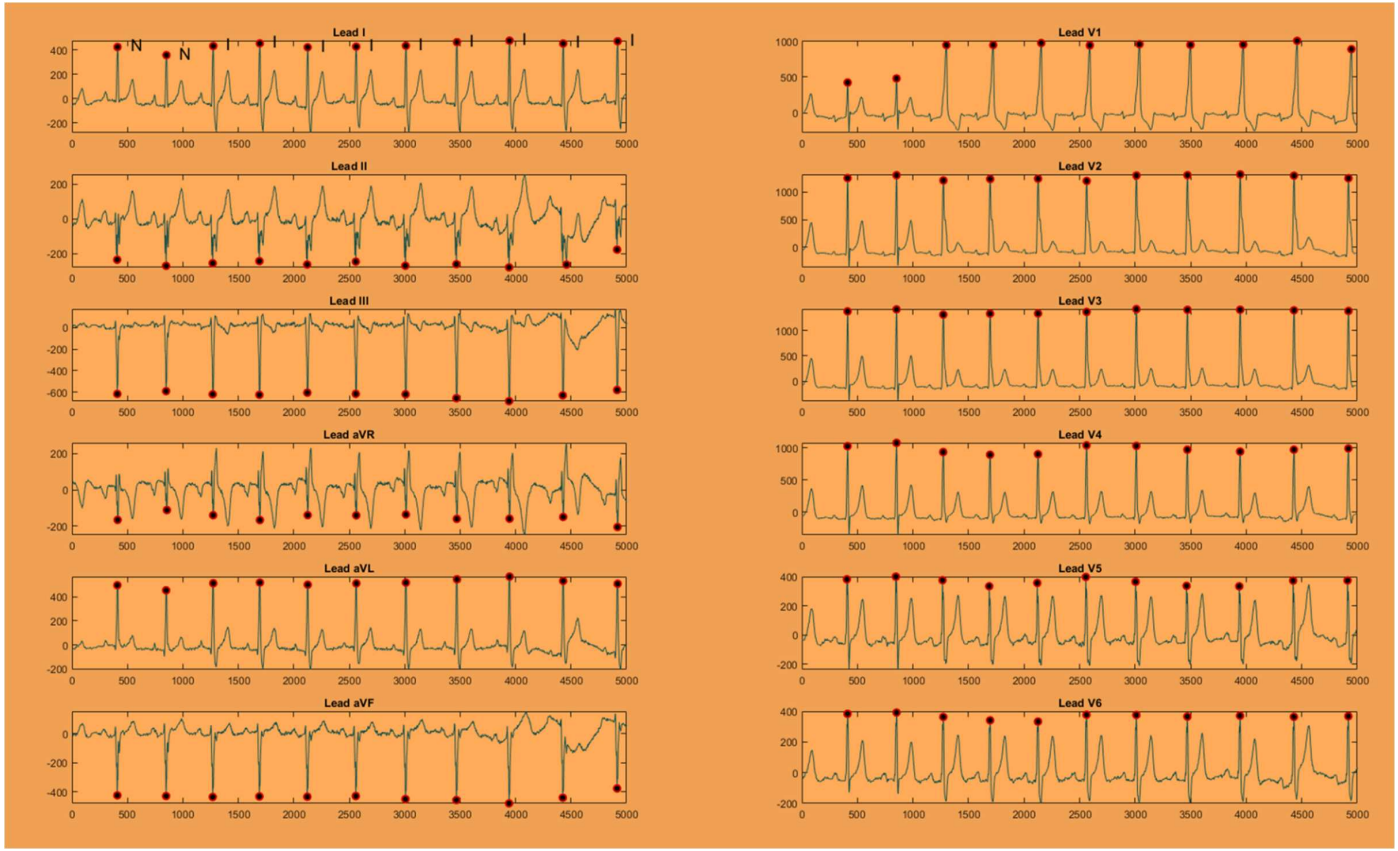
Orange-shade box = statistically significant (P<0.05) difference in the strength of the association between two competing outcomes (incident stroke versus other-than-stroke death). ICH= definite intracerebral hemorrhage; TS=thrombotic stroke; ES=embolic stroke.

