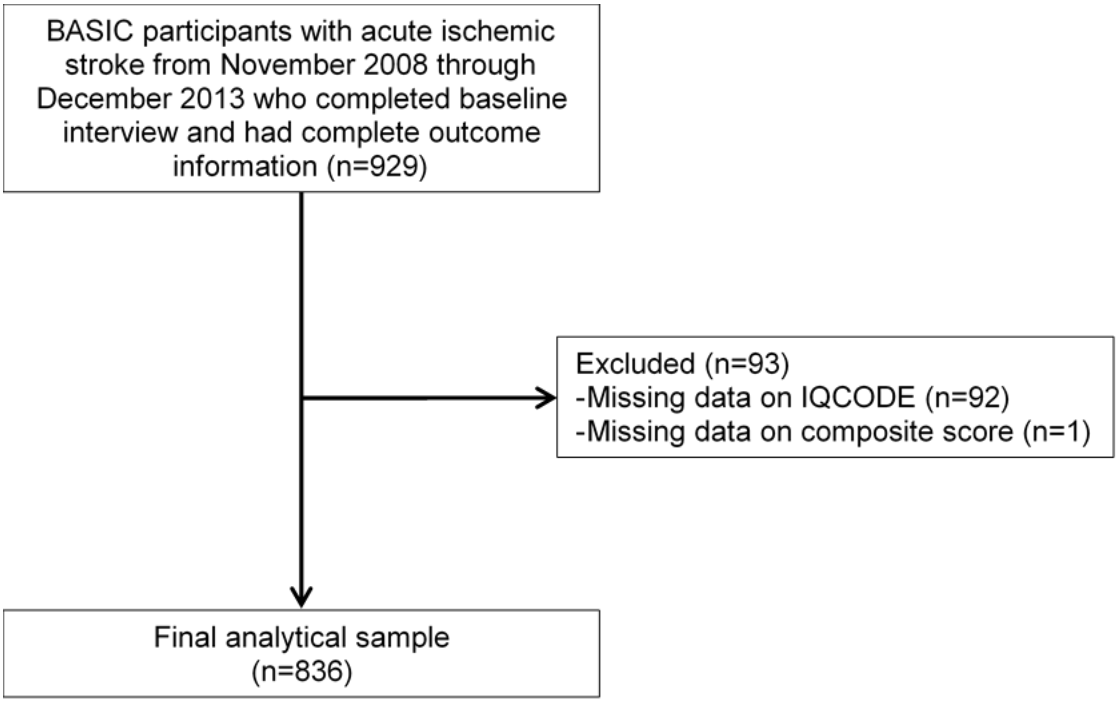
SUPPLEMENTAL MATERIAL
Levine DA, Galecki AT, Morgenstern LB et al. Mild Cognitive Impairment, Dementia, and Receipt of Treatments for Acute Ischemic Stroke

eFigure I: Derivation of Study Cohort



eFigure I Legend: Abbreviations: BASIC, Brain Attack Surveillance in Corpus Christi project; IQCODE, Informant Questionnaire On Cognitive Decline in the Elderly.

eMethods

Covariate Description

Covariates were measured at baseline using chart abstraction except race/ethnicity, education, and modified Rankin score (mRS) were collected by interview. Socio-demographics included age, sex, race/ethnicity (non-Hispanic White, Mexican American, and Other), and education. Clinical factors included cigarette smoking status (never, former, and current), alcohol consumption (excessive alcohol use or not), body mass index (BMI), history of stroke/transient ischemic attack, and comorbidity. Comorbidity was measured using a composite score based on 11 major health conditions (coronary artery disease or myocardial infarction, atrial fibrillation, heart failure, cancer, chronic obstructive pulmonary disease, diabetes, end-stage renal disease, epilepsy, high cholesterol, hypertension, Parkinson's disease). Additional factors abstracted from the medical chart include included pre-stroke functional status measured by the mRS, National Institutes of Health Stroke Severity (NIHSS) score,[1] and do not resuscitate (DNR) status.

