Accessible imaging:
Democratization of technology and tools to share and develop imaging expertise

Vikas Gulani

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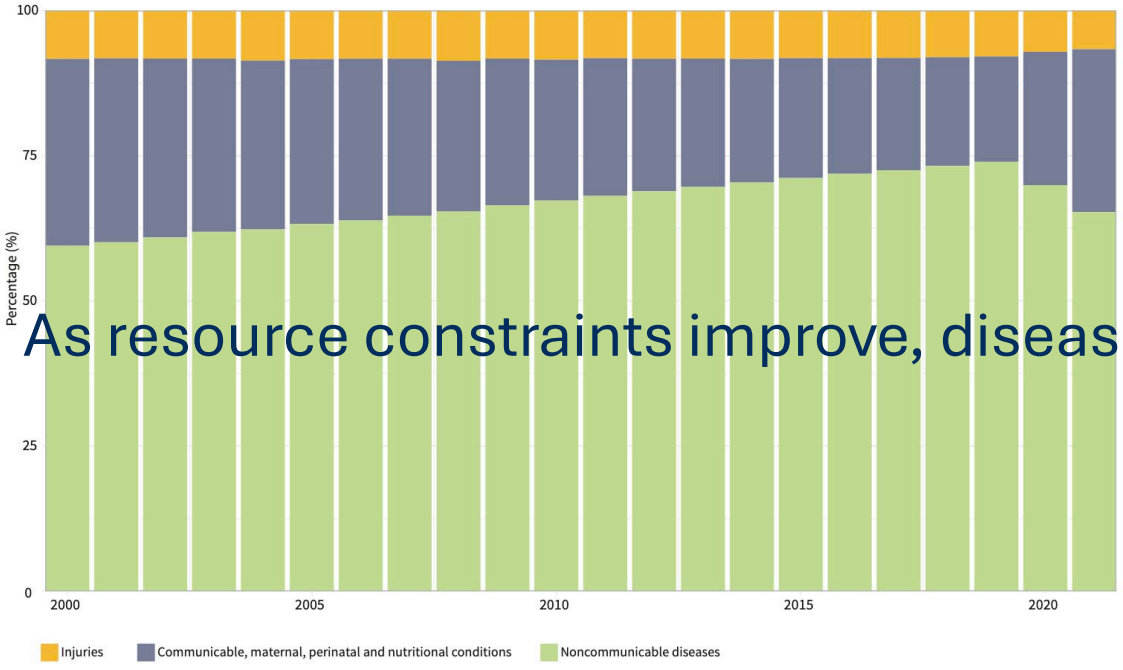
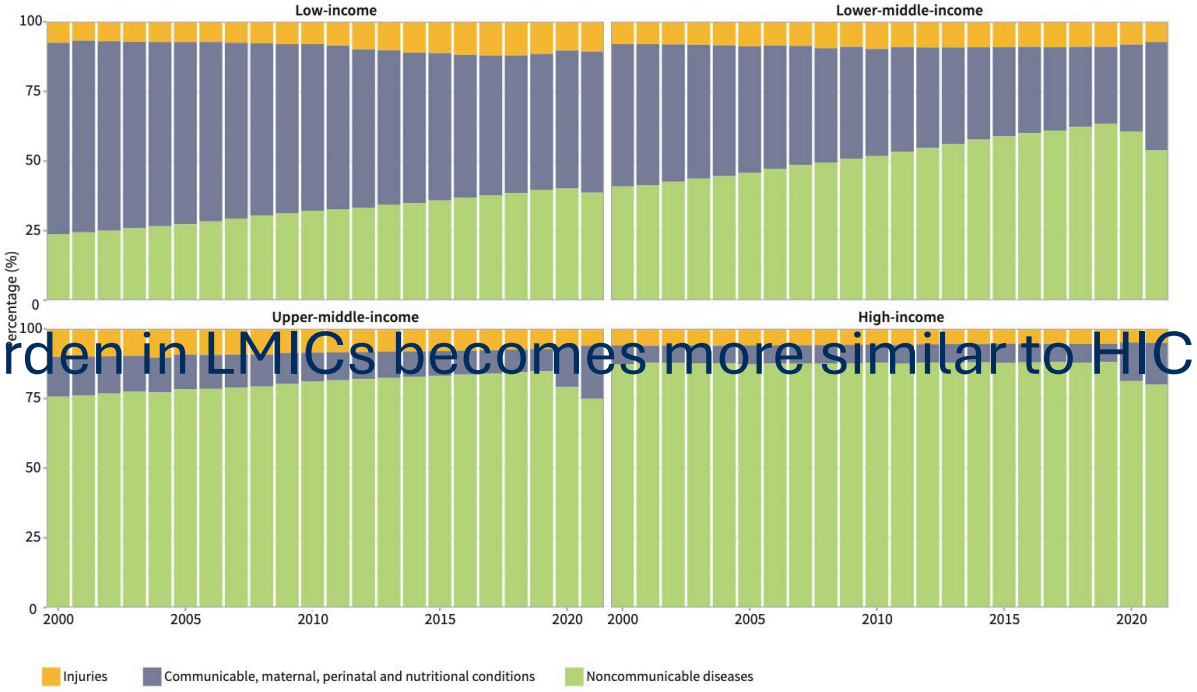
Disclosures/COIs

