

Supplemental Materials

Table S1. Treatment recommendations by the decision aids.

Decision aid	Stroke risk algorithm used	Bleed risk algorithm used	Additional factors	Recommendations
AHA guidelines	CHA ₂ DS ₂ -VASc			Non-OAC if CHA ₂ DS ₂ -VASc = 0; Non-OAC or OAC if CHA ₂ DS ₂ -VASc = 1; OAC if CHA ₂ DS ₂ -VASc ≥ 2
Casciano tool	CHADS ₂	ATRIA	Age and gender	Case specific
CHEST guidelines	CHADS ₂			Non-OAC, if CHADS ₂ = 0; OAC if CHADS ₂ ≥ 1
ESC guidelines	CHA ₂ DS ₂ -VASc	Warrants a caution if HAS-BLED score ≥ 3		Non-OAC if CHA ₂ DS ₂ -VASc = 0; Non-OAC or OAC if CHA ₂ DS ₂ -VASc = 1; OAC if CHA ₂ DS ₂ -VASc ≥ 2
LaHaye tool	CHA ₂ DS ₂ -VASc	HAS-BLED	Treatment threshold, cost threshold and bleed ratio	Case specific

AHA guideline: the 2014 American College of Cardiology/American Heart Association Task Force on Practice Guidelines, Casciano tool: Decision tool developed by Casciano *et al.*, CHEST guidelines: the 2012 American College of Chest Physicians (CHEST) guidelines, ESC guidelines: the 2012 European Society of Cardiology (ESC) guidelines, LaHaye tool: Decision tool developed by LaHaye *et al.*

Table S2. Inclusion and exclusion criteria.

AF Population of Lifelink data		# of Enrollees
Population (January 1st, 2001 through June 30th, 2013)		
Inclusion criteria:		
Primary/secondary AF diagnosis (ICD-9-CM code 427.31) between January 1st, 2002 through March 31th, 2013 (inpatient and outpatient files)		222520
Primary AF diagnosis (ICD-9-CM code 427.31) between January 1st, 2002 through March 31th, 2013 (inpatient, outpatient or ancillary files)		135618
At least 12 months of continuous enrollment in the pre-index period		83643
At least two AF diagnoses in the inpatient or outpatient files		65045
At least one diagnosis of AF at least 30 days after initial diagnosis in the study period		55320
At least one primary diagnosis of AF in the outpatient setting in the study period		55213
At least 18 years of age at the time of initial primary diagnosis of Atrial Fibrillation in the study period		54805
At least 12 months of pharmacy benefits in the pre-index period		39251
At least 3 months of pharmacy benefits in the post-index period		38434
No. of patients after applying the exclusion criteria:		
Patients with perioperative/ transient atrial fibrillation		38434
Patients with inpatient or outpatient diagnosis of mitral stenosis or prosthetic heart valve		36571
Patients with concomitant hyperthyroidism or thyrotoxicosis		35842
Patients with a diagnosis of AF in the pre-index period		19719
Patients with a prescription claims for oral anticoagulants		17031
Patients with a claim for INR/PT test		15603
Patients who have an thromboembolic event, intracranial hemorrhagic or extra-cranial hemorrhagic event within 90 days of their index AF diagnosis		15413
Potential duplicates across two datasets (if the index date, year of birth, gender, patient region and first date of enrolment are same)		15129
Final sample size		15129

Table S3. Stroke risk and bleeding risk scores.

Score	CHADS2 N (%)	CHA2DS2-VASc N (%)	ATRIA N (%)	HAS BLED N (%)
0	3950 (26.11%)	2073 (13.70%)	4281 (28.30%)	2890 (19.10%)
1	5186 (34.28%)	3197 (21.13%)	5465 (36.12%)	4754 (31.42%)
2	3620 (23.93%)	3022 (19.97%)	1202 (7.95%)	4608 (30.46%)
3	1530 (10.11%)	2578 (17.04%)	2033 (13.44%)	2053 (13.57%)
4	591 (3.91%)	2035 (13.45%)	883 (5.84%)	652 (4.31%)
5	202 (1.34%)	1224 (8.09%)	237 (1.57%)	149 (0.98%)
6	50 (0.33%)	628 (4.15%)	545 (3.60%)	21 (0.14%)
7		260 (1.72%)	253 (1.67%)	2 (0.01%)
8		97 (0.64%)	37 (0.24%)	
9		15 (0.1%)	150 (0.99%)	
10			43 (0.28%)	

Table S4. Number of patients concordant with the OAC or non-OAC treatment recommendation by decision aids.