References

[1]Williams LS, Yilmaz EY, Lopez-Yunez AM. Retrospective assessment of initial stroke severity with the NIH Stroke Scale. Stroke. 2000; 31(4) 858-62.

eTable I: Comparison of Characteristics between Included and Excluded Participants

Characteristics	Included Participants (N=836)	Excluded Participants (N=93)	P
Mean age (SD), years	69.2 (12.6)	63.7 (11.1)	<0.001
Median age, (interquartile interval)	69 (59-79)	64 (55-71)	<0.001
Women, n (%)	431 (51.6)	42 (45.2)	0.24
Race/ethnicity, n (%)			
Non-Hispanic White	276 (33.0)	34 (36.5)	0.02
Mexican American	503 (60.2)	46 (49.5)	
Other	57 (6.8)	13 (14.0)	
Marital status, n (%)			
Married/living with partner	421 (50.4)	32 (34.4)	0.003
Single	414 (49.6)	61 (65.6)	
Education, n (%)			
<12	317 (38.0)	27 (29.0)	0.23
12	232 (27.8)	29 (32.2)	
13+	285 (34.2)	37 (39.8)	
Insurance, n (%)			
Government	235 (28.1)	31 (33.3)	0.006
Private	523 (62.6)	45 (48.4)	
None	78 (9.3)	17 (18.3)	
Smoking status, n (%)			
Never	548 (65.6)	41 (44.6)	<0.001
Former	110 (13.2)	23 (25.0)	
Current	178 (21.3)	28 (30.4)	
Excessive alcohol use, n (%)	63 (7.5)	11 (11.8)	0.15
Mean body mass index (SD)	29.4 (6.7)	29.1 (5.6)	0.71
Median body mass index, (interquartile interval)	28.2 (24.9 – 32.9)	29.0 (24.4-32.7)	0.87
History of stroke, n (%)	253 (30.3)	22 (23.7)	0.19
Mean comorbidity score (SD), points	2.2 (1.3)	2.1 (1.3)	0.35
Median comorbidity score (interquartile interval), points	2 (1 – 3)	2 (1 – 3)	0.41
Mean NIHSS at baseline (SD), points	5.8 (6.0)	5.1 (6.0)	0.26
Median NIHSS at baseline (interquartile interval), points	4 (2 – 8)	3 (2 – 7)	0.32
DNR status, n (%)	39 (5.1)	2 (2.2)	0.22
Mean modified Rankin score (SD), points	1.7 (1.5)	1.3 (1.2)	0.008
Median modified Rankin Score (interquartile range), points	2 (0 – 2)	1 (0 – 2)	0.01

P-value based on chi-square test for categorical variables and t-test for continuous variables. Abbreviations: DNR, do-not-resuscitate. IV t-PA, intravenous tissue plasminogen activator. MCI, mild cognitive impairment. mRS, modified Rankin score. NIHSS, National Institute of Health Stroke Scale. SD, standard deviation.

eTable II: Predictors of Receiving Composite Quality Score, Defect-Free Quality Score, and Individual Treatments and Procedures after Acute Ischemic Stroke by Cognitive Status (Adjusted Odds Ratios and 95% Confidence Intervals)

