The use of medical imaging in the US has been steadily increasing over the last 2 decades. For patients with suspected ischemic stroke, almost all have received computed tomography (CT) imaging of the brain at initial evaluation to exclude hemorrhage. Most patients subsequently undergo MRI within several days of symptoms. Current American Heart Association/American Stroke Association guidelines state that it is reasonable to obtain additional magnetic resonance imaging (MRI) after initial head imaging in cases in which initial imaging did not demonstrate infarction. Commonly cited reasons for the use of routine MRI in these patients include assisting in classification of etiologic subtype, estimating the extent of tissue injury, assisting in distinguishing mimics and chameleons from ischemia, providing imaging biomarkers for prognostication, and estimating early stroke recurrence risk. Whether these purported benefits translate into improved clinical outcomes for patients is not clear.

Understanding the value of diagnostic imaging requires a framework that considers the size of the patient population being exposed to the diagnostic test, the anticipated clinical benefits, and the potential economic outcomes associated with the test in question. Because there are approximately 795,000 strokes annually in the US and more than 85% of these are ischemic, the size of the patient population affected by this question is substantial. Less clear are clinical benefits and cost-effectiveness of routine MRI in patients with ischemic stroke who have already had CT imaging.

To date, few studies have assessed MRI in patient-centered clinical outcomes. In an analysis of the National Inpatient Sample database, in-hospital MRI was associated with improved clinical outcomes at the expense of increased cost and length of hospitalization. However, baseline characteristics of patients were unbalanced. An extensive cost-effectiveness analysis of MRI for ischemic stroke found that routine MRI for brain imaging was more expensive and no more effective than CT, when measured by quality-of-life adjusted years or number of strokes prevented. Exceptions in which MRI was justified included to rule out hemorrhage in patients presenting several days after the onset of symptoms, genuine diagnostic uncertainty, to rule out unusual causes, or in cases in which there is doubt whether the stroke is in the territory of a high-grade carotid stenosis.

Cabral Frade et al assessed clinical outcomes in 246 patients with acute ischemic stroke imaged with either initial CT alone compared with patients who had CT plus MRI. This was a retrospective propensity score–matched cohort study conducted at a single comprehensive stroke center to assess the noninferiority of CT alone compared with CT plus MRI in patients with ischemic stroke with respect to clinical outcomes of disability, mortality, and recurrent stroke. The authors found that CT alone was noninferior with respect to death or dependance at discharge (modified Rankin Score scale of 3-6), as well as stroke or death within 1 year.

The choice of a noninferiority trial design is appropriate. Noninferiority trials are used when an experimental approach need not be better than the current standard but only not significantly worse by a predetermined acceptable margin. A strategy of CT plus MRI is undeniably more costly, time consuming, and labor intensive than CT alone. If skipping MRI does not meaningfully affect clinical outcomes, then doing so may help curb wasteful testing. Although foregoing MRI certainly means having fewer data available in the evaluation of a patient, the pertinent question is whether this negatively affects patient outcomes by an amount that exceeds an acceptable difference. That acceptable difference is the noninferiority margin and represents how much worse an intervention can be compared with the standard yet still be considered good enough. In Cabral Frade et al, the
noninferiority margins were prespecified based on prior randomized clinical trials of ischemic stroke treatment and secondary prevention.

To account for selection bias inherent in observational studies, the authors used propensity score matching to adjust for imbalances between nonrandomized comparison groups. The propensity score is defined as the probability of treatment assignment conditional on baseline characteristics. It is a balancing score that can be used to reduce confounding in observational data. Among patients with similar propensity scores, baseline characteristics should be similar and comparisons can approximate a randomized trial. In Cabral Frade et al, patients in propensity score–matched cohorts were very similar in their baseline characteristics, reflecting the balancing of propensity-score matching. This balancing mitigates the confounding one would expect in a retrospective cohort study.

Given the pervasiveness of routine MRI in addition to CT in clinical stroke practice, the implications of the study by Cabral Frade et al are substantial. As stewards of health care resources, clinicians should be asking whether the additional information provided by diagnostic tests meaningfully affects patient outcomes. The answer to this question should be data-driven rather than anecdotal. Of course, there are circumstances in which additional MRI is still justified. But at a minimum, these results should give the health care practitioners reason to pause and reconsider routine use of CT plus MRI. Hopefully, the present study paves the way for future prospective studies that would provide additional data on this common clinical question.

ARTICLE INFORMATION
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