Stroke Management in the Elderly

Neer Zeevi, MD
Vascular Neurology Fellow
Hartford Hospital, UConn Health Center

FINANCIAL DISCLOSURE:
No relevant financial relationship exists

Stroke Management in the Elderly Objectives

- Identify unique characteristics of elderly acute ischemic stroke (AIS) patients
  - Demographics
  - Clinical presentation and stroke subtype
  - Stroke outcomes
- Gain familiarity with risks and benefits of acute stroke interventions

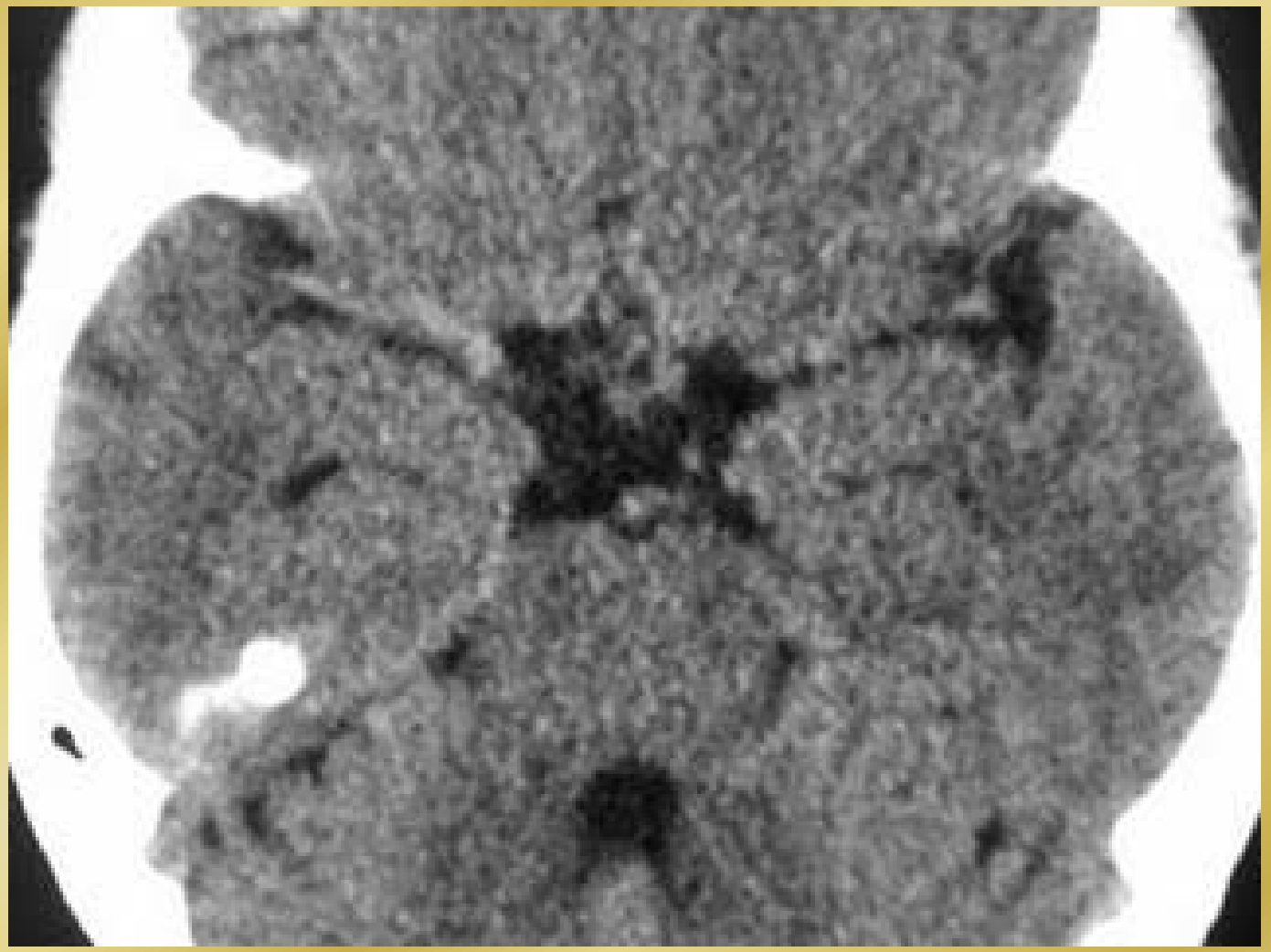
Case of Stroke in Elderly

- HPI: 87 year old RH female was visiting a neighbor when she suddenly fell due to left sided weakness.
- EMS notified immediately and patient transported to a hospital with a certified stroke center
- Stroke protocol was activated enroute
- PMH
  - HTN
  - Pacemaker placement one year ago
- SHx: Widowed, lives alone, nonsmoker, independent of ADL's

