In-hospital ischemic stroke

안 성 환
조선의대

In-Hospital Strokes:

- New Strokes during hospitalization.
- 7~15% of all acute stroke.
- Ironically, most studies revealed **greater delays** in the care of in-hospital stroke patients and **worse outcome** compared with out-of-hospital stroke patients.

병원에 있었는데,....

수술 후 뇌경색·마비… '설명의무' 소홀

환자 측, 명백한 의료과실… 수술직후 후유증

법원 측,'설명의무'위반… 손해배상금 지급하라

병원 측 "담당자에게 질의내용 전달… 현재로서는 답변할 수 없다"

최신기사

소뇌경색 제때 발견 못해 사망…병원 책임 60%

송고시간 | 2014-05-21 11:13

춘천지법 "병원이 시의적절한 조처 못해 환자 사망"

(춘천=연합뉴스) 이재현 기자 = 어지러움과 구토 증세로 입원한 환자의 소뇌경색 증상

못해 사망했다면 병원에 책임이 있다는 법원 판결이 나왔다.

춘천지법 제2민사부(이주현 부장판사)는 숨진 60대 환자의 딸 A(40·여)씨 등 가족 4명

원을 상대로 낸 손해배상 청구 소송에서 "병원은 원고에게 모두 5천148만원을 배상하

승소 판결

A씨의 아

증과 구토

성공사례 | 대동맥 스텐트 시행중 혈전으로 인한 뇌경색 사망

원고일부승

내 늘어난 상행 대동맥과 대동맥궁을 스텐트가 들어간 인조혈관으

치환술, 인조혈관삽입술, 벤탈씨 수술을 받았음. 그러나 그 후에

"의사설명의무,모든의료대상아니다" 판결

홍완기 기자 wangi0602@doctorsnews.co.kr | 승인 2019.01.07 17:38

슬관절 수술 후 뇌경색 사망…서울고법 "설명의무 위반 아냐"

"환자 자기결정권 문제되지 않아…의사 책임 물을 수 없어"

In-Hospital Strokes are more severe than community-onset Strokes

Table 4. Odds Ratios for Outcomes Comparing In-Hospital Strokes With Community-Onset Strokes

	Unadjusted OR	*P* Value	Adjusted OR	*P* Value	Sensitivity Analysis Including NIHSS* Adjusted OR	*P* Value
Overall cohort- OR (95% CI)						
Independent ambulation at discharge	0.44 (0.41–0.47)	<0.001	0.42 (0.39–0.45)	<0.001	0.70 (0.64–0.77)	<0.001
Discharge home	0.38 (0.37–0.40)	<0.001	0.37 (0.35–0.39)	<0.001	0.60 (0.55–0.65)	<0.001
In-hospital mortality	3.01(2.85–3.18)	<0.001	2.72 (2.57–2.88)	<0.001	1.51 (1.39–1.64)	<0.001
Patients receiving IV tPA†- OR (95% CI)						
Symptomatic intracranial hemorrhage	0.84 (0.7–1.02)	0.082	0.80 (0.64–1.00)	0.049	0.84 (0.66–1.08)	0.172
Independent ambulation at discharge	0.84 (0.76–0.92)	<0.001	0.89 (0.79–0.99)	0.035	0.84 (0.73–0.96)	0.012
Discharge home	0.75 (0.68–0.83)	<0.001	0.79 (0.70–0.88)	<0.001	0.74 (0.65–0.85)	<0.001
In-hospital mortality	1.28 (1.12–1.47)	<0.001	1.24 (1.06–1.44)	0.007	1.32 (1.10–1.58)	0.002

Generalized estimating equations models adjusted for age, sex, race, history of atrial fibrillation/flutter, previous stroke/transient ischemic attack, coronary artery disease/previous myocardial infarction, carotid stenosis, diabetes mellitus, peripheral vascular disease, hypertension, dyslipidemia, smoking, hospital region, hospital type, annual number of stroke discharges, and number of beds. Interaction terms were not included in the multivariable logistic regression models. CI indicates confidence interval; NIHSS, National Institutes of Health Stroke Scale; OR, odds ratio; and tPA, tissue plasminogen activator.

*Sensitivity analysis adjusting for stroke severity limited to patients with NIHSS recorded (n=541 067 overall).

†Analysis limited to patients receiving IV tPA (n=63 799 overall).

21,349 in-hospital ischemic strokes compared with 928,885 community-onset ischemic strokes

Stroke. 2014;45:231-238

Worse outcome?, Why?

