Benefits, challenges and development of clinical AI-products in Neuroradiology

A case study with AI Doc

BBS Seminar: AI in Clinical Research and Drug Development

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25.09.2024

Will AI Replace Radiologists, or Make Them Better Than Ever?

Opinions differ on how much physicians should be embracing the technology. 21.05.2024

- Benefits: AI tools for clinical «real life»
- Challenges: Evidence-based vs black box
- Current use: Aidoc for brain bleeding detection
- Current evidence

The NEW ENGLAND JOURNAL of MEDICINE

REVIEW ARTICLE

AI IN MEDICINE

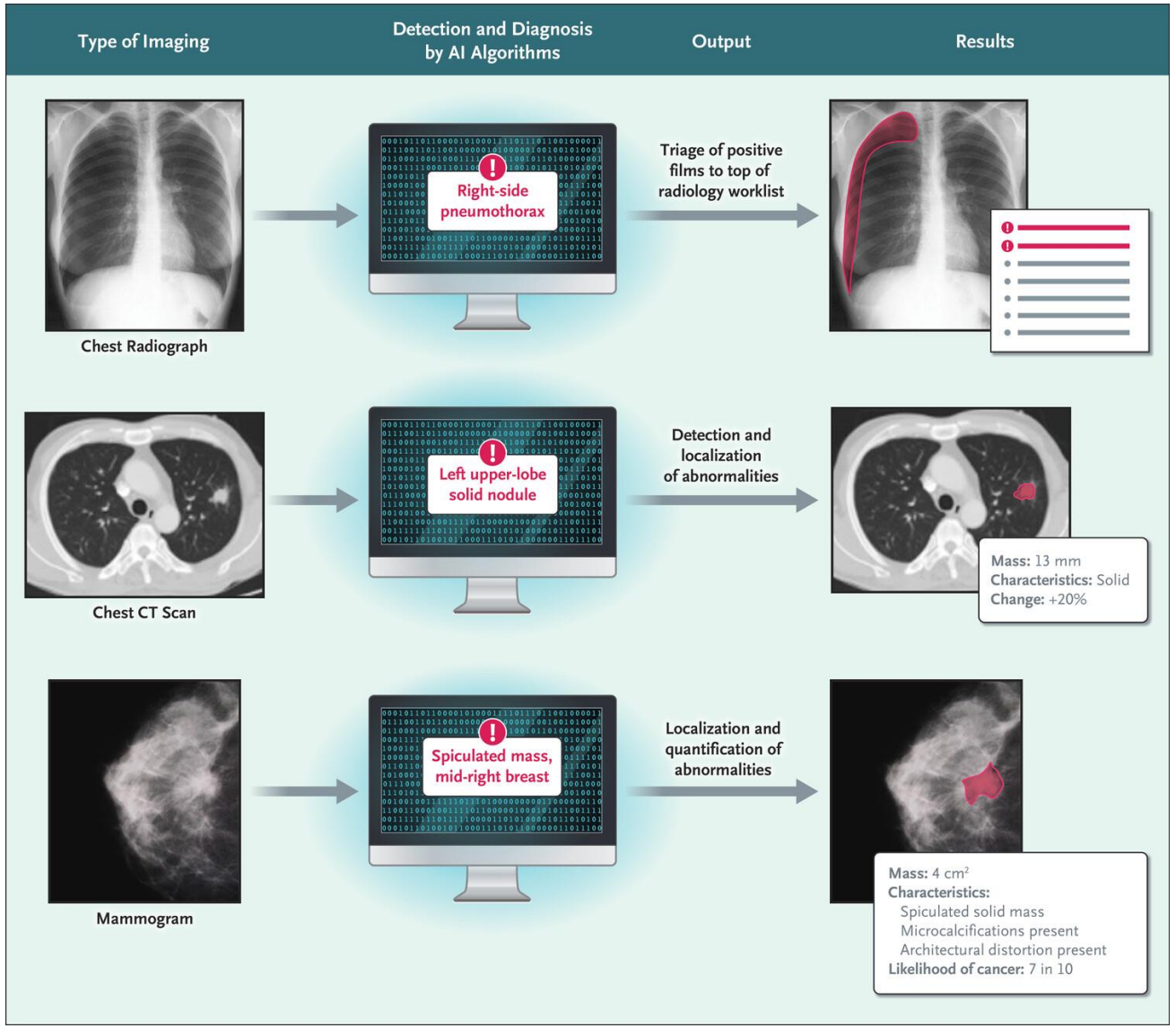
Jeffrey M. Drazen, M.D., *Editor*, Isaac S. Kohane, M.D., Ph.D., *Guest Editor*,
and Tze-Yun Leong, Ph.D., *Guest Editor*

