Update on stroke and TIA

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- UR Medicine Stroke Program receives research funding from:
  - NIH/NINDS
  - AGA Medical
  - Boehringer-Ingelheim
- I have unpaid volunteer positions with:
  - American Heart Association/American Stroke Association
  - American Academy of Neurology

AHA/ASA Guideline

Guidelines for the Early Management of Patients With Acute Ischemic Stroke

A Guideline for Healthcare Professionals From the American Heart Association/American Stroke Association

Stroke. 2013; 44:87-947

AHA/ASA Guideline

2015 American Heart Association/American Stroke Association Focused Update of the 2013 Guidelines for the Early Management of Patients With Acute Ischemic Stroke Regarding Endovascular Treatment

A Guideline for Healthcare Professionals From the American Heart Association/American Stroke Association

Stroke. 2015; 46:3020-3025

AHA/ASA Guideline

Guidelines for the Prevention of Stroke in Patients With Stroke and Transient Ischemic Attack

A Guideline for Healthcare Professionals From the American Heart Association/American Stroke Association

The American Academy of Neurology affirms the value of this guideline as an educational tool for neurologists.

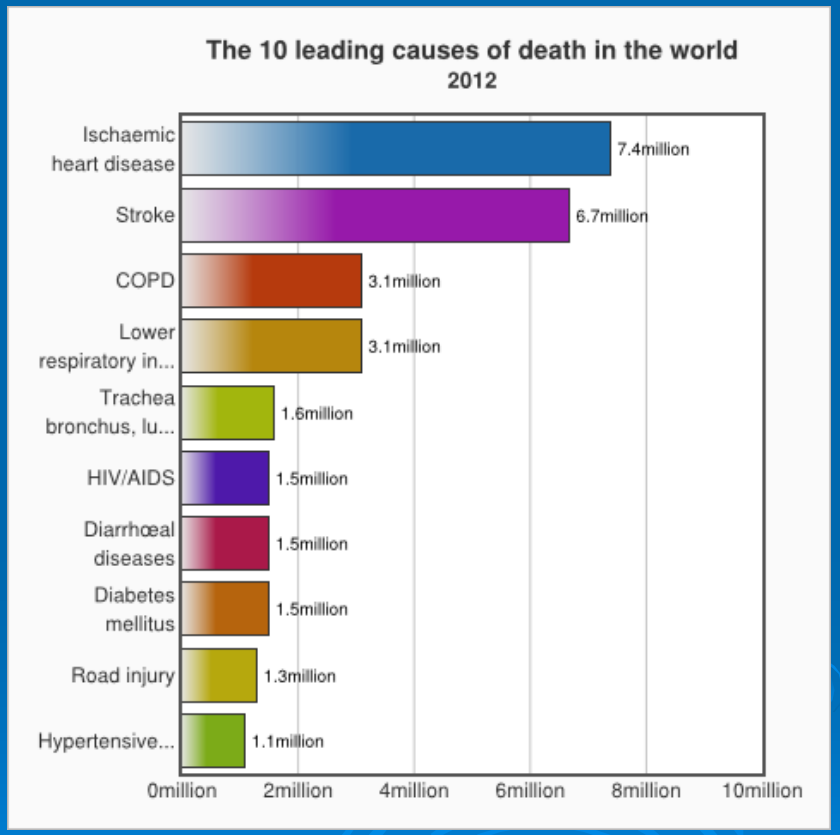
Endorsed by the American Association of Neurological Surgeons and Congress of Neurological Surgeons

Walter N. Kernan, MD, Chair; Bruce Ovbiagele, MD, MSc, MAS, Vice Chair; Henry R. Black, MD; Dawn M. Bravata, MD; Marc I. Chimowitz, MBChB, FAHA; Michael D. Ezekowitz, MBChB, PhD; Margaret C. Fang, MD, MPH; Marc Fisher, MD, FAHA; Karen L. Furie, MD, MPH, FAHA; Donald V. Heck, MD; S. Claiborne (Clay) Johnston, MD, PhD; Scott E. Kasner, MD, FAHA; Steven J. Kittner, MD, MPH, FAHA; Pamela H. Mitchell, PhD, RN, FAHA; Michael W. Rich, MD; DeJuran Richardson, PhD; Lee H. Schwamm, MD, FAHA; John A. Wilson, MD; on behalf of the American Heart Association Stroke Council, Council on Cardiovascular and Stroke Nursing, Council on Clinical Cardiology, and Council on Peripheral Vascular Disease

Stroke. 2014; 45:2160-2236

Scope of the problem

- Stroke is common
  - Roughly 800,000 strokes annually in U.S.
- Stroke is a high morbidity, high mortality, costly disease
  - Fifth leading cause of death in U.S.
  - Second leading cause of death worldwide
  - Leading cause of long-term disability
  - $33 billion in direct and indirect costs



World Health Organization
www.who.int

Scope of the problem

- We can do better at stroke prevention
  - Roughly 25-30% of strokes are recurrent strokes
- There is a huge public education gap regarding stroke
  - Almost 40% of patients cannot name a *single* stroke symptom
  - Less than 10% can name most of the common symptoms
- Not enough patients are getting acute stroke treatments
  - Nationally, 3-5% of patients get treated with IV tPA
  - In our region, 12-15% receive tPA or endovascular stroke therapy

Outline

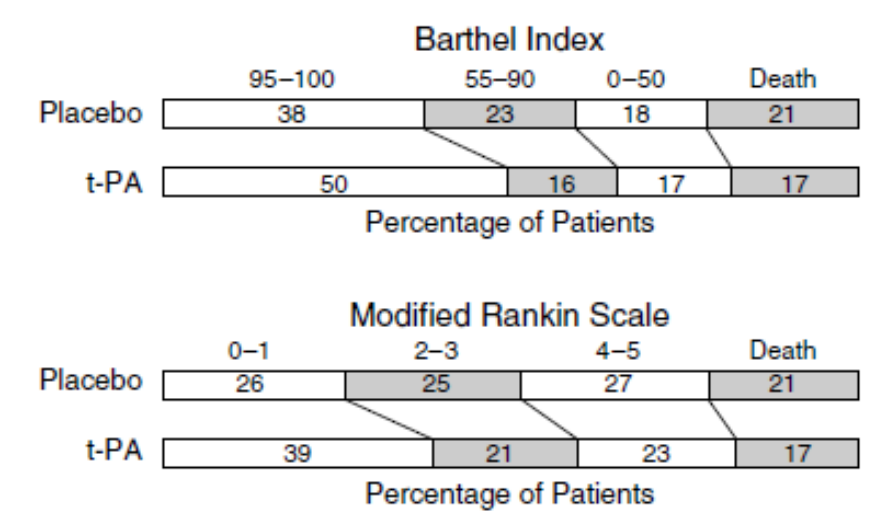
- Acute stroke treatment
  - IV thrombolytics
  - Endovascular stroke therapy
- Secondary stroke prevention
  - Antithrombotic choice
  - Risk factor management
- My strategies
- Questions

IV thrombolysis (Alteplase)

- Tissue plasminogen activator (tPA) remains the only FDA-approved treatment of acute ischemic stroke
  - Approved for use up to 3 hours from symptom onset
  - Supported for use up to 4.5 hours in certain patients (age < 80, without severe stroke, not on any anticoagulant, etc.)

- Based largely on NINDS rtPA trial and ECASS-3 trials:
  - Patients treated with tPA had better chance of achieving functional independence at 90 days
  - Also showed more symptomatic hemorrhages and more deaths from hemorrhage in tPA group
  - Still a strong net clinical benefit favoring tPA treatment

IV thrombolysis



N Engl J Med 1995;333:1581-7

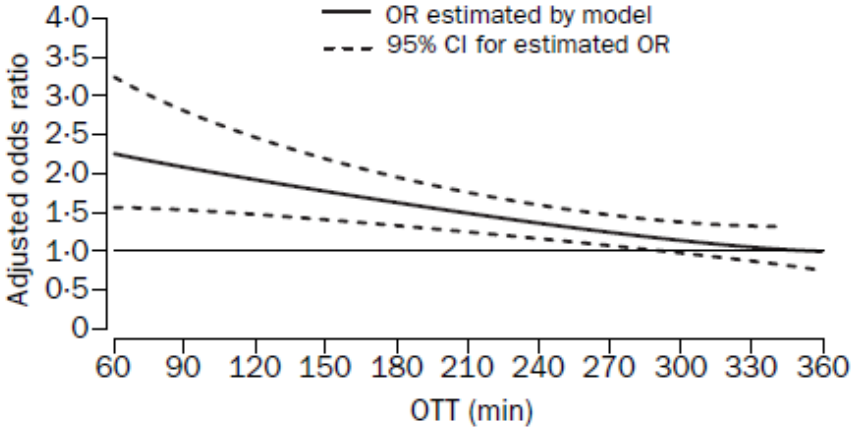


Figure 3: **Model estimating odds ratio for favourable outcome at 3 months in rt-PA-treated patients compared with controls by OTT**