Stroke risk	Bleeding risk	AHA Aggressive	AHA Conservative	Casciano	CHEST	ESC	LaHaye
Low (CHA₂DS₂-VASc score = 0)	Low (HAS-BLED score = 0)	1001 (61.49%)	1001 (61.49%)	1001 (61.49%)	1001 (61.49%)	1001 (61.49%)	1001 (61.49%)
	Medium (HAS-BLED score = 1 or 2)	263 (59.91 %)	263 (59.91%)	263 (59.91 %)	263 (59.91%)	263 (59.91 %)	263 (59.91 %)
	High (HAS-BLED score ≥ 3)	5 (83.33%)	5 (83.33%)	5 (83.33%)	5 (83.33%)	5 (83.33%)	5 (83.33%)
	Sub-total	1269 (61.21%)	1269 (61.21%)	1269 (61.21%)	1269 (61.21%)	1269 (61.21%)	1269 (61.21%)
Medium (CHA₂DS₂-VASc score = 1)	Low (HAS-BLED score = 0)	403 (38.64%)	640 (61.36%)	729 (69.89%)	728 (69.80%)	403 (38.64%)	640 (61.36%)
	Medium (HAS-BLED score = 1 or 2)	1041 (49.74%)	1052 (50.26%)	1101 (52.60%)	1101 (52.60%)	1041 (49.74%)	1052 (50.26%)
	High (HAS-BLED score ≥ 3)	34 (55.74%)	27 (44.26%)	30 (49.18%)	30 (49.18%)	27 (44.26%)	27 (44.26%)
	Sub-total	1478 (46.23%)	1719 (53.77%)	1860 (58.18%)	1859 (58.15%)	1471 (46.01%)	1719 (53.78%)
High (CHA₂DS₂-VASc score ≥ 2)	Low (HAS-BLED score = 0)	129 (58.90%)	129 (58.90%)	147 (67.12%)	152 (69.41%)	129 (58.90%)	129 (58.90%)
	Medium (HAS-BLED score = 1 or 2)	3727 (54.57%)	3727 (54.57%)	3766 (55.14%)	3763 (55.10%)	3727 (54.57%)	3121 (45.70%)
	High (HAS-BLED score ≥ 3)	1530 (54.45%)	1530 (54.45%)	1544 (54.95%)	1527 (54.34%)	1530 (54.45%)	1317 (46.87%)
	Sub-total	5386 (54.63%)	5386 (54.63%)	5457 (55.35%)	5442 (55.20%)	5386 (54.63%)	4567 (46.32%)
Total		8133 (53.76%)	8374 (55.35%)	8586 (56.75%)	8570 (56.65%)	8126 (53.71%)	7555 (49.94%)

Data is presented as n (%) of patients who are consistent with the treatment recommendation (OAC/non-OAC) by each decision aid. AHA Aggressive: AHA guidelines (assuming that guideline recommends OAC at CHA₂DS₂-VASc = 1), AHA Conservative: AHA guidelines (assuming that guideline recommends non-OAC at CHA₂DS₂-VASc = 1), Casciano: Casciano tool, CHEST: CHEST guidelines, ESC: ESC guidelines, LaHaye: LaHaye tool.

Table S5. Percent discordant with OAC/non-OAC recommendations of the decision aids stratified by index year.