Supplemental Table 4. Heterogeneity by sex and age in the association of ECG-ventricular substrate with incident stroke in cause-specific, fully adjusted time-updated Cox model #5.

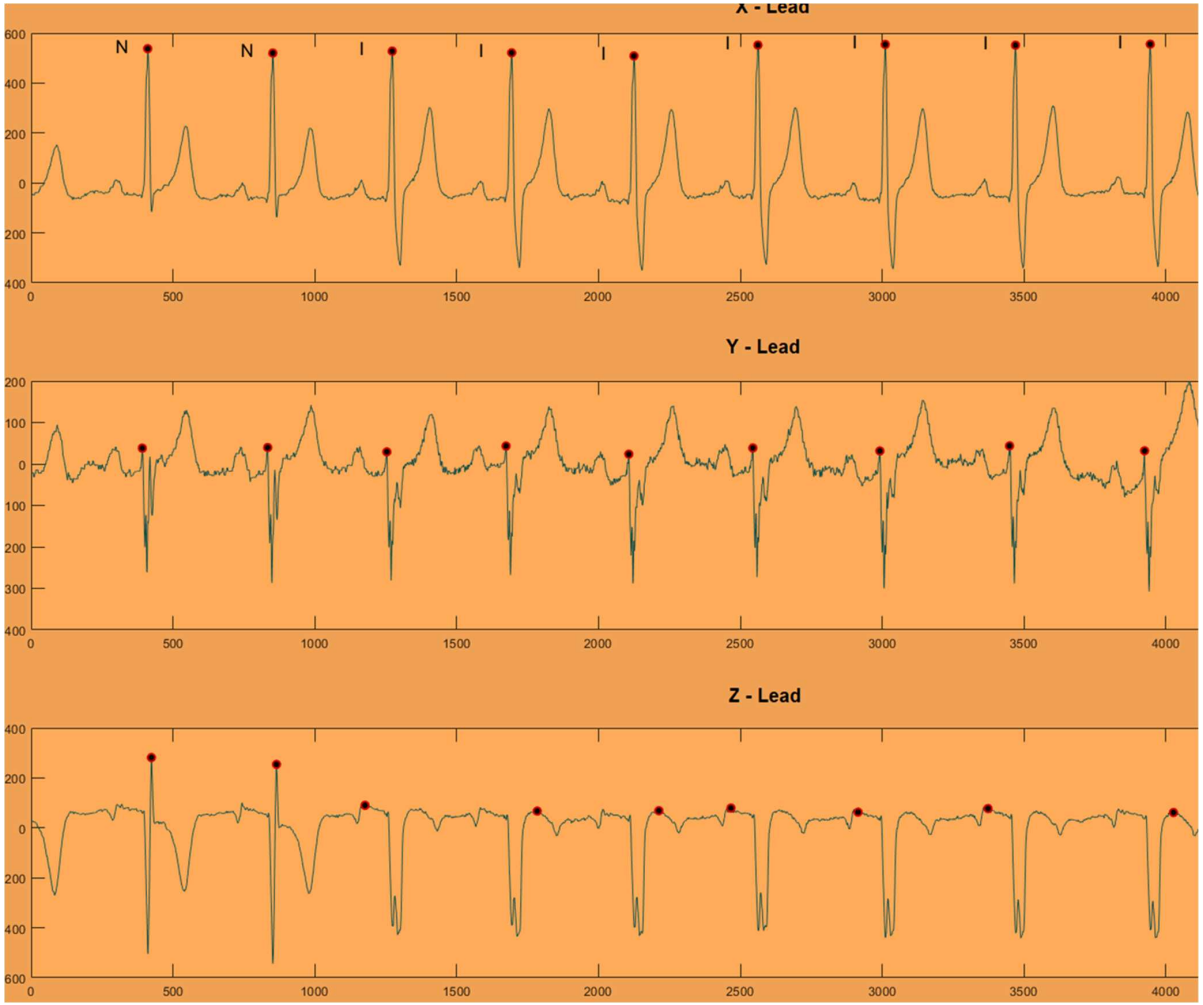
		Men		Women		*P- sex*	*P-age*
	Predictor, per 1 SD	HR(95%CI)	P-value	HR(95%CI)	P-value	*interaction*	*interaction*
Embolic stroke (n=335)	Peak QRS-T angle	1.14(1.00-1.30)	0.048	1.12(0.98-1.28)	0.099	0.821	0.831
	Area QRS-T angle	1.21(1.05-1.41)	0.009	1.10(0.95-1.26)	0.174	0.425	0.829
	Peak SVG elevation	1.08(0.94-1.24)	0.288	0.99(0.85-1.16)	0.918	0.397	0.965
	Area SVG elevation	1.01(0.88-1.16)	0.890	1.01(0.87-1.17)	0.905	0.889	0.901
	Peak SVG azimuth	1.06(0.95-1.19)	0.280	0.96(0.82-1.13)	0.611	0.322	0.643
	Area SVG azimuth	1.03(0.92-1.16)	0.568	1.02(0.89-1.17)	0.793	0.867	0.135
	Peak SVG magnitude	1.21(1.04-1.41)	0.012	1.05(0.92-1.22)	0.460	0.245	0.158
	Area SVG magnitude	1.30(1.12-1.50)	<0.0001	1.08(0.93-1.25)	0.296	0.177	0.159
	SAIQRST	1.13(1.01-1.27)	0.030	1.18(1.01-1.38)	0.038	0.738	0.675
	Bazett's QTc	1.04(0.92-1.18)	0.535	0.95(0.82-1.09)	0.447	0.730	0.921
	QRS duration	0.87(0.73-1.05)	0.140	0.99(0.81-1.22)	0.954	0.477	0.157
	PVC	**0.86(0.46-1.66)**	**0.631**	**2.08(1.16-3.73)**	**0.013**	**0.051**	0.113
	TD-IBBB	2.17(0.30-15.77)	0.445	1.87(0.25-13.76)	0.538	0.946	0.521