Lancet 2004; 363: 768–74

Endovascular stroke treatment

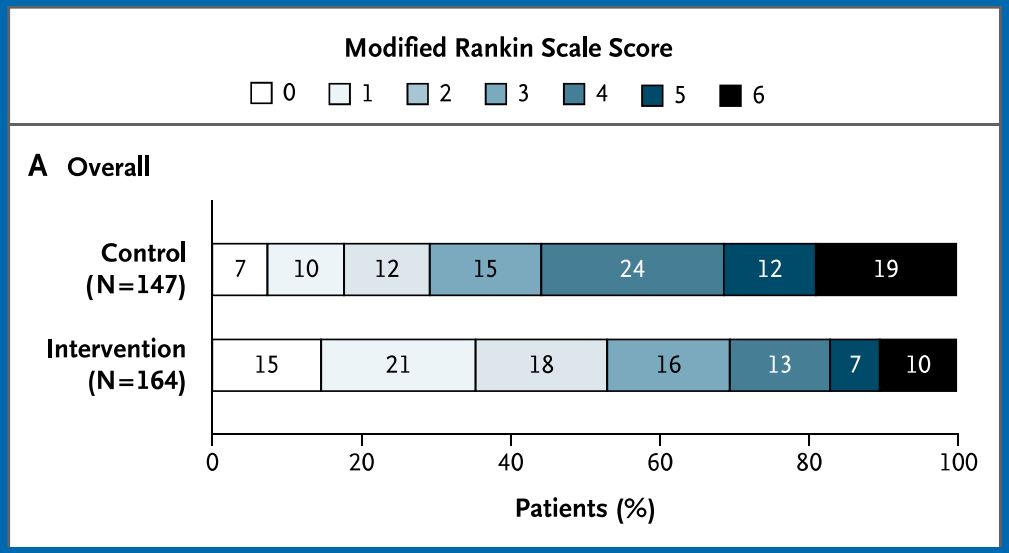
- Generally reserved for patients with severe deficits and symptoms/imaging suggestive of large vessel occlusion
  - Often guided by multimodal CT imaging

- Clot extraction/mechanical thrombectomy
  - Multiple early generation devices (MERCI, Penumbra) received FDA approval as clot removal devices
  - IMS-3, MR RESCUE, SYNTHESIS trials (2013): all negative trials, showing no benefit to endovascular therapy
    - Older devices with lower recanalization rates
    - Slower door-to-puncture times
    - Failure to identify patients at highest likelihood of success

Endovascular stroke treatment

- More recent data has definitively established a role for endovascular therapy in stroke:
  - 5 recently published trials (MR CLEAN, ESCAPE, EXTEND-IA, SWIFT PRIME, REVASCAT), all showing benefits to endovascular therapy over IV tPA alone
    - Large effect sizes – NNT in the 3-7 range
  - Differences with prior endovascular studies:
    - Newer generation devices
    - Much faster door-to-puncture times (90 minutes in SWIFT PRIME)
    - Proven ICA and/or MCA occlusion prior to treatment
    - High rates of IV tPA utilization (~70%)

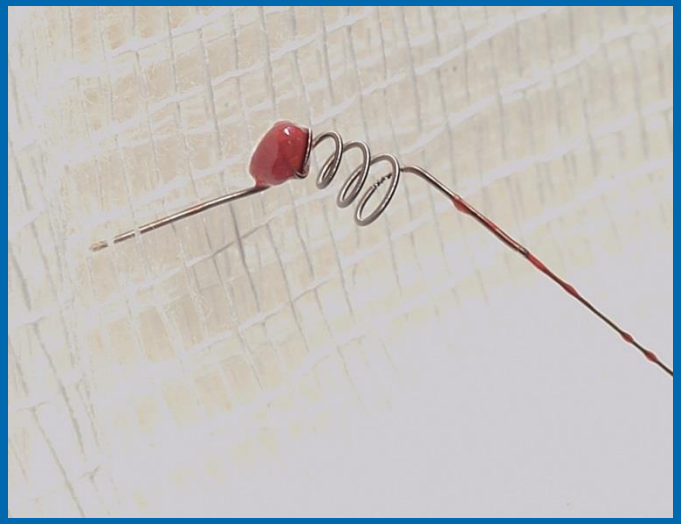
Endovascular stroke treatment



NEJM. 2015;372:1019-1030

Table 2. Primary and Secondary Efficacy Outcomes.

Outcome	Intervention (N=165)	Control (N=150)	Difference (95% CI)*	Effect Variable	Unadjusted Value (95% CI)	Adjusted Value (95% CI)†
Primary outcome: modified Rankin score at 90 days‡				Common odds ratio	2.6 (1.7–3.8)	3.1 (2.0–4.7)
Modified Rankin score of 0–2 at 90 days — no./total no. (%)§	87/164 (53.0)	43/147 (29.3)	23.8 (13.2–34.4)	Rate ratio	1.8 (1.4–2.4)	1.7 (1.3–2.2)
NIHSS score of 0–2 at 90 days — no./total no. (%)	79/153 (51.6)	31/134 (23.1)	28.4 (17.8–39.2)	Rate ratio	2.2 (1.6–3.2)	2.1 (1.5–3.0)
Barthel Index score of 95–100 at 90 days — no./total no. (%)¶	94/163 (57.7)	49/146 (33.6)	24.1 (13.3–34.9)	Rate ratio	1.7 (1.3–2.2)	1.7 (1.3–2.2)
TICI score of 2b or 3 at final angiogram — no./total no. (%)‖	113/156 (72.4)					



Conclusions

- tPA and endovascular therapy are both associated with improved outcomes in patients with acute stroke

- Effects of both treatments are highly influenced by earlier treatment – time is brain!!
  - 1.9 million neurons, 14 billion synapses, and 7.5 miles of nerve fibers are lost with every minute of brain ischemia
  - Patients with possible stroke symptoms should activate 911 and be transported to the nearest stroke center

Secondary stroke prevention

- Relevant diagnostic testing
- Antiplatelet/anticoagulant medication
- Risk factor modification through pharmacotherapy and lifestyle changes
- Patient education

Diagnostic testing – Imaging

- Brain imaging:
  - CT highly sensitive for detection of intracranial hemorrhage
  - MRI with diffusion weighted imaging (DWI) is effective for detecting acute injury due to ischemia
  - CT does not reliably show ischemic changes for the first 6-12 hours – normal head CT at presentation does not rule out stroke
- Evaluation of extracranial circulation:
  - Carotid Doppler, MR angiography, CT angiography
- Evaluation of intracranial circulation:
  - Transcranial Doppler, MR angiography, CT angiography

Diagnostic testing - Cardiac

- Evaluation of cardiac function and potential sources of cardiac emboli:
  - Echocardiography
- Screening for atrial fibrillation:
  - Electrocardiogram (also important to look for concomitant coronary artery disease)
  - Holter monitor
  - Extended cardiac monitoring/implantable loop recorders

Diagnostic testing - Laboratory

- Bloodwork to evaluate for other risk factors:
  - Glucose and glycosylated hemoglobin measurement
  - Serum lipid evaluation
  - In some cases, testing for hypercoagulable states, autoimmune conditions, etc.

- All diagnostic testing should be taken in the context of:
  - Patient's overall prognosis
  - Patient's other co-morbid conditions
  - Test's potential to change management

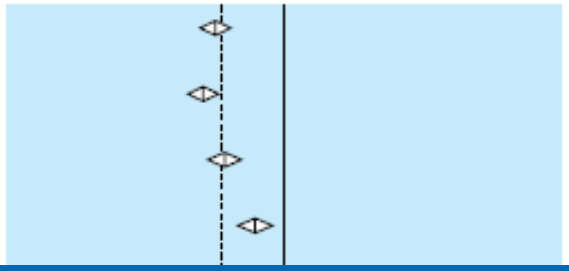
Antiplatelet therapy

- Use of aspirin has been shown to decrease risk of second stroke by ~22%
  - No evidence that one dose of aspirin is superior to another for stroke prevention
  - Shown to decrease risk of early recurrent stroke in patients with acute stroke when given within 48 hours.