- More likely to have multiple comorbidities.
  - AF, Coronary artery disease, congestive heart failure, diabetes mellitus, and cancer.
- Less likely to be ambulating independently prior to stroke onset.
- May be older……
- Common etiology: Cardiogenic or embolic Stroke

Cardioembolic Pathogenesis

Variables	In-Hospital Stroke	Community-Onset Stroke	*P* Value
Medical history- n responding, missing (%)	21 013 (1.6%)	904 501 (2.6%)	
Previous stroke/TIA	5400 (25.7%)	283 771 (31.4%)	<0.0001
Atrial fibrillation	4824 (23.0%)	166 430 (18.4%)	<0.0001
Prosthetic heart valve	585 (2.8%)	12 806 (1.4%)	<0.0001
Heart failure	2833 (13.5%)	62 077 (6.9%)	<0.0001
Coronary artery disease/previous MI	8110 (38.6%)	242 021 (26.8%)	<0.0001
Carotid stenosis	1422 (6.8%)	37 470 (4.1%)	<0.0001
Diabetes mellitus	7546 (35.9%)	290 080 (32.1%)	<0.0001
Peripheral vascular disease	1735 (8.3%)	43 720 (4.8%)	<0.0001
Hypertension	15 977 (76.0%)	698 343 (77.2%)	<0.0001
Smoker	3149 (15.0%)	174 257 (19.3%)	<0.0001
Dyslipidemia	9136 (43.5%)	374 781 (41.4%)	<0.0001

Stroke. 2014;45:231-238

Table 3. Adjusted Outcomes for Patients With In-Hospital vs Community-Onset Stroke

Variable	In-Hospital vs Community-Onset Stroke, AOR (95% CI)[a]
Time from stroke recognition to neuroimaging <2 h	0.21 (0.18-0.24)
Thrombolysis	0.54 (0.43-0.67)
Alive at discharge	1.03 (0.85-1.23)
Dead or disabled at discharge[b]	1.64 (1.38-1.96)
Disabled at discharge[c]	1.59 (1.32-1.90)
Poststroke mortality, No. (%)	
At 7 d	0.67 (0.53-0.85)
At 30 d	0.89 (0.74-1.07)
At 1 y	0.99 (0.85-1.16)
Discharge destination	
Acute care hospital	1.13 (0.90-1.43)
Home	0.76 (0.64-0.90)
Rehabilitation	1.42 (1.22-1.66)
Long-term care	0.79 (0.53-1.04)

Abbreviation: AOR, adjusted odds ratio.

[a] Adjusted for age, sex, vascular risk factors (hypertension, diabetes mellitus, hyperlipidemia, previous stroke or transient ischemic attack, peripheral vascular disease, atrial fibrillation, and smoking status), other medical comorbidities (dementia, heart failure, cancer, cirrhosis, asthma or chronic obstructive pulmonary disease, renal dialysis, gastrointestinal bleeding, depression, and arthritis), stroke type (ischemic or hemorrhagic), and stroke severity (based on the Canadian Neurological Scale).

[b] Modified Rankin Scale score of 3 to 6.

[c] Modified Rankin Scale score of 3 to 5.

Stroke Recognition?

- Compared with those with community-onset stroke, patients with in-hospital stroke had delays in investigations and treatment.

결국, 뇌졸중 교육?

JAMA Neurol. 2015;72(7):749-755.

Knowing your enemy, first!

Patient location at time of stroke[a]	
Angiography suite	150 (15)
Medical service	314 (32)
Cardiac surgical service	240 (25)
Other surgical service	212 (22)
Undetermined	55 (6)

JAMA Neurol. 2015;72(7):749-755.

- Almost half of in-hospital strokes occurred during admission for surgery and 15% of strokes occurred during angiography.

Stroke. 2017;48:2176-2183

In-Patient Code Stroke

A Quality Improvement Strategy to Overcome Knowledge-to-Action Gaps in Response Time

Charles D. Kassardjian, MD, MSc, FRCPC; Jacqueline D. Willems, MN; Krystyna Skrabka, MA; Rosane Nisenbaum, PhD; Judith Barnaby, MEd; Pawel Kostyrko, MD; Daniel Selchen, MD, FRCPC; Gustavo Saposnik, MD, MSc, FAHA, FRCPC

Table 3. Comparison of Outcome Measures Before and After Intervention

Measure	Preimplementation (n=131)	Postimplementation (n=87)	*P* Value
Primary outcome			
Median time from LSN to initial assessment, min (IQR)	600.0 (109–1460)	160 (35–630)	0.0065
Secondary outcomes			
Median time from LSN to brain imaging, min (IQR)	925.0 (213–1965)	348.5 (128–1587)	0.023
Median time from initial assessment to brain imaging, min (IQR)	135.0 (43–480)	110.0 (51–331)	0.509
Number with complications of poststroke pneumonia or urinary tract infection, n (%)	24 (18.3)	11 (12.6)	0.263
Discharge destination, n (%)			0.681
Death	19 (14.5)	16 (18.6)	
Home	33 (25.2)	22 (25.6)	
Other acute care hospital	7 (5.3)	5 (5.8)	
Long-term care	6 (4.6)	1 (1.2)	
Rehabilitation	66 (50.4)	42 (48.8)	
Acute care interventions, n (%)			
IV thrombolysis	9 (6.9)	3 (3.5)	0.370
Endovascular procedure	2 (1.5)	0 (0)	NA

IQR values are given as 25th and 75th quartiles. IQR indicates interquartile range; and LSN, last seen normal.

