

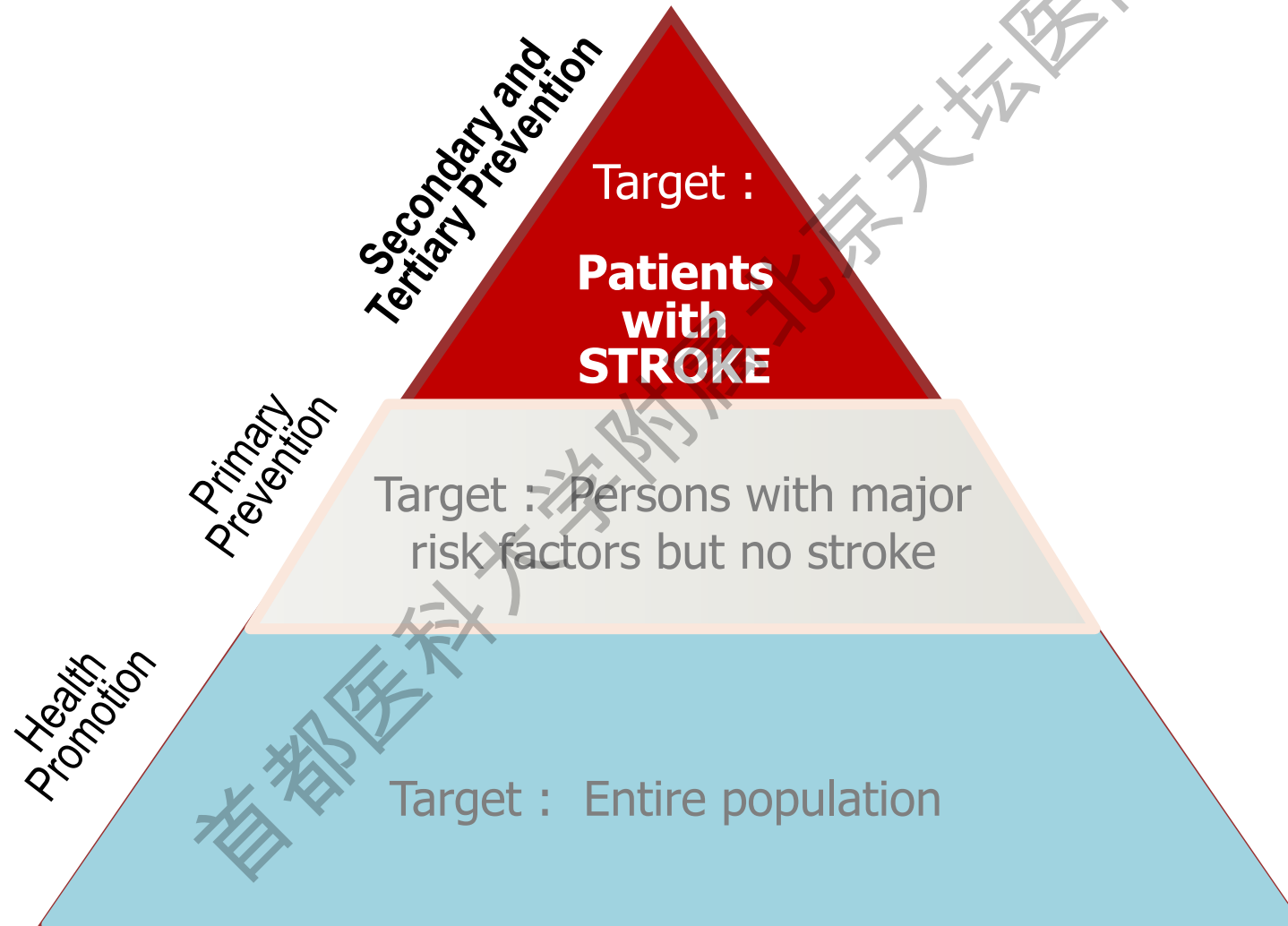
# Secondary Prevention Strategies for Stroke



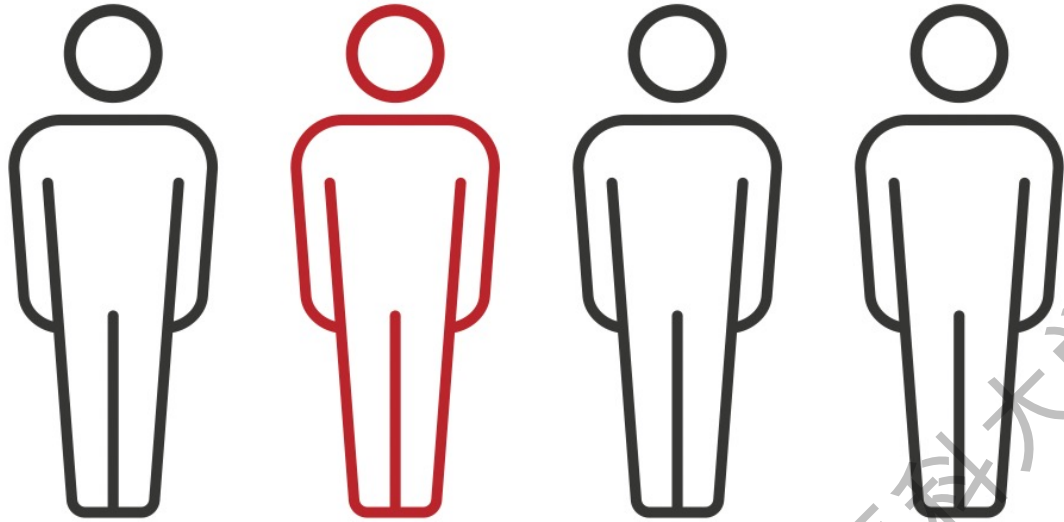
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# Prevention Levels to Control Stroke