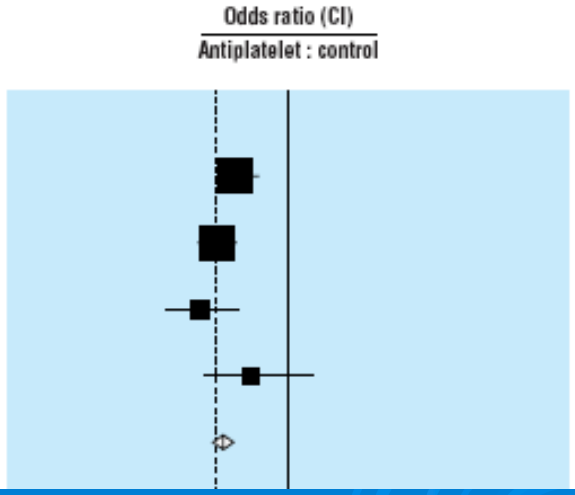
- Clopidogrel and ASA/dipyridamole are other options for antiplatelet therapy
  - High NNT (eg, 196 patients need to be treated with clopidogrel instead of ASA to prevent one vascular event at two years)

Aspirin meta-analysis

Category of trial	No of trials with data	No (%) of vascular events: Allocated antiplatelet	No (%) of vascular events: Adjusted control	Observed-expected	Variance	% Odds reduction (SE)
Previous myocardial infarction	12	1345/9984 (13.5)	1708/10 022 (17.0)	-159.8	567.6	25 (4)
Acute myocardial infarction	15	1007/9658 (10.4)	1370/9644 (14.2)	-181.5	519.2	30 (4)
Previous stroke/transient ischaemic attack	21	2045/11 493 (17.8)	2464/11 527 (21.4)	-152.1	625.8	22 (4)
Acute stroke	7	1670/20 418 (8.2)	1858/20 403 (9.1)	-94.6	795.3	11 (3)



Category of trial	No of trials with data	No (%) of vascular events: Allocated antiplatelet	No (%) of vascular events: Adjusted control	Observed-expected	Variance	% Odds reduction (SE)
Aspirin alone (mg daily):						
500-1500	34	1621/11 215 (14.5)	1930/11 236 (17.2)	-147.1	707.8	19 (3)
160-325	19	1526/13 240 (11.5)	1963/13 273 (14.8)	-219.9	742.6	26 (3)
75-150	12	366/3370 (10.9)	517/3406 (15.2)	-72.0	183.8	32 (6)
<75	3	316/1827 (17.3)	354/1828 (19.4)	-18.9	136.5	13 (8)
Any aspirin*	65	3829/29 652 (12.9)	4764/29 743 (16.0)	-452.3	1717.0	23 (2)



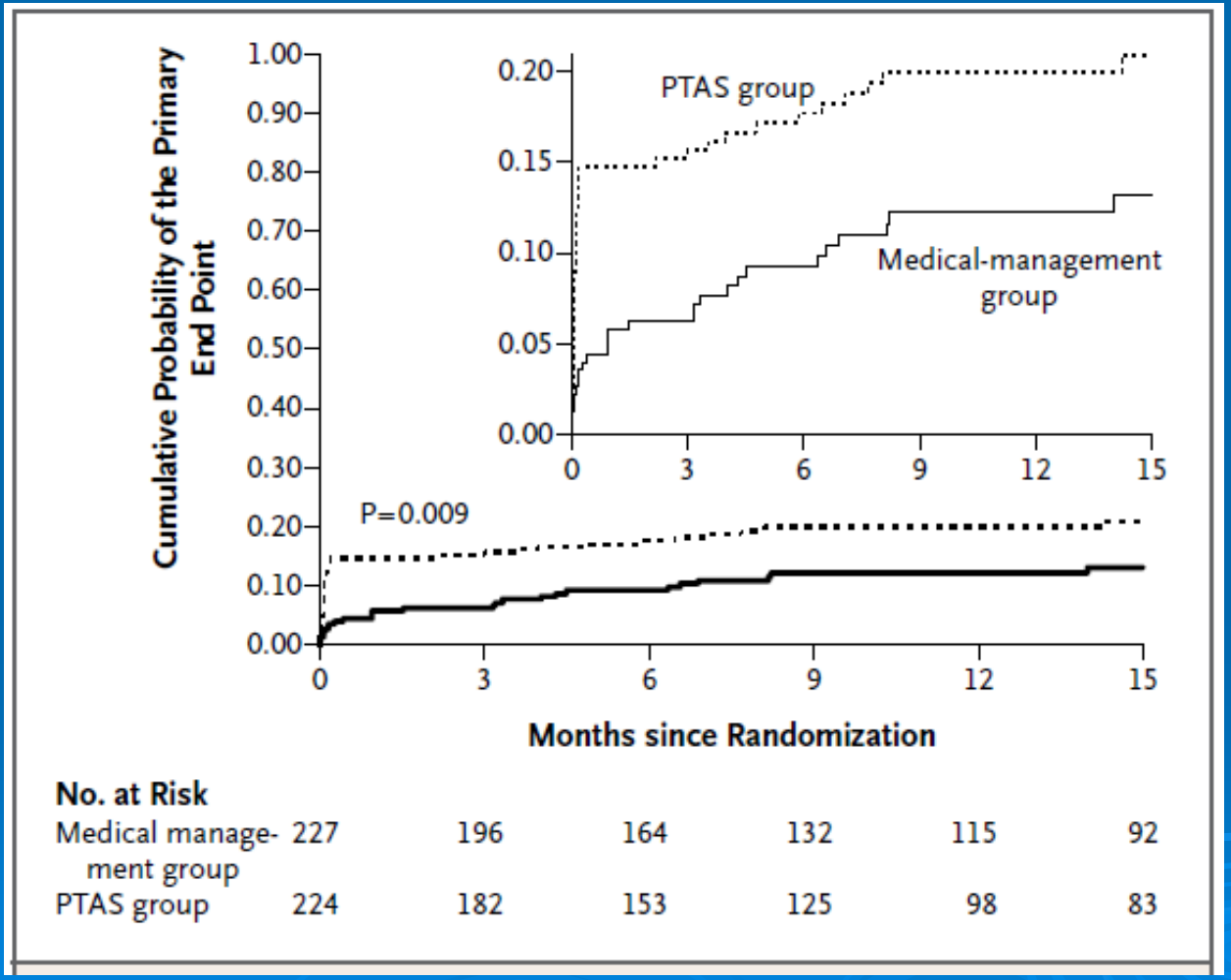
BMJ 2002;324;71-86

Clopidogrel + ASA

- Results of multiple clinical trials have led to guidelines against the *routine* use in patients with cerebrovascular disease alone
  - AHA/ASA Class III recommendation

- Based on SAMMPRIS study, combination often used (plus aggressive medical management) for 3 months following stroke due to symptomatic intracranial atherosclerotic disease
  - More effective and safer than intracranial angioplasty and stenting

SAMMPRIS results



No. at Risk

Medical management group	227	196	164	132	115	92
PTAS group	224	182	153	125	98	83

NEJM 2011; 365:991-1003

Warfarin/novel anticoagulants

- No clear indication for recurrent stroke patients
  - Studies show trend (though not significant) towards lower stroke risk in ASA treated group, with significantly increased risk of hemorrhage in warfarin group

- Except in clear cases of cardioembolic stroke (AF, valvular disease, etc.), the routine use of anticoagulation is not recommended for secondary stroke prevention

Conclusions

- ASA, clopidogrel, and combination ASA/dipyridamole are all considered reasonable options for patients with non-cardioembolic stroke

- Decisions regarding antiplatelet choice should weigh efficacy and risks of each agent, stroke etiology, cost considerations, and other medical issues
  - Still unknown - what is the optimal strategy in patients who have a stroke while taking an antiplatelet agent?

