



## WICH

# Resumption of Oral Anticoagulation after Intracerebral Hemorrhage is Associated with Decreased Mortality and Favorable Functional Outcome

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# Study Design and Methods

- **Meta-analysis of individual-level data from three ICH studies:**
  1. RETRACE study (multi-center), Germany (n = 542)
  2. MGH ICH study (single center), Boston USA (n = 268)
  3. ERICH study (multi-center), USA (n = 217)
- **Inclusion Criteria:**
  1. acute ICH (CT-confirmed)
  2. age 18 years or older
  3. history of non-valvular atrial fibrillation
  4. on OAT with VKA/NOAC
  5. no history of prior ICH (high re-bleeding risk)
- **Statistical methods:**
  - Univariable and multivariable analyses in each study
  - Meta-analysis (random effects) to combine individual studies

# OAT Resumption and Outcomes

## Non-lobar ICH

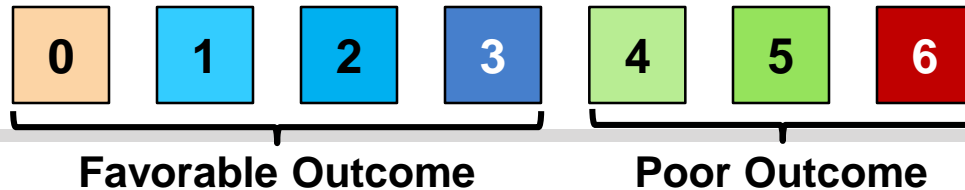
Outcome at 1 Year	Effect of OAT Resumption		
	HR	95% CI	p
Favorable Outcome (mRS 0 -3)	4.41	2.92-6.67	<0.0001
Mortality	0.26	0.17-0.39	<0.0001
All-cause Stroke	0.45	0.28-0.71	<b>0.0008</b>
- Recurrent ICH	1.12	0.94-1.34	0.22
- Ischemic Stroke	0.42	0.22-0.81	<b>0.011</b>

## Lobar ICH

Outcome at 1 Year	Effect of OAT Resumption		
	HR	95% CI	p
Favorable Outcome (mRS 0 -3)	4.15	2.81-6.13	<0.0001
Mortality	0.29	0.20-0.42	<0.0001
All-cause Stroke	0.51	0.32-0.80	<b>0.004</b>
- Recurrent ICH	1.26	0.99-1.60	0.059
- Ischemic Stroke	0.48	0.27-0.85	<b>0.013</b>

# OAT Resumption and mRS at 1 Year from ICH

**Modified Rankin Scale**



# Factors Associated with OAT Resumption

*Several factors potentially associated with OAT resumption included in Propensity Score adjustment*

	Non-lobar ICH			Lobar ICH		
	OAT (n = 179)	No OAT (n = 462)	p	OAT (n = 88)	No OAT (n = 298)	p
Age (in years)	72.3 (9.3)	72.7 (10.2)	0.56	73.5 (10.2)	73.2 (9.9)	0.22
GCS at Presentation	14 (12-15)	14 (12-15)	0.37	14 (12-15)	14 (12-15)	0.27
ICH Volume (in cc)	9.9 (4.7 – 23.1)	10.3 (4.9 – 23.5)	0.65	24.7 (10.6 – 52.1)	25.1 (11.0 – 53.2)	0.076
IVH (count, %)	66 (37)	177 (38)	0.26	27 (30)	87 (29)	0.14
Discharge mRS	4 (3-5)	4 (3-5)	0.39	3 (3-4)	4 (3-5)	<b>0.020</b>
CHADS2	2 (2-3)	2 (2-3)	0.53	2 (2-3)	2 (2-3)	0.32
HAS-BLED	3 (3-4)	3 (3-4)	0.74	3 (3-4)	3 (3-4)	0.38

# Demographics and PMH of Discharge Survivors with Atrial Fibrillation

Characteristic	Black (n= 69)	Hispanic (n= 66)	White (n= 197)	p Value
Age, mean (SD), y	60.8 (13.8)	71.5 (11.3)	74.7 (10.4)	<0.0001
Male, No. (%)	44 (63.8)	39 (59.1)	122 (61.9)	0.852
<b>Medical history, No. (%)</b>				
Hypertension	66 (95.7)	59 (89.4)	172 (87.3)	0.152
Diabetes mellitus	24 (34.8)	33 (50.0)	59 (29.9)	0.013
Hypercholesterolemia	30 (43.5)	32 (48.5)	111 (56.3)	0.148
CAD	19 (27.5)	26 (39.4)	65 (33.0)	0.342
Dementia	6 (8.7)	4 (6.1)	17 (8.6)	0.789
Prior stroke	19 (27.5)	15 (22.7)	48 (24.2)	0.799
Smoking use (ever)	50 (58.0)	28 (42.4)	151 (45.5)	0.065
Pre-morbid disability (mRS > 1)	19 (27.5)	15 (22.7)	61 (31.1)	0.415
<b>Medications, No. (%)</b>				
OAC	19 (27.5)	34 (51.5)	99 (50.3)	0.003
Aspirin	40 (58.0)	37 (56.1)	108 (54.8)	0.901