Common Problems in In-Hospital Stroke.

- IV tPA? Mechanical Thrombectomy?
- Perioperative stroke management.

Comparison of Short-term Outcomes of Thrombolysis for In-Hospital Stroke and Out-of-Hospital Stroke in United States

Yogesh Moradiya, MD; Steven R. Levine, MD

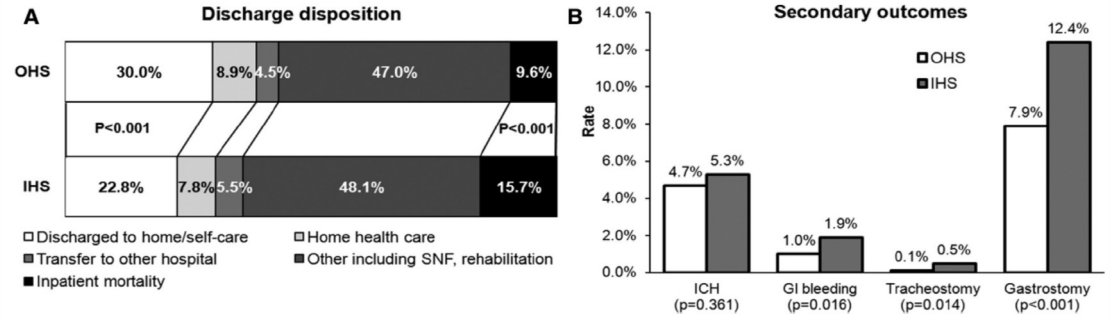

Figure 2. Comparison of outcomes between thrombolysed in-hospital stroke and out-of-hospital stroke. GI indicates gastrointestinal; ICH, intracerebral hemorrhage; IHS, in-hospital stroke; OHS, out-of-hospital stroke; and SNF, skilled nursing facility.

- Perioperative hypotension, postoperative infections, cardiac complications such as atrial fibrillation, and interruption of antithrombotics are the common risk factors for in-hospital strokes.

Stroke. 2013;44:1903-1908

Quality of Care for In-Hospital Stroke

Analysis of a Statewide Registry

Ethan Cumbler, MD; Paul Murphy, MSHA, MA; William J. Jones, MD; Heidi L. Wald, MD, MSPH; Jean S. Kutner, MD, MSPH; Don B. Smith, MD

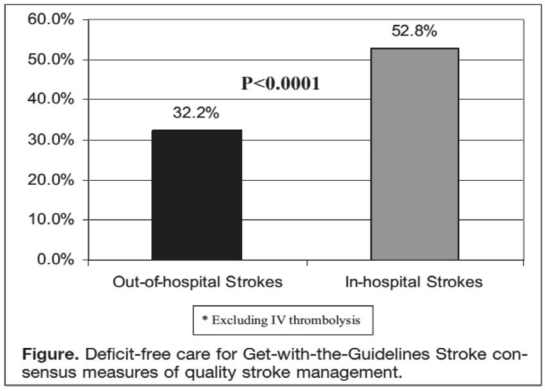

Figure. Deficit-free care for Get-with-the-Guidelines Stroke consensus measures of quality stroke management.

- The most common medical contraindication to thrombolysis for community stroke was rapid improvement or mild stroke severity, whereas for in-hospital stroke it was recent surgery or trauma.

Stroke. 2011;42:207-210

In-hospital ischaemic stroke treated with intravenous thrombolysis or mechanical thrombectomy

François Caparros[1] · Marc Ferrigno[1] · Amélie Decourcelle[1] · Anais Hochart[1] · Solène Moulin[1] · Nelly Dequatre[1] · Marie Bodenant[1] · Hilde Hénon[1] · Charlotte Cordonnier[1] · Didier Leys[1]

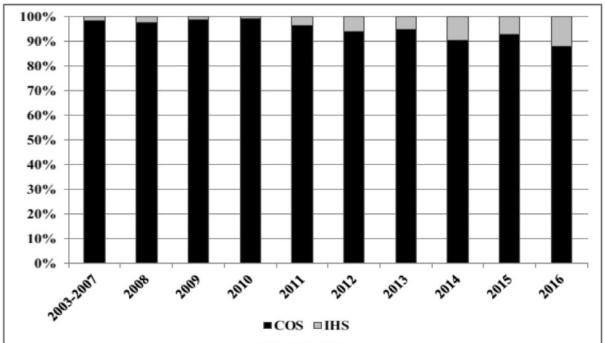

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Fig. 1 Proportion of patients with in-hospital (IHS) and community-onset strokes (COS) treated with recanalization procedures (thrombolysis, mechanical thrombectomy, or combination of both) per year ($p = 0.001$). Due to the small number of patients before 2008, years 2003–2007 are combined

- Although patients with IHS had worse outcomes at 3 months, after adjustment on confounders, IHS was not associated with any of the symptomatic ICH, mRS 0-1, mRS 0-2, and Death at 3 months.
- Occurring during hospitalization is not an independent predictor of worse outcome after stroke, but a marker of a worse pre-existing medical status.

