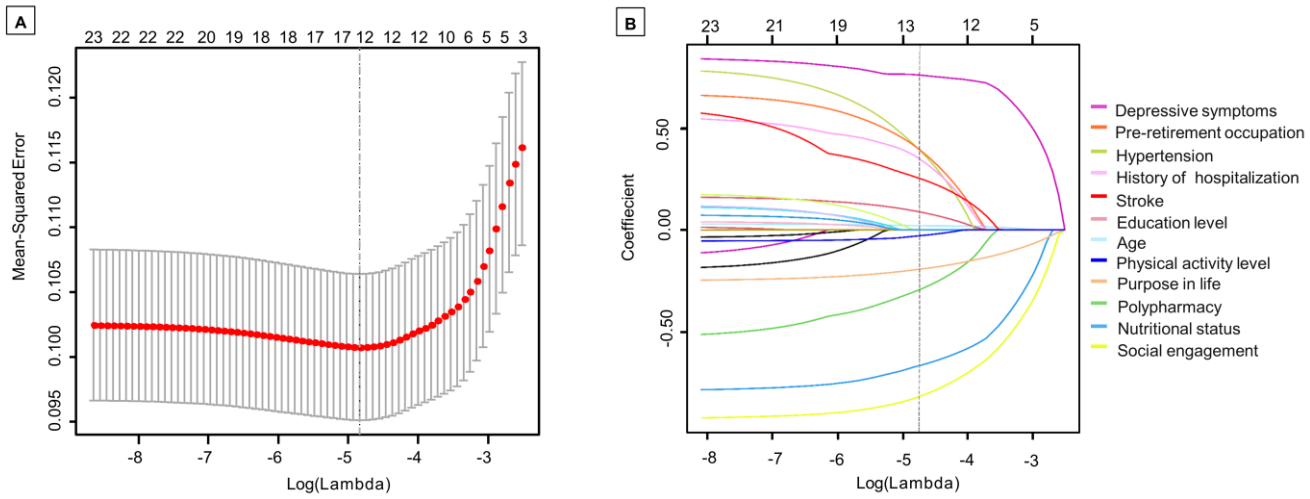

Supplementary Figure 1 Predictors selection by Lasso regression on training dataset. A: The optimal parameter (Lambda) identified in the LASSO model was used with 10-fold cross-validation and minimum criteria. The dotted vertical line represented the minimum criteria, a Lambda value of 0.00795 was chosen, with Log (Lambda) = -4.835; (B) Lasso coefficient profiles of the 12 variables. 10-fold cross-validation was used to plot the dotted vertical line at the chosen value. (Lasso, least absolute shrinkage and selection operator).

Supplementary Table 1 TRIPOD Checklist: Prediction model development

Section/Topic	Item	Checklist Item	Page
Title and abstract			
Title	1	Identify the study as developing and/or validating a multivariable prediction model, the target population, and the outcome to be predicted.	Title
Abstract	2	Provide a summary of objectives, study design, setting, participants, sample size, predictors, outcome, statistical analysis, results, and conclusions.	Abstract
Introduction			
Background and objectives	3a	Explain the medical context (including whether diagnostic or prognostic) and rationale for developing or validating the multivariable prediction model, including references to existing models.	Introduction Paragraphs 1-4
	3b	Specify the objectives, including whether the study describes the development or validation of the model or both.	Introduction Paragraph 5
Methods			

Source of data	4a	Describe the study design or source of data (e.g., randomized trial, cohort, or registry data), separately for the development and validation data sets, if applicable.	Methods Study design and participants Paragraphs 1-2
	4b	Specify the key study dates, including start of accrual; end of accrual; and, if applicable, end of follow-up.	Methods Study design and participants Paragraphs 2
Participants	5a	Specify key elements of the study setting (e.g., primary care, secondary care, general population) including number and location of centres.	Methods Study design and participants Paragraphs 2
	5b	Describe eligibility criteria for participants.	Methods Study design and participants Paragraphs 2-4
	5c	Give details of treatments received, if relevant.	Not Applied
Outcome	6a	Clearly define the outcome that is predicted by the prediction model, including how and when assessed.	Methods Outcome and predictor variables
	6b	Report any actions to blind assessment of the outcome to be predicted.	Not Applied

Predictors	7a	Clearly define all predictors used in developing or validating the multivariable prediction model, including how and when they were measured.	Methods Outcome and predictor variables Supplementary Table S2
	7b	Report any actions to blind assessment of predictors for the outcome and other predictors.	Not Applied
Sample size	8	Explain how the study size was arrived at.	Methods Sample size estimation
Missing data	9	Describe how missing data were handled (e.g., complete-case analysis, single imputation, multiple imputation) with details of any imputation method.	Methods Data collection
Statistical analysis methods	10a	Describe how predictors were handled in the analyses.	Methods Statistical analysis Paragraph 1
	10b	Specify type of model, all model-building procedures (including any predictor selection), and method for internal validation.	Methods Statistical analysis Paragraph 2
	10d	Specify all measures used to assess model performance and, if relevant, to compare multiple models.	Methods Statistical analysis Paragraph 3
Risk groups	11	Provide details on how risk groups were created, if done.	Not Applied

Results			
Participants	13a	Describe the flow of participants through the study, including the number of participants with and without the outcome and, if applicable, a summary of the follow-up time. A diagram may be helpful.	Results Recruitment, attrition and prevalence of MCR Fig. 1. flowchart Supplementary Table S3
	13b	Describe the characteristics of the participants (basic demographics, clinical features, available predictors), including the number of participants with missing data for predictors and outcome.	Results Characteristics of the study cohort Supplementary Table S4
Model development	14a	Specify the number of participants and outcome events in each analysis.	Results Characteristics of the study cohort Supplementary Table S4
	14b	If done, report the unadjusted association between each candidate predictor and outcome.	Results Results of the predictor selection Supplementary Tables S4-S5 Supplementary Figure S1
Model specification	15a	Present the full prediction model to allow predictions for individuals (i.e., all regression coefficients, and	Results

		model intercept or baseline survival at a given time point).	Establishment and exhibition of LR model Supplementary Table S6 Fig. 2 Establishment and exhibition of the DT model Paragraphs 1 Supplementary Table S7 Supplementary Figure S2
	15b	Explain how to the use the prediction model.	Results Establishment and exhibition of LR model Fig. 2 Establishment and exhibition of the DT model Paragraphs 2 Fig. 3
Model performance	16	Report performance measures (with CIs) for the prediction model.	Results Results of the model performance Paragraphs 1-3 Supplementary Table S8-S10

			Fig. 4A-B, Fig. Fig. 5A-C, Fig. 6A-B
Discussion			
Limitations	18	Discuss any limitations of the study (such as nonrepresentative sample, few events per predictor, missing data).	Discussion Strengths and limitations Paragraph
Interpretation	19b	Give an overall interpretation of the results, considering objectives, limitations, and results from similar studies, and other relevant evidence.	Discussion Strengths and limitations Paragraphs
Implications	20	Discuss the potential clinical use of the model and implications for future research.	Discussion Strengths and limitations Paragraphs
Other information			
Supplementary information	21	Provide information about the availability of supplementary resources, such as study protocol, Web calculator, and data sets.	Supplementary Material
Funding	22	Give the source of funding and the role of the funders for the present study.	Funding information

We recommend using the TRIPOD Checklist in conjunction with the TRIPOD Explanation and Elaboration document.