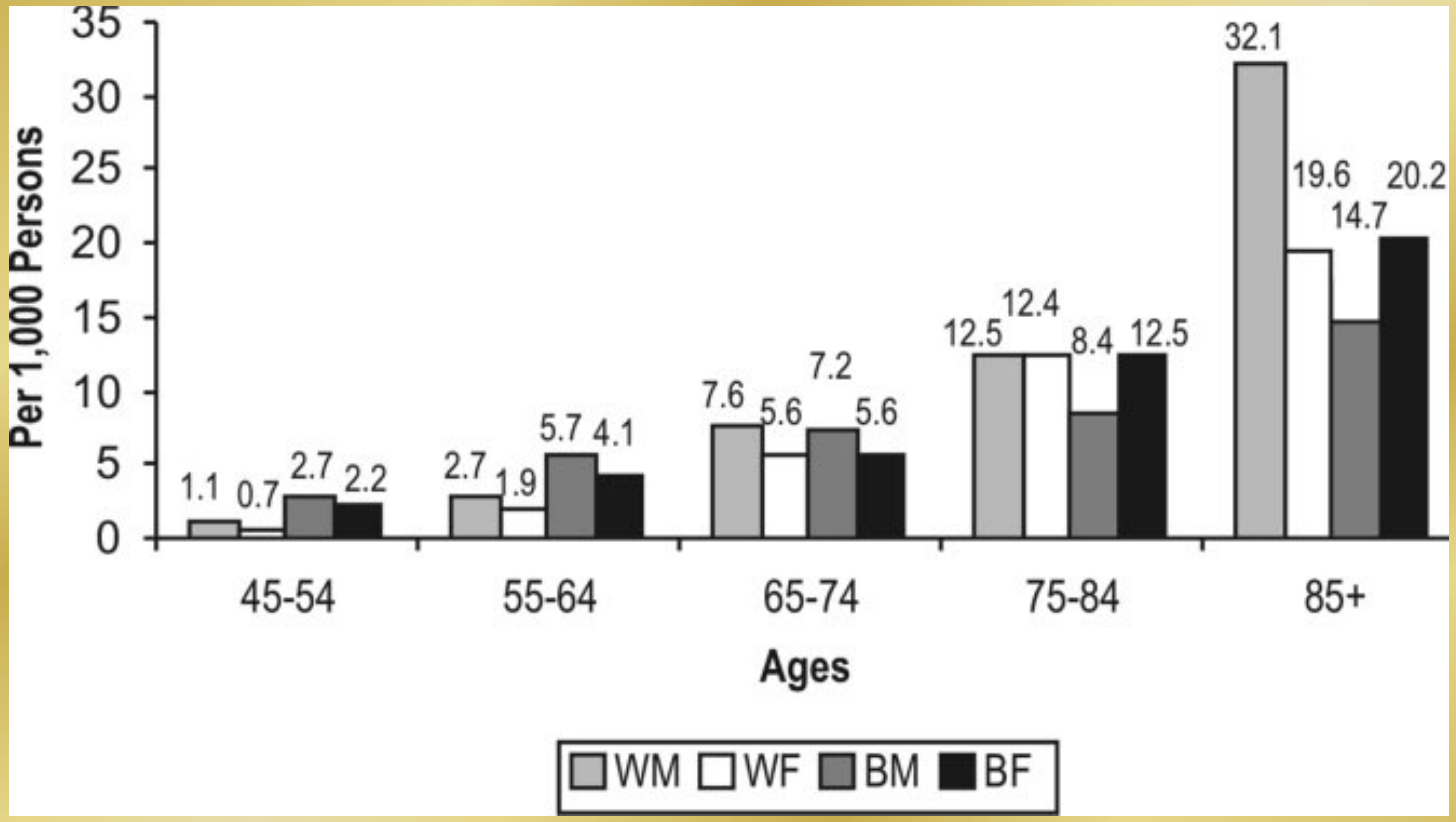
Case of Stroke in Elderly

- Exam:
  - BP 167/77
  - Irregular pulse
  - Right gaze preference
  - Left sided neglect
  - Left hemiparesis
  - NIHSS=12
- EKG – Atrial fibrillation
- Blood tests negative
- Head CT expedited as part of stroke protocol

Neuroimaging



Frequency of Stroke is Age Dependent



- Doubling rates after age 55
- Growing numbers with major impact on medical resources

Rosamond et al., Circulation 2008

Cerebrovascular Diseases

Cerebrovasc Dis 2007;23:304–308
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Acute Stroke Management in the Elderly

Neer Zeevi[a] Jyoti Chhabra[b] Isaac E. Silverman[c] Nora S. Lee[c]
Louise D. McCullough[c]

[a]Department of Neurology, [b]Research Program and [c]Stroke Center, Hartford Hospital, Hartford, Conn., USA

- Retrospective review of the Stroke Center at Hartford Hospital (SCHH) database from October 2005 to September 2009
- SCHH is certified by the Joint Commission of Accreditation of Healthcare Organizations (JCAHO) as a Primary Stroke Center
- Multidisciplinary stroke team and an organized stroke triage system with experience using thrombolytic (rtPA) according to accepted protocols

Demographics of AIS patients

	Age <80	Age ≥80
Patients	1465 (65%)	789 (35%)
Mean Age	63 ±11	86 ±6
Sex		
Males	762 (52%)	292 (37%)
Females	703 (48%)	497 (63%)*
Place of origin:		
Home	1040 (71%)	513 (65%)
Facility	59 (4%)*	174 (22%)*
Pre-stroke Barthel	19.5 ± 1.7*	17.8 ± 3.7*

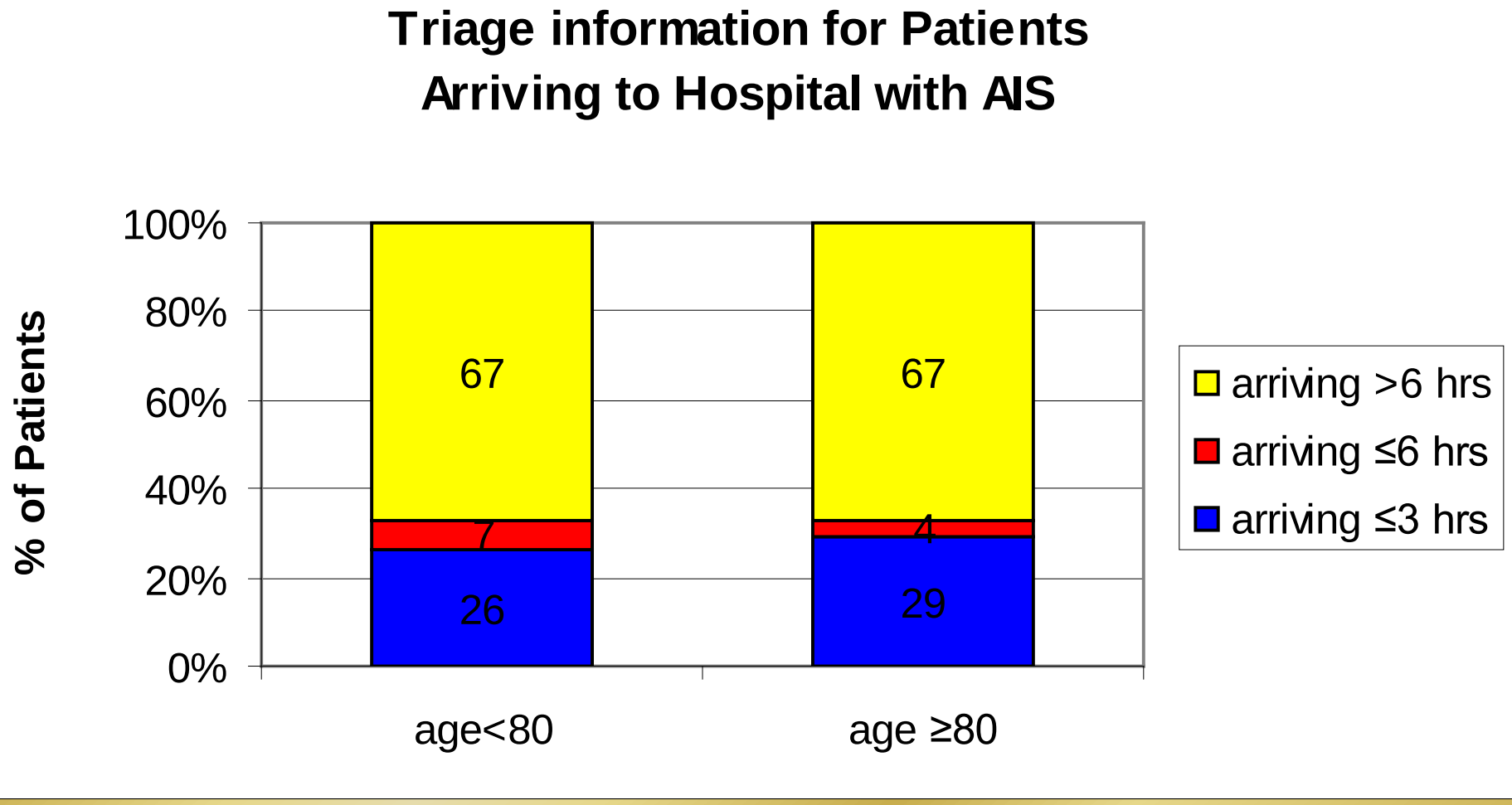
Figures in parentheses are percentages, * $p < 0.05$; χ^2 test.