J Neurol (2017) 264:1804–1810

Perioperative or procedure related Stroke

- The absolute periprocedural or perioperative risk to suffer from IHS is about 0.25% in PCI, 0.9% after acute coronary events and about 1.4% after CABG.
- Stroke after non-cardiac and non–vascular major operation.
- Operation in patients recovered from recent or previous stroke.

Prevention of Surgical related Stroke
: Perioperative management in High risk patients

- Physicians should follow guidelines regarding periprocedural antithrombotic management to avoid stopping antithrombotics unnecessarily early and/or failing to restart antithrombotics in a timely fashion.

Perioperative stroke

the American College of Surgeons National Surgical Quality Improvement Program (ACS-NSQIP) database

TABLE 1. Incidence of Stroke for Noncardiac, Nonvascular, Nonneurologic Surgeries

	Stroke – All Age %, (n)	Stroke – Age ≥ 65 %, (n)
Bateman, et al, 2009; Nationwide Inpatient Sample		
Hip Arthroplasty (N = 1,568)	0.4 (6)	0.5 (5)
Lung Resection (N = 1,484)	0.3 (5)	0.7 (5)
Colectomy (N = 33,426)	0.4 (130)	0.7 (100)
Mashour et al, 2011; American College of Surgeons- National Surgical Quality Improvement Program		
Hepatobiliary – Biliary Tree (N = 43,289)	0.1 (36)	0.2 (23)
Excisional breast (N = 36,793)	0.0 (16)	0.1 (11)
Hernia – Ventral/Umbilical/Incisional/Other (N = 32,638)	0.1 (28)	0.3 (21)
Hernia – Inguinal/Femoral Incisional Mesh (N = 26,448)	0.1 (17)	0.1 (10)
Colorectal – Appendectomy (N = 26,046)	0.0 (6)	0.2 (4)
Esophagogastric – Bariatric (N = 23,766)	0.0 (5)	0.0 (0)
Head and Neck – Tumor (N = 20,057)	0.0 (7)	0.1 (3)
Minor Vascular - Chest/Extremity (N = 5,883)	0.0 (2)	0.1 (1)
Small Intestine – Resection/Ostomy (N = 5,860)	0.5 (27)	0.6 (14)
Small Intestine – Lysis of adhesions, other (N = 5,683)	0.3 (17)	0.7 (14)
Abdominal – Exploration (N = 5,760)	0.5 (26)	0.9 (18)
Hepatobiliary – Pancreas (N = 4,832)	0.3 (15)	0.5 (10)
Musculoskeletal – Amputation (N = 4,800)	0.8 (37)	1.1 (29)
Esophagogastric – Gastric (N = 4,749)	0.3 (16)	0.7 (12)
Esophagogastric (N = 4,635)	0.0 (1)	0.1 (1)
Hysterectomy (N = 4,454)	0.1 (3)	0.2 (1)
Musculoskeletal – Arthroscopy (N = 4,255)	0.0 (0)	0.0 (0)
Musculoskeletal – Spine (N = 3,480)	0.1 (4)	0.3 (3)
Colorectal – Abdominoperineal resection (N = 3,169)	0.2 (7)	0.5 (5)
Musculoskeletal – Knee (N = 2,970)	0.1 (4)	0.2 (4)
Anorectal – Abscess (N = 2,508)	0.0 (0)	0.0 (0)
Simple skin and soft tissue (N = 2,383)	0.3 (6)	0.6 (4)
Colorectal – Low anastomosis (N = 2,293)	0.2 (4)	0.2 (2)
Hepatobiliary – Liver (N = 2,144)	0.3 (6)	0.8 (6)
Anorectal – Resection (N = 2,103)	0.0 (1)	0.0 (0)
Musculoskeletal – Fracture repair (N = 2,065)	0.1 (3)	0.3 (3)
Biopsy skin and soft tissue (N = 2,014)	0.1 (2)	0.2 (1)

Mashour et al. J Neurosurg Anesthesiol 2014

TABLE 2. Independent Predictors of Perioperative Stroke Identified in Large Epidemiologic Studies

