SUPPLEMENTAL MATERIAL

Table S1. Baseline and clinical characteristics of patients included and excluded in the final analysis.

	Included	Excluded	P value
Participants, No.	3222	273	
Sex, male, n (%)	2301(71.4)	194(71.1)	0.957
Age, years, mean (SD)	63.01(13.06)	64.05(14.00)	0.21
BMI, kg/m^2, mean (SD)	24.57(3.53)	24.71(3.56)	0.617
Smoking history, n (%)	2454(76.2)	189(69.2)	0.112
Medical history, n (%)			
Hypertension	2075(64.4)	178(65.2)	0.842
Diabetes	1052(32.7)	102(37.4)	0.128
Prior Stroke	190(5.9)	23(8.4)	0.146
Myocardial infarction	73(2.6)	8(3.3)	0.648
Atrial fibrillation	402(12.5)	44(16.1)	0.102
Lipid-lowering medication before admission	380(18.5)	44(23.4)	0.124
Lipid-lowering therapy in hospital	2883(89.5)	228(83.4)	0.071
TOAST subtype, n (%)			0.057
large artery atherosclerosis	1304(40.5)	117(42.9)	
small vessel occlusion	799(24.8)	45(16.5)	
cardioembolic stroke	406(12.6)	44(16.1)	
other determined etiology	127(3.9)	10(3.7)	
undetermined etiology	586(18.2)	57(20.9)	
NIHSS			0.061
mild: 0-4, n (%)	1817(56.4)	129(47.3)	
moderate: 5-15, n (%)	1156(35.9)	121(44.3)	
severe: 16-42, n (%)	249(7.7)	23(8.4)	

Data are presented as mean (SD), median [IQR] or number (%).

SD, standard deviation; IQR, interquartile range; BMI, body mass index; TOAST, trial of ORG 10172 in acute stroke treatment.

Table S2. Association of remnant cholesterol <20 mg/dL at admission with in-hospital outcomes of ischemic stroke.

	Model 1			Model 2			Risk difference (95% CI), %	
	OR	95% CI	P value	OR	95% CI	P value	Model 1	Model 2
Remnant cholesterol ≥20 mg/dL	Ref							
Bleeding event during hopital	1.710	1.119-2.67	0.015	2.418	1.170-5.279	0.021	1.5 (0.3~2.7)	2.4 (0.5~4.2)
Death in hospital	1.270	0.731-2.279	0.407	1.814	0.558-6.754	0.341	0.5 (-0.5~1.3)	1.1 (-1.0~3.1)

OR, odds ratio; CI, confidence interval; BMI, body mass index; TOAST, trial of ORG 10172 in acute stroke treatment; LDL, low-density lipoprotein; HDL, high-density lipoprotein; eGFR, estimated glomerular filtration rate.

Model 1 was adjusted for age and sex; model 2 was further adjusted for BMI, smoking, hypertension, diabetes, mycardial infaction, atrial fibrillation, prior stroke, eGFR, TOAST subtype, lipid-lowering before admission, intravenous thrombolytic therapy and mechanical thrombectomy, LDL cholesterol and HDL cholesterol.

Table S3. Association of remnant cholesterol levels at admission with in-hospital outcomes after NIHSS additionally adjusted.

	β	OR	95% CI	P value
Remnant cholesterol 20-29.9 mg/dL				
Bleeding event				
<20 mg/dL	0.921	2.513	1.089-6.594	0.042
≥30 mg/dL	0.211	1.235	0.354-4.021	0.727
Death in hospital				
<20 mg/dL	0.944	2.570	0.653-13.213	0.211
≥30 mg/dL	0.414	1.513	0.067-14.577	0.740

OR, odds ratio; CI, confidence interval; BMI, body mass index; TOAST, trial of ORG 10172 in acute stroke treatment; LDL, low-density lipoprotein; HDL, high-density lipoprotein; eGFR, estimated glomerular filtration rate; NIHSS, National Institutes of Health Stroke Scale. Analyses were adjusted for age, sex, BMI, smoking, hypertension, diabetes, myocardial infarction, atrial fibrillation, prior stroke, eGFR, TOAST subtype, lipid-lowering before admission, intravenous thrombolytic therapy and mechanical thrombectomy, LDL cholesterol, HDL cholesterol and NHISS.

Table S4. Adjusted odds ratios of remnant cholesterol levels at admission for in-hospital outcomes of ischemic stroke among the imputed datasets.

	β	OR	95% CI	P value
Remnant cholesterol 20-29.9 mg/dL	Ref			
Bleeding event				
<20 mg/dL	0.583	1.791	1.011-3.175	0.046
≥30 mg/dL	0.251	1.285	0.621-2.660	0.499
Death in hospital				
<20 mg/dL	0.157	1.170	0.553-2.474	0.681
≥30 mg/dL	0.063	1.065	0.383-2.963	0.903

OR, odds ratio; CI, confidence interval; BMI, body mass index; TOAST, trial of ORG 10172 in acute stroke treatment; LDL, low-density lipoprotein; HDL, high-density lipoprotein; eGFR, estimated glomerular filtration rate.

Analyses were adjusted for age, sex, BMI, smoking, hypertension, diabetes, myocardial infarction, atrial fibrillation, prior stroke, eGFR, TOAST subtype, lipid-lowering before admission, intravenous thrombolytic therapy and mechanical thrombectomy, LDL cholesterol and HDL cholesterol.

