Duration of Heightened Stroke Risk after Acute Myocardial Infarction

Alexander E. Merkler, MD
Assistant Professor of Neurology
Weill Cornell Medicine
Brain and Mind Research Institute

International Stroke Conference
January 26, 2018

Duration of Heightened Stroke Risk after MI

- Disclosures:
  - NIH KL2-TR-002385

Duration of Heightened Stroke Risk after MI

- Acute MI is considered an etiological cause of stroke when it occurs within 1 month of stroke
    - TOAST / ESUS: MI is cause of stroke only when it occurs within 1 month of stroke
    - RE-SPECT ESUS / ARCADIA

TABLE 3. TOAST Classification of High- and Medium-Risk Sources of Cardioembolism

High-risk sources
Mechanical prosthetic valve
Mitral stenosis with atrial fibrillation
Atrial fibrillation (other than lone atrial fibrillation)
Left atrial/atrial appendage thrombus
Sick sinus syndrome
Recent myocardial infarction (<4 weeks)
Left ventricular thrombus
Dilated cardiomyopathy
Akinetic left ventricular segment
Atrial myxoma
Infective endocarditis

Panel 2:* Criteria for diagnosis of embolic stroke of undetermined source

- Stroke detected by CT or MRI that is not lacunar†
- Absence of extracranial or intracranial atherosclerosis causing ≥50% luminal stenosis in arteries supplying the area of ischaemia
- No major-risk cardioembolic source of embolism‡
- No other specific cause of stroke identified (eg, arteritis, dissection, migraine/vasospasm, drug misuse)

*Requires minimum diagnostic assessment (panel 3). †Lacunar defined as a subcortical infarct smaller than or equal to 1·5 cm (≤2·0 cm on MRI diffusion images) in largest dimension, including on MRI diffusion-weighted images, and in the distribution of the small, penetrating cerebral arteries; visualisation by CT usually needs delayed imaging greater than 24–48 h after stroke onset. ‡Permanent or paroxysmal atrial fibrillation, sustained atrial flutter, intracardiac thrombus, prosthetic cardiac valve, atrial myxoma or other cardiac tumours, mitral stenosis, recent (<4 weeks) myocardial infarction, left ventricular ejection fraction less than 30%, valvular vegetations, or infective endocarditis.

Adams HP, *Stroke* 1993. Hart RG *Lancet Neurol* 2014; Diener HC, *Int J Stroke* 2015; Cerebral Embolism Task Force, *Arch Neuro* 1989

Objective:

Determine magnitude and duration of heightened stroke risk after acute MI

Duration of Heightened Stroke Risk after MI

- Hypothesis: acute MI would be independently associated with a heightened risk of ischemic stroke beyond the 1-month window that is currently considered as the at-risk period

Duration of Heightened Stroke Risk after MI

- Methods:
  - Retrospective cohort study of inpatient and outpatient claims data on a 5% sample of Medicare beneficiaries
  - Only included patients >65 years of age
  - Predictor variable: acute MI
  - Primary outcome: ischemic stroke
    - both defined by well-validated *ICD-9-CM* codes.
  - Excluded ischemic stroke prior to/within hospitalization for acute MI
    - To exclude strokes due to PCI/CABG
  - Adjusted for demographics, stroke risk factors, Charlson comorbidities
  - Sensitivity analysis censoring patients who underwent PCI/CABG after hospitalization for MI

Kiyota Y, *Am Heart J* 2014; Tirschwell DL, *Stroke* 2002.

Duration of Heightened Stroke Risk after MI

- Statistics:
  - Survival statistics were used to calculate incidence rates
  - Kaplan-Meier statistics used to calculate cumulative rates
  - Fit Cox regression models separately for the groups with and without acute MI
  - Used the corresponding survival probabilities to compute the HR in each 4-week interval after discharge
  - Nonparametric bootstrap function to compute CIs