Vascular risk factors

	Age <80	Age ≥80
Diabetes	557 (38%)*	229 (29%)*
Hypertension	1187 (81%)*	686 (87%)*
Heart Disease	615 (42%)*	387 (49%)*
Atrial Fibrillation	205 (14%)*	331 (42%)*
Coumadin use	176 (12%)*	142 (18%)*
Statin use	762 (52%)*	347 (44%)*

Figures in parentheses are percentages, * $p < 0.05$; χ^2 test.

Denti et al JAGS 2009;58:12-17
Simpson et al Stroke 2005;35:1771-5



- Older patients were no more delayed in reaching the hospital (P > .05)

Berrouschot et al Stroke 2005;36:2421-25

Stroke Severity

	Age <80	Age ≥80
Admission NIHSS	6.8 ± .36 *	9.3 ± .57 *
Male	6.5 ± .49	7.8 ± .86 *
Female	6.9 ± .56	10.2 ± .75 *

Figures in parentheses are percentages, ** $p < 0.05$; χ^2 test.

- Most severe strokes in elderly especially in women
- Larger proportion of cardioembolic strokes which has worse prognosis

Denti et al JAGS 2009;58:12-17

Mouradian et al J Neurol Neurosurg Psych 2005;76:1234-37

Unilateral neglect is more severe and common in older patients with right hemispheric stroke

R.F. Gottesman, MD, PhD
J.T. Kleinman, BA
C. Davis, BA
J. Heidler-Gary, MS
M. Newhart, BS
V. Kannan, BA
A.E. Hillis, MD

Address correspondence and reprint requests to Dr. Rebecca F. Gottesman, Meyer 6-109, 600 N. Wolfe St., Baltimore, MD 21287
rgottesm@jhmi.edu

ABSTRACT

Introduction: Unilateral neglect after acute right hemispheric stroke significantly impedes post-stroke recovery. We studied patients with right hemispheric stroke to determine whether increasing age was associated with more frequent or more severe neglect.

Methods: Eight neglect tests within 5 days of symptom onset (and within 24 hours of admission) were administered to 204 subjects with acute right hemispheric stroke. Size of infarct was measured, and neglect tests were scored as percent error. "Any neglect" was defined by an elevated neglect test score, standardized relative to a group of normal controls.

Results: When tested for neglect soon after acute stroke admission, 69.6% of subjects older than 65 years had "any neglect" (defined by comparison to a group of normal controls), compared with 49.4% of subjects aged 65 years and younger ($p = 0.008$). For every additional 10 years of age, patients were 1.83 times as likely to have neglect, even after adjusting for diffusion-weighted imaging (DWI) infarct volume and NIH Stroke Scale (NIHSS) score (95% CI 1.38–2.43). In addition, DWI volume and NIHSS independently predicted neglect. Score on virtually all of the neglect tests worsened as an effect of age. Percentage error on a line cancellation task was 3.8% higher for every additional 10 years of age, after adjustment for DWI volume and NIHSS ($p = 0.006$). Similar results were found for other neglect tests.

Conclusions: Increasing age in patients with acute right hemispheric stroke significantly increases the odds of unilateral neglect as well as severity of neglect, independently of size of the stroke or NIH Stroke Scale score. The reason for this finding in older patients may be because they have more brain atrophy and may be less able to compensate for cerebral infarction, or because they tend to have more cardioembolic strokes, which may be more cortically based.

Neurology® 2008;71:1439–1444

Acute Stroke Interventions

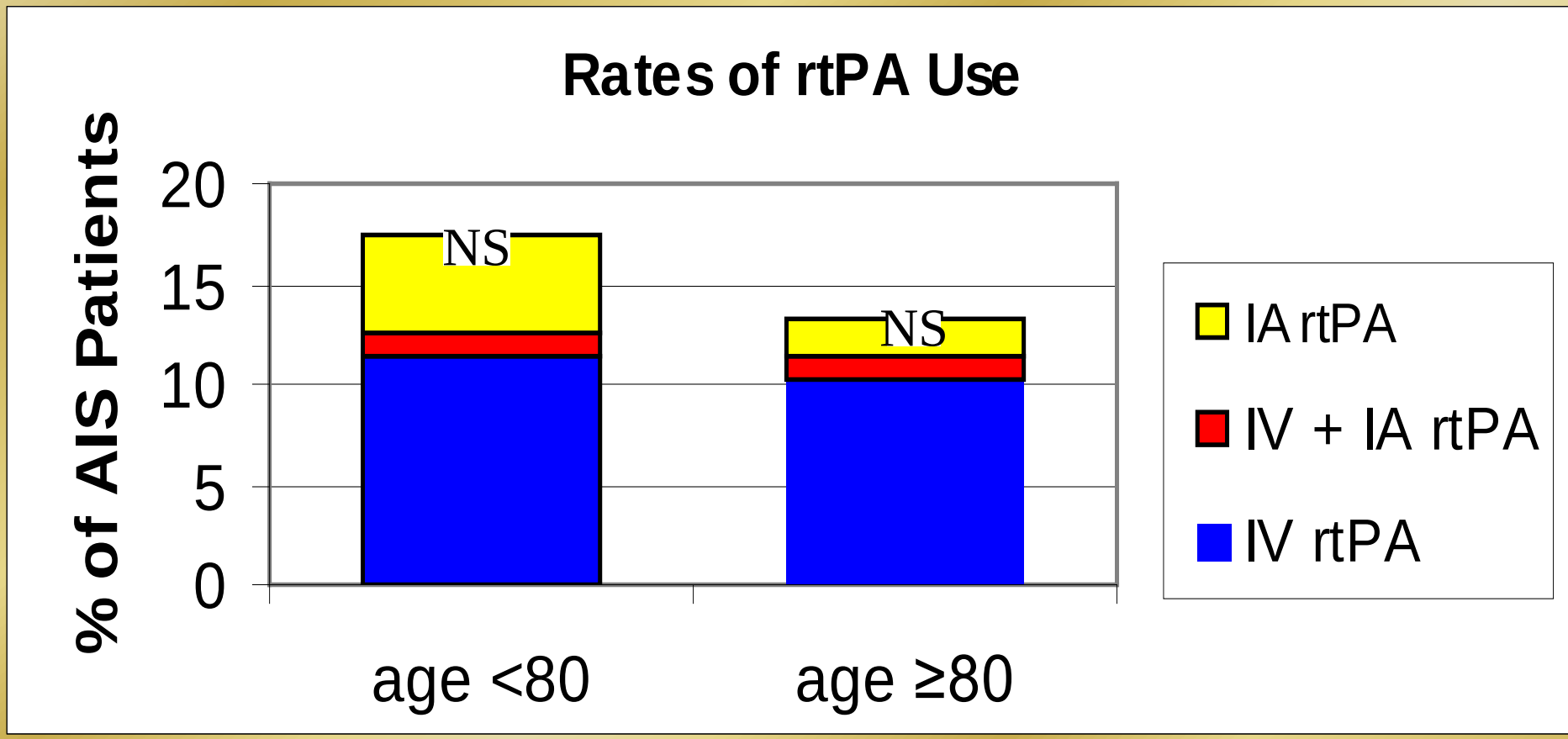
- Increasing use of reperfusion therapies by stroke centers
- Intravenous rtPA
  - FDA approved
  - Within 3 hours of symptom onset
- Endovascular therapies
  - intra-arterial thrombolysis
  - mechanical reperfusion techniques
  - Within 8 hours of symptom onset