- Grant support: Siemens, Cook Medical
- IP licensed: Siemens, Philips





As resource constraints improve, disease burden in LMICs becomes more similar to HICs

World health statistics 2024: monitoring health for the SDGs, Sustainable Development Goals. Geneva: World Health Organization; 2024. Licence: CC BY-NC-SA 3.0 IGO.

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NM – Ongoing expansion in LMIC

Asia-Pacific

- China (installing a PET scanner every 2 weeks),
- Malaysia (CAGR of 9.86%)
- India: NM market revenue projected to >$1b by 2030)

Latin America, Caribbean

Countries can have populations that are simultaneously high, middle and low income

- Brazil and Mexico have largest markets, others (e.g. Jamaica) are emerging.

Africa

- South Africa has a nuclear reactor and is quite active
- Others (Kenya, Ghana, Ethiopia) are emerging

World Health Organization

Seventy-eighth World Health Assembly

Agenda item 13.3

WHA78.13

27 May 2025

Strengthening medical imaging capacity

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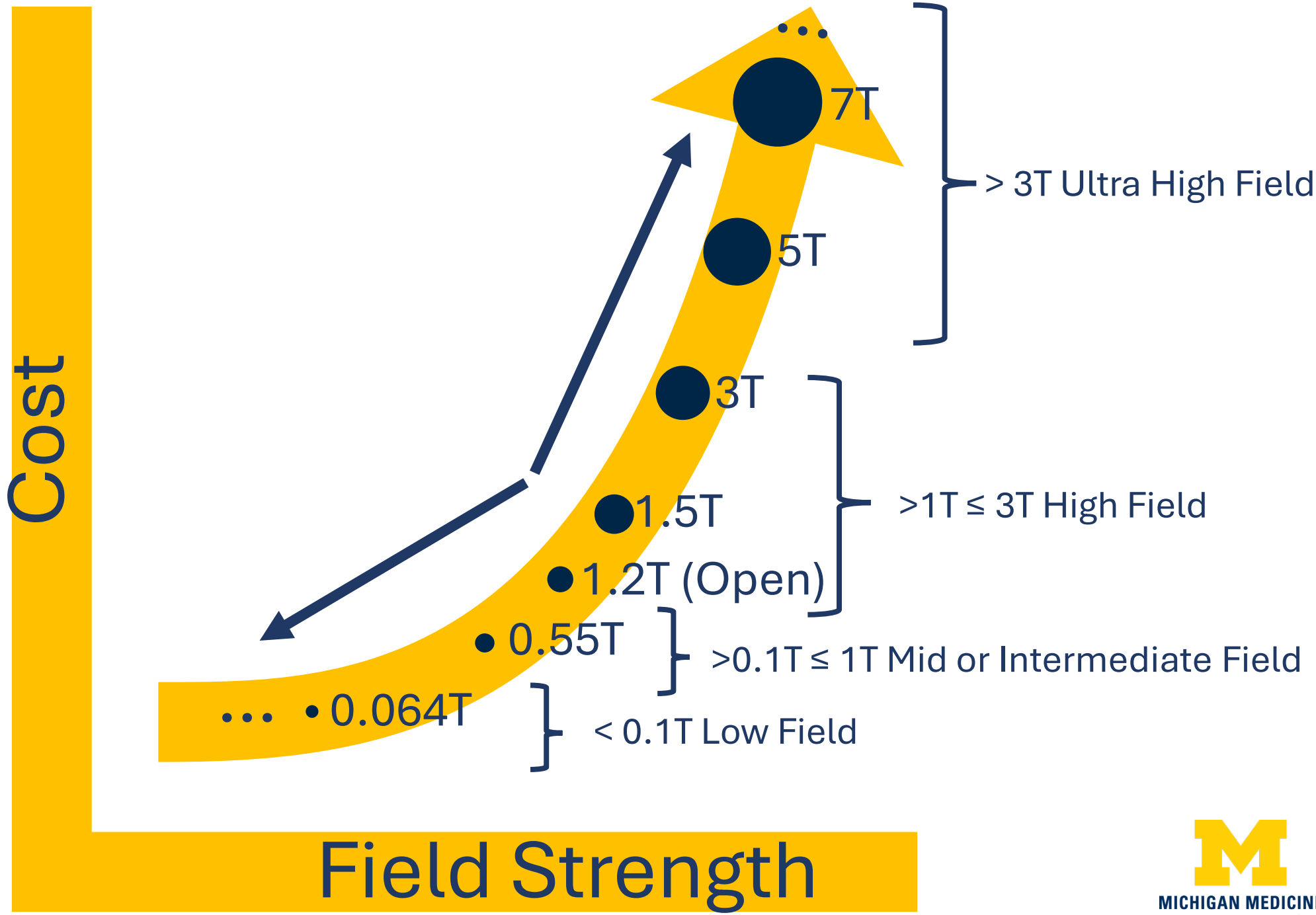