Predictors	Odds Ratio	Confidence Intervals
Independent Predictors found in Bateman et al, 2009. *Nationwide Inpatient Sample; hip, colon and lung surgery*		
Renal disease	2.98	2.52 to 3.54
Atrial fibrillation	1.95	1.69 to 2.26
History of stroke	1.64	1.25 to 2.14
Valvular disease	1.54	1.25 to 1.90
Congestive heart failure	1.44	1.21 to 1.70
Age (per 10 years)	1.43	1.35 to 1.51
Diabetes mellitus	1.18	1.01 to 1.39
Female (vs. Male)	1.21	1.07 to 1.36
Independent predictors found in Mashour et al, 2011. *American College of Surgeons- National Surgical Quality Improvement Program; broad population of noncardiac, nonvascular, nonneurologic surgery*		
Age $\geq$ 62 years	3.9	3.0 to 5.0
Myocardial infarction within 6 months	3.8	2.4 to 6.0
Acute renal failure	3.6	2.3 to 5.8
History of stroke	2.9	2.3 to 3.8
Pre-existing dialysis	2.3	1.6 to 3.4
Hypertension requiring medication	2.0	1.6 to 2.6
History of transient ischemic attack	1.9	1.3 to 2.6
Chronic obstructive pulmonary disease	1.8	1.4 to 2.4
Current smoker	1.5	1.1 to 1.9
Body mass index 35-40 kg/m^2 (protective)	0.6	0.4 to 0.9
Independent predictors found in Sharifpour, Moore et al, 2013. *American College of Surgeons- National Surgical Quality Improvement Program; noncarotid vascular surgery*		
Acute renal failure	2.03	1.39 to 2.97
History of stroke, transient ischemic attack, or hemiplegia	1.72	1.29 to 2.30
Female (vs. Male)	1.47	1.12 to 1.93
History of cardiac disease (myocardial infarction, congestive heart failure, angina, prior cardiac intervention)	1.42	1.07 to 1.87
Age (each additional year of life)	1.02	1.01 to 1.04

Note that certain variables relevant to stroke, such as atrial fibrillation and valvular disease, are not collected in the National Surgical Quality Improvement Program database.

Independent Risk Factors in Perioperative Stroke

- Renal disease (ARF)
- Atrial fibrillation, Congestive heart disease, MI, Valvular HD
- Stroke History
- Older age

Mashour et al. J Neurosurg Anesthesiol 2014

Possible risk for bleeding according to surgery /procedure type

Low risk	Laparoscopic cholecystectomy
	Laparoscopic inguinal hernia repair
	Noncataract ophthalmologic procedures
	Coronary angiography
	Gastroscopy or colonoscopy (with/without biopsy)
Very low risk (anticoagulation interruption not required)	Single tooth extraction
	Skin biopsy or selected skin cancer removal
	Cataract removal

Note that risk in certain cases may also relate to the consequences of bleeding (e.g., intracranial or spine procedure) rather than merely the volume of bleeding. Table reproduced with permission from Darvish-Kazem and Douketis, Perioperative management of patients having noncardiac surgery who are receiving anticoagulant or antiplatelet therapy: an evidence-based but practical approach. Semin Thromb Hemost 2012;38:652-660.

Table 1. Stroke and Bleeding Risk Assessment Tools

Risk type	Scheme	Components	Points	Annual event rate: Total score	Annual event rate: Stroke risk, %	Thrombotic risk category
Thrombosis risk	$CHADS_2$[31]	Congestive heart failure	1	0	1.9	Low risk
		Hypertension	1	1	2.8	
		Age ≥ 75 yrs	1	2	4.0	
		Diabetes mellitus	1	3	5.9	Moderate risk
		Stroke or TIA	2	4	8.5	
				5	12.5	High risk
				6	18.2	
	CHA_2DS_2-VASc[32]	Congestive heart failure	1	0	0	Low risk
		Hypertension	1	1	1.2	
		Age ≥ 75 yrs	2	2	2.2	
		Diabetes mellitus	1	3	3.2	
		Stroke or TIA	2	4	4.0	
		Vascular disease[a]	1	5	6.7	Moderate risk
		Age 65–74 yrs	1	6	9.8	
		Sex, female	1	7	9.6	High risk
				8	6.7	
				9	15.2	
				Total score	Bleed risk[a]	
Bleeding risk	HAS-BLED[33]	Hypertension[b]	1	0	1.13	
		Abnormal liver[c] or renal[d] function (1 point each)	1 or 2	1	1.02	
		Stroke	1	2	1.88	
		Bleeding history[e] or predisposition (anemia)	1	3	3.74	
		Labile INR[f]	1	4	8.70	
		Elderly ≥ 65 yrs	1	≥ 5	12.5	
		Drugs (antiplatelets, NSAIDs) or alcohol[g] (1 point each)	1 or 2			

Pharmacotherapy 2017;37(6):712–724)