NEJM 1995;333:1581-7

Acute Stroke Interventions

- Older patients often excluded from clinical stroke trials
- Prior studies have shown lower frequency of thrombolytic administration
- Prior studies of IV rtPA treatment for AIS similar rate of symptomatic ICH

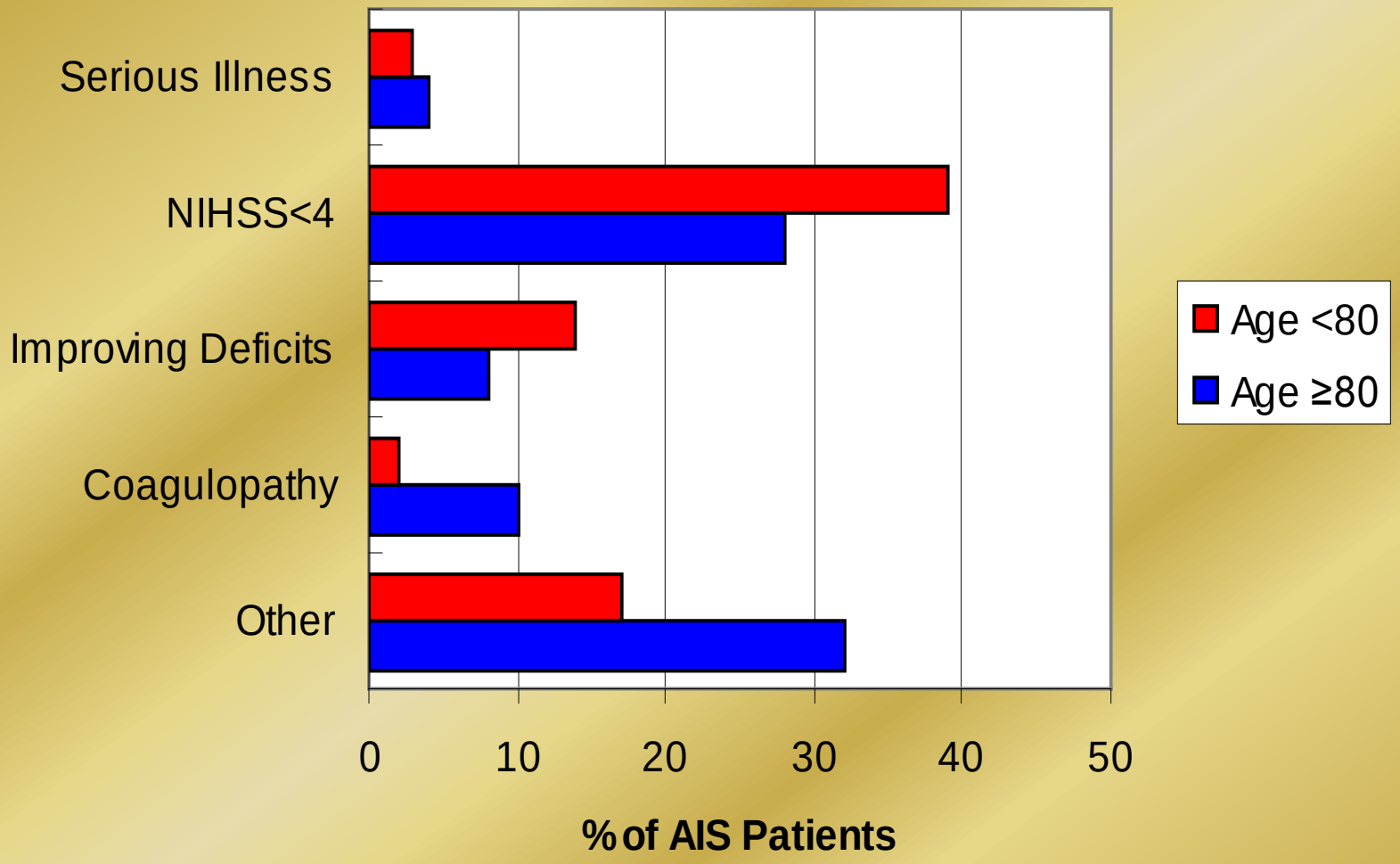
Gladstone et al Stroke 2002;33:2123-36
Engelter et al Age Ageing 2006;35:572-80
Sanossian et al Lancet Neurology 2009;8:1031-41



- Rate of thrombolytic administration is comparable for two age groups
- older patients less likely to receive endovascular treatment

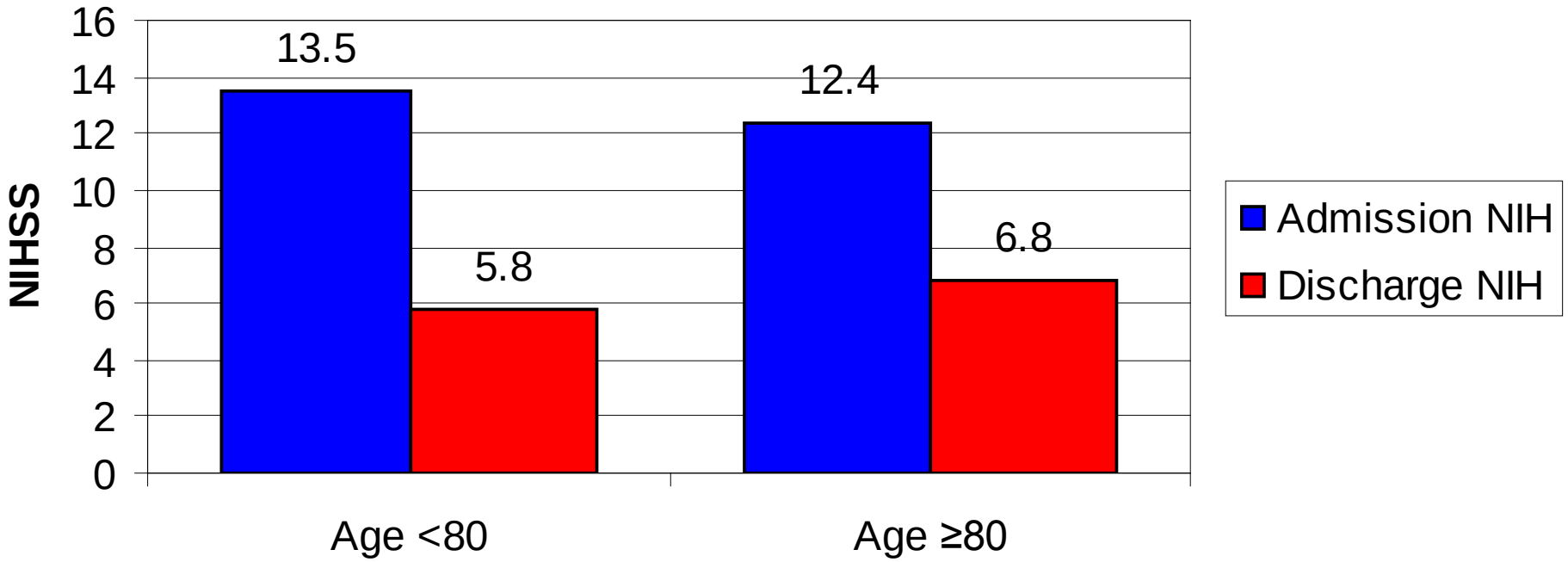
Tanne et al *Stroke.* 2000;31:370-5

Thrombolytic Exclusion Criteria for Patients with AIS arriving within 3 hours



Older patients more likely to be withheld rtPA due to reasons not listed as exclusion criteria ($P < .05$)