	BBB/IVCD	1.00(0.57-1.76)	0.995	0.72(0.36-1.43)	0.350	0.610	0.625
	ECG-LVH	1.65(1.01-2.69)	0.043	1.11(0.71-1.76)	0.632	0.565	0.120
Thrombotic stroke (n=819)	Peak QRS-T angle	1.07(0.98-1.17)	0.127	1.04(0.94-1.14)	0.469	0.771	0.605
	Area QRS-T angle	1.02(0.93-1.13)	0.626	1.00(0.90-1.11)	0.995	0.916	0.793
	Peak SVG elevation	**1.05(0.96-1.15)**	**0.295**	**0.88(0.79-0.99)**	**0.026**	**0.038**	0.825
	Area SVG elevation	1.02(0.93-1.11)	0.707	0.94(0.84-1.04)	0.220	0.278	0.323
	Peak SVG azimuth	0.97(0.89-1.05)	0.426	0.92(0.82-1.03)	0.150	0.644	0.334
	Area SVG azimuth	0.97(0.90-1.05)	0.418	0.99(0.89-1.09)	0.784	0.670	0.060
	Peak SVG magnitude	1.12(1.02-1.24)	0.017	1.12(1.01-1.22)	0.031	0.861	0.639
	Area SVG magnitude	1.10(1.01-1.21)	0.039	1.12(1.01-1.24)	0.027	0.802	0.839
	SAIQRST	1.05(0.97-1.15)	0.177	1.14(1.02-1.28)	0.024	0.128	0.790
	Bazett's QTc	1.09(0.99-1.20)	0.081	1.08(0.99-1.18)	0.102	0.968	0.861
	QRS duration	0.98(0.86-1.10)	0.693	0.98(0.85-1.13)	0.822	0.620	0.520
	PVC	0.90(0.56-1.45)	0.671	0.78(0.41-1.48)	0.477	0.846	0.821
	TD-IBBB	0.62(0.09-4.44)	0.634	0.48(0.07-3.58)	0.477	0.769	0.415
	BBB/IVCD	0.89(0.60-1.33)	0.576	0.81(0.49-1.35)	0.422	0.877	0.237
	ECG-LVH	1.21(0.87-1.68)	0.250	1.10(0.79-1.52)	0.580	0.891	0.895
Hemorrhagic stroke (n=120)	Peak QRS-T angle	0.86(0.62-1.18)	0.349	1.24(0.95-1.61)	0.109	0.327	**0.029**