The Current and Future State of AI Interpretation of Medical Images

Pranav Rajpurkar, Ph.D., and Matthew P. Lungren, M.D., M.P.H.

N Engl J Med 2023;388:1981-90. DOI: 10.1056/NEJMra2301725

The benefits



Triage

Detection

Quantification

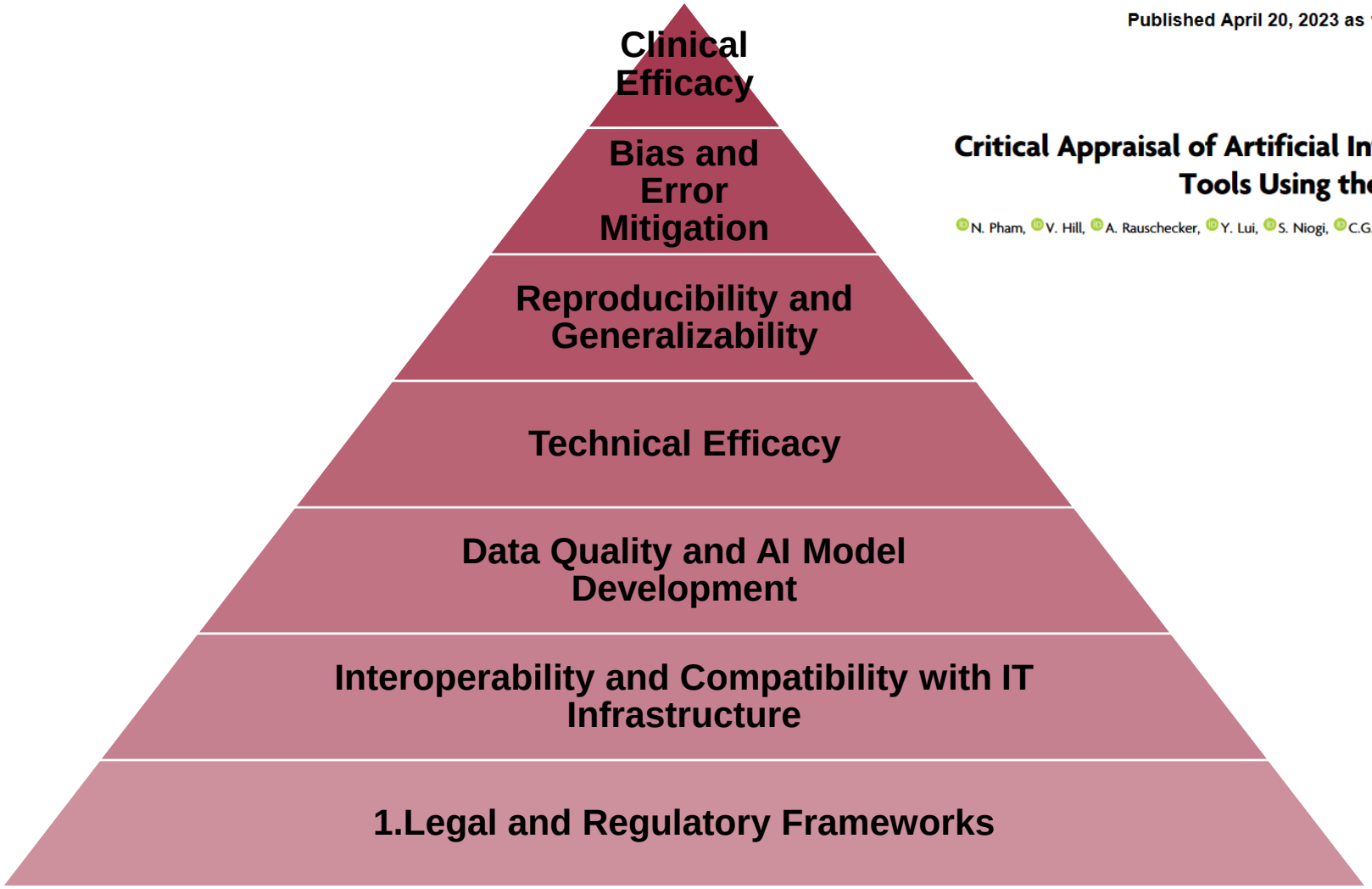
N Engl J Med 2023;388:1981-90.
DOI: 10.1056/NEJMra2301725