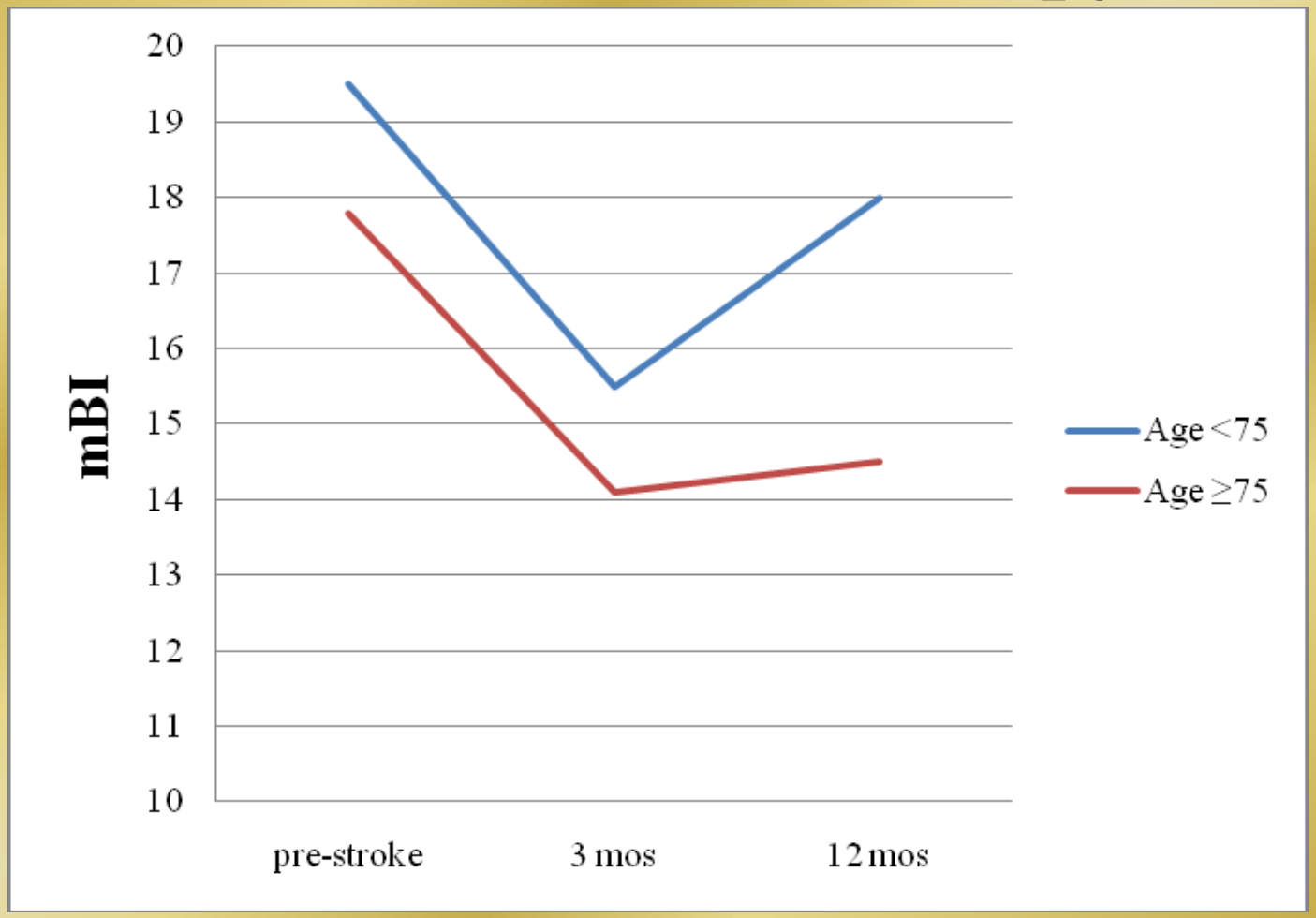
NIHSS on Admission and Discharge in Patients Receiving Thrombolytics



- Both age groups have severe strokes
- Improvement in NIHSS in both groups
- Change in NIHSS significantly larger for <80 year ($P < .05$)

Engelter et al Neurology 2005;65:1795-8

Functional Outcomes Following Endovascular Therapy



Symptomatic ICH

	IV rtPA	IA rtPA
age <80	8/166 (5.0%)	9/97 (9%)*
age ≥ 80	2/81 (2.2%)	7/31 (22%)*

Figures in parentheses are percentages, * $p < 0.05$; χ^2 test.

- Rate of symptomatic ICH not increased for IV rtPA administration
- Increased rate of ICH in ≥ 80 receiving IA rtPA

Simon et al *Age and Ageing* 2004;33**:**143-149

Risk of ICH

- Cardioembolic strokes from atrial fibrillation
- Coumadin use
- rtPA clearance
- Amyloid angiopathy
- Blood-brain barrier function

Tanne et al Stroke 2000;31:370-75
Di Carlo et al Stroke 1999;30:2313-19
Olindo et al Stroke 2003;34:1593-97

Endovascular Treatment

	Age <75	Age ≥75
INR value	1.1 ± .25	1.2 ± .37
Treatment Regimen		
IA only	18 (26%)	8 (22%)
IV and IA	16 (23%)	12 (32%)
IA and device	11 (16%)	5 (14%)
Device only	21 (30%)	12 (32%)
IV, IA and device	4 (6%)	0
Time to intervention	141 ± 92	153 ± 87
Duration of intervention	204 ± 69*	172 ± 55*
Recanalization rate	68%	79%

Figures in parentheses are percentages, * $p < 0.05$; χ^2 test.

Multivariate Analysis: rtPA use and admission NIHSS predicted ICH

		B	S.E.	Wald	df	Sig.	Exp(B)	95.0% C.I. for EXP(B) Lower	Upper
Step 1[a]	agecat(1)	-.857	.578	2.198	1	.138	.424	.137	1.318
	ptgender(1)	.292	.466	.392	1	.531	1.338	.537	3.334
	STATIN(1)	-.866	.739	1.376	1	.241	.420	.099	1.788
	TPA(1)	1.316	.414	10.105	1	.001	3.728	1.656	8.393
	NIHADM	.051	.025	4.064	1	.044	1.052	1.001	1.106
	STATIN(1) by agecat(1)	1.656	.853	3.766	1	.052	5.237	.984	27.886
	STATIN(1) by ptgender(1)	.338	.838	.162	1	.687	1.401	.271	7.248
	Constant	-4.563	.464	96.751	1	.000	.010		

a. Variable(s) entered on step 1: agecat, ptgender, STATIN, TPA, NIHADM, STATIN * agecat , STATIN * ptgender .