	Area QRS-T angle	0.77(0.55-1.07)	0.116	1.18(0.89-1.57)	0.252	0.206	**0.026**
	Peak SVG elevation	0.90(0.67-1.21)	0.499	0.91(0.78-1.21)	0.499	0.493	0.175
	Area SVG elevation	0.98(0.73-1.32)	0.889	0.96(0.71-1.30)	0.788	0.554	0.130
	Peak SVG azimuth	0.93(0.70-1.23)	0.620	1.16(0.87-1.54)	0.314	0.607	**0.025**
	Area SVG azimuth	0.98(0.71-1.37)	0.914	1.35(0.97-1.87)	0.076	0.456	**0.042**
	Peak SVG magnitude	1.26(0.96-1.66)	0.089	1.16(0.90-1.49)	0.262	0.339	0.413
	Area SVG magnitude	1.27(0.99-1.63)	0.062	1.23(0.95-1.59)	0.116	0.909	0.553
	SAIQRST	1.04(0.76-1.42)	0.808	1.22(0.85-1.74)	0.288	0.837	0.218
	Bazett's QTc	0.78(0.51-1.20)	0.266	0.94(0.70-1.27)	0.696	0.769	0.468
	QRS duration	0.97(0.61-1.54)	0.902	0.78(0.50-1.22)	0.282	0.333	0.227
	PVC	3.2e(-20)	n/a	2.73(0.83-8.93)	0.097	n/a	0.634
	TD-IBBB	4.63e(-16)	1.00	2.06e(-14)	1.00	n/a	1.00
	BBB/IVCD	0.57(0.11-2.85)	0.494	0.79(0.09-6.63)	0.829	0.842	0.542
	ECG-LVH	**3.06(1.18-7.99)**	**0.022**	**0.46(0.10-2.09)**	**0.315**	**0.030**	0.075

Supplemental Figure 1 A. Representative example of tachycardia-dependent intermittent right bundle branch block on a 12-lead ECG (A) and orthogonal XYZ ECG (B). Normal sinus beats are labeled N. Sinus beats with intermittent bundle branch block beats are labeled I.

A.