Index year	AHA Aggressive, n (%)	AHA Conservative, n (%)	Casciano, n (%)	CHEST, n (%)	ESC, n (%)	LaHaye, n (%)
2002	73 (42.44)	79 (45.93)	62 (36.05)	66 (38.37)	74 (43.02)	89 (51.74)
2003	47 (40.52)	49 (42.24)	49 (42.24)	46 (39.44)	47 (40.52)	70 (60.34)
2004	218 (44.95)	215 (44.33)	205 (42.27)	203 (41.86)	219 (45.15)	250 (51.55)
2005	216 (42.02)	222 (43.19)	210 (40.86)	211 (41.05)	217 (42.22)	287 (55.84)
2006	255 (46.45)	283 (51.55)	268 (48.82)	265 (48.27)	256 (46.63)	287 (52.28)
2007	757 (47.14)	754 (46.95)	713 (44.40)	723 (45.02)	760 (47.32)	813 (50.62)
2008	1207 (46.39)	1147 (44.08)	1137 (43.70)	1123 (43.16)	1210 (46.50)	1294 (49.73)
2009	1348 (47.33)	1305 (45.82)	1225 (43.01)	1247 (43.79)	1345 (47.23)	1435 (50.39)
2010	1170 (46.06)	1113 (43.82)	1074 (42.28)	1094 (43.07)	1165 (45.87)	1240 (48.82)
2011	1012 (47.76)	943 (44.50)	938 (44.27)	928 (43.79)	1016 (47.95)	1024 (48.32)
2012/13	693 (43.92)	645 (40.87)	662 (41.95)	653 (41.38)	694 (43.98)	785 (49.75)
Total	6996 (46.24)	6755 (44.65)	6543 (43.24)	6559 (43.33)	7003 (46.28)	7574 (50.06)

AHA Aggressive: AHA guidelines (assuming that guideline recommends OAC at $\text{CHA}_2\text{DS}_2\text{-VASc} = 1$), AHA Conservative: AHA guidelines (assuming that guideline recommends non-OAC at $\text{CHA}_2\text{DS}_2\text{-VASc} = 1$), Casciano: Casciano tool, CHEST: CHEST guidelines, ESC: ESC guidelines, LaHaye: LaHaye tool.

Table S6. Baseline characteristics of patients who are discordant with OAC recommendations of decision aids.

Characteristics	OAC unexposed (n = 7461)					
	AHA Aggressive recommends OAC, n (%)	AHA Conservative recommends OAC, n (%)	Casciano recommends OAC, n (%)	CHEST recommends OAC, n (%)	ESC recommends OAC, n (%)	LaHaye recommends OAC, n (%)
Total	6192 (82.99)	4473 (59.95)	4319 (57.8)	5035 (67.48)	6145(82.63)	1081 (14.49)
Female	3089 * (49.89)	2450 * (54.77)	1895 * (43.88)	2252 * (44.73)	3089 * (50.11)	783 * (72.43)
Age (18–30)	53 * (0.86)	8 * (0.18)	21 * (0.49)	23 * (0.46)	53 * (0.86)	4 * (0.37)
Age (31–49)	666 * (10.76)	224 * (5.01)	383 * (8.87)	429 * (8.52)	660 * (10.71)	27 * (2.5)
Age (50–64)	2406 * (38.86)	1306 * (29.2)	1549 * (35.86)	1823 * (36.21)	2385 * (38.69)	141 * (13.04)
Age (65–74)	1240 * (20.03)	1108 * (24.77)	802 * (18.57)	933 * (18.53)	1240 * (20.11)	123 * (11.38)
Age (75–84)	1429 * (23.08)	1429 * (31.95)	1218 * (28.2)	1429 * (28.38)	1429 * (23.18)	596 * (55.13)
Age (85 or greater)	398 * (6.43)	398 * (8.9)	346 * (8.01)	398 * (7.9)	398 * (6.46)	190 * (17.58)
CHF	884 * (14.28)	850 * (19)	775 * (17.94)	884 * (17.56)	884 * (14.34)	477 * (44.13)
Diabetes	1265 * (20.43)	1222 * (27.32)	1088 * (25.19)	1265 * (25.12)	1265 * (20.52)	486 * (44.96)
Vascular	2202 * (35.56)	2063 * (46.12)	1601 * (37.07)	1921 * (38.15)	2202 * (35.72)	815 * (75.39)
Anemia	834 * (13.47)	735 * (16.43)	263 * (6.09)	759 * (15.07)	830 * (13.46)	253 * (23.4)
Renal failure	432 * (6.98)	404 * (9.03)	144 * (3.33)	421 * (8.36)	428 * (6.94)	101 * (9.34)
Hypertension	4263 * (68.85)	3531 * (78.94)	3645 * (84.39)	4263 * (84.67)	4236 * (68.71)	842 * (77.89)
Liver failure	232 † (3.75)	182 * (4.07)	157 (3.64)	206 * (4.09)	221 (3.58)	25 (2.31)
Stroke	476 * (7.69)	476 * (10.64)	476 * (11.02)	476 * (9.45)	476 * (7.72)	249 * (23.03)
Bleeding	664 * (10.72)	554 * (12.39)	373 * (8.64)	591 * (11.74)	646 * (10.48)	75 * (6.94)
Alcohol	87 † (1.41)	44 * (0.98)	59 (1.37)	72 (1.43)	82 * (1.33)	1 * (0.09)
Anti-platelets	401 * (6.48)	393 * (8.79)	330 * (7.64)	387 * (7.69)	401 * (6.5)	76 † (7.03)
NASIDs	1048 * (16.93)	772 † (17.26)	714 (16.53)	861 † (17.1)	1031 † (16.72)	79 * (7.31)
GI protectants	1271 * (20.53)	1019 * (22.78)	863 † (19.98)	1100 * (21.85)	1261 * (20.45)	254 * (23.5)
Heparin	23 † (0.37)	18 (0.4)	9 (0.21)	20 (0.4)	23 (0.37)	3 (0.28)
Immunosuppressant	25 (0.4)	16 (0.36)	9 (0.21)	20 (0.4)	24 (0.39)	5 (0.46)
Corticosteroids	820 * (13.24)	612 † (13.68)	543 (12.57)	667 † (13.25)	817 * (13.25)	155 (14.34)
CHA₂DS₂-VASc = 0	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Table S6. Cont.