# Prevent another stroke



**1 IN 4**  
**CLOT-RELATED STROKE**  
**AND HEART ATTACK SURVIVORS**  
**WILL HAVE ANOTHER.**



# Guideline for secondary stroke prevention

## Stroke

### AHA/ASA GUIDELINE

## 2021 Guideline for the Prevention of Stroke in Patients With Stroke and Transient Ischemic Attack

A Guideline From the American Heart Association/American Stroke Association

*Reviewed for evidence-based integrity and endorsed by the American Association of Neurological Surgeons and Congress of Neurological Surgeons.*

*Endorsed by the Society of Vascular and Interventional Neurology*

*The American Academy of Neurology affirms the value of this statement as an educational tool for neurologists.*

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**Key Words:** AHA Scientific Statements ■ ischemic attack, transient ■ secondary prevention ■ stroke

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# Class of Recommendation and Level of Evidence

CLASS (STRENGTH) OF RECOMMENDATION	
<b>CLASS 1 (STRONG)</b>	<b>Benefit &gt;&gt;&gt; Risk</b>
<b>Suggested phrases for writing recommendations:</b> <ul style="list-style-type: none"> <li>Is recommended</li> <li>Is indicated/useful/effective/beneficial</li> <li>Should be performed/administered/other</li> <li>Comparative-Effectiveness Phrases†:               <ul style="list-style-type: none"> <li>Treatment/strategy A is recommended/indicated in preference to treatment B</li> <li>Treatment A should be chosen over treatment B</li> </ul> </li> </ul>	
<b>CLASS 2a (MODERATE)</b>	<b>Benefit &gt;&gt; Risk</b>
<b>Suggested phrases for writing recommendations:</b> <ul style="list-style-type: none"> <li>Is reasonable</li> <li>Can be useful/effective/beneficial</li> <li>Comparative-Effectiveness Phrases†:               <ul style="list-style-type: none"> <li>Treatment/strategy A is probably recommended/indicated in preference to treatment B</li> <li>It is reasonable to choose treatment A over treatment B</li> </ul> </li> </ul>	
<b>CLASS 2b (WEAK)</b>	<b>Benefit ≥ Risk</b>
<b>Suggested phrases for writing recommendations:</b> <ul style="list-style-type: none"> <li>May/might be reasonable</li> <li>May/might be considered</li> <li>Usefulness/effectiveness is unknown/unclear/uncertain or not well-established</li> </ul>	
<b>CLASS 3: No Benefit (MODERATE)</b> (Generally, LOE A or B use only)	<b>Benefit = Risk</b>
<b>Suggested phrases for writing recommendations:</b> <ul style="list-style-type: none"> <li>Is not recommended</li> <li>Is not indicated/useful/effective/beneficial</li> <li>Should not be performed/administered/other</li> </ul>	
<b>Class 3: Harm (STRONG)</b>	<b>Risk &gt; Benefit</b>
<b>Suggested phrases for writing recommendations:</b> <ul style="list-style-type: none"> <li>Potentially harmful</li> <li>Causes harm</li> <li>Associated with excess morbidity/mortality</li> <li>Should not be performed/administered/other</li> </ul>	

LEVEL (QUALITY) OF EVIDENCE‡	
<b>LEVEL A</b>	
<ul style="list-style-type: none"> <li>High-quality evidence‡ from more than 1 RCT</li> <li>Meta-analyses of high-quality RCTs</li> <li>One or more RCTs corroborated by high-quality registry studies</li> </ul>	
<b>LEVEL B-R</b>	<b>(Randomized)</b>
<ul style="list-style-type: none"> <li>Moderate-quality evidence‡ from 1 or more RCTs</li> <li>Meta-analyses of moderate-quality RCTs</li> </ul>	
<b>LEVEL B-NR</b>	<b>(Nonrandomized)</b>
<ul style="list-style-type: none"> <li>Moderate-quality evidence‡ from 1 or more well-designed, well-executed nonrandomized studies, observational studies, or registry studies</li> <li>Meta-analyses of such studies</li> </ul>	
<b>LEVEL C-LD</b>	<b>(Limited Data)</b>
<ul style="list-style-type: none"> <li>Randomized or nonrandomized observational or registry studies with limitations of design or execution</li> <li>Meta-analyses of such studies</li> <li>Physiological or mechanistic studies in human subjects</li> </ul>	
<b>LEVEL C-EO</b>	<b>(Expert Opinion)</b>
<ul style="list-style-type: none"> <li>Consensus of expert opinion based on clinical experience</li> </ul>	

COR and LOE are determined independently (any COR may be paired with any LOE).

A recommendation with LOE C does not imply that the recommendation is weak. Many important clinical questions addressed in guidelines do not lend themselves to clinical trials. Although RCTs are unavailable, there may be a very clear clinical consensus that a particular test or therapy is useful or effective.

\* The outcome or result of the intervention should be specified (an improved clinical outcome or increased diagnostic accuracy or incremental prognostic information).

† For comparative-effectiveness recommendations (COR 1 and 2a; LOE A and B only), studies that support the use of comparator verbs should involve direct comparisons of the treatments or strategies being evaluated.

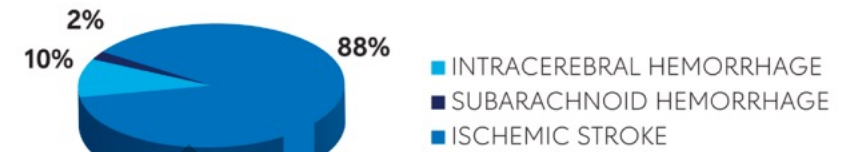
‡ The method of assessing quality is evolving, including the application of standardized, widely-used, and preferably validated evidence grading tools; and for systematic reviews, the incorporation of an Evidence Review Committee.

COR indicates Class of Recommendation; EO, expert opinion; LD, limited data; LOE, Level of Evidence; NR, nonrandomized; R, randomized; and RCT, randomized controlled trial.