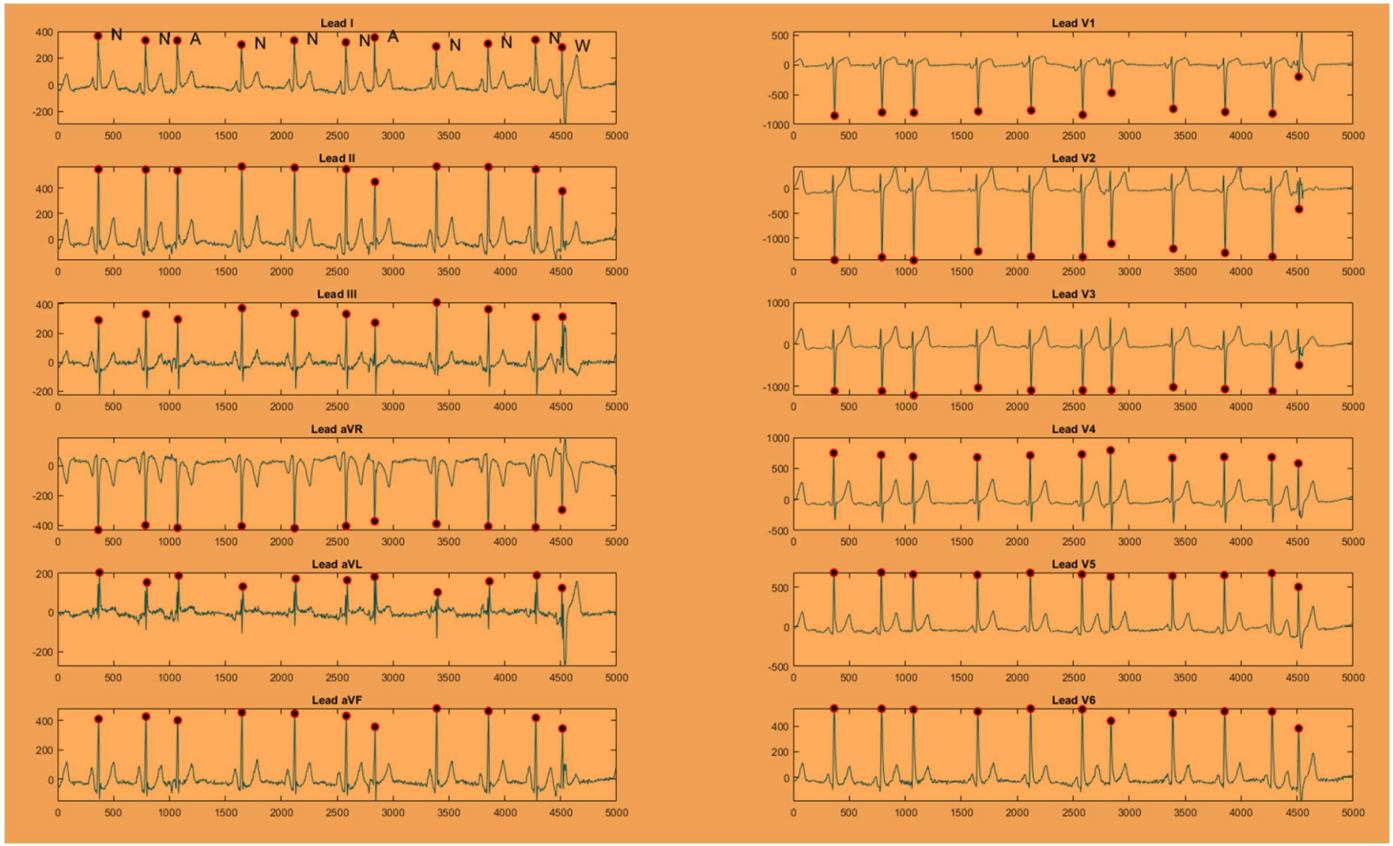


B.