In-hospital Mortality

	IV rtPA	IA rtPA	No Intervention
age <80	21/166 (18%)*	22/97 (23%)*	168/1202(14%)*
age ≥ 80	17/81 (38%)*	13/31 (42%)*	196/677(29%)*

Figures in parentheses are percentages, * $p < 0.05$; χ^2 test.

- Higher mortality in elderly receiving rtPA same for untreated older patients
- ICH contributing to IA rtPA mortality

Denti et al JAGS 2009;58:12-17
Fonarow et al Circulation 2010;121:879-91
Kammersgaard Age and Ageing 2004;33:149-54

Poor Outcomes in Older Stroke Patients

- Higher rates of cardioembolic stroke
- Increased stroke severity especially women
- Increased medical comorbidities and polypharmacy
- Lower pre-stroke functional status
- Medical complications
- Social factors

Jorgensen et al Stroke 1996;27:1765-69
Niewada et al Neuroepidemiology 2005;24:123-8
Khaw et al Stroke 1984;15:244-8
Craft et al Stroke 2005;36:2006-11

Predisposing Factors Related to the Aging Brain

- Blood-brain barrier
- Increased brain inflammation
- Neuronal vulnerability to ischemia
- Angiogenesis
- Neurogenesis
- Neural plasticity

Zeevi et al JAGS (In press)
Hoffman et al Stroke 1985;16:860-63
Zhao et al Neurosci and Biobehav Rev 2008;32:56-71
Baltan et al J Neurosci 2008;28:1479-89

Response to Stroke Interventions

- Several studies show IV rtPA use in older AIS patients to be both safe and effective
- Dichotomy of response to rtPA treatment
  - High mortality
  - Favorable functional outcomes in survivors
  - may reflect a different response of cardiac emboli to rt-PA

Engelter et al Neurology 2005;65:1795-8
Tanne et al Stroke 2000;31:370-5
Simon et al Age and Ageing 2004; **33:** 143-149

Advantages of a Stroke Center

- AHA's "Get with the Guidelines" stroke initiative
- Reduce age-related differences in stroke care
- Improves rates of rtPA treatment
- Optimal secondary stroke prevention

Fonarow et al Circulation;121:879-91

Prospective Randomized Trials Addressing Age Specific aspects of AIS

- Improving stroke outcomes
- Better selection criteria for stroke interventions
- Neuroprotective agents

Course of Hospital Stay

- Intravenous rtPA administered early
- Left hemiparesis and neglect significantly improved
- Follow up Head CT showed Right MCA infarct with asymptomatic hemorrhagic conversion
- Coumadin withheld due to ICH
- Discharged to rehab