# Conceptual representation of ischemic stroke subtypes

- ❖ The incidence rate of ischemic stroke is much higher than that of hemorrhagic stroke
- ❖ Specific recommendations for prevention strategies often depend on the ischemic stroke or transient ischemic attack subtype
- ❖ To identify targets for treatment in order to reduce the risk of recurrent ischemic stroke

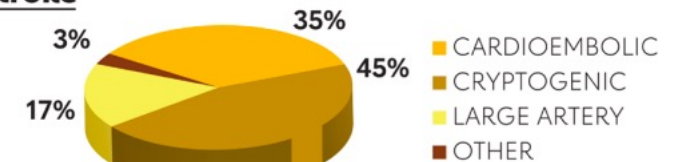
## Stroke



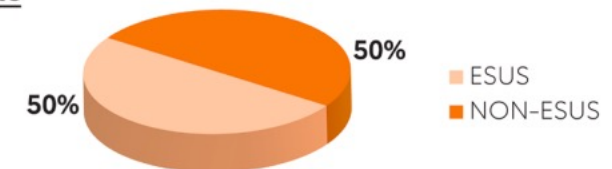
## Ischemic Stroke



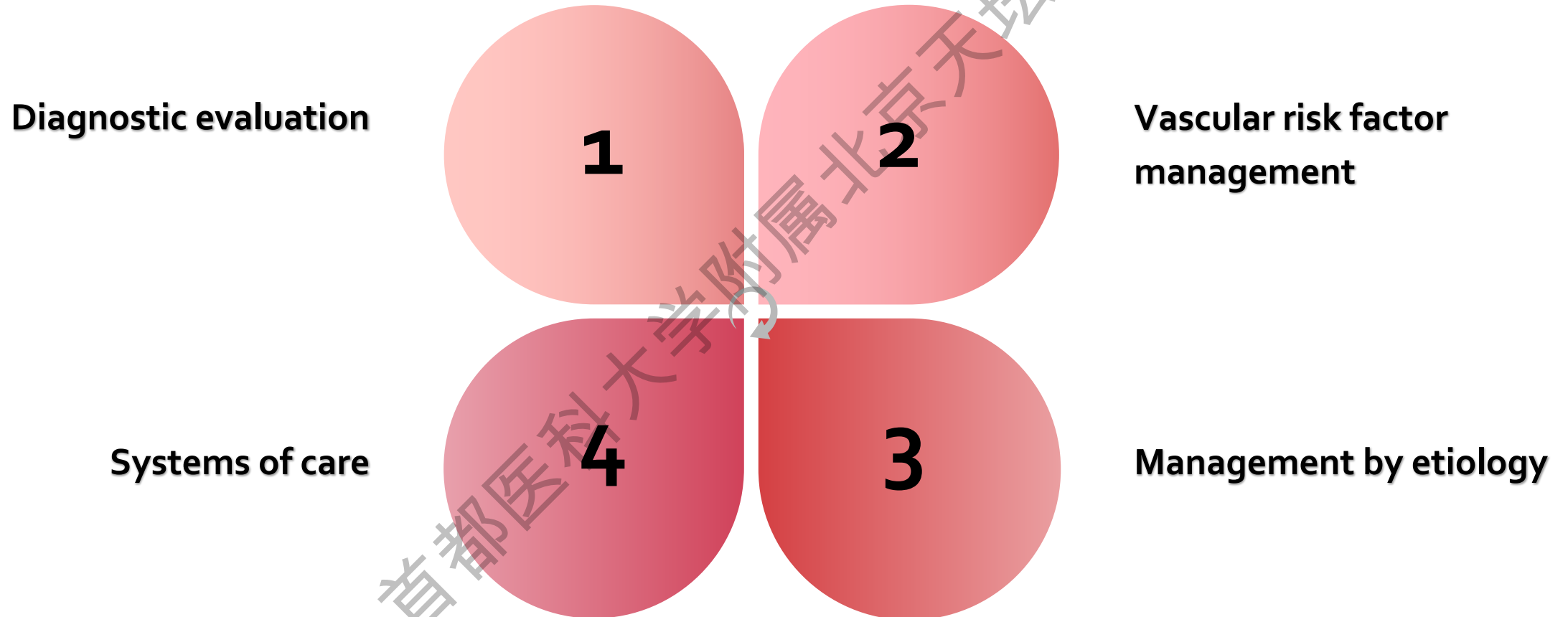
## Non-lacunar Stroke



## Cryptogenic Stroke

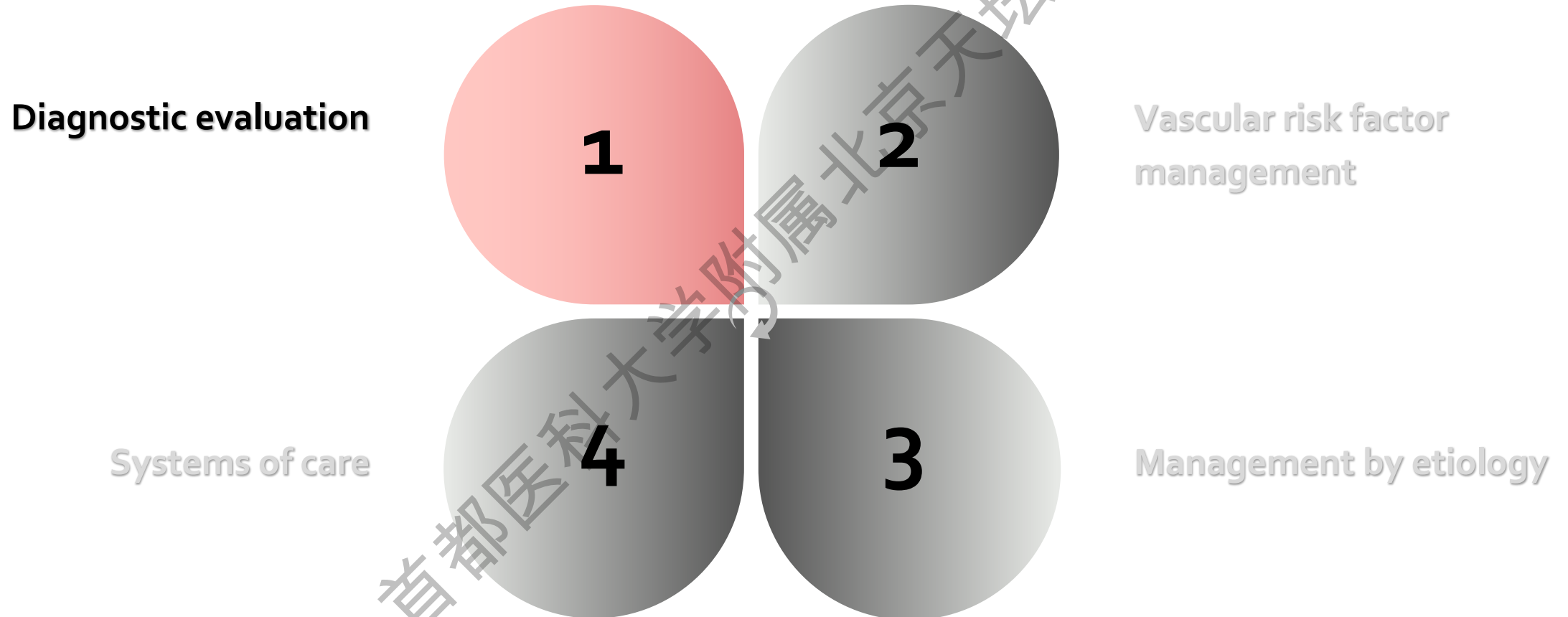


# Principles of secondary stroke prevention



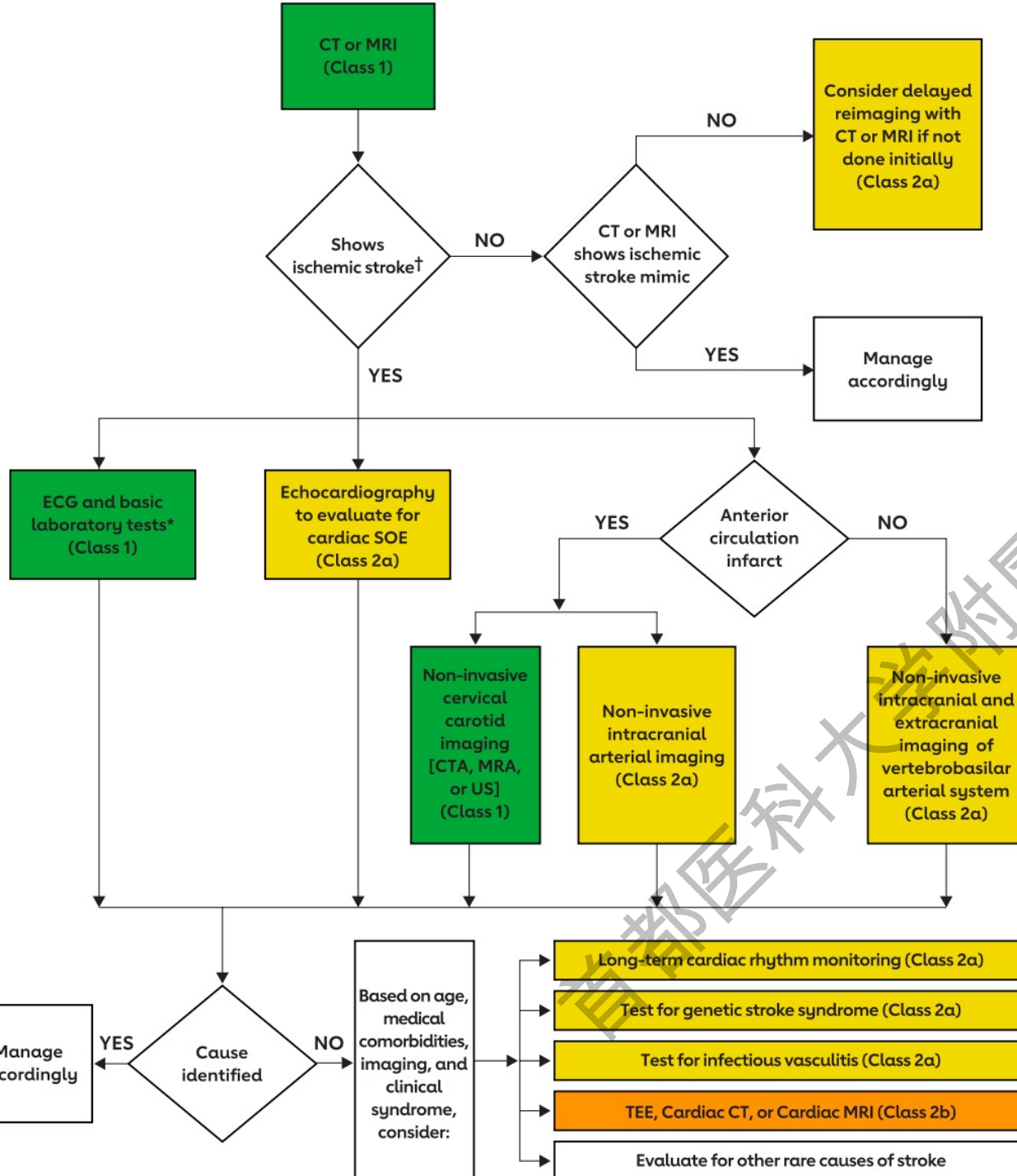


# Principles of secondary stroke prevention





# Diagnosis evaluating

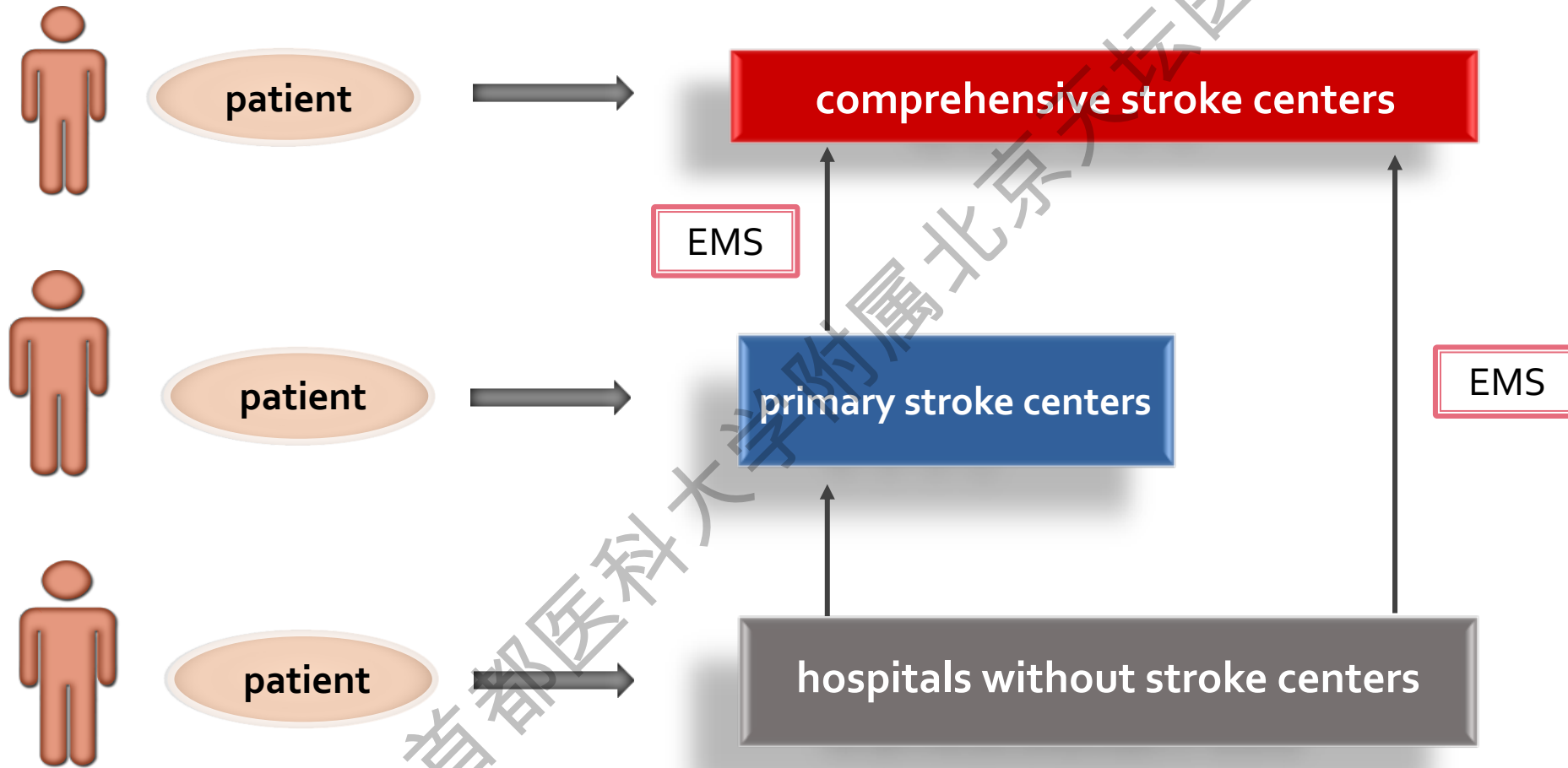