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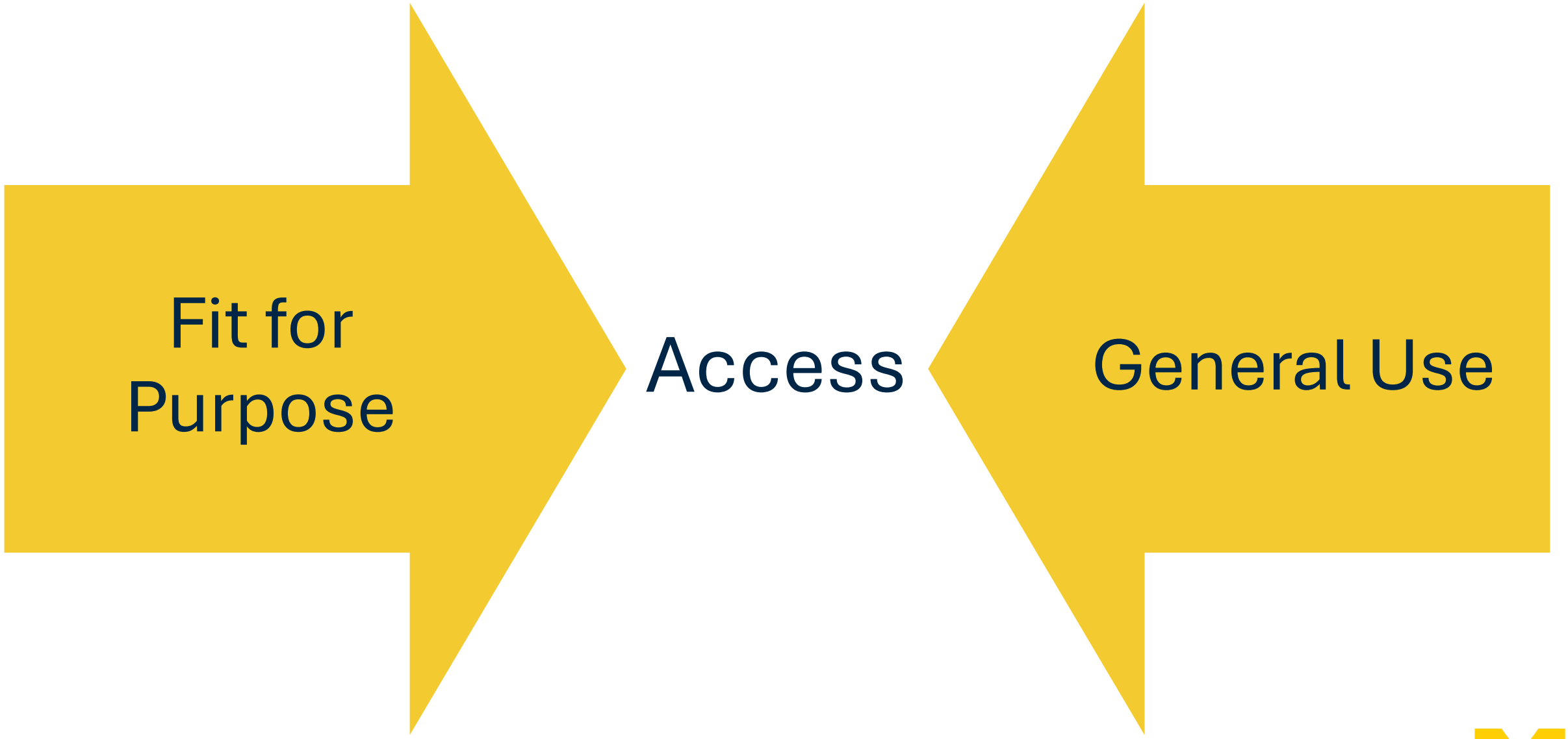