Characteristics	OAC unexposed (n = 7461)					
	AHA Aggressive recommends OAC, n (%)	AHA Conservative recommends OAC, n (%)	Casciano recommends OAC, n (%)	CHEST recommends OAC, n (%)	ESC recommends OAC, n (%)	LaHaye recommends OAC, n (%)
CHA₂DS₂-VASc = 1	1719 * (27.76)	0 (0)	721 * (16.69)	809 * (16.07)	1692 * (27.45)	0 (0)
CHA₂DS₂-VASc = 2	1420 * (22.93)	1420 * (31.75)	1017 * (23.55)	1194 * (23.71)	1420 * (23.03)	84 * (7.77)
CHA₂DS₂-VASc = 3	1089 * (17.59)	1089 * (24.35)	894 * (20.7)	1068 * (21.21)	1089 * (17.66)	6 * (0.56)
CHA₂DS₂-VASc = 4	868 * (14.02)	868 * (19.41)	714 * (16.53)	868 * (17.24)	868 * (14.08)	116 (10.73)
CHA₂DS₂-VASc = 5	596 * (9.63)	596 * (13.32)	512 * (11.85)	596 * (11.84)	596 * (9.67)	512 * (47.36)
CHA₂DS₂-VASc = 6	298 * (4.81)	298 * (6.66)	263 * (6.09)	298 * (5.92)	298 * (4.83)	205 * (18.96)
CHA₂DS₂-VASc = 7	141 * (2.28)	141 * (3.15)	137 * (3.17)	141 * (2.8)	141 * (2.29)	114 * (10.55)
CHA₂DS₂-VASc = 8	53 * (0.86)	53 * (1.18)	53 * (1.23)	53 * (1.05)	53 * (0.86)	38 * (3.52)
CHA₂DS₂-VASc = 9	8 (0.13)	8 † (0.18)	8 † (0.19)	8 † (0.16)	8 (0.13)	6 * (0.56)
HAS-BLED = 0	730 * (11.79)	90 * (2.01)	99 (2.29)	102 * (2.03)	730 * (11.84)	90 * (8.33)
HAS-BLED = 1	2114 * (34.14)	1306 * (29.2)	1561 * (36.14)	1681 * (33.39)	2114 * (34.29)	138 * (12.77)
HAS-BLED = 2	2041 * (32.96)	1797 * (40.17)	1678 * (38.85)	1951 * (38.75)	2041 * (33.11)	404 * (37.37)
HAS-BLED = 3	924 * (14.92)	898 * (20.08)	707 * (16.37)	918 * (18.23)	898 * (14.57)	392 * (36.26)
HAS-BLED = 4	288 * (4.65)	287 * (6.42)	202 * (4.68)	288 * (5.72)	287 * (4.66)	57 † (5.27)
HAS-BLED = 5	83 * (1.34)	83 * (1.86)	63 * (1.46)	83 * (1.65)	83 * (1.35)	0 (0)
HAS-BLED = 6	10 (0.16)	10 † (0.22)	7 (0.16)	10 (0.2)	10 (0.16)	0 (0)
HAS-BLED = 7	2 (0.03)	2 (0.04)	2 (0.05)	2 (0.04)	2 (0.03)	0 (0)