stroke will undergo an evaluation tailored to ensure that, when appropriate, they receive reperfusion therapy and secondary prevention

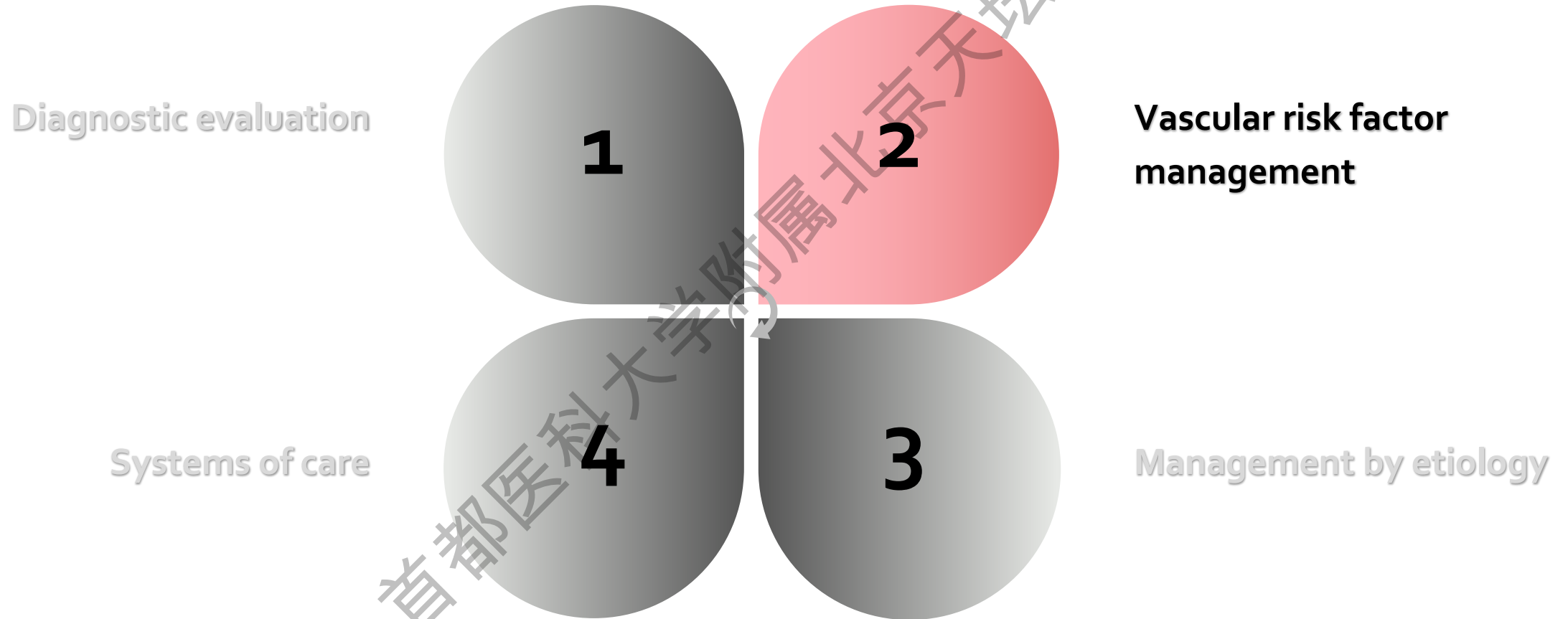
- ❖ stroke onset time within 24 hours, clinicians should evaluate the appropriate patients to receive reperfusion therapy.
- ❖ stroke patients not suitable for reperfusion, should be detected the etiology of stroke.