Duration of Heightened Stroke Risk after MI

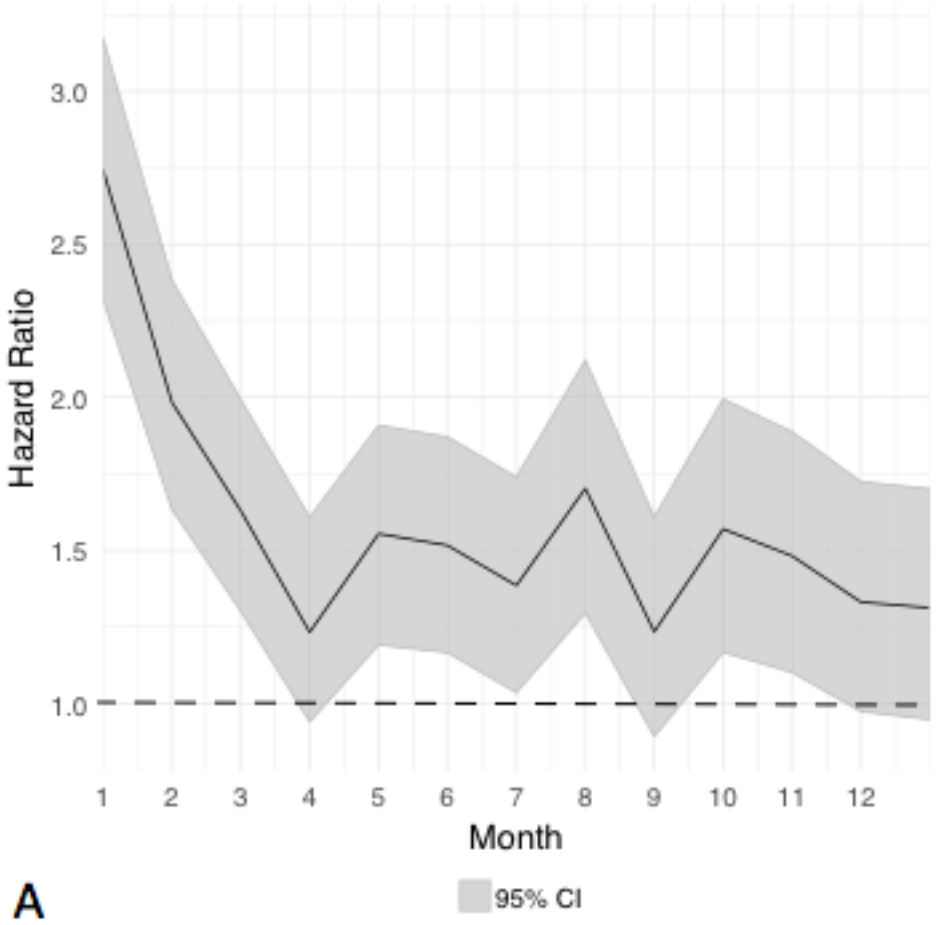
- Results:
  - Identified 1,746,476 beneficiaries of which 46,182 were hospitalized for MI
  - Patients with MI were older, male, more stroke risk factors