Nora S. Lee, MD

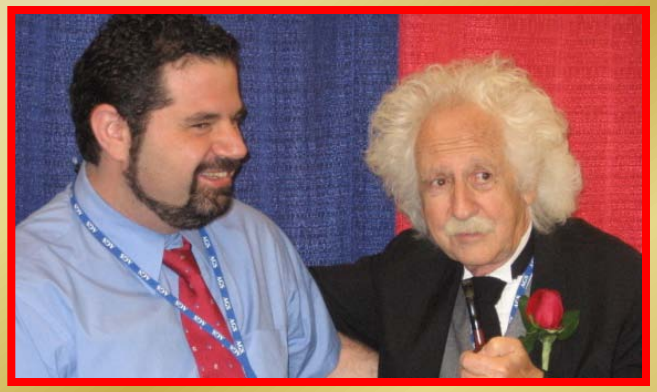
George A. Kuchel, MD, FRCP

Louise D. McCullough, MD, PhD

Isaac E. Silverman, MD

Gary Spiegal, MDCM

Thank You



Albert Einstein

Dawn Beland, RN

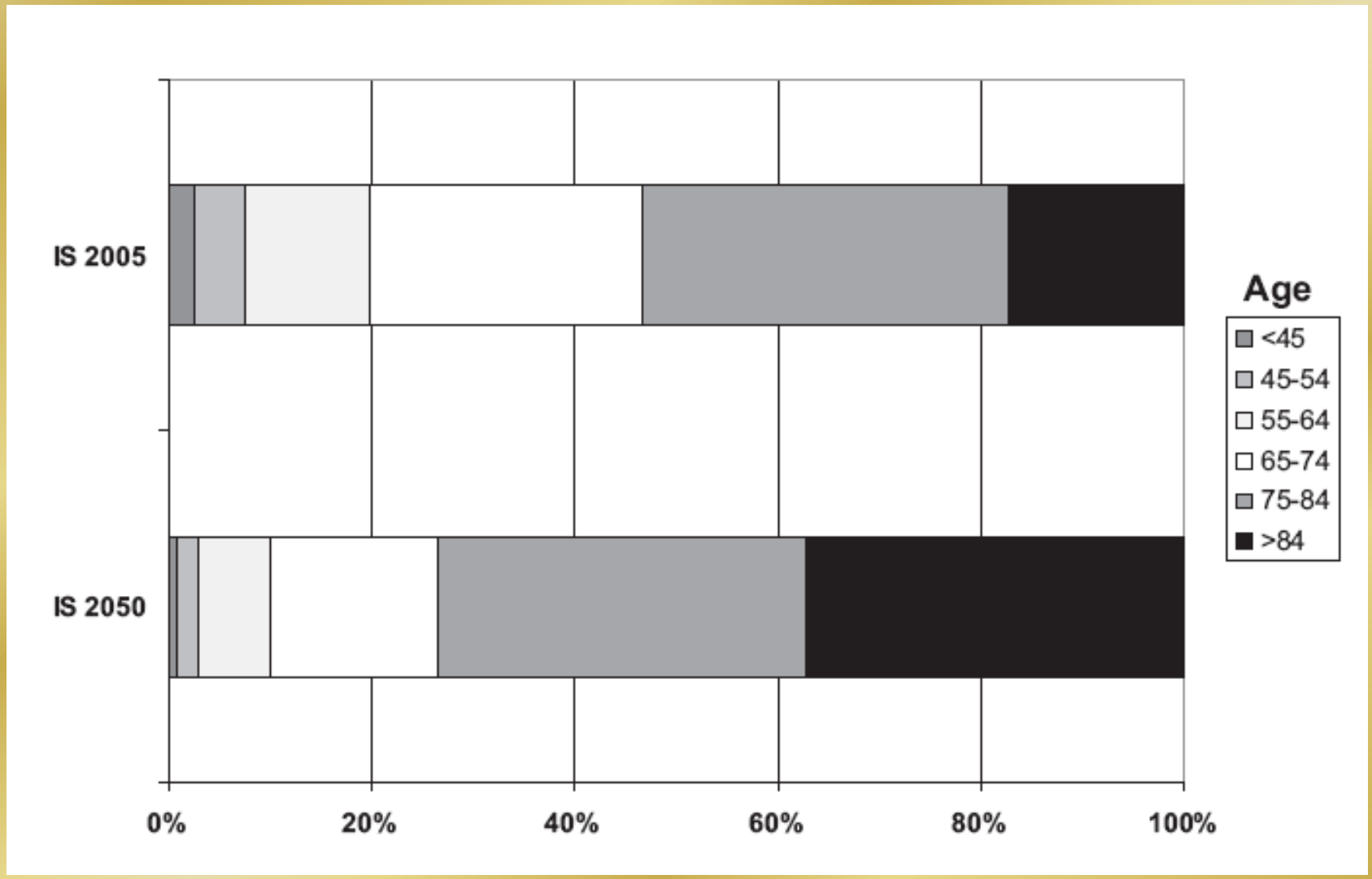
- Ilene Staff, PhD

THE STROKE CENTER
HARTFORD HOSPITAL

UNIVERSITY OF CONNECTICUT HEALTH CENTER

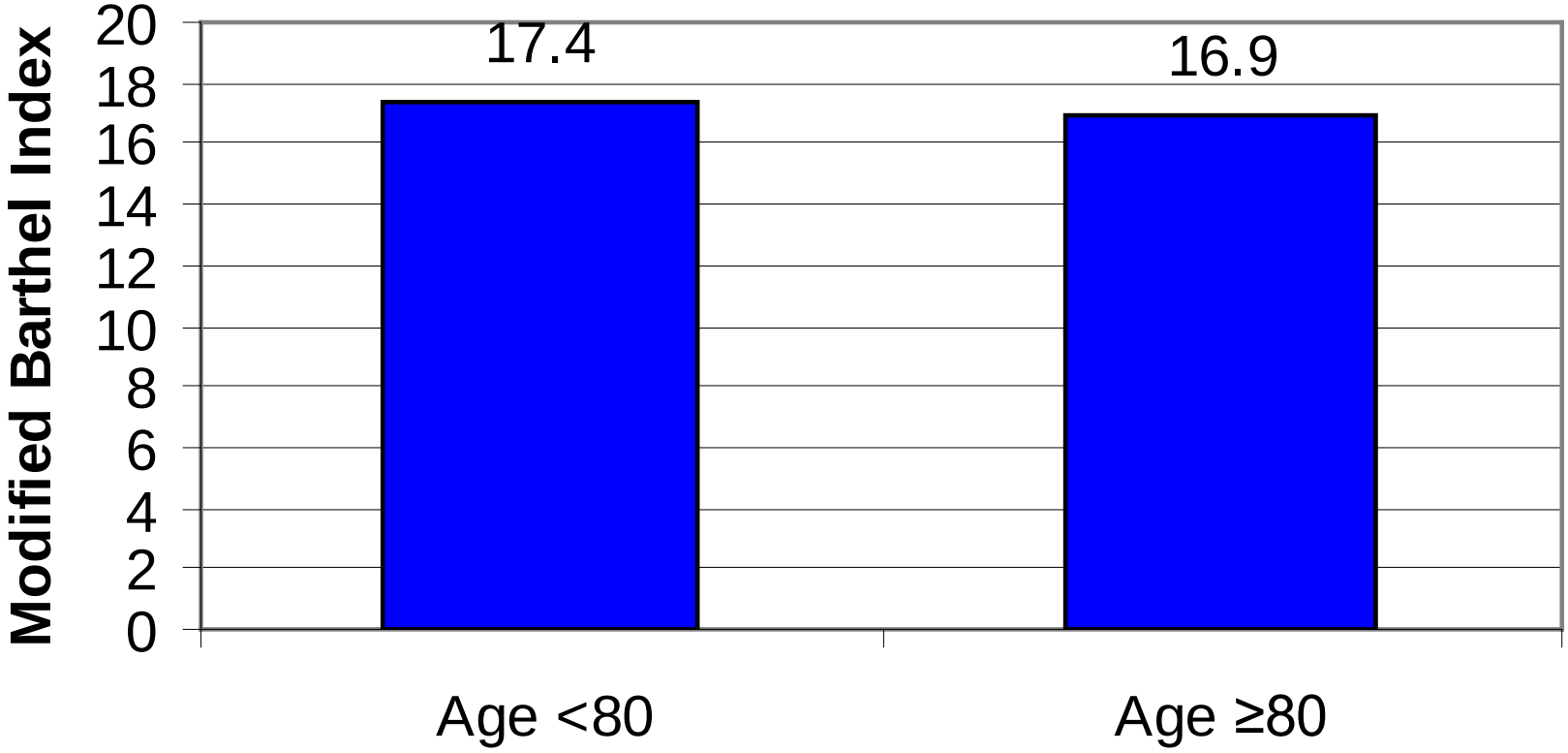
Thank You

- Stroke Center at Hartford Hospital
  - Louise D McCullough
  - Nora S Lee
  - Ilene Staff
- UConn Center on Aging
  - George Kuchel



Foerch et al Stroke 2009

12 Month Modified Barthel Index in AIS Patients Receiving Thrombolytics



Long-term outcome not significantly different (P > .05)

Correlation of ^{99m}Tc-DTPA SPECT of the Blood–Brain Barrier with Neurologic Outcome After Acute Stroke

Mordechai Lorberboym, MD[1]; Yair Lampl, MD[2]; and Menahem Sadeh, MD[2]