**Note:** colors correspond to Class of Recommendation 9

# Treatment of acute ischemic stroke



# Principles of secondary stroke prevention



# Vascular risk factor management

## 1. hypertension

COR	LOE	Recommendations
1	A	1. In patients with hypertension who experience a stroke or TIA, treatment with a thiazide diuretic, angiotensin-converting enzyme inhibitor, or angiotensin II receptor blockers is useful for lowering BP and reducing recurrent stroke risk. <sup>185-189</sup>
1	B-R	2. In patients with hypertension who experience a stroke or TIA, an office BP goal of <130/80 mmHg is recommended for most patients to reduce the risk of recurrent stroke and vascular events. <sup>185,190-194</sup>
1	B-NR	3. In patients with hypertension who experience a stroke or TIA, individualized drug regimens that take into account patient comorbidities, agent pharmacological class, and patient preference are recommended to maximize drug efficacy. <sup>188,189,195,196</sup>



# Vascular risk factor management

## 2. hyperlipidemia

COR	LOE	Recommendations
		<b>Treatment</b>
1	A	1. In patients with ischemic stroke with no known coronary heart disease, no major cardiac sources of embolism, and LDL cholesterol (LDL-C) >100 mg/dL, atorvastatin 80 mg daily is indicated to reduce risk of stroke recurrence. <sup>208,209</sup>
1	A	2. In patients with ischemic stroke or TIA and atherosclerotic disease (intracranial, carotid, aortic, or coronary), lipid-lowering therapy with a statin and also ezetimibe, if needed, to a goal LDL-C of <70 mg/dL is recommended to reduce the risk of major cardiovascular events. <sup>210</sup>

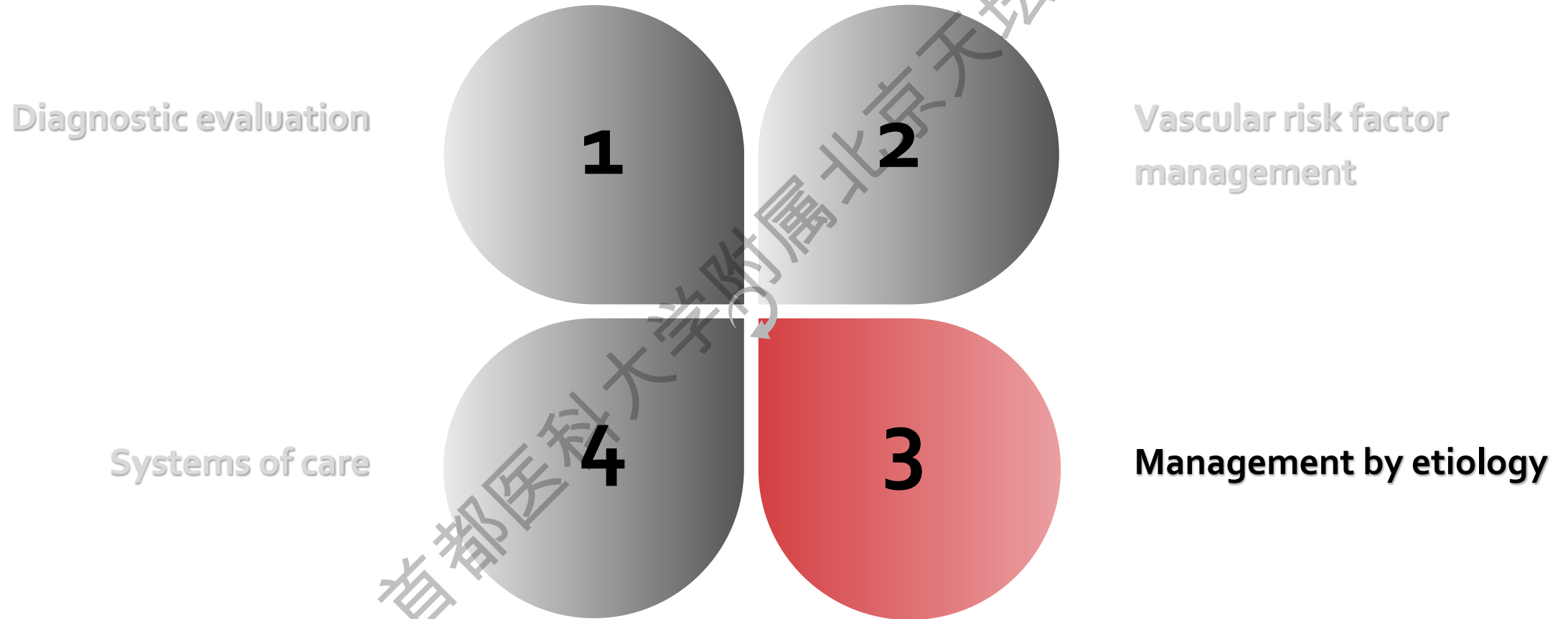
**Note:** colors correspond to Class of Recommendation