Supplementary Table 2 The definitions, assignment, and types of all research variables

Research variables (45)	Types	Coding or unit of measurement	Definitions	Missing rate (%)
Demographic characteristics (11)				
Gender	Binary	0=Male; 1=Female.	NA.	0
Age	Continuous	Years old.	NA.	0
Nationality	Binary	0=Han; 1=Others.	Others include Yi, Hui, Mongol, Tujia.	0
Education level	Categorical	0=Illiteracy=0 (Reference); 1=Primary school, 0=Middle school, 0=High school, 0=College and above=0; 1=Middle school, 0=Primary school, 0=High school, 0=College and above; 1=High school, 0=Primary school, 0=Middle school, 0=College and above;	Illiterate means never accepted formal education, primary school means less than or equal to 5 years, middle school means 6-8 years, high school means 9-11 years, and university means greater than or equal to 12 years.	0

		1=College and above, 0=Primary school, 0=Middle school, 0=High school.		
Pre-retirement occupation	Binary	0=Manual labor;1=Mental labor.	Manual labor included peasants and workers, and mental labor included civil servants, cadres, teachers, medical workers, accountants, policemen.	0
Marital status	Categorical	0=Single (Reference); 1=Married, 0=Divorced, 0=Widowed; 1=Divorced, 0=Married, 0=Widowed; 1=Widowed, 0=Married, 0=Divorced.	NA.	0
Living condition	Categorical	0=Living alone=0 (Reference); 1=Living with family (spouse/children), 0=Living	NA.	0

		with other relatives/friends; 1=Living with other relatives/friends, 0=Living with family (spouse/children).		
Residential area	Categorical	1=Urban; 2=Rural.	NA.	0
Monthly income (Yuan)	Categorical	0=≤1000 (Reference); 1=1001-2999, 0=3000-4999, 0=≥5000; 1=3000-4999, 0=1001-2999, 0=≥5000; 1=≥5000, 0=3000-4999, 0=1001-2999.	According to retirement salary of China, divided ≤ 1000 yuan, 1001-2999 yuan, 3000-4999 yuan and ≥ 5000 yuan.	0
Medical insurance	Categorical	0=New rural cooperative medical system (Reference); 1=Basic medical insurance for urban employees/residents, 0=No, 0=Others;	NA.	0

		1=No, 0=Basic medical insurance for urban employees/residents, 0=Others; 1=Others, 0=Basic medical insurance for urban employees/residents, 0=No.		
Family history of dementia	Binary	0=No; 1=Yes.	According to the medical history of first-degree relatives diagnosed with dementia by physicians.	0
Lifestyles and behaviors (5)				
Smoking status	Categorical	0=Never (Reference); 1=Current, 0=Past; 1=Past, 0=Current.	Having a habit of smoking in the past six months [1].	0
Drinking status	Categorical	0=Never (Reference); 1=Current, 0=Past; 1=Past, 0=Current.	Having a habit of drinking in the past six months [1].	0
Social engagement	Binary	0=Irregular; 1=Regular.	NA.	0
Sedentary behavior	Binary	0=No; 1=Yes.	Sedentary behavior was defined as the total	0

			sedentary behavior time (≥ 6 hours/day), which included sedentary activities such as sitting, reclining or lying flat, such as using electronic devices (such as television, smart phone, computer, etc.), reading, writing, talking, and taking buses, cars, trains, etc [2].	
Physical activity level	Categorical	0=Low (Reference); 1=Moderate, 0=High; 1=High. 0=Moderate.	According to the calculation criteria of International Physical Activity Questionnaire-Short-Chinese version (IPAQ-S-C), the physical activity level was divided into low, moderate and high levels [2].	0
Physical functional state (25)				
Height	Continuous	Meter (m).	Measured during investigation.	0
Weight	Continuous	Kilograms (Kg).	Measured during investigation.	0
BMI	Continuous	Kilograms/meter^2 (Kg/m^2).	Body mass index, calculated as weight in kilograms divided by height in meters squared [3].	0

Handgrip strength	Continuous	Kilograms (Kg).	Measured twice using a dynamometer (EH101) and the maximum value was selected [4].	0
Skeletal muscle mass	Continuous	Kilograms (Kg).	Assessed with a multifrequency bioelectrical impedance analyzer (InBody H20N) [5].	2.12 (26/1189)
Body fat mass	Continuous	Kilograms (Kg).	Assessed with a multifrequency bioelectrical impedance analyzer (InBody H20N) [5].	2.12 (26/1189)
Obesity	Binary	0=No; 1=Yes.	The World Health Organization's BMI classification system was used to define obesity (≥ 25 Kg/m^2) means obese and normal weight (< 25 Kg/m^2) according to result of BMI [3].	0
Nutritional status	Categorical	0=Malnourished (Reference); 1=At risk of malnutrition, 0=Non-malnutrition; 1=Non-malnutrition, 0=At risk of malnutrition.	According to the Mini-Nutrition Assessment Short Form scale (MNA- SF), 12-14 points was defined as non-malnutrition, 8-11 points as at risk of malnutrition, and 0-7 points as malnourished [6].	0
Pain	Categorical	0=No (Reference); 1=Low; 0=Moderate;	According to Visual Analogue Pain Scale (VAS), 0 points was defined as no pain, 1-4 points as low	0