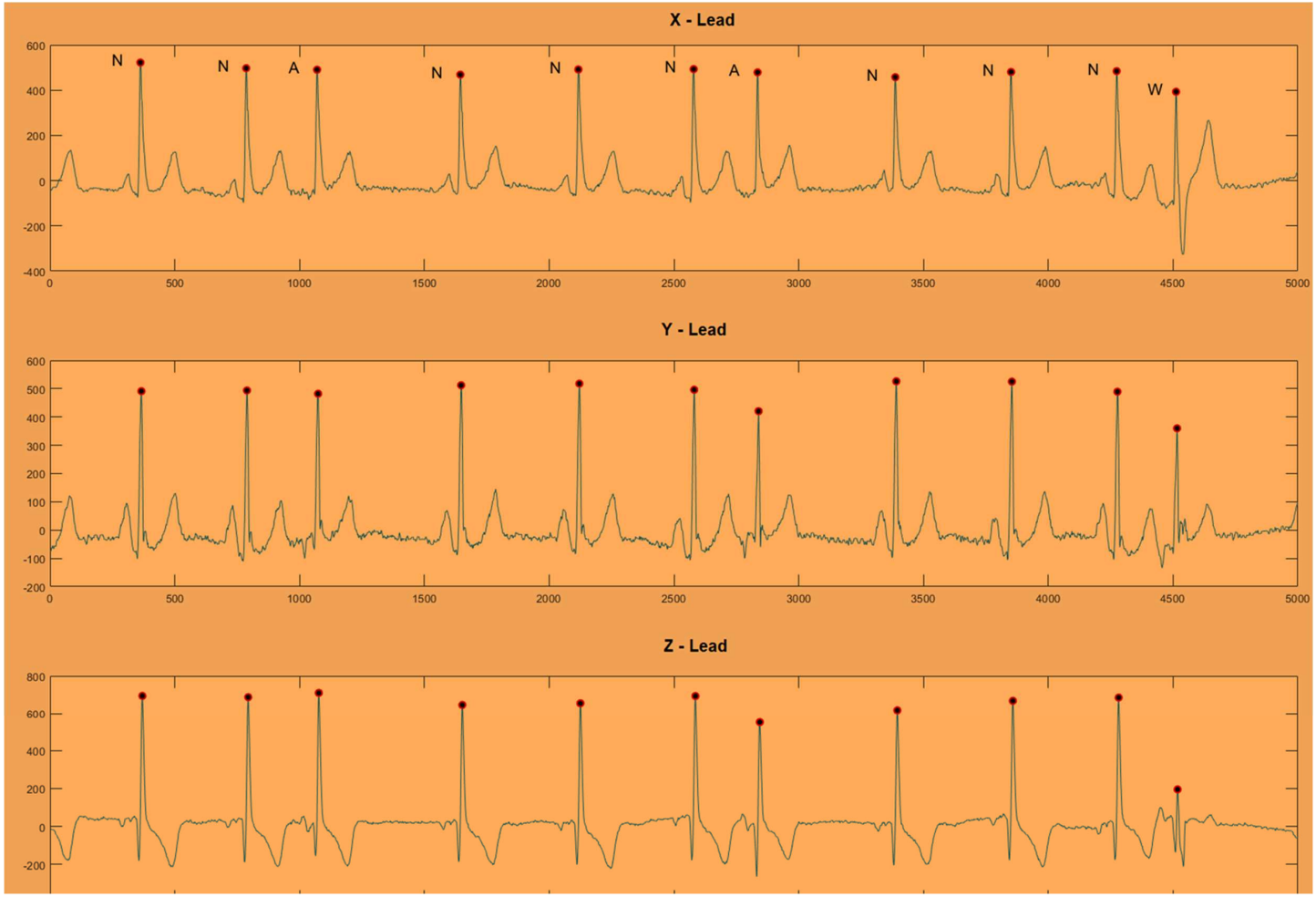


Supplemental Figure 2. A representative example of an aberrant premature atrial complex on a 12-lead ECG (A) and orthogonal XYZ ECG (B). Normal sinus beats are labeled N. Premature atrial complexes with normal ventricular conduction are labeled A. Premature atrial complex with aberrant ventricular conduction (right bundle branch block) is labeled W.