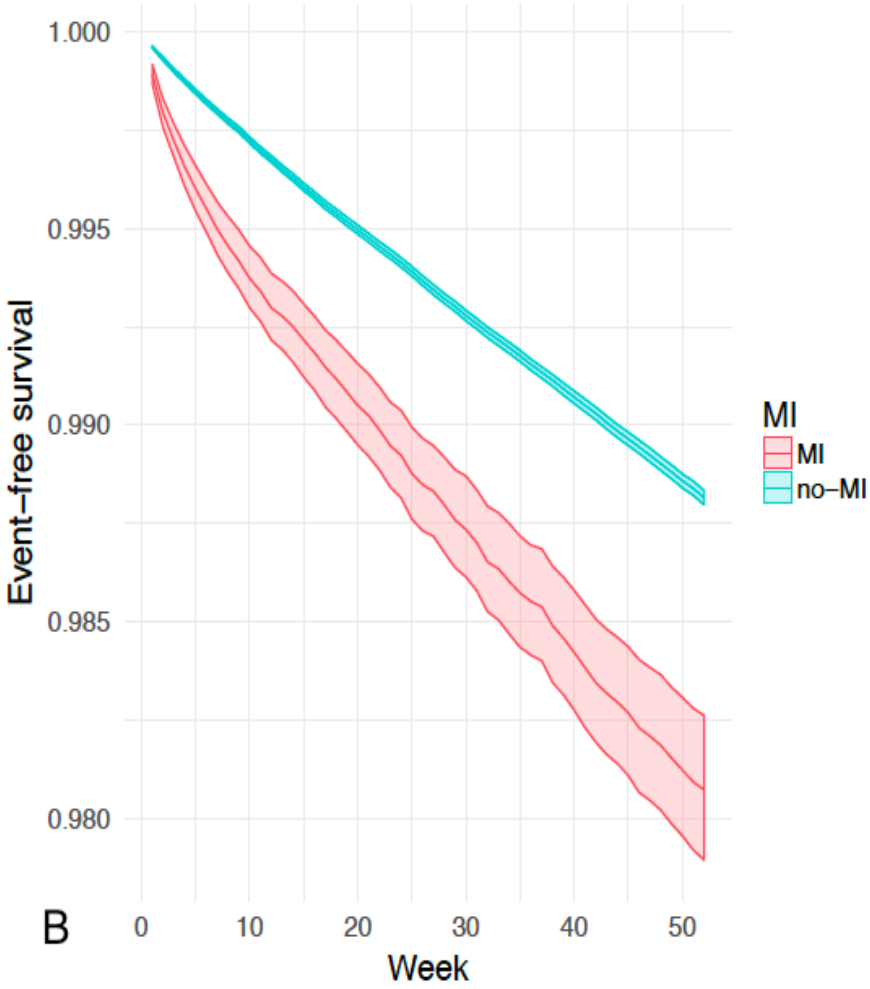
Duration of Heightened Stroke Risk after MI

- Results:
  - Over a mean follow-up of 4.6 (2.2) years, 80,466 had an acute ischemic stroke
  - Patients with stroke were older, female, more stroke risk factors

Duration of Heightened Stroke Risk after MI

- Results:
  - After adjustment for demographics, stroke risk factors, and Charlson comorbidities:
    - Risk of ischemic stroke was highest in first 4 weeks after discharge from MI hospitalization (HR 2.7; 9% CI, 2.3-3.2)
    - Ischemic stroke risk remained elevated 5-8 weeks after MI (HR 2.0; 95% CI, 1.6-2.4)
    - Ischemic stroke risk remained elevated 9-12 weeks after MI (HR 1.6; 95% CI, 1.3-2.0)
    - Ischemic stroke risk no longer elevated beyond 12 weeks after MI


Hazard Ratio
3.0
2.5
2.0
1.5
1.0
1
2
3
4
5
6
7
8
9
10
11
12
Month
95% CI
A


Event−free survival
1.000
0.995
0.990
0.985
0.980
0
10
20
30
40
50
Week
MI
MI
no−MI
B

Duration of Heightened Stroke Risk after MI

- Acute MI is associated with elevated risk of ischemic stroke which extends beyond the 1-month window which is currently considered the at-risk period
- Risk of stroke appears to be elevated for 3 months after acute MI
- Ischemic stroke risk was independent of periprocedural strokes that may have occurred in setting of coronary reperfusion therapies

Duration of Heightened Stroke Risk after MI

- Limitations:
  - Lacked data regarding MI severity/location/angiography
  - Lacked data regarding stroke severity/location/radiology
  - Lacked data regarding antithrombotic medications/adherence
  - Misclassification of MI/stroke events
  - Patients all >65 years of age and had Medicare

Duration of Heightened Stroke Risk after MI

Acute MI is associated with an elevated risk of ischemic stroke which appears to extend beyond the 1-month window that is currently considered as the at-risk period

Acknowledgements

- Hooman Kamel, MD
- Ivan Diaz, PhD
- Santosh Murthy, MD, MPH
- Xian Wu, MPH
- Babak Navi, MD MS
- Costantino Iadecola, MD
- Monika M. Safford, MD
- Peter M. Okin, MD
- Jonathan W. Weinsaft, MD
- Gino Gialdini, MD
- Shadi Yaghi, MD
- Matthew E. Fink, MD