The big challenge: Lacking evidence

Very few **randomized, controlled trials** have shown the safety and effectiveness of existing AI algorithms in radiology, and **the lack of real-world evaluation of AI systems** can pose a **substantial risk** to patients and clinicians.

N Engl J Med 2023;388:1981-90. DOI: 10.1056/NEJMra2301725

The big challenge: Lacking evidence



FDA approval

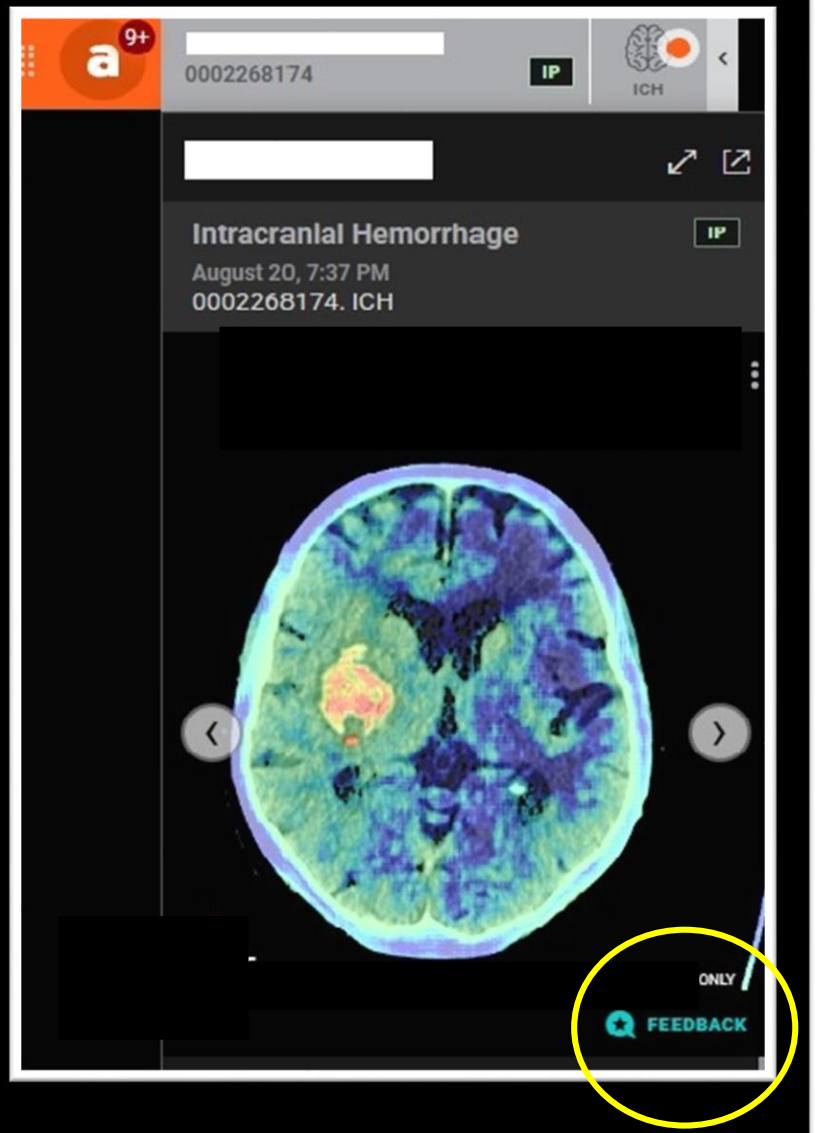
Published April 20, 2023 as 10.3174/ajnr.A7850