		0=Severe; 0=Intense; 1=Moderate, 0=Low, 0=Severe, 0=Intense; 1=Severe, 0=Low, 0=Moderate, 0=Intense; 1=Intense, 0=Low, 0=Moderate, 0=Severe.	pain, 5-6 points as moderate pain, 7-9 points as severe pain, and 10 points as intense pain [7].	
Frailty condition	Categorical	0=No frailty (Reference); 1=Pre-frailty, 0=Frailty; 1=Frailty, 0=Pre-frailty.	According to FRAIL scale, 0-1 points was defined as no frailty, 2 points as pre-frailty, and 3-5 points as frailty [8].	0
Sleep quality	Binary	0=Good; 1=Poor.	According to Pittsburgh Sleep Quality Index scale (PSQI), if the score < 8 was defined as good sleep quality, or ≥ 8 was defined as poor sleep quality [9].	0
History of falling	Binary	0=No; 1=Yes.	Having a history of falling in the past 12 months [10].	0
Number of falling	Continuous	NA.	Having a number of falling in the past 12 months [10].	0
Fear of falling	Categori	0=No; 1=Yes.	Fear of falling (FOF) was assessed using a	0

	cal		question presented with five response choices: "Are you usually afraid that you may fall?" If participants answered "considerably" or "very much," they were considered to have a FoF. Participants who responded "not at all", "a little", or "don't know" were considered to have no FOF [11].	
History of hospitalization	Binary	0=No; 1=Yes.	Having a history of hospitalization in the past 12 months [10].	0
Number of hospitalization	Continuous	NA.	Having a number of hospitalization in the past 12 months [10].	0
Polypharmacy	Binary	0=No; 1=Yes.	Using medication types greater than or equal to 5 [10].	0
Comorbidity status	Binary	0=No; 1=Yes.	Defined as a person having two or more of chronic diseases according to the diagnosis of the physician.	0
Chronic disease: Coronary artery disease	Binary	0=No; 1=Yes.	Having diagnosis of coronary artery disease in the past six months.	0

Hypertension	Binary	0=No; 1=Yes.	Having diagnosis of hypertension in the past six months.	0
Stroke	Binary	0=No; 1=Yes.	Having diagnosis of stroke in the past six months.	0
Diabetes mellitus	Binary	0=No; 1=Yes.	Having diagnosis of diabetes mellitus in the past six months.	0
Asthma	Binary	0=No; 1=Yes.	Having diagnosis of asthma in the past six months.	0
Osteoarthritis	Binary	0=No; 1=Yes.	Having diagnosis of osteoarthritis in the past six months.	0
Tumor	Binary	0=No; 1=Yes.	Having diagnosis of tumor in the past six months.	0
Psychological condition (4)				
Depressive symptoms	Binary	0=No; 1=Yes.	According to the 15-item Geriatric Depression Scale (GDS-15), ≥ 8 points was defined as depressive symptoms [12-13].	0
Apathetic conditions	Binary	0=No; 1=Yes.	According to the three apathy items of the Geriatric Depression Scale (GDS-3A), ≥ 2 points was defined as apathetic conditions [14].	0

Personality traits	Categorical	0=Neuroticism (Reference); 1=Conscientiousness, 0=Agreeableness, 0=Openness, 0=Extroversion; 1=Agreeableness, 0=Conscientiousness, 0=Openness, 0=Extroversion; 1=Openness, 0=Conscientiousness, 0=Agreeableness, 0=Extroversion; 1=Extroversion, 0=Conscientiousness, 0=Agreeableness,0=Openness.	According to the Chinese Big Five Personality Inventory Brief version (CBF-PI-B Mini-Scale), personality traits was determined according to dimension scores, and individuals with higher dimension scores were divided into five groups as following: neuroticism, conscientiousness, agreeableness, openness extroversion [15].	0
Purpose in life	Continuous	Points.	According to the Purpose in Life Test-Short Form (PIL-SF), the higher the score, the stronger the sense of purpose and meaning in life [16].	0

Abbreviation: NA, not applicable; m, meter; Kg, kilogram; BMI, body mass index; IPAQ-S-C, International Physical Activity

Questionnaire-Short-Chinese version; MNA- SF, Mini-Nutrition Assessment Short Form scale; VAS, Visual Analogue Pain Scale, PSQI, Pittsburgh Sleep Quality Index scale; FOF, Fear of falling; GDS-15, 15-item Geriatric Depression Scale; GDS-3A, three apathy items of the Geriatric Depression Scale; CBF-PI-B Mini-Scale; Chinese Big Five Personality Inventory Brief version; PIL-SF, Purpose in Life Test-Short Form.

Supplementary Table 3 The comparison characteristics of between training dataset and testing dataset

Variables	**Whole (n = 1189)**	**Whole cohort (n = 1189)**		**Statistics**	**Training dataset (n = 810)**		**Statistics**	**Testing dataset (n= 379)**		**Statistics**
		Training dataset (n = 810)	**Testing dataset (n = 379)**		**Non-MCR (n = 702)**	**MCR (n = 108)**		**Non-MCR (n = 331)**	**MCR (n = 48)**	
Demographic characteristics										
Age (Years) *	68.00 (10.00)	68.00 (12.00)	69.00 (9.00)	U (148825) = -0.847, P = 0.397	67.00 (10.00)	73.00 (11.00)	U (26843) = -4.894, P1 < 0.001	68.00 (9.00)	69.00 (12.00)	U (6527.5) = -1.999, P2 = 0.046
Gender, n (%)										

Male	475	317	158	χ^2 (1) =	268	49	χ^2 (1) =	145	13	χ^2 (1) =
	(39.95)	(37.14)	(41.69)	0.701, P =	(38.18)	(45.37)	2.034, P1 =	(43.81)	(27.08)	4.823, P2
Female	714	493	221	0.402	434	58	0.154	186	35	= 0.028
	(60.05)	(60.86)	(58.31)		(61.82)	(54.63)		(56.19)	(72.92)	
Nationality, n (%)										
Han	1179	803	376	χ^2 (1) =	696	107	χ^2 (1) =	329	47	χ^2 (1) =
	(99.16)	(99.14)	(99.21)	0.016 P =	(99.15)	(99.07)	0.006, P1 =	(99.40)	(97.92)	1.168,
Others	10 (0.84)	7 (0.86)	3 (0.79)	0.898	6 (0.85)	1 (0.93)	0.941	2 (0.06)	1 (2.08)	P2=0.280
Education level, n (%)										
Illiteracy	238	162	76	χ^2 (4) =	116	46	χ^2 (4) =	54	22	χ^2 (4) =
	(20.02)	(20.00)	(20.05)	31.412, P <	(16.52)	(42.59)	44.866, P1	(16.31)	(45.83)	25.086, P2
Primary	330	215	115	0.001	186	29	< 0.001	104	11	< 0.001
school	(27.75)	(26.54)	(30.35)		(26.49)	(26.85)		(31.42)	(22.92)	
Middle school	350	213	137		194	19		129	8 (16.67)	
	(29.44)	(26.30)	(36.14)		(27.64)	(17.59)		(38.97)		
High school	154	123	31 (8.18)		114	9 (8.33)		27 (8.16)	4 (8.33)	
	(12.95)	(15.18)			(16.24)					