# Vascular risk factor management

## 3. glucose

COR	LOE	Recommendations
1	A	1. In patients with an ischemic stroke or TIA who also have diabetes, the goal for glycemic control should be individualized based on the risk for adverse events, patient characteristics and preferences, and, for most patients, especially those <65 years of age and without life-limiting comorbid illness, achieving a goal of HbA1c $\leq 7\%$ is recommended to reduce risk for microvascular complications. <sup>229,230</sup>
1	B-R	2. In patients with an ischemic stroke or TIA who also have diabetes, treatment of diabetes should include glucose-lowering agents with proven cardiovascular benefit to reduce the risk for future major adverse cardiovascular events (ie, stroke, MI, cardiovascular death). <sup>231-236</sup>

# Principles of secondary stroke prevention



# MANAGEMENT BY ETIOLOGY

## 1. Large Artery Atherosclerosis

COR	LOE	Recommendations
		<b><i>Antithrombotic Therapy</i></b>
1	B-R	1. In patients with a stroke or TIA caused by 50% to 99% stenosis of a major intracranial artery, aspirin 325 mg/d is recommended in preference to warfarin to reduce the risk of recurrent ischemic stroke and vascular death. <sup>335,336</sup>

**Note:** colors correspond to Class of Recommendation



# MANAGEMENT BY ETIOLOGY

## 2. Extracranial Large Artery Atherosclerosis

COR	LOE	Recommendations
1	A	1. In patients with a TIA or nondisabling ischemic stroke within the past 6 months and ipsilateral severe (70%–99%) carotid artery stenosis, carotid endarterectomy (CEA) is recommended to reduce the risk of future stroke, provided that perioperative morbidity and mortality risk is estimated to be <6%. <sup>369</sup>
1	A	2. In patients with ischemic stroke or TIA and symptomatic extracranial carotid stenosis who are scheduled for carotid artery stenting (CAS) or CEA, procedures should be performed by operators with established periprocedural stroke and mortality rates of <6% to reduce the risk of surgical adverse events. <sup>370</sup>
1	A	3. In patients with carotid artery stenosis and a TIA or stroke, intensive medical therapy, with antiplatelet therapy, lipid-lowering therapy, and treatment of hypertension, is recommended to reduce stroke risk. <sup>210</sup>
1	B-R	4. In patients with recent TIA or ischemic stroke and ipsilateral moderate (50%–69%) carotid stenosis as documented by catheter-based imaging or noninvasive imaging, CEA is recommended to reduce the risk of future stroke, depending on patient-specific factors such as age, sex, and comorbidities, if the perioperative morbidity and mortality risk is estimated to be <6%. <sup>369</sup>

# MANAGEMENT BY ETIOLOGY

## 3. Extracranial Vertebral Artery Stenosis

COR	LOE	Recommendations
1	A	1. In patients with recently symptomatic extracranial vertebral artery stenosis, intensive medical therapy (antiplatelet therapy, lipid lowering, BP control) is recommended to reduce stroke risk. <sup>378</sup>

# MANAGEMENT BY ETIOLOGY

## 4. Atrial Fibrillation

COR	LOE	Recommendations
1	A	1. In patients with nonvalvular AF and stroke or TIA, oral anticoagulation (eg, apixaban, dabigatran, edoxaban, rivaroxaban, or warfarin) is recommended to reduce the risk of recurrent stroke. <sup>419-426</sup>
1	B-R	2. In patients with AF and stroke or TIA, oral anticoagulation is indicated to reduce the risk of recurrent stroke regardless of whether the AF pattern is paroxysmal, persistent, or permanent. <sup>427</sup>
1	B-R	3. In patients with stroke or TIA and AF who do not have moderate to severe mitral stenosis or a mechanical heart valve, apixaban, dabigatran, edoxaban, or rivaroxaban is recommended in preference to warfarin to reduce the risk of recurrent stroke. <sup>419-426</sup>