Risk factor modification

- Hypertension
- Hyperlipidemia
- Atrial fibrillation
- Patent foramen ovale
- Other risk factors

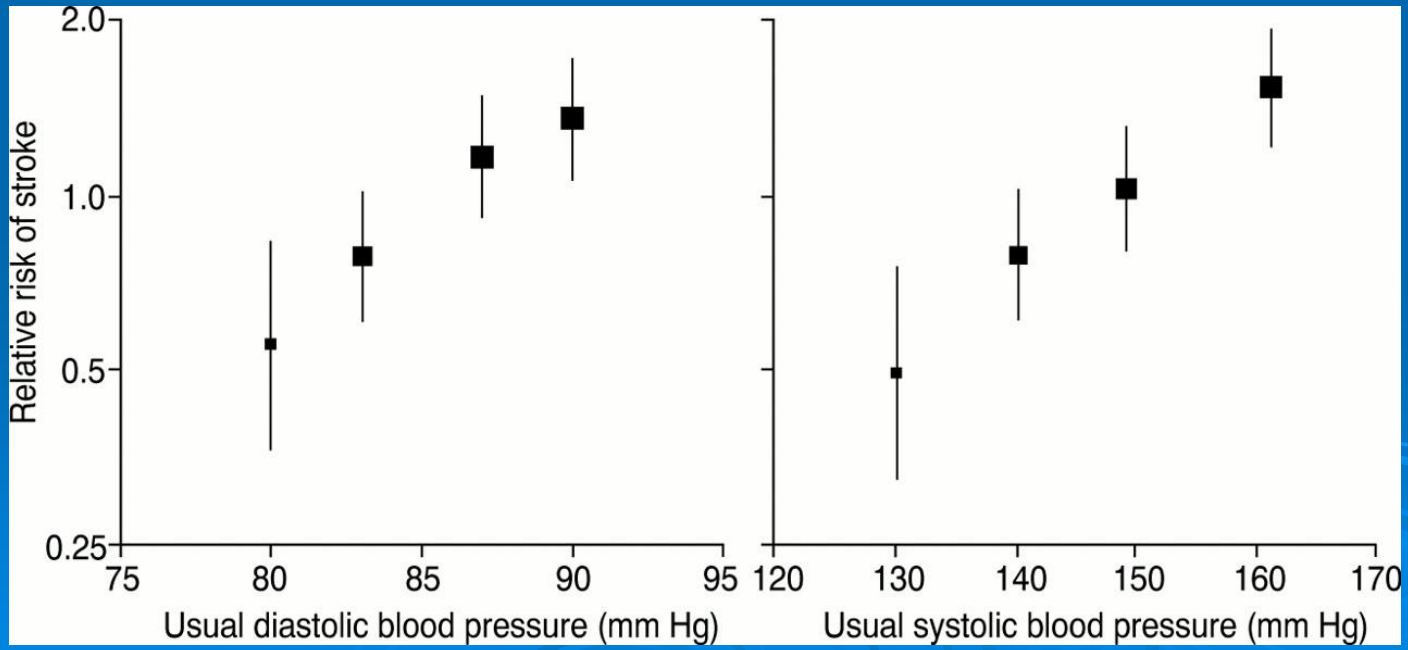
Hypertension

- Hypertension is the leading modifiable risk factor for cerebrovascular disease
  - Both ischemic and hemorrhagic stroke

- The degree of blood pressure reduction appears more important than the class of antihypertensive used
  - HOPE: ACE inhibitor
  - PROGRESS: ACE inhibitor/diuretic
  - ALLHAT: Calcium channel blockers or diuretics

How low can you go?

- Epidemiological studies have shown a linear association between blood pressure and stroke risk
  - ~30% risk reduction for each 10 mm Hg drop in SBP and 5 mm Hg drop in DBP



BMJ 1996;313:147

How low should you go?

- Treatment-related complications are more likely with intensive BP control
  - Syncope, falls, cognitive dysfunction, etc.
  - Possible higher risk of stroke in patients with BP 110 or lower
- Recent BP guidelines advocate not initiating treatment until BP > 150/90 and treat to goal < 140/90
  - Written from primary prevention standpoint; no mention of cerebrovascular disease-specific goals

Conclusions

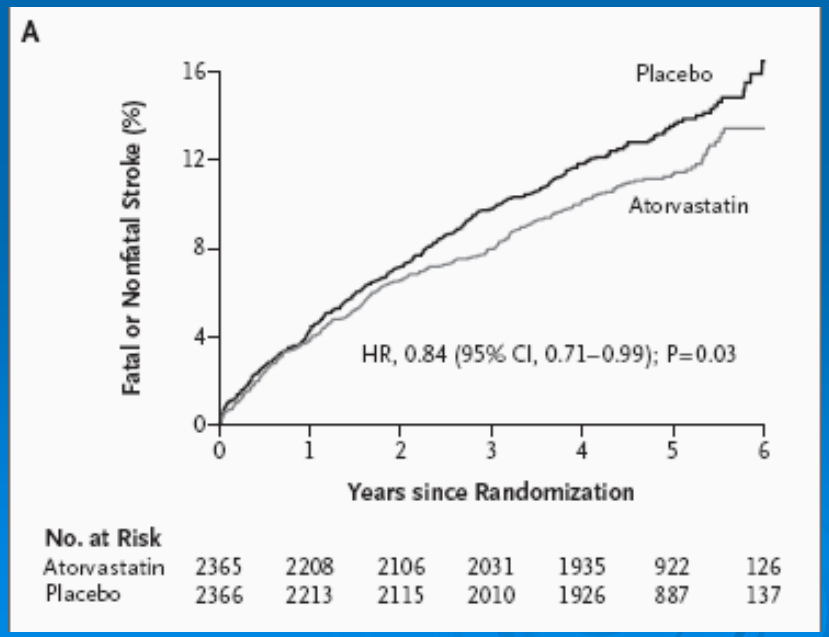
- Outside of the immediate post-stroke period, antihypertensive treatment should be *considered* for all stroke patients, even those without a known history
  - May simply be lifestyle modifications
- Blood pressure goal and antihypertensive regimen should be tailored to the individual patient
  - Minimum goal < 140/90
  - More aggressive target of < 130/80 considered for patients with lacunar stroke or patients with diabetes
  - Choice of agent based on other comorbidities, patient/provider preferences

Hyperlipidemia

- There is a weak epidemiological relationship between elevated cholesterol and stroke risk.
  - Not as clear a relationship as seen with coronary disease
  - Stroke has a variety of different mechanisms, some more closely linked with high cholesterol
- Several studies have investigated the role of lipid-lowering therapy in preventing recurrent stroke.
  - SPARCL (2006)

SPARCL results

Outcome*	Atorvastatin (N=2365)	Placebo (N=2366)	Unadjusted P Value†	Prespecified Adjusted Model‡	
				HR (95% CI)	P Value
	no. (%)				
Primary outcome					
Nonfatal or fatal stroke§	265 (11.2)	311 (13.1)	0.05	0.84 (0.71–0.99)	0.03
Nonfatal stroke	247 (10.4)	280 (11.8)	0.14	0.87 (0.73–1.03)	0.11
Fatal stroke	24 (1.0)	41 (1.7)	0.04	0.57 (0.35–0.95)	0.03



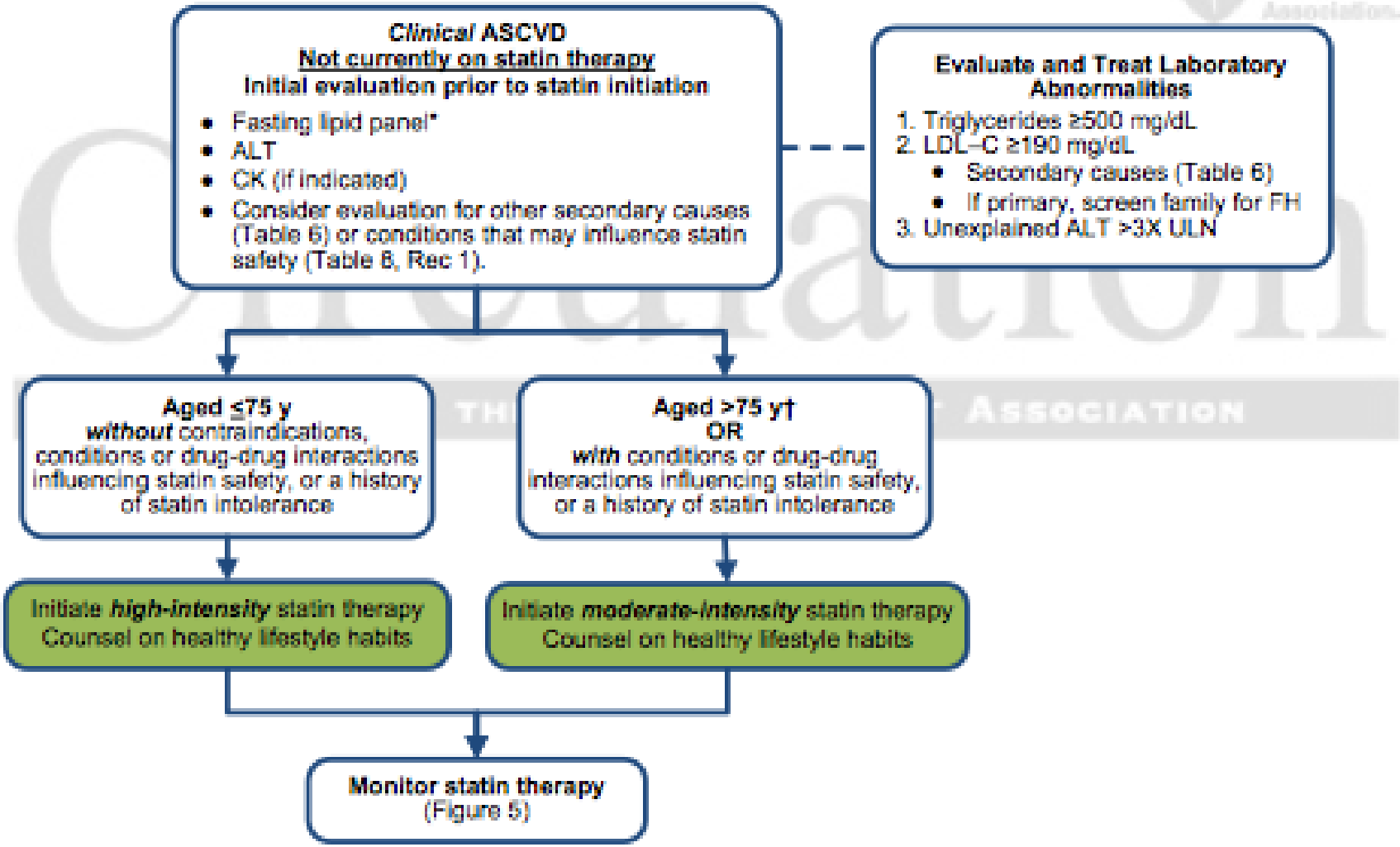
NNT = 53 patients for 5 years with atorvastatin 80 mg daily to prevent one stroke