College and above	117 (9.84)	97 (11.98)	20 (5.28)		92 (13.11)	5 (4.63)		17 (5.14)	3 (6.25)	
Pre-retirement occupation, n (%)										
Manual labor	190 (15.98)	121 (14.94)	69 (18.21)	χ^2 (1) = 2.053, P = 0.125	98 (13.96)	23 (21.30)	χ^2 (1) = 3.964, P1 = 0.046	44 (13.29)	25 (52.08)	χ^2 (1) = 42.359, P2<0.001
Mental labor	999 (84.02)	689 (85.06)	310 (81.79)		604 (86.04)	85 (78.70)		287 (86.71)	23 (47.92)	
Marital status, n (%)										
Unmarried	9 (0.76)	5 (0.62)	4 (1.06)	χ^2 (3) = 5.442, P = 0.142	4 (0.57)	2 (1.85)	χ^2 (3) = 6.332, P1 = 0.097	3 (0.90)	1 (2.08)	χ^2 (3) = 4.907, P2 = 0.179
Married	979 (82.34)	681 (84.07)	298 (78.63)		599 (85.33)	81 (75.00)		265 (80.06)	33 (68.76)	
Divorce	35 (2.94)	22 (2.72)	13 (3.43)		17 (2.42)	5 (4.63)		12 (3.63)	1 (2.08)	
Widowed	166 (13.96)	102 (12.59)	64 (16.89)		82 (11.68)	20 (18.52)		51 (15.41)	13 (27.08)	
Living condition, n (%)										
Living alone	173 (14.55)	107 (13.21)	66 (17.41)	χ^2 (2) = 3.677, P = 0.159	89 (12.68)	18 (16.67)	χ^2 (2) = 1.784, P1 = 0.410	55 (16.62)	11 (22.92)	χ^2 (2) = 3.723, P2 = 0.155
Living with family	924 (77.71)	639 (78.89)	285 (75.20)		559 (79.63)	80 (74.07)		254 (76.74)	31 (64.58)	

(spouse/children)										
Living with other (relatives/friends)	92 (7.74)	64 (7.90)	28 (7.39)		54 (7.69)	10 (9.26)		22 (6.64)	6 (12.50)	
Residential area, n (%)										
Urban	952 (80.07)	655 (80.86)	297 (78.36)	χ^2 (1) = 1.011, P = 0.315	568 (80.91)	86 (79.63)	χ^2 (1) = 0.099, P1 = 0.753	260 (78.55)	37 (77.08)	χ^2 (1) = 0.053, P2 = 0.818
Rural	237 (19.93)	155 (19.14)	47 (21.64)		134 (19.09)	22 (20.37)		71 (21.45)	11 (22.92)	
Monthly income, n (%) †										
≤ 1000 yuan	153 (12.87)	103 (12.72)	50 (13.19)	χ^2 (3) = 0.112, P = 0.090	89 (12.68)	14 (12.96)	χ^2 (3) = 2.494, P1 = 0.476	43 (12.99)	7 (14.58)	χ^2 (3) = 0.161, P2 = 0.984
1001-2999 yuan	586 (49.28)	399 (49.26)	187 (49.34)		346 (49.29)	53 (49.08)		163 (49.24)	24 (50.00)	
3000-4999 yuan	282 (23.72)	192 (23.70)	90 (23.75)		171 (24.35)	21 (19.44)		79 (23.87)	11 (22.92)	
≥ 5000 yuan	168	116	52		96	20		46	6 (12.50)	

	(14.13)	(14.32)	(13.72)		(13.68)	(18.52)		(13.90)		
Medical insurance, n (%)									
New rural cooperative medical system	654 (55.00)	444 (54.81)	210 (55.41)	χ^2 (3) = 0.447, P = 0.390	389 (55.41)	55 (50.93)	χ^2 (3) = 1.518, P1 = 0.678	180 (54.38)	30 (62.50)	χ^2 (3) = 0.867, P2 = 0.600
Basic medical insurance for urban employees/residents	509 (42.81)	347 (42.84)	162 (42.74)		296 (42.17)	51 (47.22)		144 (43.51)	18 (37.50)	
No	21 (1.77)	15 (1.86)	6 (1.58)		13 (1.85)	2 (1.85)		6 (1.81)	0 (0.00)	
Other	5 (0.42)	4 (0.49)	1 (0.27)		4 (0.57)	0 (0.00)		1 (0.30)	0 (0.00)	
Family history of dementia, n (%)										
No	1092 (91.84)	751 (92.72)	341 (89.97)	χ^2 (1) = 2.592, P = 0.107	650 (92.59)	101 (93.52)	χ^2 (1) = 0.119, P1 = 0.844	297 (89.73)	44 (91.67)	χ^2 (1) = 0.175, P2 = 0.676
Yes	97 (8.16)	59 (7.28)	38 (10.03)		52 (7.41)	7 (6.48)		34 (10.27)	4 (8.33)	

Lifestyles and behaviors										
Smoking, n (%)										
Never smoking	814 (68.46)	558 (68.89)	256 (67.55)	χ^2 (2) = 0.229, P = 0.892	505 (71.94)	53 (49.07)	χ^2 (2) = 23.210, P1 < 0.001	215 (64.96)	41 (85.42)	χ^2 (2) = 9.186, P2 = 0.010
Smoking current	215 (18.08)	145 (17.90)	70 (18.47)		115 (16.38)	30 (27.78)		68 (20.54)	2 (4.17)	
Quit smoking	160 (13.46)	107 (13.21)	53 (13.98)		82 (11.68)	25 (23.15)		48 (14.50)	5 (10.41)	
Drinking, n (%)										
Never drinking	827 (69.55)	571 (70.49)	256 (67.55)	χ^2 (2) = 1.892, P = 0.388	504 (71.80)	67 (62.04)	χ^2 (2) = 4.681, P1=0.096	216 (65.26)	40 (83.34)	χ^2 (2) = 6.451, P2=0.040
Drinking current	206 (17.33)	132 (16.30)	74 (19.52)		111 (15.81)	21 (19.44)		70 (21.14)	4 (8.33)	
Quit drinking	156 (13.12)	107 (13.21)	49 (12.93)		87 (12.39)	20 (18.52)		45 (16.60)	4 (8.33)	
Social engagement, n (%)										
Irregular	403 (33.89)	244 (30.12)	159 (41.95)	χ^2 (1) =	183 (26.07)	61 (56.48)		245 (74.02)	30 (62.50)	χ^2 (1) =