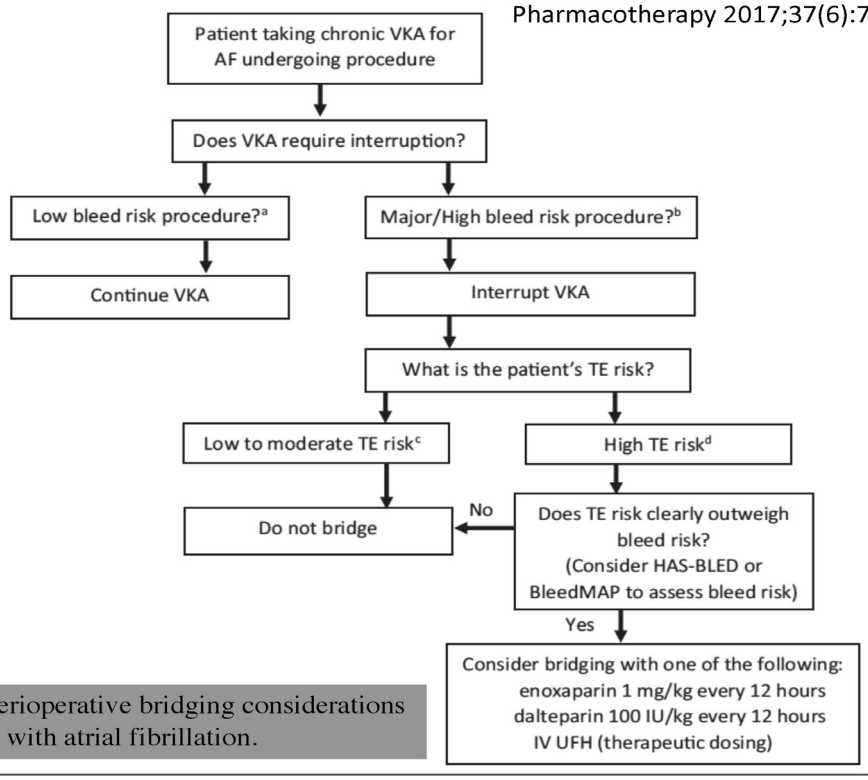


Figure 1. Perioperative bridging considerations for patients with atrial fibrillation.

Stroke itself is a major risk factor.

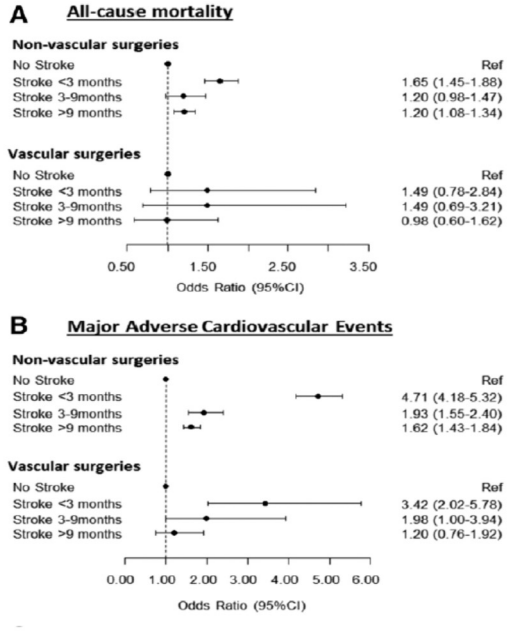
Of 146,694 nonvascular surgeries,

Table 2. Outcomes by Stroke Subgroup

	No Previous Stroke (N = 135,689)		Stroke < 3 months (N = 2,289)		Stroke 3–9 months (N = 1,090)		Stroke > 9 months (N = 4,117)	
Incidence	n	%	n	%	n	%	n	%
30-day all-cause mortality	6,501	4.8	376	16.4	134	12.3	482	11.7
30-day MACE	3,187	2.3	473	20.7	112	10.3	363	8.8
Separately analyzed endpoints*								
Acute myocardial infarction	396	0.3	19	0.8	11	1.0	26	0.6
Ischemic stroke	353	0.3	227	9.9	30	2.8	95	2.3
Cardiovascular death	2,438	1.8	227	9.9	71	6.5	242	5.9

Major adverse cardiovascular events (MACE) included nonfatal myocardial infarction, nonfatal ischemic stroke, and any cardiovascular death.
*Constitute the components of the combined endpoint of MACEs.

Anesthesiology 2017; 127:9-19



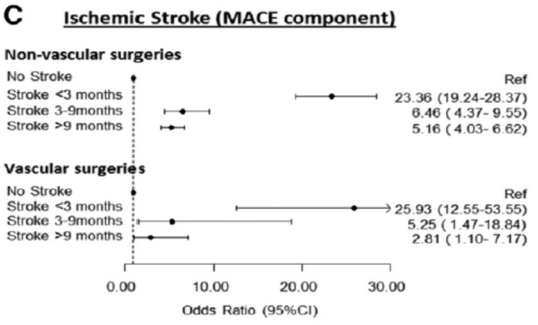


Fig. 1. Odds ratios for major adverse cardiovascular events and all-cause mortality. Data were adjusted for sex, age, body mass index, and all comorbidities, pharmacotherapy, surgery group, and surgery risk, as listed in table 1. MACE = major adverse cardiovascular events; Ref = reference.