	Adjusted Cumulative Odds Ratios (95% CI)	**Adjusted Odds Ratios (95% CI)**							
	Primary Outcome	**Secondary outcomes**							
Predictors	**Composite quality score (n=836)**	**Defect-free quality score (n=836)**	**IV t-PA* (N=140)**	**Anti-thrombotic by hospital day 2 (N=689)**	**Deep venous thrombosis prophylaxis (n=521)**	**Assessed for rehabilitation (N=702)**	**Antithrombotic therapy at discharge (n=818)**	**Lipid-lowering therapy at discharge (N=577)**	**Anti-coagulation for atrial fibrillation at discharge* (N=162)**
Pre-existing MCI vs normal cognition	1.06 (0.77-1.45) P=0.72	1.07 (0.77-1.49) P=0.67	**0.36 (0.14-0.96) P=0.04**	0.68 (0.29-1.63) P=0.39	1.05 (0.59-1.85) P=0.87	**0.28 (0.10-0.79) P=0.016**	1.26 (0.83-1.92) P=0.28	1.01 (0.59-1.72) P=0.97	1.13 (0.42-3.00) P=0.81
Pre-existing dementia vs normal cognition	0.79 (0.55-1.12) P=0.19	0.76 (0.52-1.11) P=0.16	0.84 (0.30-2.35) P=0.74	**0.39 (0.16-0.96) P=0.04**	1.01 (0.55-1.87) P=0.97	0.42 (0.11-1.56) P=0.19	0.88 (0.56-1.39) P=0.59	0.61 (0.34-1.10) P=0.10	0.72 (0.27-1.92) P=0.51
Age, per 1-year increase	1.0 (0.98-1.01) P=0.47	1.0 (0.98-1.01) P=0.50	0.99 (0.95-1.02) P=0.40	1.00 (0.97-1.03) P=0.98	1.02 (1.00-1.04) P=0.07	1.02 (0.97-1.06) P=0.50	1.00 (0.98-1.01) P=0.80	0.99 (0.97-1.02) P=0.59	0.99 (0.95-1.04) P=0.73
Women vs men	**0.74 (0.57-0.98) P=0.03**	0.82 (0.61-1.09) P=0.17	1.96 (0.81-4.76) P=0.14	**0.37 (0.18-0.77) P=0.007**	0.72 (0.45-1.16) P=0.18	1.08 (0.45-2.61) P=0.86	0.84 (0.59-1.20) P=0.34	0.67 (0.43-1.05) P=0.08	1.33 (0.60-2.99) P=0.48
Mexican American vs non-Hispanic white	1.08 (0.78-1.48) P=0.66	1.09 (0.78-1.53) P=0.61	0.62 (0.25– 1.53) P=0.30	0.55 (0.24-1.26) P=0.16	1.13 (0.64-2.00) P=0.67	0.62 (0.21-1.84) P=0.39	1.16 (0.77-1.75) P=0.47	1.26 (0.76-2.11) P=0.37	**0.20 (0.07-0.52) P=0.001**
Other race/ethnicity vs non-Hispanic white	1.24 (0.71-2.15) P=0.45	1.16 (0.64-2.08) P=0.63	0.54 (0.06-4.79) P=0.58	0.69 (0.18-2.71) P=0.60	1.06 (0.42-2.68) P=0.91	0.49 (0.09-2.74) P=0.42	1.67 (0.77-3.65) P=0.20	1.30 (0.52-3.23) P=0.58	0.23 (0.05-1.08) P=0.06
High school vs <high school	0.97 (0.68-1.39) P=0.89	1.05 (0.73-1.53) P=0.78	0.64 (0.22-1.80) P=0.39	0.63 (0.27-1.46) P=0.28	1.21 (0.65-2.27) P=0.55	0.41 (0.15-1.16) P=0.09	1.02 (0.64-1.62) P=0.92	0.69 (0.39-1.25) P=0.23	0.38 (0.12-1.15) P=0.09
>High school vs < high school	1.0 (0.71-1.42) P=0.98	1.06 (0.73-1.52) P=0.77	0.57 (0.21-1.57 P=0.28	0.84 (0.35-2.04) P=0.70	1.09 (0.59-2.04) P=0.78	1.30 (0.37-4.54) P=0.68	1.06 (0.67-1.68) P=0.80	0.78 (0.44-1.40) P=0.41	0.96 (0.35-2.60) P=0.93
Comorbidity score per 1-point increase	**0.88 (0.79-0.97) P=0.01**	**0.84 (0.76-0.94) P=0.003**	1.04 (0.77-1.41) P=0.78	1.00 (0.79-1.27) P=1.00	0.85 (0.71-1.01) P=0.06	1.01 (0.70-1.46) P=0.95	0.89 (0.78-1.02) P=0.09	**1.21 (1.01-1.44) P=0.03**	1.16 (0.86-1.55) P=0.33

Body mass index per 1-unit increase	**1.03 (1.01-1.05) P=0.01**	**1.03 (1.00-1.05) P=0.03**	1.03 (0.96-1.10) P=0.41	1.04 (0.99-1.09) P=0.15	1.0 (0.97-1.04) P=0.96	0.95 (0.90-1.01) P=0.09	**1.04 (1.0-1.07) P=0.008**	1.02 (0.98-1.05) P=0.37	1.01 (0.95-1.08) P=0.76
NIHSS score per 1-point increase	0.99 (0.97-1.01) P=0.37	0.99 (0.96-1.01) P=0.22	**1.15 (1.08-1.23) P <0.001**	0.97 (0.92-1.01) P=0.15	1.0 (0.97-1.04) P=0.83	**1.13 (1.00-1.28) P=0.057**	0.98 (0.95-1.01) P=0.12	0.98 (0.95-1.02) 0.29	**1.11 (1.03-1.20) P=0.007**
DNR status present vs absent	1.16 (0.61-2.20) P=0.65	1.00 (0.51-2.0) P=0.99	2.54 (0.21-30.02) P=0.46	0.60 (0.21-1.74) P=0.35	0.93 (0.35-2.46) P=0.88	NA	1.77 (0.64-4.90) P=0.27	0.57 (0.24-1.33) P=0.19	1.06 (0.23-4.83) P=0.94
mRS score per 1-unit increase	0.97 (0.88-1.07) P=0.54	1.00 (0.90-1.11) P=0.98	**0.66 (0.48-0.91) P=0.01**	0.90 (0.71-1.15) P=0.40	0.97 (0.81-1.15) P=0.71	1.13 (0.79-1.61) P=0.49	1.01 (0.89-1.16) P=0.85	0.89 (0.75-1.05) P=0.16	0.85 (0.65-1.11) P=0.24

Bolded figures denote 95% confidence intervals that do not include 1.0. NA, not available.