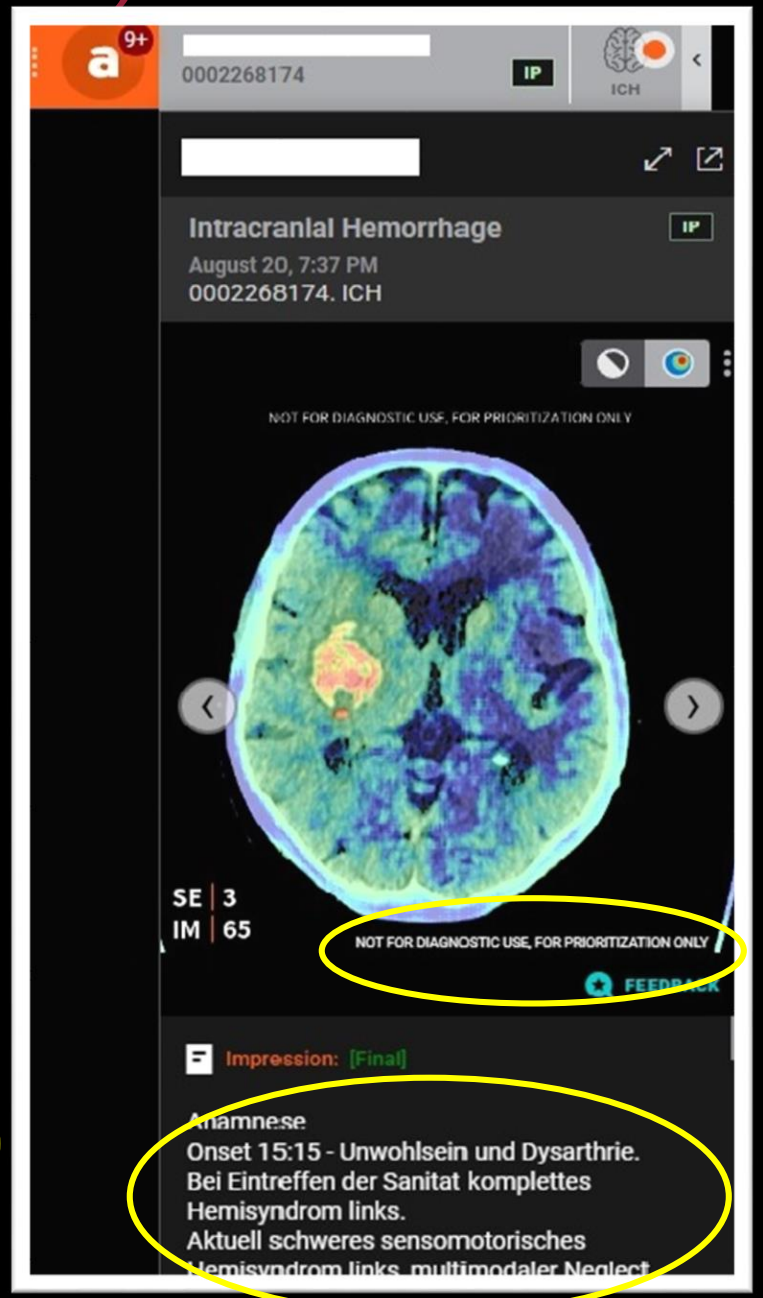
WHITE PAPER

Critical Appraisal of Artificial Intelligence–Enabled Imaging Tools Using the Levels of Evidence System