Anesthesiology 2017; 127:9-19

Anticoagulation Resumption after ICH in patients with A-fib

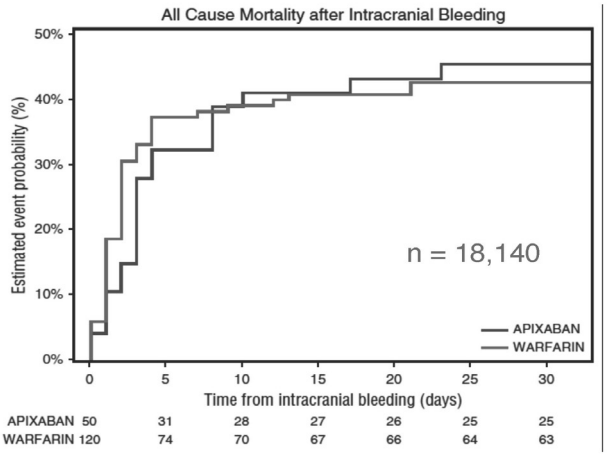
- The Annual incidence of ICH on Anticoagulation
  - 0.6~1%/year
- Compared with sICH, Anticoagulation-related ICH is more severe and higher mortality rate.
- Previous ICH patients have been excluded from randomized clinical trials of stroke prevention in AF.
- So, the lack of high-quality evidence, however, makes the decision-making challenging for clinicians and quite variable in practice.

Current Atherosclerosis Reports (2018) 20: 32

Figure 2. Thirty-day all-cause mortality after ICH event by randomized treatment.

The mortality rates per 100 patient-years of follow-up were 88.8%for the ICH group and 3.5%for the non-ICH group.

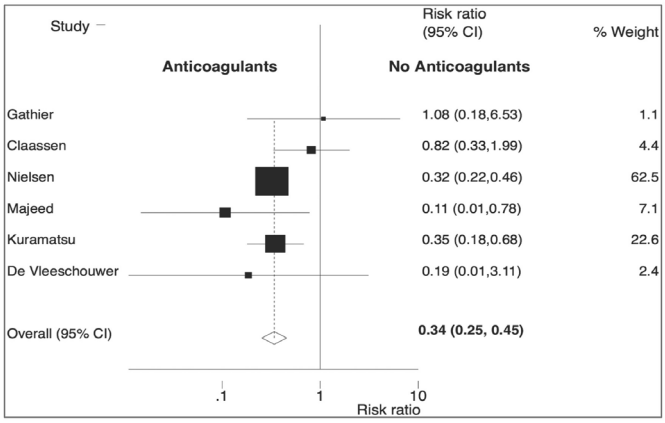
No difference between NOAC and Warfarin.



Blood. 2017;129(22):2980-2987

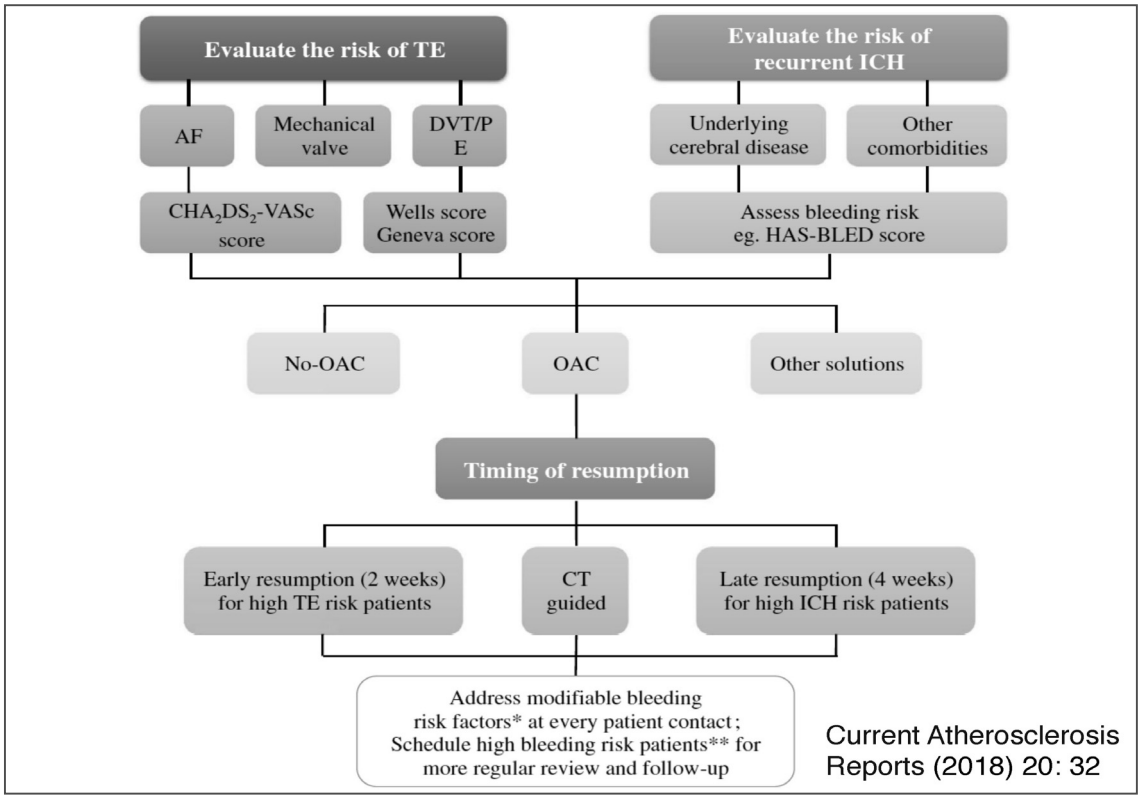
Figure 1. Forest plot of the association between resumption of oral anticoagulation therapy and arterial thromboembolic complications after intracranial hemorrhage.