Abbreviations: CI, confidence interval. DNR, do-not-resuscitate. IV t-PA, intravenous tissue plasminogen activator. MCI, mild cognitive impairment. mRS, modified Rankin score. NIHSS, National Institute of Health Stroke Scale. For each dependent variable the fully adjusted model (Model M3) included pre-existing cognitive status (normal cognition, MCI, dementia), age, sex, race/ethnicity, education, comorbidity score, body mass index, NIHSS score, DNR status, and mRS score as covariates except the fully adjusted model for rehabilitation assessment does not include DNR status because no patients with DNR orders were assessed for rehabilitation.

Composite quality measure (primary outcome) was calculated by dividing the number of performance measures that a patient received by the number of measures a patient was eligible to receive. This score ranges between 0 and 1, with values closer to 1 implying better adherence to the performance measures. Based on the distribution of the data, we classified the composite quality score into three categories resulting in an ordinal 3-level composite quality measure (values of <0.75, 0.75-0.99, and 1.0) corresponding to the percentage of treatments received. Process measures of ischemic stroke treatment were 1) intravenous t-PA administered, 2) antithrombotic therapy by end of hospital day 2, 3) deep venous thrombosis prophylaxis, 4) assessed for rehabilitation, 5) discharged on antithrombotic therapy, 6), discharged on lipid-lowering therapy, and 7) discharged on anticoagulation therapy for atrial fibrillation. Defect-free score was defined as a patient receiving all of the performance measures they were eligible to receive.

*Given a small number of events relative to the number of covariates the results of the adjusted models for these process measures should be interpreted with caution.

eTable III: Predictors of Receiving Brain MRI, Carotid Imaging, and Echocardiogram after Acute Ischemic Stroke by Cognitive Status (Adjusted Odds Ratios and 95% Confidence Intervals)

Predictors	Adjusted Odds Ratios (95% CI)		
	Brain MRI (n=768)	**Carotid Imaging (n=768)**	**Echocardiogram (n=768)**
Pre-existing MCI vs normal cognition	0.80 (0.48-1.33) P=0.39	0.80 (0.45-1.43) P=0.46	**0.48 (0.32-0.73) P=0.001**
Pre-existing dementia vs normal cognition	0.99 (0.56-1.74) P=0.96	0.66 (0.35-1.24) P=0.20	**0.42 (0.26-0.67) P<0.001**
Age, per 1-year increase	0.98 (0.96-1.00) P=0.12	0.98 (0.96-1.00) P=0.06	1.01 (0.99-1.02) P=0.37
Women vs men	1.17 (0.76-1.82) P=0.47	1.17 (0.72-1.90) P=0.53	1.05 (0.74-1.49) P=0.79
Mexican American vs non-Hispanic white	1.08 (0.65-1.79) P=0.76	0.83 (0.47– 1.45) P=0.51	0.89 (0.59– 1.33) P=0.56
Other race/ethnicity vs non-Hispanic white	0.83 (0.37-1.87) P=0.65	1.01 (0.36-2.82) P=0.99	1.36 (0.63-2.94) P=0.43
High school vs <high school	0.76 (043-1.33) P=0.34	0.68 (0.37-1.25) P=0.21	1.08 (0.67-1.72) P=0.76
>High school vs < high school	0.95 (0.54-1.66) P=0.85	1.02 (0.54-1.93) P=0.94	0.80 (0.51-1.24) P=0.32
Comorbidity score per 1-point increase	**0.72 (0.61-0.84) P <0.001**	1.12 (0.93-1.35) P=0.25	0.93 (0.81-1.06) P=0.28
Body mass index per 1-unit increase	1.0 (0.97-1.03) P=0.92	0.99 (0.95-1.03) P=0.63	1.02 (0.99-1.05) P=0.17
NIHSS score per 1-point increase	**0.96 (0.93-0.99) P=0.02**	0.98 (0.95-1.02) P=0.30	0.99 (0.97-1.02) P=0.68
DNR status present vs absent	1.18 (0.48-2.86) P=0.72	1.64 (0.53-5.06) P=0.39	0.79 (0.37-1.65) P=0.53
mRS score per 1-unit increase	0.88 (0.76-1.03) P=0.12	0.93 (0.77-1.11) P=0.39	0.94 (0.83-1.08) P=0.39