* Indicates statistically significant difference at $p < 0.001$. † Indicates statistically significant difference at $p < 0.05$. AHA Aggressive: AHA guidelines (assuming that guideline recommends OAC at CHA₂DS₂-VASc = 1), AHA Conservative: AHA guidelines (assuming that guideline recommends non-OAC at CHA₂DS₂-VASc = 1), Casciano: Casciano tool, CHEST: CHEST guidelines, ESC: ESC guidelines, LaHaye: LaHaye tool.

Table S7. Baseline characteristics of patients who are discordant with non-OAC recommendations of the decision aids.

Characteristics	OAC exposed (n = 7668)					
	AHA Aggressive recommends non-OAC, n (%)	AHA Conservative recommends non-OAC, n (%)	Casciano recommends non-OAC, n (%)	CHEST recommends non-OAC, n (%)	ESC recommends non-OAC, n (%)	LaHaye recommends non-OAC, n (%)
Total	804 (10.49)	2282 (29.76)	2224 (29.00)	1524 (19.87)	838 (10.93)	6493 (84.68)
Female	0 (0)	249 * (10.91)	692 * (31.12)	390 * (25.59)	1 * (0.12)	1897 * (29.22)
Age (18–30)	20 * (2.49)	26 * (1.14)	21 * (0.94)	21 * (1.38)	20 * (2.39)	29 † (0.45)
Age (31–49)	188 * (23.38)	409 * (17.92)	296 * (13.31)	250 * (16.4)	194 * (23.15)	558 * (8.59)
Age (50–64)	596 * (74.13)	1668 * (73.09)	1217 * (54.72)	910 * (59.71)	622 * (74.22)	3215 * (49.51)
Age (65–74)	0 (0)	179 * (7.84)	499 (22.44)	343 (22.51)	2 * (0.24)	1578 * (24.3)
Age (75–84)	0 (0)	0 (0)	175 * (7.87)	0 (0)	0 (0)	959 * (14.77)
Age (85 or greater)	0 (0)	0 (0)	16 * (0.72)	0 (0)	0 (0)	154 * (2.37)
CHF	0 (0)	128 * (5.61)	156 * (7.01)	0 (0)	0 (0)	898 * (13.83)
Diabetes	0 (0)	60 * (2.63)	214 * (9.62)	0 (0)	0 (0)	1285 * (19.79)
Vascular	0 (0)	101 * (4.43)	489 * (21.99)	203 * (13.32)	1 * (0.12)	1555 * (23.95)
Anemia	18 * (2.24)	76 * (3.33)	511 * (22.98)	45 * (2.95)	21 * (2.51)	537 * (8.27)
Renal failure	7 * (0.87)	35 * (1.53)	311 * (13.98)	12 * (0.79)	17 * (2.03)	408 (6.28)
Hypertension	0 (0)	761 * (33.35)	615 * (27.65)	0 (0)	30 * (3.58)	4251 * (65.47)
Liver failure	12 † (1.49)	56 (2.45)	70 (3.15)	32 † (2.1)	19 (2.27)	238 * (3.67)
Stroke	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	287 * (4.42)
Bleeding	44 * (5.47)	143 * (6.27)	257 * (11.56)	88 * (5.77)	64 (7.64)	612 * (9.43)
Alcohol	20 † (2.49)	62 * (2.72)	42 (1.89)	27 (1.77)	28 * (3.34)	123 * (1.89)
Anti-platelets	4 * (0.5)	17 * (0.74)	82 * (3.69)	20 * (1.31)	5 * (0.6)	390 † (6.01)
NASIDs	108 * (13.43)	367 * (16.08)	390 (17.54)	237 * (15.55)	135 † (16.11)	1302 * (20.05)
GI protectants	78 * (9.7)	289 * (12.66)	400 † (17.99)	191 * (12.53)	87 * (10.38)	1222 * (18.82)
Heparin	6 (0.75)	16 (0.7)	23 (1.03)	14 (0.92)	6 (0.72)	47 † (0.72)
Immunosuppressant	2 (0.25)	4 (0.18)	12 (0.54)	2 (0.13)	2 (0.24)	22 (0.34)
Corticosteroids	93 † (11.57)	273 * (11.96)	336 (15.11)	203 (13.32)	99† (11.81)	944 (14.54)
CHA₂DS₂-VASc = 0	804 (100)	804 (35.23)	804 (36.15)	804 (52.76)	804 (95.94%)	804 (12.38)