NEJM 2006;355:549-59

How low should you go?

- More intensive lipid management may have more robust effects at reducing vascular endpoints compared to less intensive regimens
  - 14% RRR in stroke risk in patients intensive LDL reduction compared to less-intensive regimen, though event rates low in both groups
  - High intensity regimens include atorvastatin (40 or 80 mg), rosuvastatin (20 or 40 mg), and simvastatin (80 mg)
- Latest lipid-lowering guidelines do not advocate treating to specific levels

Figure 3. Initiating statin therapy in individuals with clinical ASCVD



Circulation. 2014; 129:S1-45

What about other lipid components?

- No strong evidence behind lowering of triglyceride levels, increasing of HDL levels.
- Can consider niacin, fibrates, etc., on case-by-case basis.

Conclusions

- AHA/ASA recommendations include the following:
  - Patients with stroke/TIA and LDL > 100 should be treated with statins with intensive lipid-lowering effects
  - Lower level of evidence: even patients with LDL < 100 may benefit from treatment with statins with intensive lipid-lowering effects
- My approach: think about stroke mechanism
  - Patients with carotid or other large artery atherosclerosis are more likely to benefit from higher potency regimens
  - Patients with lacunar disease – less of a link with hyperlipidemia, maybe spend your efforts on hypertension…

Atrial fibrillation

- Affects ~5-10% of population > 75 years of age; incidence increases with age
- ~20-25% of strokes in the older adult population are attributable to AF
- Clear benefit to anticoagulation in secondary stroke prevention and in high-risk patients; less robust evidence for primary prevention
  - Must weigh risk of stroke, risks/benefits of treatment

CHA_2DS_2VASc score

- Multiple risk stratification scores can help predict stroke risk (and benefit of anticoagulation) in AF

- CHA_2DS_2VASc score is one option:
  - History of CHF (1 point)
  - History of hypertension (1 point)
  - Age (< 65 0 points, 65-74 1 point, > 75 2 points)
  - History of diabetes (1 point)
  - History of stroke or TIA (2 points)
  - History of vascular disease (1 point)
  - Female sex (1 point)

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  - History of vascular disease (1 point)
  - Female sex (1 point)

CHA_2DS_2VASc score

- Higher CHA_2DS_2VASc scores are associated with higher risks of stroke
- Treatment recommendations:
  - Score = 0: antiplatelet
  - Score = 1: antiplatelet or anticoagulant
  - Score ≥ 2: anticoagulant

CHA_2DS_2-VASc Score	Annual Stroke Risk %
0	0.8
1	2.0
2	3.7
3	5.9
4	9.3
5	15.3
6	19.7
7	21.5
8	22.4
9	23.6

Weighing risks and benefits

- Bleeding risks are often over-estimated
  - Particularly risk from falls
- Can use HASBLED score to estimate risks of anticoagulation in a specific patient
  - 1 point each for hypertension, abnormal kidney or liver fxn, hx of stroke, history of bleeding events, labile INR values, age > 65, alcohol use, ASA/NSAID use

HAS-BLED Score	Bleeding Risk %
0	0.9
1	3.4
2	4.1
3	5.8
4	8.9
5	9.1
≥6	Insufficient data

Antithrombotic options (historical)

- Warfarin is very effective at preventing strokes in patients with AF who have had a stroke or TIA
  - Relative risk reduction ~65-70% at recommended goal INR 2-3
- Aspirin can be used when anticoagulation is contraindicated
  - Relative risk reduction ~20-25% (about the same as stroke prevention in general)
  - The routine addition of aspirin or other antiplatelets is not recommended for stroke prevention purposes

Antithrombotic options (contemporary)

- Four novel oral anticoagulants now approved:
  - Dabigatran (direct thrombin inhibitor)
  - Rivaroxaban, apixaban, edoxaban (factor Xa antagonists)
- Potential benefits over warfarin:
  - No need for routine blood monitoring
  - Limited drug-drug and dietary interactions
  - Comparable/increased stroke prevention benefits with good safety profiles (especially lower risks of ICH)

Novel oral anticoagulants

- Potential concerns compared to warfarin:
  - Costly
  - No widely available method to measure effect
  - Impaired clearance in patients with renal dysfunction and in older adults
  - Disqualifies patients from tPA treatment for stroke
  - No well-established antidote or reversal strategy

Novel oral anticoagulants

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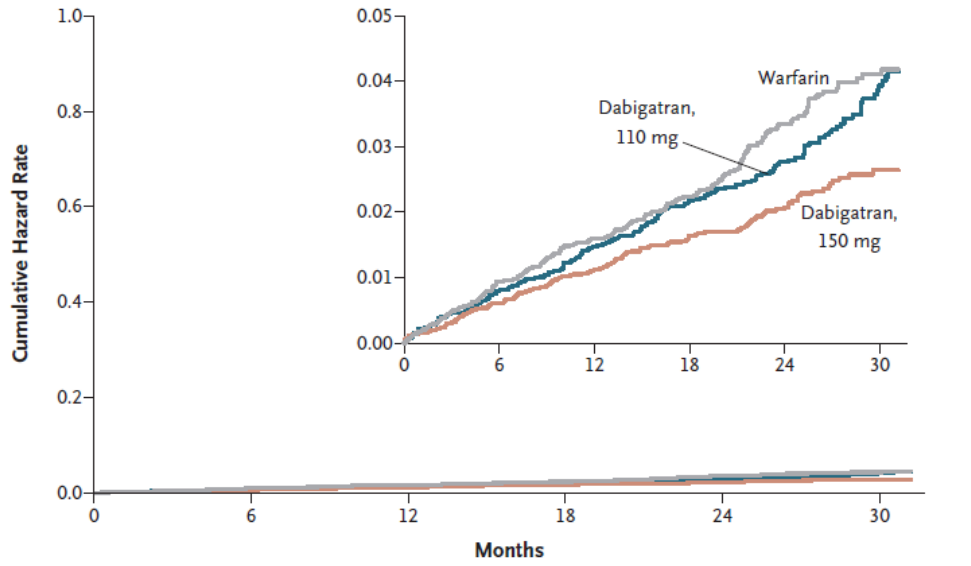
  - Costly
  - No widely available method to measure effect
  - Impaired clearance in patients with renal dysfunction and in older adults
  - Disqualifies patients from tPA treatment for stroke
  - ~~No well-established antidote or reversal strategy~~ (?)
    - Monoclonal antibody to reverse dabigatran (idarucizumab)
    - Factor Xa decoy protein to competitively inhibit Xa antagonists (andexanet)

Novel oral anticoagulants



No. at Risk

Warfarin	6022	5862	5718	4593	2890	1322
Dabigatran, 110 mg	6015	5862	5710	4593	2945	1385
Dabigatran, 150 mg	6076	5939	5779	4682	3044	1429