Regular	786 (66.11)	566 (69.88)	220 (58.05)	16.124, P < 0.001	519 (73.93)	47 (43.52)	χ^2 (1) = 41.130, P1 < 0.001	86 (25.98)	18 (37.50)	2.793, P2 = 0.095
Sedentary behavior, n (%)										
No	752 (63.25)	517 (63.83)	235 (62.01)	χ^2 (1) = 0.369, P = 0.544	462 (65.81)	55 (50.93)	χ^2 (1) = 8.984, P1 = 0.003	213 (64.35)	22 (45.83)	χ^2 (1) = 6.101, P2 = 0.014
Yes	437 (36.75)	293 (36.17)	144 (37.99)		240 (34.19)	53 (49.07)		118 (35.65)	26 (54.17)	
Physical activity level, n (%)										
Low	316 (26.58)	239 (29.51)	77 (20.32)	χ^2 (2) = 36.369, P < 0.001	182 (25.93)	57 (52.78)	χ^2 (2) = 39.841, P1 < 0.001	55 (16.62)	22 (45.83)	χ^2 (2) = 30.042, P2 < 0.001
Moderate	409 (34.40)	302 (37.28)	107 (28.23)		264 (37.60)	38 (35.19)		90 (27.19)	17 (35.42)	
High	464 (39.02)	269 (33.21)	195 (51.45)		256 (36.47)	13 (12.03)		186 (56.19)	9 (18.75)	
Physical functional state										

Height (m) *	1.60 (0.12)	1.60 (0.12)	1.61 (0.13)	U (150324.5) = -0.575, P = 0.565	1.60 (0.12)	1.62 (0.14)	U (36091) = -0.803, P1 = 0.422	1.61 (0.13)	1.58 (0.10)	Z (6394) = -2.188, P2 = 0.029
Weight (Kg) *	60.90 (13.90)	60.9 (14.00)	60.5 (13.60)	U (150280) = -0.583, P = 0.560	61.00 (13.92)	60.65 (15.05)	U (37458.5) = -0.199, P1 = 0.843	61.00 (13.70)	58.80 (14.60)	U (6397) = -2.181, P2 = 0.029
BMI (Kg/m^2) *	23.50 (4.28)	23.51 (4.34)	23.47 (4.23)	U (151681.5) = -0.329, P = 0.742	23.49 (4.33)	23.50 (3.86)	U (36733.5) = -0.519, P1 = 0.604	23.72 (3.08)	23.07 (4.73)	t (377) = 1.367*, P2 = 0.172
Handgrip strength (Kg) *	22.80 (9.10)	22.85 (9.70)	22.60 (7.90)	U (152394) = -0.200, P = 0.842	23.10 (9.60)	21.40 (11.30)	U (31090) = -3.012, P1 = 0.003	23.20 (7.70)	19.45 (7.70)	U (5004.5) = -4.144, P2<0.001
Skeletal muscle mass (Kg) *	21.60 (7.05)	21.60 (6.90)	21.80 (7.70)	U (145274) = -1.490, P =	21.70 (6.80)	20.50 (7.45)	U (34721) = -1.408, P1 = 0.159	22.40 (7.60)	19.35 (5.73)	U (5873.5) = -2.919, P2 = 0.004

				0.136						
Body fat mass (Kg) *	18.40 (8.30)	18.35 (8.30)	18.40 (8.60)	U (152769) = -0.132, P = 0.895	18.40 (8.70)	17.36 (7.10)	U (34978) = -1.294, P1 = 0.196	18.50 (8.80)	17.75 (9.60)	U (7915) = -0.041, P2 = 0.967
Obesity, n (%)										
No	812 (68.29)	558 (68.89)	254 (67.02)	χ^2 (1) = 0.417, P = 0.518	479 (68.23)	79 (73.15)	χ^2 (1) = 1.055, P1 = 0.304	219 (66.16)	35 (72.92)	χ^2 (1) = 0.865. P2 = 0.352
Yes	377 (31.71)	252 (31.11)	125 (32.98)		223 (31.77)	29 (26.85)		112 (33.84)	13 (27.08)	
Nutritional status, n (%)										
Malnutrition	19 (1.60)	12 (1.48)	7 (1.85)	χ^2 (3) = 0.310, P = 0.856	8 (1.14)	4 (3.70)	χ^2 (2) = 32.861, P1 < 0.001	4 (1.21)	3 (6.25)	χ^2 (2) = 15.355, P2 < 0.001
Malnutrition risk	311 (26.16)	210 (25.93)	101 (26.65)		160 (22.79)	50 (46.30)		80 (24.17)	21 (43.75)	
Non-malnutrition	859 (72.25)	588 (72.59)	271 (71.50)		534 (76.07)	54 (50.00)		247 (74.62)	24 (50.00)	
Pain, n (%)										
No	605 (50.88)	423 (52.22)	182 (48.02)	χ^2 (2) =	371 (52.85)	52 (48.15)		164 (49.55)	18 (37.50)	χ^2 (2) =

Mild	571 (48.02)	378 (46.67)	193 (50.92)	1.877, P = 0.391	326 (46.44)	52 (48.15)	χ^2 (2) = 7.993, P1 = 0.018	165 (49.85)	28 (58.33)	6.900, P2 = 0.032
Moderate	13 (1.09)	9 (1.11)	4 (1.06)		5 (0.71)	4 (3.70)		2 (0.60)	2 (4.17)	
Severe	0 (0.00)	0 (0.00)	0 (0.00)		0 (0.00)	0 (0.00)		0 (0.00)	0 (0.00)	
Acute	0 (0.00)	0 (0.00)	0 (0.00)		0 (0.00)	0 (0.00)		0 (0.00)	0 (0.00)	
Frailty condition, n (%)										
No frailty	852 (71.66)	575 (70.99)	277 (73.09)	χ^2 (2) = 0.595, P = 0.742	519 (73.93)	56 (51.85)	χ^2 (2) = 46.594, P1<0.001	254 (76.74)	23 (47.92)	χ^2 (2) = 22.551, P2<0.001
Pre-frailty	237 (19.93)	166 (20.49)	71 (18.73)		141 (20.09)	25 (23.15)		57 (17.22)	14 (29.17)	
Frailty	100 (8.41)	69 (8.52)	31 (8.18)		42 (5.98)	27 (25.00)		20 (6.04)	11 (22.92)	
Sleep quality, n (%)										
Good	549 (46.17)	274 (46.17)	175 (46.17)	χ^2 (1) = 0.000, P = 1.000	323 (46.01)	51 (47.22)	χ^2 (1) = 0.055, P1=0.814	159 (48.04)	16 (33.33)	χ^2 (1) = 3.646, P2=0.056
Poor	640 (53.83)	436 (53.83)	204 (53.83)		379 (53.99)	57 (52.78)		172 (51.96)	32 (66.67)	
History of falls, n (%)										