Table S7. Cont.

Characteristics	OAC exposed (n = 7668)					
	AHA Aggressive recommends non-OAC, n (%)	AHA Conservative recommends non-OAC, n (%)	Casciano recommends non-OAC, n (%)	CHEST recommends non- OAC, n (%)	ESC recommends non-OAC, n (%)	LaHaye recommends non-OAC, n (%)
CHA₂DS₂-VASc = 1	0 (0)	1478 * (64.77)	616 * (27.7)	529 * (34.71)	34 * (4.06)	1478 * (22.76)
CHA₂DS₂-VASc = 2	0 (0)	0 (0)	326 * (14.66)	166 * (10.89)	0 (0)	1493 * (22.99)
CHA₂DS₂-VASc = 3	0 (0)	0 (0)	235 * (10.57)	25 * (1.64)	0 (0)	1471 * (22.66)
CHA₂DS₂-VASc = 4	0 (0)	0 (0)	161 * (7.24)	0 (0)	0 (0)	1024 † (15.77)
CHA₂DS₂-VASc = 5	0 (0)	0 (0)	62 * (2.79)	0 (0)	0 (0)	89 * (1.37)
CHA₂DS₂-VASc = 6	0 (0)	0 (0)	20 * (0.9)	0 (0)	0 (0)	109 * (1.68)
CHA₂DS₂-VASc = 7	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	12 * (0.18)
CHA₂DS₂-VASc = 8	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	9 * (0.14)
CHA₂DS₂-VASc = 9	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	4 † (0.06)
HAS-BLED = 0	627 (77.99)	1030 (45.14)	914 (41.10)	907 (59.51)	627 (74.32)	1030 (15.86)
HAS-BLED = 1	160 * (19.9)	926 * (40.58)	602 * (27.07)	495 (32.48)	160 * (19.09)	2237 * (34.45)
HAS-BLED = 2	16 * (1.99)	291 * (12.75)	391 * (17.58)	108 * (7.09)	16 * (1.91)	2147 (33.07)
HAS-BLED = 3	1 * (0.12)	32 * (1.4)	221 * (9.94)	13 * (0.85)	32 * (3.82)	702 * (10.81)
HAS-BLED = 4	0 (0)	3 * (0.13)	84 (3.78)	1 * (0.07)	3 * (0.36)	300 (4.62)
HAS-BLED = 5	0 (0)	0 (0)	12 (0.54)	0 (0)	0 (0)	66 * (1.02)
HAS-BLED = 6	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	11 (0.17)
HAS-BLED = 7	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

* Indicates statistically significant difference at $p < 0.001$. † Indicates statistically significant difference at $p < 0.05$. AHA Aggressive: AHA guidelines (assuming that guideline recommends OAC at CHA₂DS₂-VASc = 1), AHA Conservative: AHA guidelines (assuming that guideline recommends non-OAC at CHA₂DS₂-VASc = 1), Casciano: Casciano tool, CHEST: CHEST guidelines, ESC: ESC guidelines, LaHaye: LaHaye tool.