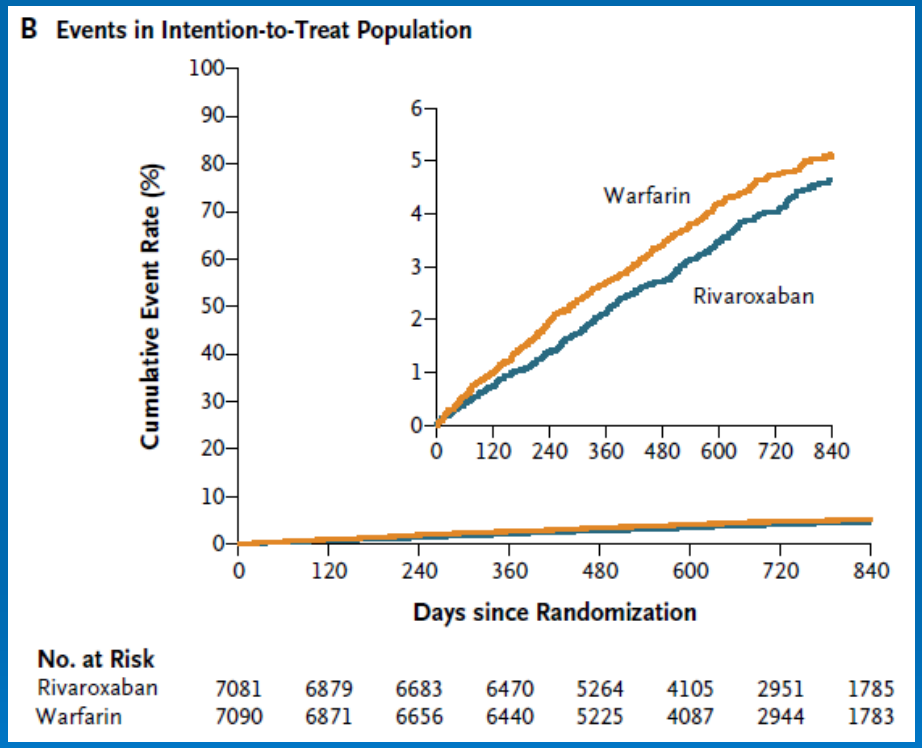
Event rates per year:

Dabigatran 150 mg	1.11%
Warfarin	1.69%

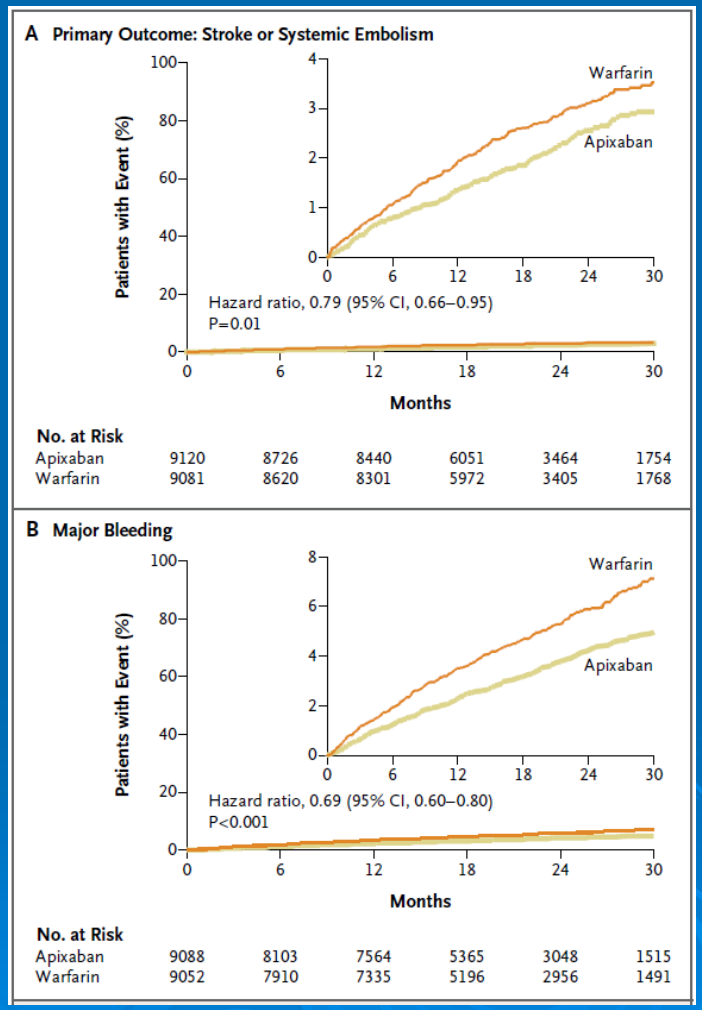
Need to treat ~170 patients with dabigatran instead of warfarin to prevent one stroke or systemic embolism