No	946 (79.56)	643 (79.38)	303 (79.95)	χ^2 (1) = 0.051, P = 0.822	563 (80.20)	80 (74.07)	χ^2 (1) = 2.146, P1=0.143	269 (81.27)	34 (70.83)	χ^2 (1) = 2.848, P2=0.092
Yes	243 (20.44)	167 (20.62)	76 (20.05)		139 (19.80)	28 (25.93)		62 (18.73)	14 (29.17)	
Number of falls*	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	U (152875.5) = -0.160, P = 0.873	0.00 (0.00)	0.00 (1.00)	U (35461) = -1.539, P1 = 0.124	0.00 (0.00)	0.00 (1.00)	U (7112.5) = -1.683, P2 = 0.092
Fear of falling, n (%)										
No	815 (68.55)	556 (68.64)	259 (68.34)	χ^2 (1) = 0.011, P = 0.916	483 (68.80)	73 (67.59)	χ^2 (1) = 0.064, P1 = 0.081	236 (71.30)	23 (47.92)	χ^2 (1) = 10.593, P2 < 0.001
Yes	374 (31.45)	254 (31.36)	120 (31.66)		219 (31.20)	35 (32.41)		95 (28.70)	25 (52.08)	
History of hospitalization, n (%)										
No	975 (82.00)	665 (82.10)	310 (81.79)	χ^2 (1) = 0.016, P = 0.899	590 (84.05)	75 (69.44)	χ^2 (1) = 13.578, P1 < 0.001	282 (85.20)	28 (58.33)	χ^2 (1) = 20.315, P2 < 0.001
Yes	214 (18.00)	145 (17.90)	69 (18.21)		112 (15.95)	33 (30.56)		49 (14.80)	20 (41.67)	

Number of hospitalization*	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	U (153414.5) = -0.022, P = 0.983	0.00 (0.00)	0.00 (1.00)	Z (32249.5) = -3.743, P1 < 0.001	0.00 (0.00)	0.00 (1.00)	Z (5844.5) =-4.416, P2 < 0.001
Polypharmacy, n (%)										
No	1089 (91.59)	752 (92.84)	337 (88.92)	χ^2 (1) = 5.154, P = 0.023	661 (94.16)	91 (84.26)	χ^2 (1) = 13.801, P1 < 0.001	302 (91.24)	35 (72.92)	χ^2 (1) = 14.282, P2 < 0.001
Yes	100 (8.41)	58 (7.16)	42 (11.08)		41 (5.84)	17 (15.74)		29 (8.76)	13 (27.08)	
Comorbidity status, n (%)										
No	890 (74.85)	596 (73.58)	294 (77.57)	χ^2 (1) = 2.186, P = 0.139	520 (74.07)	76 (70.37)	χ^2 (1) = 0.660, P1 = 0.416	263 (79.46)	31 (64.58)	χ^2 (1) = 5.330, P2 = 0.021
Yes	299 (25.15)	214 (26.42)	85 (22.43)		182 (25.93)	32 (29.63)		68 (20.54)	17 (35.42)	
History of chronic disease										
Coronary artery disease, n (%)										
No	956 (80.40)	656 (80.99)	300 (79.16)	χ^2 (1) = 0.550, P = 0.458	573 (81.62)	83 (76.85)	χ^2 (1) = 1.384, P1 = 0.238	258 (77.95)	42 (87.50)	χ^2 (1) = 2.319, P2 = 0.128
Yes	233	154	79		129	25		73	6 (12.50)	

	(19.60)	(19.01)	(20.84)		(19.38)	(23.15)		(22.05)		
Hypertension, n (%)										
No	612	367	245	χ^2 (1) =	327(46.5	40	χ^2 (1) =	222	23	χ^2 (1) =
	(51.47)	(45.31)	(64.64)	38.643, P <	8)	(37.04)	3.441, P1 =	(67.07)	(47.92)	6.728, P2
Yes	577	443	134	0.001	375	68	0.064	109	25	= 0.009
	(48.53)	(54.69)	(35.36)		(53.42)	(62.96)		(32.93)	(52.08)	
Stroke, n (%)										
No	1130	769	361	χ^2 (1) =	673	96	χ^2 (1) =	320	41	χ^2 (1) =
	(95.04)	(94.94)	(95.25)	0.053, P =	(95.87)	(88.89)	9.490, P1 =	(96.68)	(85.42)	11.749, P2
Yes	59 (4.96)	41 (5.06)	18 (4.75)	0.817	29 (4.13)	12	0.007	11 (3.32)	7 (14.58)	= 0.001
						(11.11)				
Diabetes mellitus, n (%)										
No	910	614	296	χ^2 (1) =	536	78	χ^2 (1) =	261	35	χ^2 (1) =
	(76.53)	(75.80)	(78.10)	0.759, P =	(76.35)	(72.22)	0.871, P1 =	(78.85)	(72.92)	0.863, P2
Yes	279	196	83	0.384	166	30	0.351	70	13	= 0.353
	(23.47)	(24.20)	(21.90)		(23.65)	(27.78)		(21.15)	(27.08)	
Asthma, n (%)										
No	1184	806	378		698	108		330	48	

	(99.58)	(99.51)	(99.74)	χ^2 (1) =	(99.43)	(100.00)	χ^2 (1) =	(99.70)	(100.00)	χ^2 (1) =
Yes	5 (0.42)	4 (0.49)	1 (0.26)	0.326, P =	4 (0.57)	0 (0.00)	0.618, P1 =	1 (0.30)	0 (0.00)	0.145, P2
				0.568			0.432			= 0.703
Osteoarthritis, n (%)										
No	1090	744	346	χ^2 (1) =	646	98	χ^2 (1) =	304	42	χ^2 (1) =
	(91.67)	(91.85)	(91.29)	0.106, P =	(92.02)	(90.74)	0.206, P1 =	(91.84)	(87.50)	0.995, P2
Yes	99 (8.33)	66 (8.15)	33 (8.71)	0.745	56 (7.98)	10 (9.26)	0.650	27 (8.16)	6 (12.50)	= 0.315
Tumor, n (%)										
No	1174	801	373	χ^2 (1) =	694	107	χ^2 (1) =	325	48	χ^2 (1) =
	(98.74)	(98.89)	(98.42)	0.462, P =	(98.86)	(99.07)	0.039, P1 =	(98.19)	(100.00)	0.084, P2
Yes	15 (1.26)	9 (1.11)	6 (1.58)	0.497	8 (1.14)	1 (0.93)	0.844	6 (1.81)	0 (0.00)	= 0.347
Psychological condition										
Depressive symptoms, n (%)										
No	1066	723	343	χ^2 (1) =	647	76	χ^2 (1) =	307	36	χ^2 (1) =
	(89.66)	(89.26)	(90.50)	0.429, P =	(92.17)	(70.37)	46.376, P1	(92.75)	(75.00)	15.363, P2
Yes	123	87	36 (9.50)	0.512	55 (7.83)	32	< 0.001	24 (7.25)	12	< 0.001
	(10.34)	(10.74)				(29.63)			(25.00)	
Apathetic conditions, n (%)										

