

Measuring Missed Strokes Using Administrative and Claims Data: Towards a Diagnostic Performance Dashboard to Monitor Diagnostic Errors

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Background: Stroke misdiagnosis is a significant public health problem. An estimated 100,000 strokes are missed at first medical contact annually in the US; the majority present with symptoms of dizziness or vertigo.

Objective: In this collaboration between Kaiser Permanente Mid-Atlantic States (KPMAS) and Johns Hopkins University, we sought to identify strokes not initially diagnosed among patients with dizziness. KPMAS healthcare facilities include ambulatory outpatient clinics, urgent care clinics (UC), and clinical decision units (CDU). CDUs provide pre-hospital triage. If patients require emergency department (ED) care or hospitalization, they attend non-KPMAS facilities.

Methods: Retrospective cohort analysis using administrative (KPMAS) and claims (non-KPMAS) data. Our cohort was adult patients discharged from an outpatient clinic, UC, CDU, or ED with a primary diagnosis of benign or non-specific dizziness/vertigo (ICD-9-CM codes 386.x or 780.4). We identified subsequent hospital admissions with a primary inpatient diagnosis of stroke (Healthcare Cost and Utilization Project Clinical Classifications Software code level 3). For patients with more than one dizziness visit during the study period, we used the first. We constructed rate-of-return-with-stroke curves for short-term risk of admission after treat-and-release visit. We used rate curves to define the time window and number of patients potentially harmed by a missed index visit cerebrovascular event.

Results: Between January 2010 and September 2015, 46,700 patients had 68,941 visits with a primary discharge diagnosis of benign or non-specific dizziness/vertigo. These included 40,957 primary care clinic; 13,425 other ambulatory clinic; 7,824 ED; 4,537 UC; and 2,198 CDU visits. Aggregate rate-of-return-with-stroke curves identified a short-term increased risk of stroke (peak rate ~60 per 10,000 person-months; base rate <10 per 10,000 person-months) in the first 60 days after the dizziness/vertigo discharge. The short-term increased risk was highest for patients seen in the ED and lower for patients seen in other settings (i.e., outpatient clinics, UC, CDU), though the temporal profile of increased risk was almost identical, peaking at 30 days

and stabilizing after ~60 days (Figure). In aggregate, there were 635 (0.9%) short-term stroke admissions within 60 days of the index visit over the 5-year period.

Conclusion: Approximately 1% of patients released from ED and ambulatory care settings as “benign dizziness” had strokes resulting in subsequent readmission. Accurate initial diagnosis and prompt treatment might reduce the risk of any harms from diagnostic delay. Administrative and claims-based methods to measure unexpected clinical events could be used to operationally monitor missed diagnostic opportunities and assess interventions to reduce them.

Manuscripts: One manuscript will be submitted to JAMA (brief report about primary care missed stroke); another to the New England Journal of Medicine (letter about dashboards for diagnostic errors)

System Implementation: JHU--have been able to secure access to out of JHHS network follow-up for stroke, and will be using this for dashboard development here at Hopkins in the coming months;

KP-- with the CDU physician, analyzed the CDU data using the dashboard to gather deeper insights about stroke rate, and resource utilization. Based on our analysis, we were looking into the potential option of building a risk score metric that would help capture the stroke, and reduce the utilization of imaging for those who do not need it; looking at all the encounters for dizziness. Currently, neurology is seeing all the “dizzy” patients, as patients with dizziness are currently being directed to neurology. We are changing this to be directed to otology.