NEJM 2009; 361:1139-1151

Novel oral anticoagulants



NEJM 2011; 365:883-891

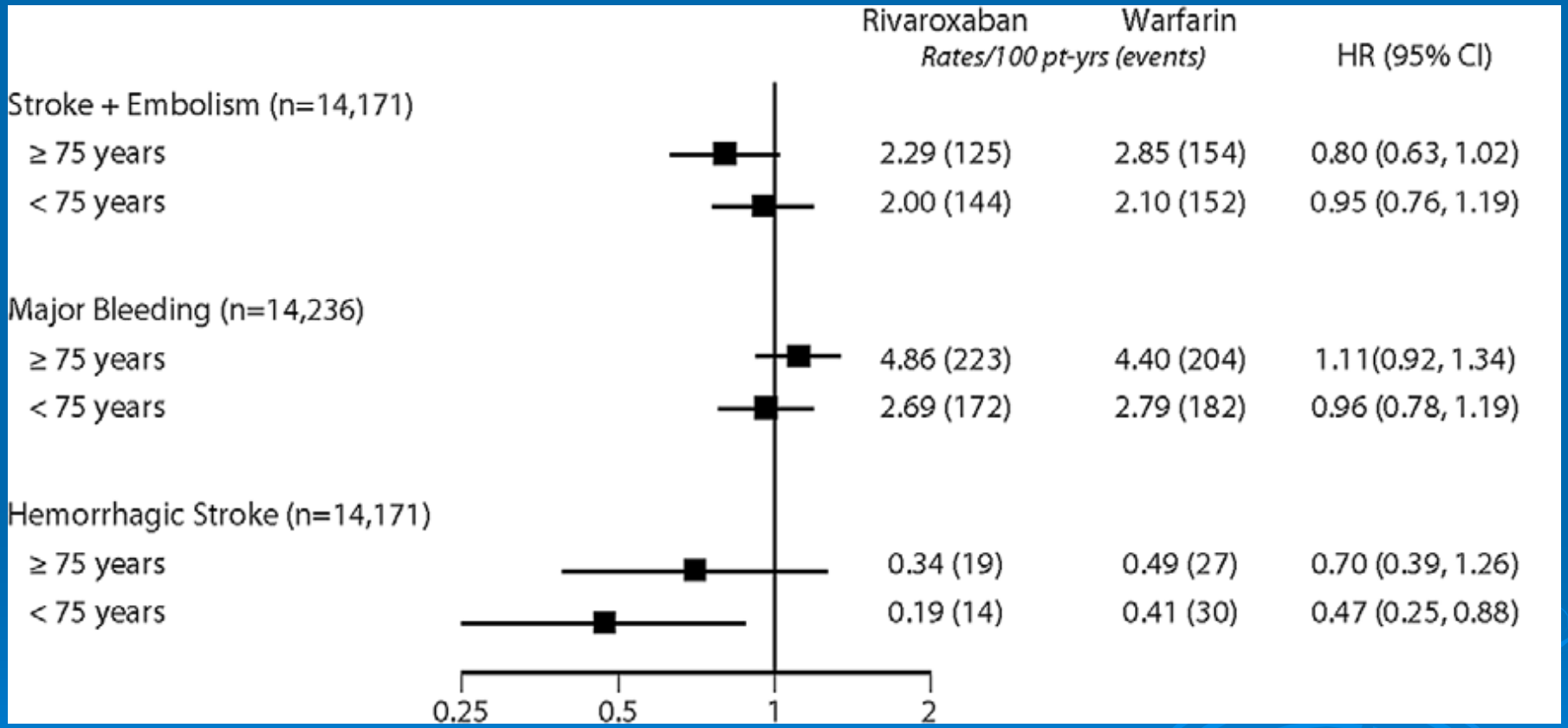


NEJM 2011; 365:981-992

Novel anticoagulants in older adults

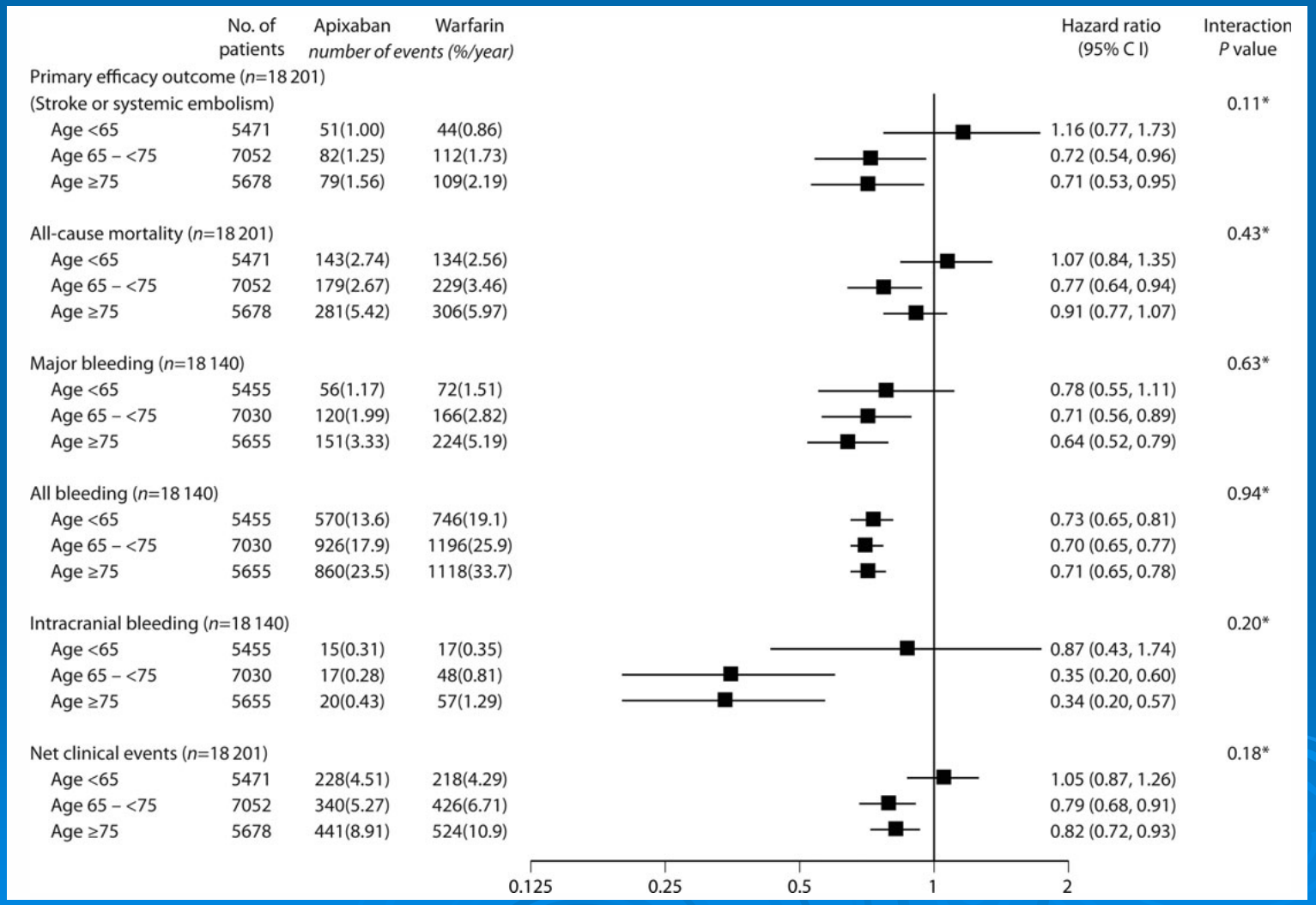
- Limited data on safety of dabigatran in older adults
  - Older adult subgroup not presented in initial trial publication or subsequently
  - Case series NZ: ~2/3 of dabigatran bleeding complications in patients > 80 years old (NEJM. 2012;366:864-866)
- Outcomes for older adults treated with rivaroxaban and apixaban have been reported
  - Stroke risks and bleeding events more common in patients > 75 years old, but efficacy and safety relative to warfarin was comparable in both age groups

Novel anticoagulants in older adults



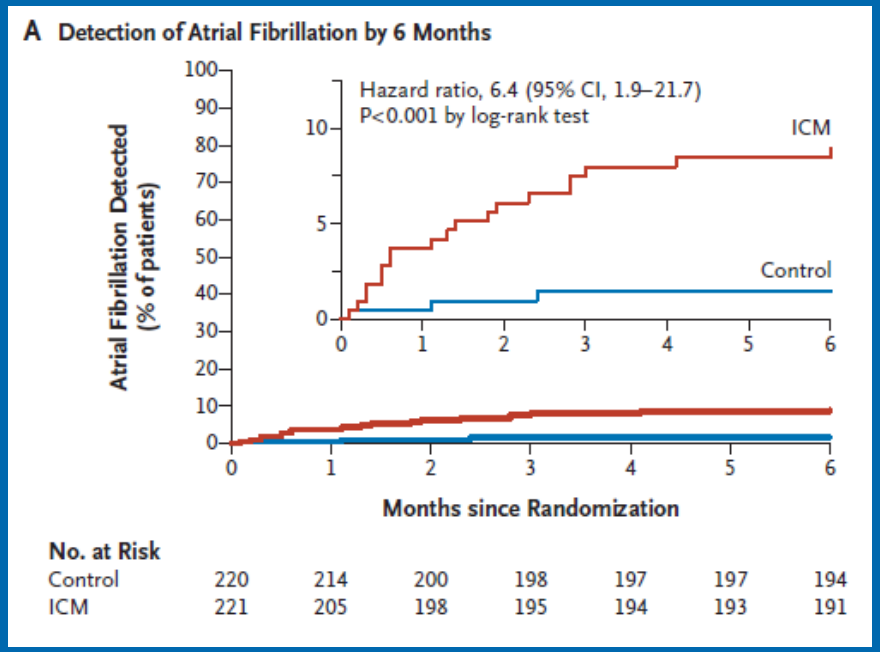
Circulation. 2014; 130:138-146

Novel anticoagulants in older adults



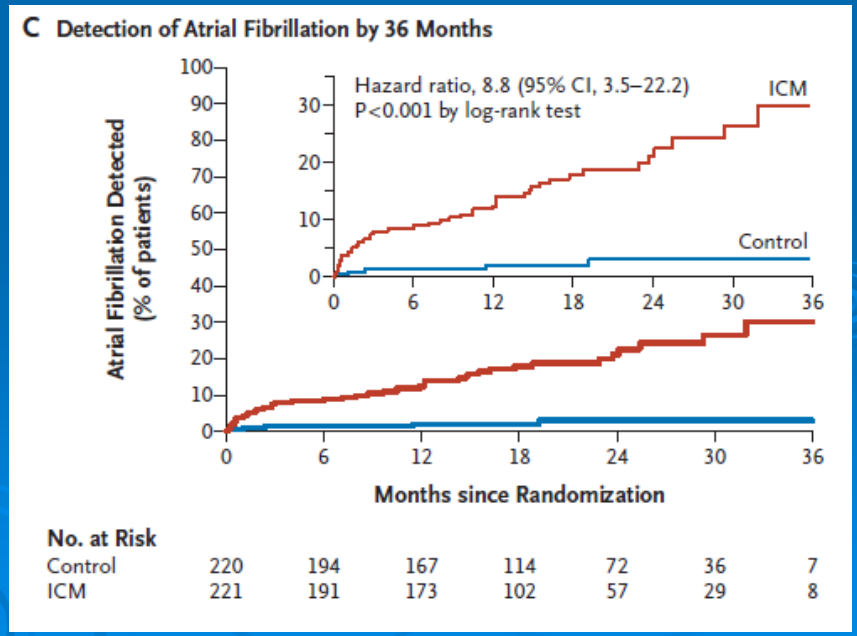
Eur Heart J. 2014; 35:1864-1872

Prolonged cardiac monitoring



Paroxysmal atrial fibrillation can be difficult to detect

- In patients with cryptogenic stroke and other risk factors (e.g., left atrial enlargement on echo), consider longer term ECG monitoring



NEJM. 2014; 370:2478-2486

Conclusions

- Anticoagulation is the standard of care in patients with stroke/TIA and atrial fibrillation
  - With prior stroke/TIA, CHADS2 score automatically ≥ 2
- Options include warfarin (goal INR 2-3), dabigatran, rivaroxaban, and apixaban
  - Choice should depend on patient/provider preference, other medical issues (dabigatran not recommended for use in valvular disease), costs
  - In patients who are well controlled on warfarin, there does not appear to be a major reason to change agents