N. Pham, V. Hill, A. Rauschecker, Y. Lui, S. Niogi, C.G. Fillipi, P. Chang, G. Zaharchuk, and M. Wintermark

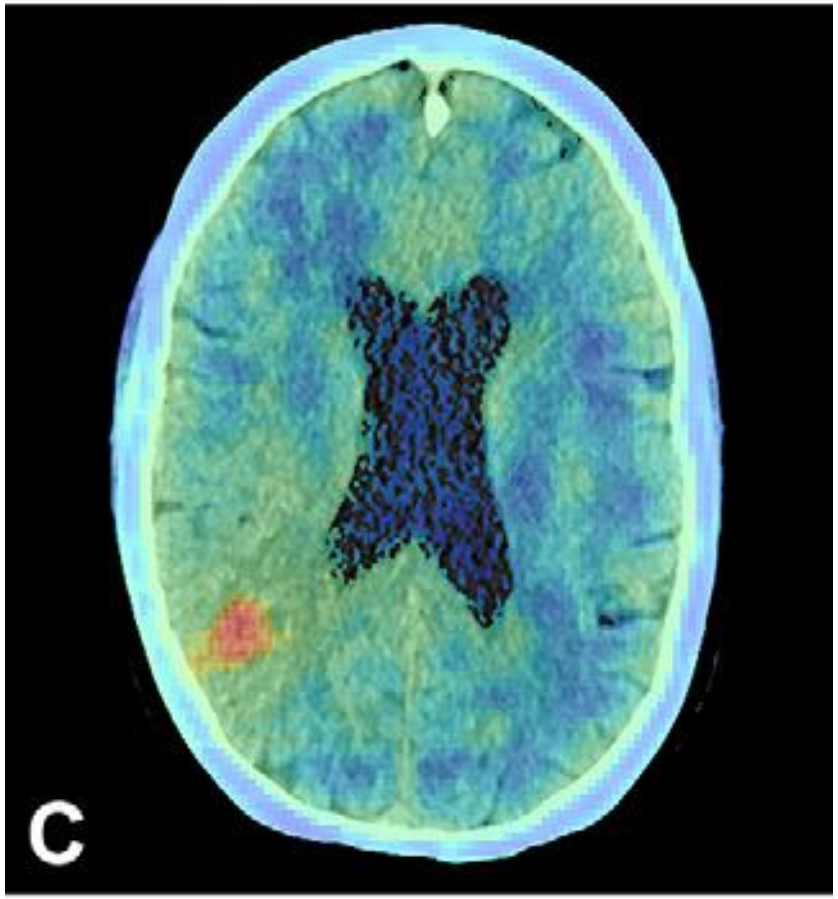
The case: AI Doc (FDA approved)