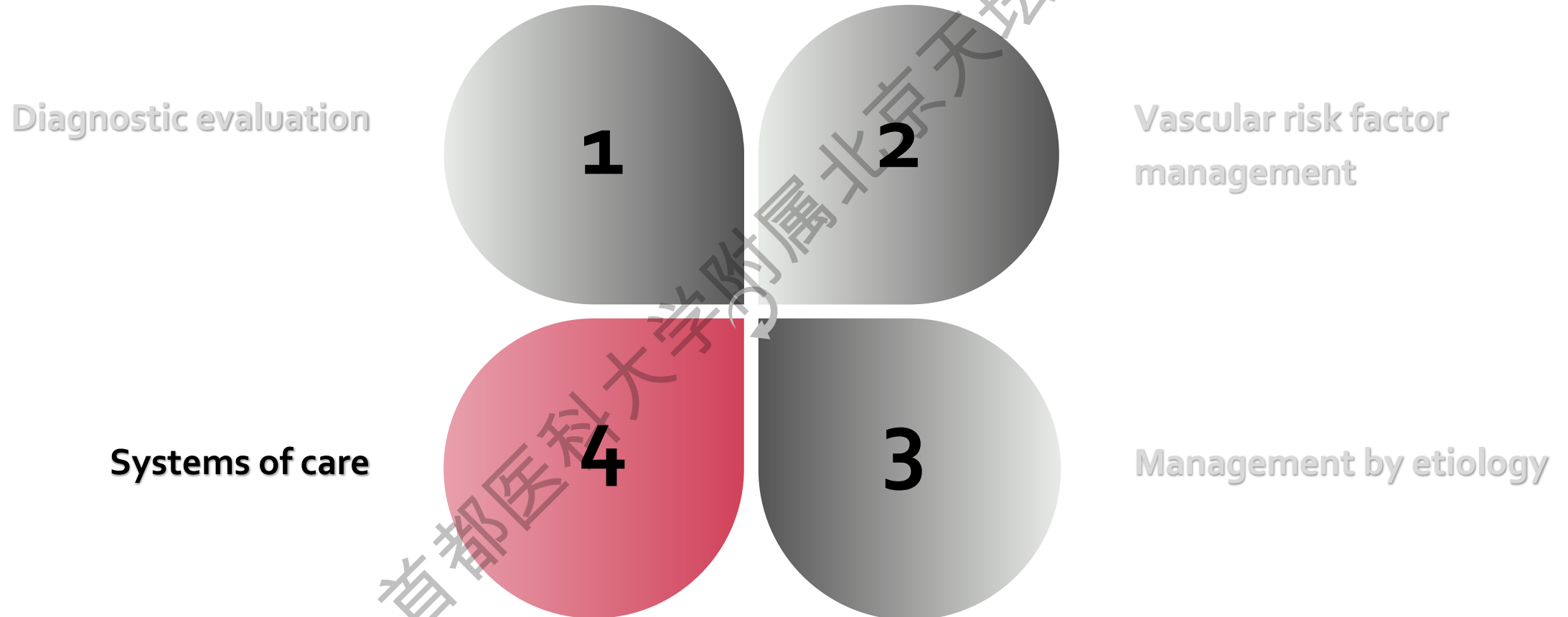
# MANAGEMENT BY ETIOLOGY

## 5. Use of Antithrombotic Medications

COR	LOE	Recommendations
1	A	1. In patients with noncardioembolic ischemic stroke or TIA, antiplatelet therapy is indicated in preference to oral anticoagulation to reduce the risk of recurrent ischemic stroke and other cardiovascular events while minimizing the risk of bleeding. <sup>789,790</sup>
1	A	2. For patients with noncardioembolic ischemic stroke or TIA, aspirin 50 to 325 mg daily, clopidogrel 75 mg, or the combination of aspirin 25 mg and extended-release dipyridamole 200 mg twice daily is indicated for secondary prevention of ischemic stroke.* <sup>791-794</sup>
1	A <sup>5B</sup>	3. For patients with recent minor (NIHSS score $\leq 3$ ) noncardioembolic ischemic stroke or high-risk TIA (ABCD <sup>2</sup> score $\geq 4$ ), DAPT (aspirin plus clopidogrel) should be initiated early (ideally within 12–24 hours of symptom onset and at least within 7 days of onset) and continued for 21 to 90 days, followed by SAPT, to reduce the risk of recurrent ischemic stroke. <sup>382,384,410,795,796</sup>



# Principles of secondary stroke prevention



# SYSTEMS OF CARE

## Health Systems–Based Interventions

COR	LOE	Recommendations
1	C-EO	1. In patients with ischemic stroke or TIA, voluntary hospital-based or outpatient-focused quality monitoring and improvement programs are recommended to improve short-term and long-term adherence to nationally accepted, evidence-based guidelines for secondary stroke prevention.
2a	B-R	2. In patients with ischemic stroke or TIA, a multidisciplinary outpatient team-based approach (ie, care provision with active medication adjustment from advanced practice providers, nurses, or pharmacists) can be effective to control BP, lipids, and other vascular risk factors. <sup>810-817</sup>
2a	B-R	3. In patients presenting to their primary care provider as the first contact after TIA or minor stroke, it is reasonable to use a decision support tool that improves diagnostic accuracy, stratifies patients in risk categories to support appropriate triage, and prompts the initiation of medications and counseling for lifestyle modification for secondary stroke prevention to reduce the 90-day risk of recurrent stroke or TIA. <sup>818</sup>

## Interventions Aimed at Changing Behavior

COR	LOE	Recommendations
1	B-R	1. In patients with ischemic stroke or TIA, behavior change interventions targeting stroke literacy, lifestyle factors, and medication adherence are recommended to reduce cardiovascular events. <sup>131,134,840</sup>
2a	B-R	2. In patients with ischemic stroke or TIA, teaching self-management skills or using behavior change theory (eg, motivational interviewing) can be beneficial in improving medication adherence. <sup>840-843</sup>
2a	B-R	3. In patients with stroke or TIA, combined exercise-based and behavior change interventions are probably indicated in preference to behavior interventions alone, exercise interventions alone, or usual care to reduce physiological stroke risk factors such as SBP. <sup>111-113,829</sup>
2a	B-R	4. In patients with TIA or nondisabling stroke, engagement in targeted secondary prevention programs (eg, cardiac rehabilitation programs or exercise and lifestyle counseling programs) can be beneficial to reduce risk factors and recurrent ischemic events. <sup>133,134</sup>
2a	B-NR	5. For patients with disabling stroke who are discharged from acute services, engaging in targeted secondary prevention programs (eg, an adapted cardiac rehabilitation program or structured exercise including aerobic activity and healthy lifestyle counseling) can be beneficial to reduce vascular risk factors and mortality. <sup>111,844</sup>

## Health Equity

COR	LOE	Recommendations
1	C-EO	1. In patients with stroke or TIA, evaluating and addressing social determinants of health (eg, literacy level, language proficiency, medication affordability, food insecurity, housing, and transportation barriers) when managing stroke risk factors is recommended to reduce healthcare disparities.
1	C-EO	2. In patients with stroke or TIA, monitoring the achievement of nationally accepted, evidence-based performance measures is recommended to allow inequities to be identified and addressed.
1	C-EO	3. In patients with stroke or TIA, systematic adoption of the Agency for Healthcare Research and Quality Universal Precautions Toolkit for Health Literacy is recommended to integrate health literacy into the secondary prevention of stroke.
2b	B-R	4. In patients from urban, predominantly minority, or low-socioeconomic-status groups with stroke or TIA, the optimal intervention model for improving stroke risk factor control and reducing disparities is unknown. <sup>815,856-859</sup>

# Secondary stroke prevention checklist

## PREVENTION CHECKLIST

I plan to take these steps  
instead of having another stroke:

- Know the cause of my stroke
- Manage high blood pressure
- Control cholesterol
- Reduce blood sugar
- Be active
- Eat better
- Lose weight
- Stop smoking
- Be involved in my treatment plan decisions
- Take medications as prescribed
- Join a program that includes exercise, education and counseling

## Reduce the RISK

It is important for stroke patients to work with doctors to create a secondary stroke prevention plan and stick with it !



# Thank You!



2021.9

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