No	762 (64.09)	512 (63.21)	250 (65.96)	χ^2 (1) = 0.850, P = 0.365	454 (64.67)	58 (53.70)	χ^2 (1) = 4.842, P1 = 0.028	227 (68.58)	23 (47.92)	χ^2 (1) = 7.972, P2 = 0.005
Yes	427 (35.91)	427 (36.79)	129 (34.04)		248 (35.33)	50 (46.30)		104 (31.42)	25 (52.08)	
Personality traits, n (%)										
Neuroticism	104 (8.75)	54 (6.67)	50 (13.19)	χ^2 (4) = 25.581, P < 0.001	32 (4.56)	22 (20.37)	χ^2 (4) = 38.147, P1 < 0.001	32 (9.67)	18 (37.50)	χ^2 (4) = 28.956, P2 < 0.001
Conscientiousness	345 (29.02)	223 (27.53)	122 (32.19)		199 (28.35)	24 (22.22)		109 (32.93)	13 (27.08)	
Agreeableness	417 (35.07)	296 (36.54)	121 (31.93)		259 (36.89)	37 (34.26)		112 (33.83)	9 (18.75)	
Openness	168 (14.13)	133 (16.42)	35 (9.23)		119 (16.95)	14 (12.96)		32 (9.67)	3(6.25)	
Extroversion	155 (13.04)	104 (12.84)	51 (13.46)		93 (13.25)	11 (10.19)		46 (13.90)	5 (10.42)	
Purpose in life (Points) *	18.00 (10.00)	18.00 (10.00)	17.00 (10.00)	U (149407) = -0.743, P = 0.458	19.00 (10.00)	15.00 (6.00)	U (23010.5) = -6.597, P1 < 0.001	18.00 (11.00)	16.00 (4.00)	U (6144) = -2.545, P2 = 0.011

The occurrence of MCR, n (%)								
Non-MCR	1033 (86.88)	702 (86.67)	331 (87.34)	χ^2 (1) = 0.101, P = 0.750	702 (86.67)	NA	331 (87.34)	NA
MCR	156 (13.12)	108 (13.33)	48 (12.66)		108 (13.33)		48 (12.66)	

Abbreviation: Mean standard deviation is presented for continuous variables with a t test statistic or median and inter-quartile range with the Mann-Whitney U test shown and counts (percentage) is presented for categorical variables with a chi-squared test statistic shown.

† shown in China RMB (yuan).

U (148825) is the Mann-Whitney U test statistic on 148825 values of U; χ2 (1) is the chi-squared test statistic on 1 degree of freedom; t (377) is the t test statistic on 377 degrees of freedom; P, the p-value of comparison between training dataset and testing dataset in the whole cohort, and p-value < 0.05 was considered statistically significant.

P1 and P2, the p-value of comparison between MCR and Non-MCR on the training dataset and testing dataset, respectively, and variables with p-value < 0.10 in univariable analysis were entered into the Lasso regression. All bold indicates statistical significance.

Non-MCR, without motoric cognitive risk syndrome; MCR, motoric cognitive risk syndrome; n, number; y, years old; m, meter; Kg, kilogram; BMI, body mass index; NA, not applicable; Lasso, least absolute shrinkage and selection operator.

Supplementary Table 4 Number, prevalence and cut-off values of MCR by sex and age groups

Age groups	Male			Female			Overall		
	Num of MCR / Num of participants	Prevalence (%)	Cut-off values (m/s)	Num of MCR / Num of participants	Prevalence (%)	Cut-off values (m/s)	Num of MCR / Num of participants	Prevalence (%)	Cut-off values (m/s)
50-54 y	2/15	13.33	1.102	5/41	12.20	1.055	7/56	12.50	1.069
55-59 y	3/31	9.68	1.012	8/66	12.12	0.949	11/97	11.34	0.955
60-64 y	4/57	7.02	0.934	12/97	12.37	0.896	16/154	10.39	0.909
65-69 y	17/142	11.97	0.894	21/209	10.05	0.886	38/351	10.83	0.887
70-74 y	15/110	13.64	0.848	18/141	12.77	0.792	33/251	13.15	0.814
75-79 y	10/65	15.39	0.778	13/71	18.31	0.763	23/136	16.92	0.760
80-84 y	4/31	12.90	0.745	6/38	15.79	0.641	10/69	14.49	0.676
≥ 85 y	7/24	29.17	0.572	11/51	21.57	0.537	18/75	24.00	0.541

Abbreviation: In this cohort, the cut-off values for defining SG in different age groups (50-54, 55-59, 60-64, 65-69, 70-74 and 75-89, 80-84 and ≥ 85 years old) were as follows: for males, 1.102, 1.012, 0.934, 0.894, 0.848, 0.778, 0.745 and 0.572 m/s, respectively; for females, 1.055, 0.949, 0.896, 0.886, 0.792, 0.763, 0.641 and 0.537m/s, respectively. MCR, motoric cognitive risk; Num, number; %, percent; m/s, meter/second; y, years old.

Supplementary Table 5 The results of the predictors selection on training dataset

Variables	β‡	Variables	β‡
Demographic characteristics		History of hospitalization	
Age (Years)	0.003	No	1 (Reference)
Education level		Yes	0.292
Illiteracy	1 (Reference)	Polypharmacy	
Primary school	-0.766	No	1 (Reference)
Middle school	-1.096	Yes	0.630
High school	-1.189	Hypertension	
College and above	-2.279	No	1 (Reference)
Pre-retirement occupation		Yes	0.659
Manual labor	1 (Reference)	Stroke	
Mental labor	-1.328	No	1 (Reference)
Lifestyles and behaviors		Yes	0.593
Social engagement		Psychological condition	
Irregular	1 (Reference)	Depressive symptoms	
Regular	-0.643	No	1 (Reference)
Physical activity level		Yes	0.747

Low	1 (Reference)	Purpose in life (Points)	-0.090
Moderate	-0.003	(Intercept)	2.564
High	-1.107		
Physical functional state			
Nutritional status			
Malnutrition	1 (Reference)		
Malnutrition risk	-0.775		
Non-malnutrition	-1.669		

Abbreviation: ‡The coefficients of Lasso regression. Lasso, least absolute shrinkage and selection operator.