Patent foramen ovale

- Persistence of fetal communication in the interatrial septum, seen in ~25-30% of adults.
- PFOs are seen more frequently in patients without another obvious stroke mechanism.
  - ~30% in patients with defined stroke mechanism, ~40% in those without stroke mechanism
- Possible mechanisms of PFO leading to stroke include:
  - Paradoxical embolization of deep venous thromboses
  - In-situ thrombus formation at PFO site

Patent foramen ovale

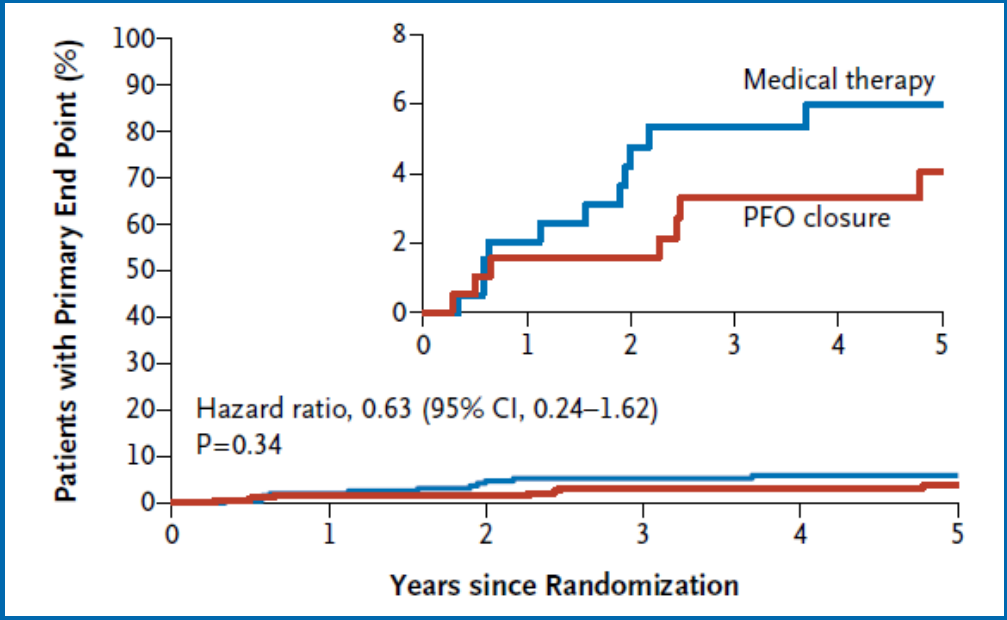
- The presence of PFO does not appear to confer a “high risk” of recurrent stroke.
  - Multiple studies have found no increased risk of stroke compared to cryptogenic stroke patients without PFO
  - Patients were being treated with antiplatelets and/or anticoagulation; no clear evidence that either is preferred
- Patients with PFO should undergo testing for presence of DVT, since this will prompt change to anticoagulation.

What about PFO closure?

- Results of the first large trial (CLOSURE) were released in 2012:
  - PFO closure was feasible (successful in ~90% of subjects)
  - No significant difference in prevention of recurrent strokes or TIAs compared to best medical management

End Point	Closure (N=447)	Medical Therapy (N=462)	Hazard Ratio (95% CI)†‡	P Value†
Intention-to-treat population				
Composite end point — no. (%)	23 (5.5)	29 (6.8)	0.78 (0.45–1.35)	0.37
Stroke — no. (%)	12 (2.9)	13 (3.1)	0.90 (0.41–1.98)	0.79
TIA — no. (%)	13 (3.1)	17 (4.1)	0.75 (0.36–1.55)	0.44

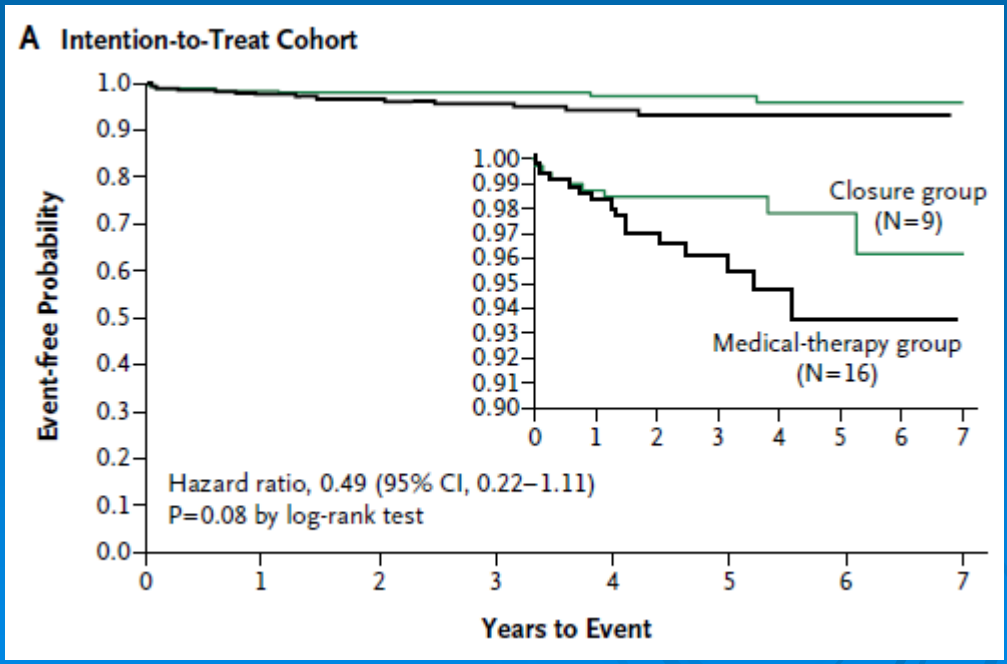
NEJM. 2012; 366:991-999



PC trial

Event rates:

PFO closure	5/204 (3.4%)
Medical therapy	11/210 (5.2%)



RESPECT trial

Event rates:

PFO closure	9/499 (1.8%)
Medical therapy	16/481 (3.3%)

Subgroup analysis suggestive of possible benefit in high-volume shunts, atrial septal aneurysms

Summary of PFO closure data

- AHA/ASA Stroke Prevention guidelines (2014):
  - “For patients with cryptogenic ischemic stroke or TIA and a PFO…, available evidence do not support a benefit for PFO closure.” (Class III, Level of Evidence A)
- Will additional analyses identify some subgroups that might benefit from closure?
  - Possible role for closure in patients with high volume shunting or atrial septal aneurysms?

Other important risk factors

- Carotid artery disease
  - Symptomatic stenosis > 50% = revascularization + intensive medical management
  - Asymptomatic stenosis = intensive medical management unless stenosis > 80% or rapidly progressive
  - In general, CEA preferred over CAS
- Obstructive sleep apnea
  - OSA is an independent risk factor for stroke; risk increases with higher severity OSA
  - OSA is associated with multiple stroke mechanisms (cardioembolism, lacunar disease, etc.)
  - No strong clinical evidence showing that CPAP lowers risk

Other risk factors

- Diabetes
- Tobacco abuse
- Excessive alcohol consumption
- Obesity/physical inactivity
- Cardiomyopathy
- Valvular heart diease
- Aortic atheromatous disease
- Arterial dissection
- Hypercoagulable states

My stroke prevention strategies

- Usual starting antithrombotic agent – ASA 325 mg daily.
  - If atrial fibrillation, intracardiac thrombus, or PFO with DVT found, then change to anticoagulation
  - If intracranial stenosis found, add clopidogrel 75 mg daily for three months, then change to single agent
  - If stroke happens while already taking ASA, change to clopidogrel or Aggrenox, ensure there is not coexistent a-fib or carotid stenosis
- Blood pressure control
  - Target goal SBP 120-130 in younger adults, 120-140 in older adults
  - No clear agent of choice, often start with diuretics

My stroke prevention strategies

- Lipid-lowering strategies
  - High potency, high dose statin for significant intra- or extra-cranial vascular disease (eg, atorvastatin 80 mg daily)
  - Otherwise, lower dose statin targeting LDL below 100
- Prolonged monitoring for atrial fibrillation
  - No other identified stroke mechanism
  - Acute or chronic bilateral, embolic appearing strokes
  - Unilateral embolic appearing stroke with other factors
    - History of palpitations
    - Left atrial enlargement on echo

My stroke prevention strategies

- Other recommendations
  - Hb A1C below 7%
  - Regular brisk activity, 30 minutes most days of the week
  - Low fat, heart healthy, Mediterranean type diets
  - Evaluate for and comply with OSA treatment if indicated
  - Complete abstinence from tobacco
  - Minimize alcohol intake to no more than 1 drink per day

Questions?