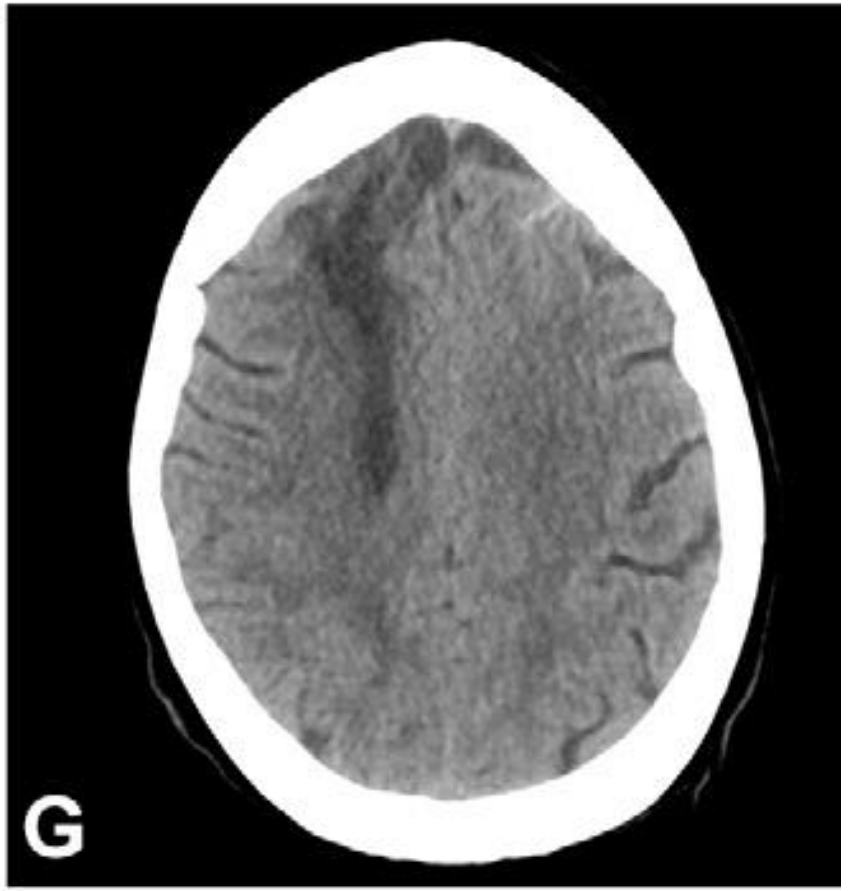


- "Always-on AI -- constantly running in the background and automatically analyzing medical imaging data, identifying urgent findings, sparing radiologists from "drowning" in vast amounts of irrelevant data”

Examples



Tumor (red shading, false-positive)



SAH right frontal lobe (missed by AI, false-negative)

Evidence AI Doc

Radiology: Artificial Intelligence

AI IN BRIEF

Utilization of Artificial Intelligence–based Intracranial Hemorrhage Detection on Emergent Noncontrast CT Images in Clinical Workflow

Muhammad Seyam, MD • Thomas Weikert, MD • Alexander Sauter, MD • Alex Brehm, MD • Marios-Nikos Psychogios, MD • Kristine A. Blackham, MD

AJR Accepted Manuscript

Prospective Evaluation of Artificial Intelligence Triage of Intracranial Hemorrhage on Noncontrast Head CT Examinations

Cody H. Savage, MD, Manoj Tanwar, MD, Asser Abou Elkassem, MD, Adam Sturdivant, MPH, MS, Omar Hamki, BS, Houman Sotoudeh, MD, Gopi Sirineni, MD, Aparna Singhal, MD, Desmin Milner, MD, Jesse Jones, MD, Dirk Rehder, MD, Mei Li, PhD, Yufeng Li, PhD, Kevin Junck, PhD, Srini Tridandapani, MD, PhD, MBA, Steven A. Rothenberg, MD, Andrew D. Smith, MD, PhD

Key points

USB

- Retrospective evaluation of diagnostic performance of Aidoc
  - diagnostic accuracy of 93.0%
  - high negative predictive value of 97.8%
- Metrics
  - Slight reduction in communication time
  - Expedited patient disposition time

UAB

- Prospective comparison before and after implementation of Aidoc
  - No change in doctor’s performance
  - No change in reporting time

- Neither study utilized worklist prioritization
- Both studies were academic centers with subspecialized neuroradiologists

Conclusion

Despite ad hoc post-market research interest and activity, barriers to clinical implementation remain

- Standardized criteria for comparing product quality and effectiveness
- Rigorous scientific evidence supporting meaningful impact on patient care and health care outcomes

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Thank you for your attention

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