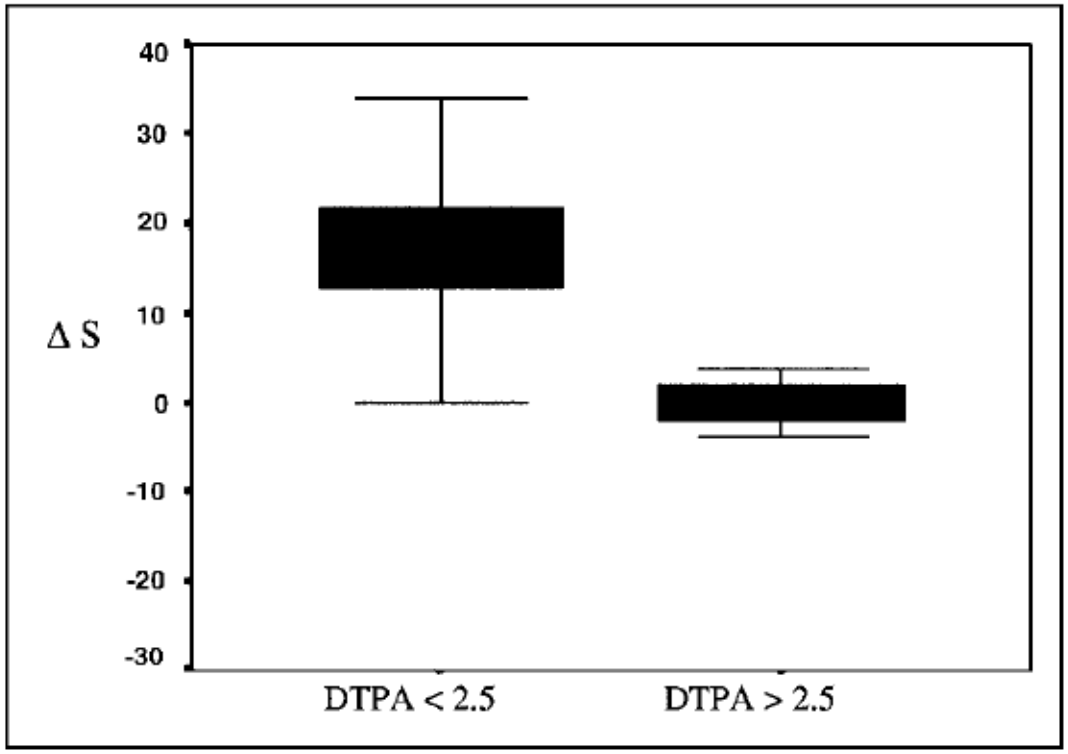
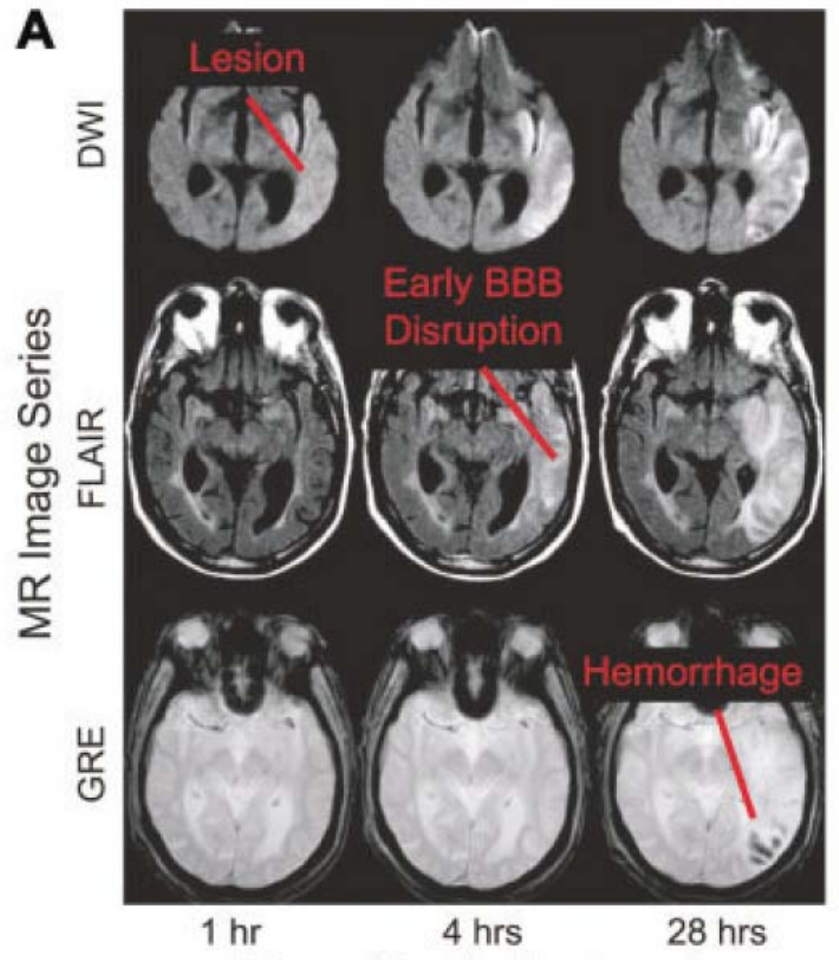


FIGURE 4. Distribution of Δ S values for ^{99m}Tc-DTPA index <2.5 and >2.5.

J Nucl Med 2003;44:1898-1904

Early Blood–Brain Barrier Disruption in Human Focal Brain Ischemia

Lawrence L. Latour, PhD, Dong-Wha Kang, MD, Mustapha A. Ezzeddine, MD, Julio A. Chalela, MD, and Steven Warach, MD, PhD

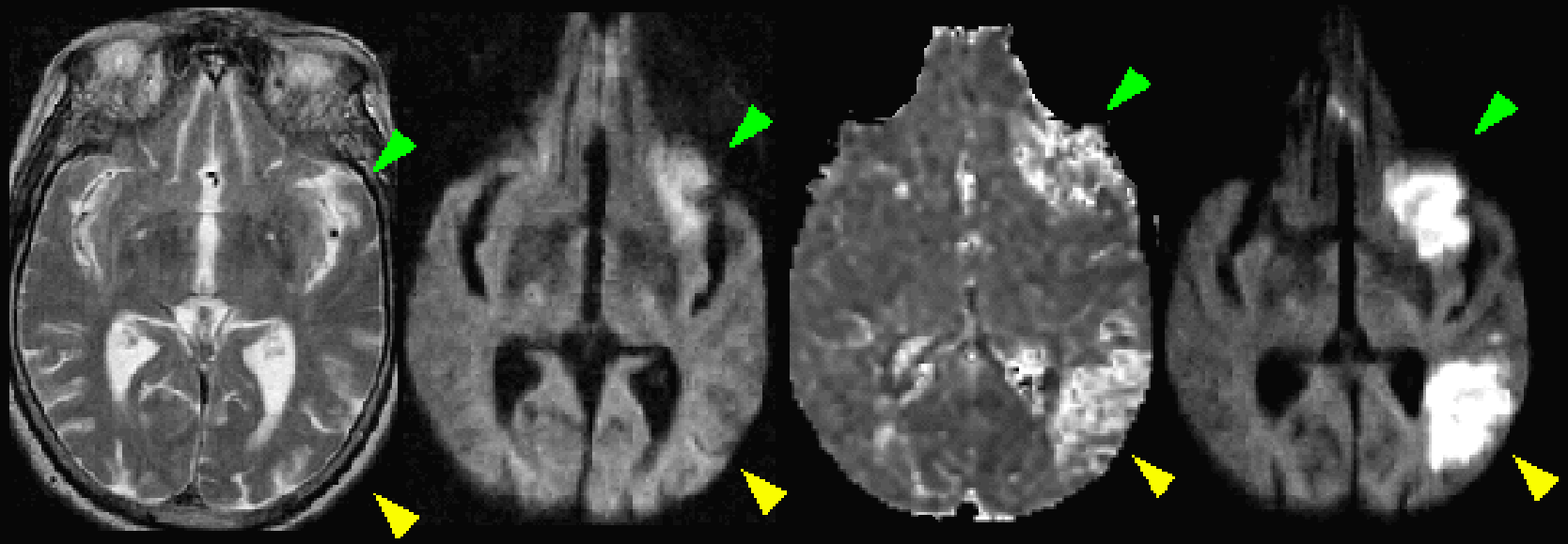


Ann Neurol 2004;56:468-77

Decreased Rate of Stroke Interventions in Older AIS Patients

- Treatment guidelines
  - Age alone is not an exclusion for IV rtPA
  - Better criteria for selecting elderly AIS patients for endovascular therapies
- Pre-admission functional status
- Care provider preference
- Social factors (advanced directives, marital status)

Diffusion / perfusion mismatch may be a marker for territory at risk.



T2 FSE | Initial DWI | Initial MTT | Follow-up DWI (5 days later)

AGS / MGH