- Warfarin only
- Non-randominization studies
- > N=5000



Heterogeneity: Q=5.12; P=0.28. CI indicates confidence interval.

Murthy et al. Meta-analysis, Stroke. 2017;48:1594-1600.



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Recognition and Process : Time is Brain, of course!

- Stroke Recognition
- Delays in stroke tea activation
- Delays in imaging and diagnosis
- Delays in treatment time

Table 3. Comparison of times to neuroimaging and intravenous alteplase between in-hospital and community-onset strokes

Study	Study period	Time to imaging, parameters varied between studies		p value
		IHS	COS	
Michigan Acute Stroke Care Overview and Treatment Surveillance System[12]	May–November 2002	3.1%[a]	3.5%[a]	0.27
Ontario Stroke Registry[10]	2003–2012	4.5 h[b]	1.2 h[b]	<0.001
SITS-EAST Registry[23]	2003–2015	40 min[b]	24 min[c]	<0.001
Colorado Stroke Alliance Registry[2,11]	August 2005–April 2009	54 min[b]	43 min[c]	0.13
Spanish Cerebrovascular Diseases Study Group[9]	January–December 2008	57.9%[d]	NA	NA
		Time to intravenous alteplase (min)[e]		
		IHS	COS	
Ontario Stroke Registry[10]	2003–2012	120	72	<0.001
AHA GWTG-Stroke Registry[2]	April 2003–April 2012	100	76	<0.0001
SITS-EAST Registry[23]	2003–2015	90	65	<0.001

AHA GWTG: American Heart Association Get With The Guidelines; IHS: in-hospital stroke; COS: community-onset stroke; SITS-EAST: safe implementation of treatments in stroke-east.
[a]Within 25 min of arrival to hospital or stroke recognition.
[b]Time from stroke recognition to neuroimaging.
[c]Door-to-neuroimaging time.
[d]Within 3 h of symptom recognition.
[e]Stroke recognition-to-needle time for in-hospital strokes and door-to-needle time for community onset strokes.

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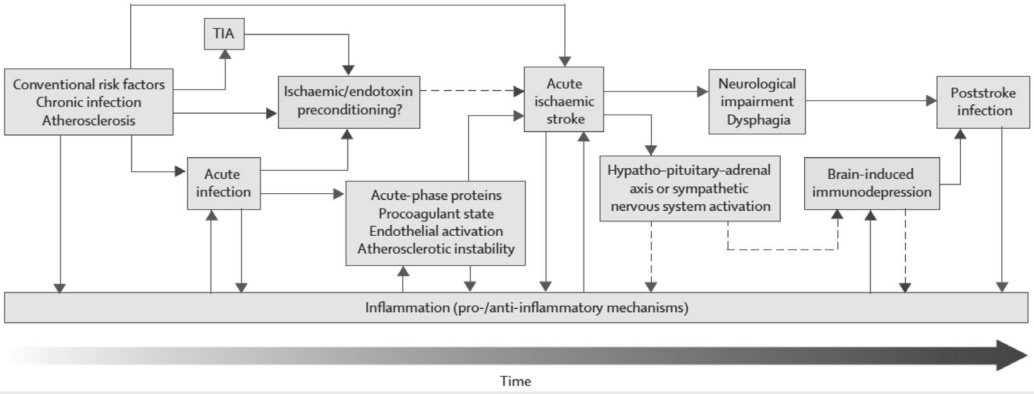
Infection and Stroke

Lancet Neurol 2008; 7: 341–53



Critically ill hospitalized patients, however, often are not able to notice and/or to communicate their deficits due to medication and/or underlying illness.

Summaries

- Increased awareness, education and training of medical staff are fundamental for timely symptom recognition, especially on cardiologcial plus intensive and intermediate care units.
- Patient with a high risk for IHS should be identified and closely clinically monitored for stroke symptoms.
- In case of suspected IHS, ‘Code Stroke’ should be activated, emergent neuroimaging performed, and treatment initiated by interdisciplinary team.