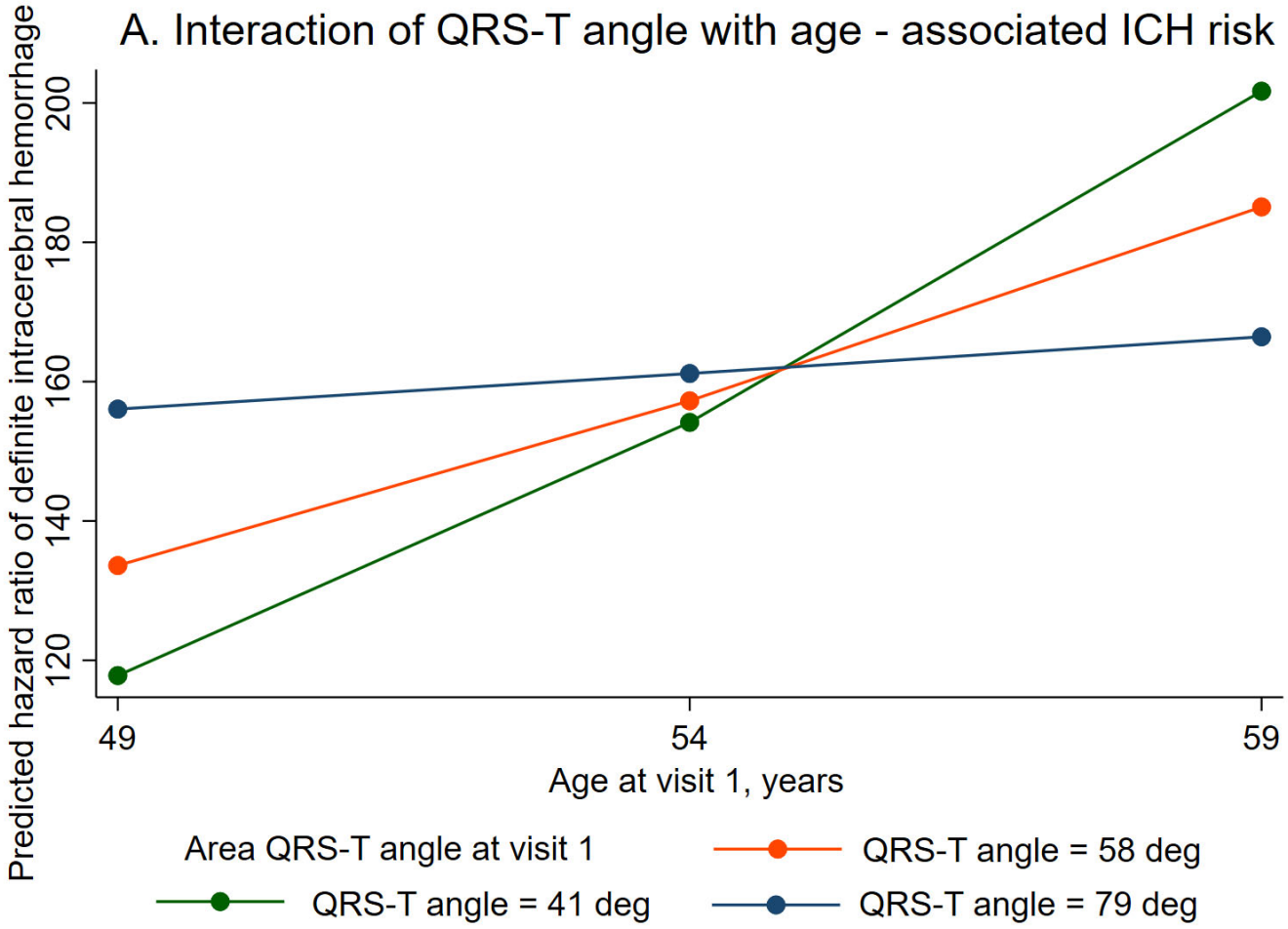
A



B



Supplemental Figure 3. Estimated fully adjusted (model 5) hazard ratio of definite intracerebral hemorrhage in participants across the range of time-updated spatial QRS-T angle and baseline (visit 1) age.



Supplemental Figure 4. Estimated fully adjusted (model 5) hazard ratio of definite intracerebral hemorrhage in participants across the range of time-updated SVG azimuth and baseline (visit 1) age.