# Clinical Characteristics of Discharge Survivors with Atrial Fibrillation

Characteristic	Black (n= 69)	Hispanic (n= 66)	White (n= 197)	p Value
Admission Systolic BP, mm Hg	192.1 (36.8)	191.9 (100.7)	169.7 (30.6)	0.002
Admission Diastolic BP, mm Hg	112.2 (23.2)	108.6 (108.7)	95.02 (65.1)	0.168
INR	1.4 (0.9)	2.4 (2.2)	1.9 (1.3)	0.001
Admission GCS, median (SD)	14 (2.9)	14.5 (3.4)	15 (2.6)	0.438
ICH Volume, mean (SD), mL	15.4 (21.7)	18.0 (22.1)	20.2 (23.0)	0.323
≥ 30 mL, No. (%)	11 (16.4)	12 (18.5)	48 (25.0)	0.259
IVH Present, No. (%)	30 (44.8)	24 (36.9)	72 (37.5)	0.538
<b>Location, No. (%)</b>				
Deep	39 (56.5)	24 (36.4)	69 (39.8)	0.006
Lobar	16 (23.3)	24 (36.4)	87 (44.2)	0.008
Brainstem	7 (10.1)	3 (4.5)	4 (2.0)	0.015
Cerebellum	5 (7.2)	11 (16.7)	31 (15.7)	0.177
OAC Resumption at any time	11 (15.9)	13 (19.7)	32 (16.2)	0.789

# OAC Use in Discharge Survivors with Atrial Fibrillation by Race

Characteristic, No. (%)	Black (n= 69)	Hispanic (n= 66)	White (n= 197)	p Value
OAC at Admission	19 (27.5)	34 (51.5)	99 (50.3)	0.003
OAC Resumption by 1 year	11 (15.9)	13 (19.7)	32 (16.2)	0.789



# OAC Resumption in Discharge Survivors with AF by Race

	Black (n= 69)			Hispanic (n= 66)			White (n= 197)		
Characteristic, No. (%)	OAC Resumption			OAC Resumption			OAC Resumption		
	Yes (n=11)	No (n=58)	P Value	Yes (n=13)	No (n=53)	P value	Yes (n=32)	No (n=165)	P value
Age, years, mean (SD)	62.5 (17.1)	60.5 (13.3)	0.658	67.1 (9.0)	72.5 (11.6)	0.085	71.8 (11.9)	75.3 (10.1)	0.082
Male	9 (81.8)	35 (60.3)	0.155	7 (53.8)	32 (60.4)	0.450	22 (68.6)	100 (60.6)	0.254
Hypertension	11 (100)	55 (94.8)	0.589	12 (92.3)	47 (88.7)	0.581	26 (81.3)	146 (88.5)	0.197
Prior Stroke	2 (18.2)	17 (29.2)	0.362	2 (15.4)	13 (24.5)	0.384	9 (28.1)	39 (23.6)	0.367
<b>OAC at admission</b>	<b>5 (45.5)</b>	<b>14 (24.1)</b>	<b>0.140</b>	<b>10 (76.9)</b>	<b>24 (45.3)</b>	<b>0.040</b>	<b>23 (71.9)</b>	<b>76 (46.1)</b>	<b>0.006</b>
Admission GCS, median (IQR)	14 (11-15)	14.5 (13-15)	0.711	15 (14.5-15)	14 (12-15)	0.025	15 (14-15)	15 (13.75-15)	0.044
ICH Volume, mL, mean (SD)	10.5 (13.8)	16.4 (22.9)	0.408	18.6 (25.3)	17.8 (21.5)	0.909	18.0 (18.9)	20.6 (23.7)	0.576
IVH present	5 (45.5)	25 (44.6)	0.608	5 (38.5)	19 (36.5)	0.569	9 (29.0)	3 (39.1)	0.19
Deep location	9 (81.8)	30 (51.7)	0.062	2 (15.4)	22 (41.5)	0.072	13 (40.6)	56 (33.9)	0.297
Lobar location	1 (9.1)	15 (25.9)	0.213	7 (53.8)	13 (32.1)	0.128	12 (37.5)	75 (45.5)	0.264

# Unadjusted Outcomes of Discharge Survivors with Atrial Fibrillation

Clinical Outcomes, No. (%)	Black (n= 54)	Hispanic (n= 52)	White (n= 166)	p Value
6 month mortality	13 (24.1)	13 (25.0)	42 (25.3)	0.984
6 month mRS > 3	27 (50.0)	28 (54.9)	78 (49.0)	0.786
1 year mortality	15 (27.8)	15 (28.8)	52 (31.3)	0.863
1 year mRS > 3	27 (50.9)	27 (52.9)	80 (51.9)	0.979

## Unadjusted Outcomes of Discharge Survivors with Atrial Fibrillation who Resumed OAC at any time

Clinical Outcomes, No. (%)	Black (n= 9)	Hispanic (n= 11)	White (n= 29)	p Value
6 month mortality	1 (11.1)	0 (0.0)	1 (3.4)	0.422
6 month mRS > 3	3 (33.3)	2 (18.2)	9 (31.0)	0.681
1 year mortality	1 (1.11)	0 (0.0)	4 (13.8)	0.435
1 year mRS > 3	3 (33.3)	3 (27.3)	8 (28.6)	0.951

# Summary

- Among discharge survivors with AF, blacks subjects are younger than whites or Hispanics
- Blacks were also less likely to have been prescribed warfarin at the time of their index admission in unadjusted analyses
- Blacks more likely to have deep and less likely to have lobar bleeds than whites or Hispanics
- Despite these differences, OAC resumption does not differ by race/ethnicity
- Clinical outcomes do not differ by race/ethnicity in univariate analysis or after adjustment for ICH score components

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