Number of missing cases: BMI (n=756) and eGFR (n=45). Five-iteration imputed datasets were generated by Markov Chain Monte Carlo method.

Table S5. Association between remnant cholesterol levels at admission and outcomes of ischemic stroke among 2883 patients with lipid-lowering medication during hospitalization.

	Model 1				Model 2			
	OR	95% CI	P value	P interaction∗	OR	95% CI	P value	P interaction
Remnant cholesterol 20-29.9 mg/dL	Ref							
Bleeding event								
<20 mg/dL	1.980	1.129-3.720	0.024	0.612	3.012	1.267-8.385	0.020	0.978
≥30 mg/dL	1.326	0.597-2.902	0.479	0.849	1.387	0.389-4.739	0.598	0.944
Death in hospital								
<20 mg/dL	1.378	0.537-4.237	0.534	0.615	1.256	0.212-11.162	0.814	0.565
≥30 mg/dL	1.075	0.218-4.431	0.922	0.857	- †	-	-	-

OR, odds ratio; CI, confidence interval; BMI, body mass index; TOAST, trial of ORG 10172 in acute stroke treatment; LDL, low-density lipoprotein; HDL, high-density lipoprotein; eGFR, estimated glomerular filtration rate.

Model 1 was adjusted for age and sex; model 2 was further adjusted for BMI, smoking, hypertension, diabetes, myocardial infarction, atrial fibrillation, prior stroke, eGFR, TOAST subtype, lipid-lowering before admission, intravenous thrombolytic therapy and mechanical thrombectomy, LDL cholesterol and HDL cholesterol.

∗P interaction was calculated with the interaction term of remnant cholesterol group (middle/low/high) and lipid-lowering medication use in hospital (yes/no) fitted in the model among 3,222 patients.

† unrobust variance estimation.

Table S6. Subgroup analysis of low remnant cholesterol levels at admission with bleeding event.

	OR	95% CI	P value	P interaction
Non-smoking (Ref: ≥20 mg/dL)				
<20 mg/dL	2.382	1.064-6.063	0.047	0.413
Current smoking (Ref: ≥20 mg/dL)				
<20 mg/dL	1.480	1.097-2.497	0.031	
Non-obesity (Ref: ≥20 mg/dL)				
<20 mg/dL	1.985	1.127-3.669	0.022	0.827
Obesity (Ref: ≥20 mg/dL)				
<20 mg/dL	1.603	1.043-2.351	0.043	

OR, odds ratio; CI, confidence interval; BMI, body mass index; TOAST, trial of ORG 10172 in acute stroke treatment; LDL, low-density lipoprotein; HDL, high-density lipoprotein; eGFR, estimated glomerular filtration rate.

Analyses were adjusted for age, sex, BMI, smoking, hypertension, diabetes, myocardial infarction, atrial fibrillation, prior stroke, eGFR, TOAST subtype, lipid-lowering before admission, intravenous thrombolytic therapy and mechanical thrombectomy, LDL cholesterol, HDL cholesterol, if not stratified.

Table S7. Risk for bleeding events according to remnant cholesterol and LDL cholesterol levels.

	Model 1		Model 2	
	OR (95% CI)	P value	OR (95% CI)	P value
Moderate LDL-C and high RC	Ref			
Bleeding event during hospital				
Moderate LDL-C and low RC	1.985 (1.090-3.824)	0.031	2.190 (0.801-7.015)	0.148
Low LDL-C and high RC	0.417 (0.023-2.098)	0.400	0.934 (0.049-5.453)	0.950
Low LDL-C and low RC	3.180 (1.648-6.367)	0.001	7.030 (2.570-22.573)	<0.001
High LDL-C and high RC	2.356 (1.136-4.941)	0.021	3.052 (0.944-10.607)	0.064
High LDL-C and low RC	1.905 (0.665-4.842)	0.195	4.046 (0.934-16.527)	0.050

OR, odds ratio; CI, confidence interval; LDL-C, low-density lipoprotein cholesterol; RC, remnant cholesterol.

Model 1 was adjusted for age and sex; model 2 was further adjusted for BMI, smoking, hypertension, diabetes, myocardial infarction, atrial fibrillation, prior stroke, eGFR, TOAST subtype, lipid-lowering before admission, intravenous thrombolytic therapy and mechanical thrombectomy, and HDL cholesterol.

Table S8. Risk for bleeding events according to remnant cholesterol stratified by LDL cholesterol levels.

	OR	95% CI	P value
LDL cholesterol <70 mg/dL			
Remnant cholesterol ≥20 mg/dL	Ref		
Remnant cholesterol <20 mg/dL	7.877	1.630-14.801	0.045
LDL cholesterol 70-129.9 mg/dL			
Remnant cholesterol ≥20 mg/dL	Ref		
Remnant cholesterol <20 mg/dL	1.908	1.042-3.691	0.043
LDL cholesterol ≥130 mg/dL			
Remnant cholesterol ≥20 mg/dL	Ref		
Remnant cholesterol <20 mg/dL	0.785	0.275-1.973	0.625

OR, odds ratio; CI, confidence interval; LDL, low-density lipoprotein

Analysis was adjusted for age, sex, BMI, smoking, hypertension, diabetes, myocardial infarction, atrial fibrillation, prior stroke, eGFR, TOAST subtype, lipid-lowering before admission, intravenous thrombolytic therapy and mechanical thrombectomy, and HDL cholesterol.

Figure S1. Absolute risk of in-hospital outcomes of ischemic stroke by remnant cholesterol at admission.