Bolded figures denote 95% confidence intervals that do not include 1.0.
Abbreviations: DNR, do-not-resuscitate. MCI, mild cognitive impairment. MRI, magnetic resonance imaging. mRS, modified Rankin score. NIHSS, National Institute of Health Stroke Scale. For each dependent variable the fully adjusted model (Model M3) included pre-existing cognitive status (normal cognition, MCI, dementia), age, sex, race/ethnicity, education, comorbidity score, body mass index, NIHSS score, DNR status, and mRS score as covariates.

eTable IV: Sensitivity Analysis of Unadjusted and Adjusted Odds Ratios (95% CIs) for Receiving Composite Quality Score after Acute Ischemic Stroke Using Continuous IQCODE Score as a Covariate (n=834)

Primary outcome	Base model (M1): Unadjusted cumulative odds ratios (95% CI)	Parsimonious model (M2): Adjusted cumulative odds ratios (95% CI)	Full model (M3): Adjusted cumulative odds ratios (95% CI)
Composite quality measure (ordinal scale with 3 levels)	0.76 (0.59-0.99) P=0.04	0.86 (0.65-1.12) P=0.27	0.91 (0.68-1.21) P=0.51
Abbreviations: CI, confidence interval. DNR, do-not-resuscitate. IQCODE, Informant Questionnaire On Cognitive Decline in the Elderly. IV t-PA, intravenous tissue plasminogen activator. MCI, mild cognitive impairment. mRS, modified Rankin score. NIHSS, National Institute of Health Stroke Scale.			
Composite quality measure (primary outcome) was calculated by dividing the number of performance measures that a patient received by the number of measures a patient was eligible to receive. This score ranges between 0 and 1, with values closer to 1 implying better adherence to the performance measures. Based on the distribution of the data, we classified the composite quality score into three categories resulting in an ordinal 3-level composite quality measure (values of <0.75, 0.75-0.99, and 1.0) corresponding to the percentage of treatments received. Process measures of ischemic stroke treatment were 1) intravenous t-PA administered, 2) antithrombotic therapy by end of hospital day 2, 3) deep venous thrombosis prophylaxis, 4) assessed for rehabilitation, 5) discharged on antithrombotic therapy, 6), discharged on lipid-lowering therapy, and 7) discharged on anticoagulation therapy for atrial fibrillation.			
Covariates used in Models M1-M3 Model M1 (Base model): continuous IQCODE score. Model M2: covariates in Model M1 + age, sex, race/ethnicity, education, comorbidity score, and body mass index. Model M3: covariates in Model M2 + NIHSS score, DNR status, and mRS score Higher IQCODE scores indicate worse cognition. Two patients with Alzheimer's disease or dementia were excluded from the analysis because they had missing values for the IQCODE score.			

eTable V: Adjusted Odds Ratios (95% CIs) for Receiving Composite Quality Score and Defect-Free Quality Score after Acute Ischemic Stroke by Cognitive Status after Adjusting for Time Periods of Stroke Hospitalization

	Model adding time period of stroke hospitalization to full model (M3): (n=836)	
Effect/contrast	**Composite quality measure (primary outcome) Adjusted cumulative odds ratios (95% CI)**	**Defect-free quality score (secondary outcome) Adjusted odds ratios (95% CI)**
MCI vs normal cognition	1.08 (0.79-1.48) P=0.62	1.10 (0.79-1.53) P=0.57
Dementia vs normal cognition	0.83 (0.58-1.19) P=0.31	0.80 (0.55-1.17) P=0.25
Time effect per two-year increase	1.28 (1.07-1.53) P=0.006	1.23 (1.02-1.48) P=0.03
Abbreviations: MCI, mild cognitive impairment.		
Composite quality measure was calculated by dividing the number of performance measures that a patient received by the number of measures a patient was eligible to receive. This score ranges between 0 and 1, with values closer to 1 implying better adherence to the performance measures. Based on the distribution of the data, we classified the composite quality score into three categories resulting in an ordinal 3-level composite quality measure (values of <0.75, 0.75-0.99, and 1.0) corresponding to the percentage of treatments received. Process measures of ischemic stroke treatment were 1) intravenous t-PA administered, 2) antithrombotic therapy by end of hospital day 2, 3) deep venous thrombosis prophylaxis, 4) assessed for rehabilitation, 5) discharged on antithrombotic therapy, 6), discharged on lipid-lowering therapy, and 7) discharged on anticoagulation therapy for atrial fibrillation. Defect-free score was defined as a patient receiving all of the performance measures they were eligible to receive.		
Covariates used in Model M3: IQCODE score, age, sex, race/ethnicity, education, comorbidity score, and body mass index, NIHSS score, DNR status, mRS score, and time periods of stroke hospitalization in 2-year intervals (2008-2009, 2010-2011, 2012-2013).		