Supplementary Table 6 The results of the multivariable LR analysis on training dataset

Variables	**B**	**S.E.**	**Waldχ^2**	**df**	**OR (95% CI)**	**P**
Age (Years)	NA	NA	NA	NA	NA	NA
Education level						
Illiteracy	1 (Reference)					
Primary school	-0.776	0.300	6.677	1	0.460 (0.254-0.825)	0.010
Middle school	-1.102	0.341	10.433	1	0.332 (0.167-0.640)	0.001
High school	-1.216	0.438	7.712	1	0.297 (0.119-0.674)	0.005
College and above	-2.334	0.617	14.304	1	0.097 (0.026-0.300)	<0.001

Pre-retirement occupation						
Manual labor	1 (Reference)					
Mental labor	-1.349	0.363	13.831	1	0.259 (0.127-0.530)	<0.001
Social engagement						
Irregular	1 (Reference)					
Regular	-0.645	0.250	6.667	1	0.525 (0.321-0.856)	0.010
Physical activity level						
Low	1 (Reference)					
Moderate	-0.013	0.273	0.002	1	0.987 (0.578-1.6920)	0.961
High	-1.042	0.371	7.907	1	0.353 (0.166-0.715)	0.005
Nutritional status						
Malnutrition	1 (Reference)					
Malnutrition risk	-0.816	0.692	1.388	1	0.442 (0.118-1.887)	0.239
Non-malnutrition	-1.741	0.683	6.492	1	0.175 (0.048-0.737)	0.011
History of hospitalization						
No	1 (Reference)					
Yes	NA	NA	NA	NA	NA	NA
Polypharmacy						
No	1 (Reference)					

Yes	0.779	0.393	3.932	1	2.179 (0.991-4.656)	0.047
Hypertension						
No	1 (Reference)					
Yes	0.635	0.255	6.175	1	1.886 (1.151-3.141)	0.013
Stroke						
No	1 (Reference)					
Yes	NA	NA	NA	NA	NA	NA
Depressive symptoms						
No	1 (Reference)					
Yes	0.763	0.305	6.245	1	2.146 (1.170-3.885)	0.012
Purpose in life (Points)	-0.092	0.022	16.843	1	0.911 (0.872-0.952)	<0.001
(Intercept)	3.000	0.921	10.857	1	20.078 (3.173-121.984)	0.001

Abbreviation: Odds ratios are tested with Waldχ^2 tests with 1 degree of freedom. The P-value < 0.05 was considered statistically significant. Considered the existence of clinical significance of age, combine age with these statistically significant variables to construct the multivariable LR model and generate a forest plot. LR, logistic regression; B, estimate; S.E., standard error; OR, odds ratio; CI, confidence interval; NA, not applicable.

Supplementary Table 7 The pruning CP table of DT model on training dataset

Level	CP	Num Splits	Rel Error	X Error	X Std Dev	Model performance with different number of pruning levels		
						AUC	Sensitivity	Specificity
1	0.057	0	1.000	1.002	0.076	NA	NA	NA
2	0.034	1	0.943	1.010	0.078	0.609	0.922	0.296
3	0.025	2	0.909	1.028	0.077	0.696	0.782	0.593
4	0.025	3	0.884	1.005	0.077	0.704	0.849	0.556
5	0.021	4	0.859	1.020	0.077	0.714	0.849	0.556
6	0.018	5	0.838	1.036	0.078	0.727	0.868	0.556
7	0.016	6	0.820	1.041	0.078	0.741	0.896	0.556
8 §	0.016	10	0.756	1.044	0.079	0.834	0.795	0.741
9	0.014	11	0.740	1.034	0.078	0.838	0.795	0.741
10	0.013	13	0.713	1.035	0.077	0.842	0.795	0.741
11	0.013	16	0.673	1.037	0.078	0.877	0.791	0.796
12	0.011	17	0.660	1.038	0.078	0.878	0.791	0.796
13	0.010	18	0.649	1.046	0.078	0.879	0.791	0.796

Abbreviation: §Based on the DT pruning rule of thumb. CP, complexity parameters; Num Splits, tree splitting scale; Rel Error, relative error; X Error, minimum cross-validation error; X Std Dev, minimum standard error; AUC, the area under the receiver operating characteristic curve.

Supplementary Table 8 Confusion matrices for both models on training dataset

	Nomogram			Classification tree		
	MCR	**Non-MCR**	**Overall**	**MCR**	**Non-MCR**	**Overall**
MCR	86	191	277	80	144	224
Non-MCR	22	511	533	28	558	586
Overall	108	702	810	108	702	810

Abbreviation: Non-MCR, without motoric cognitive risk syndrome; MCR, motoric cognitive risk syndrome.

Supplementary Table 9 Confusion matrices for both models on testing dataset

	Nomogram			Classification tree		
	MCR	**Non-MCR**	**Overall**	**MCR**	**Non-MCR**	**Overall**
MCR	34	44	78	35	46	81
Non-MCR	14	287	301	13	285	298
Overall	48	331	379	48	331	379

Abbreviation: Non-MCR, without motoric cognitive risk syndrome; MCR, motoric cognitive risk syndrome

Supplementary Table 10 The predictive performance of both models on training and testing datasets

Parameters	Training dataset (n = 810)		Testing dataset (n = 379)	
	LR model	DT model	LR model	DT model
Specificity	0.728	0.795	0.867	0.861
Sensitivity	0.796	0.741	0.708	0.729
Accuracy	0.737	0.788	0.847	0.844
Balanced accuracy	0.762	0.768	0.788	0.795
PPV	0.311	0.357	0.436	0.432
NPV	0.959	0.952	0.953	0.956
F1 score	0.447	0.482	0.540	0.543
Youden index	0.524	0.536	0.575	0.590
Optimal cut-off value	0.119	0.106	0.177	0.130
AUC (95% CI)	0.840 (0.805-0.874)	0.834 (0.794-0.874)	0.859 (0.799-0.919)	0.821 (0.748-0.895)
Difference (DT model-LR model) (95% CI) [a]	0.006 (-4.569-2.867)		0.038 (-11.125-2.258)	

Abbreviation: LR, logistic regression; DT, decision tree; PPV, positive predictive value; NPV, negative predictive value; AUC, the area under the receiver operating characteristic curve; 95% CI, 95% confidence interval, [a]Bootstrap estimation.