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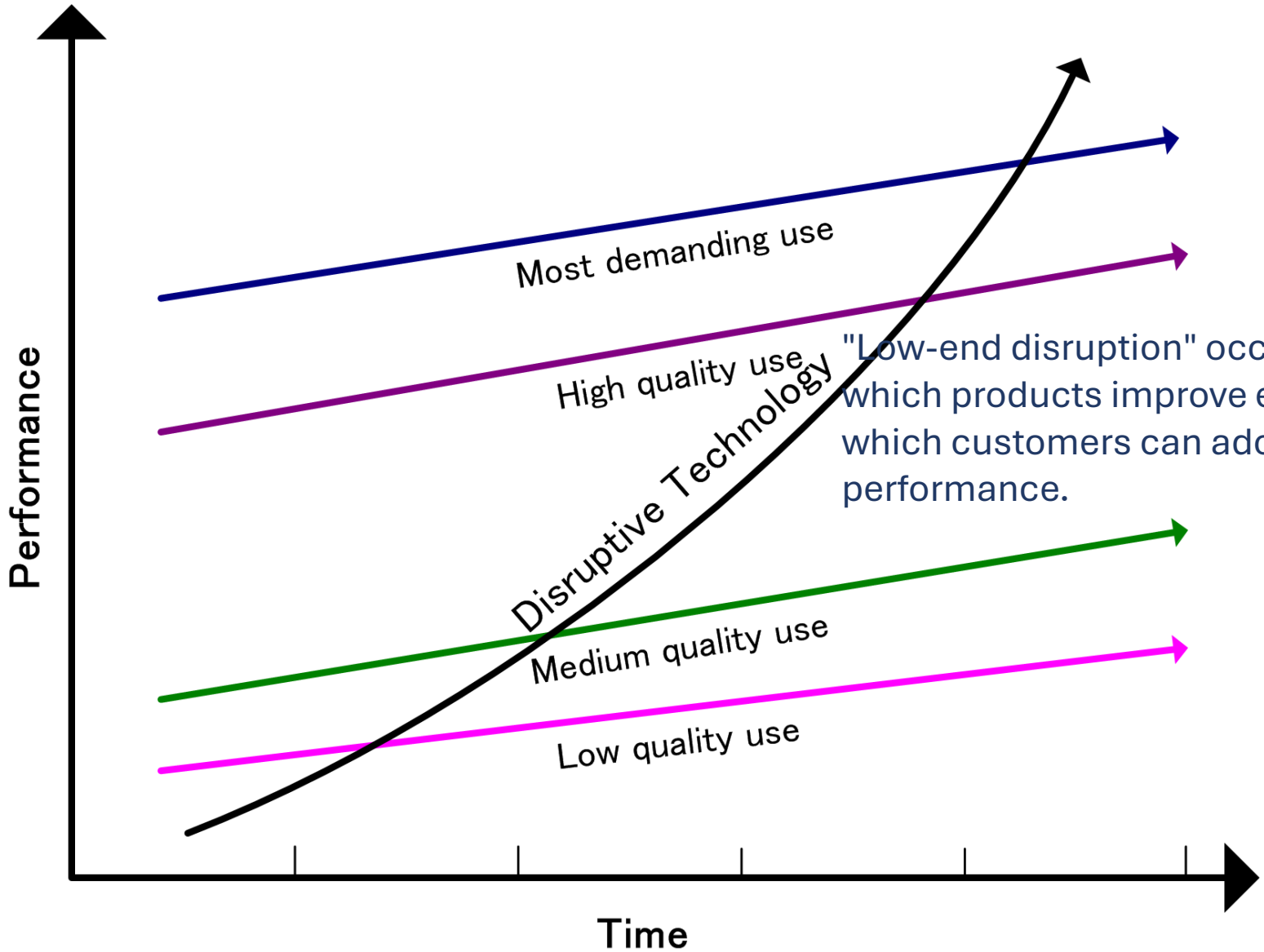
Need new business models



"Low-end disruption" occurs when the rate at which products improve exceeds the rate at which customers can adopt the new performance.

https://en.wikipedia.org/wiki/Disruptive_innovation Accessed Aug 14 2023

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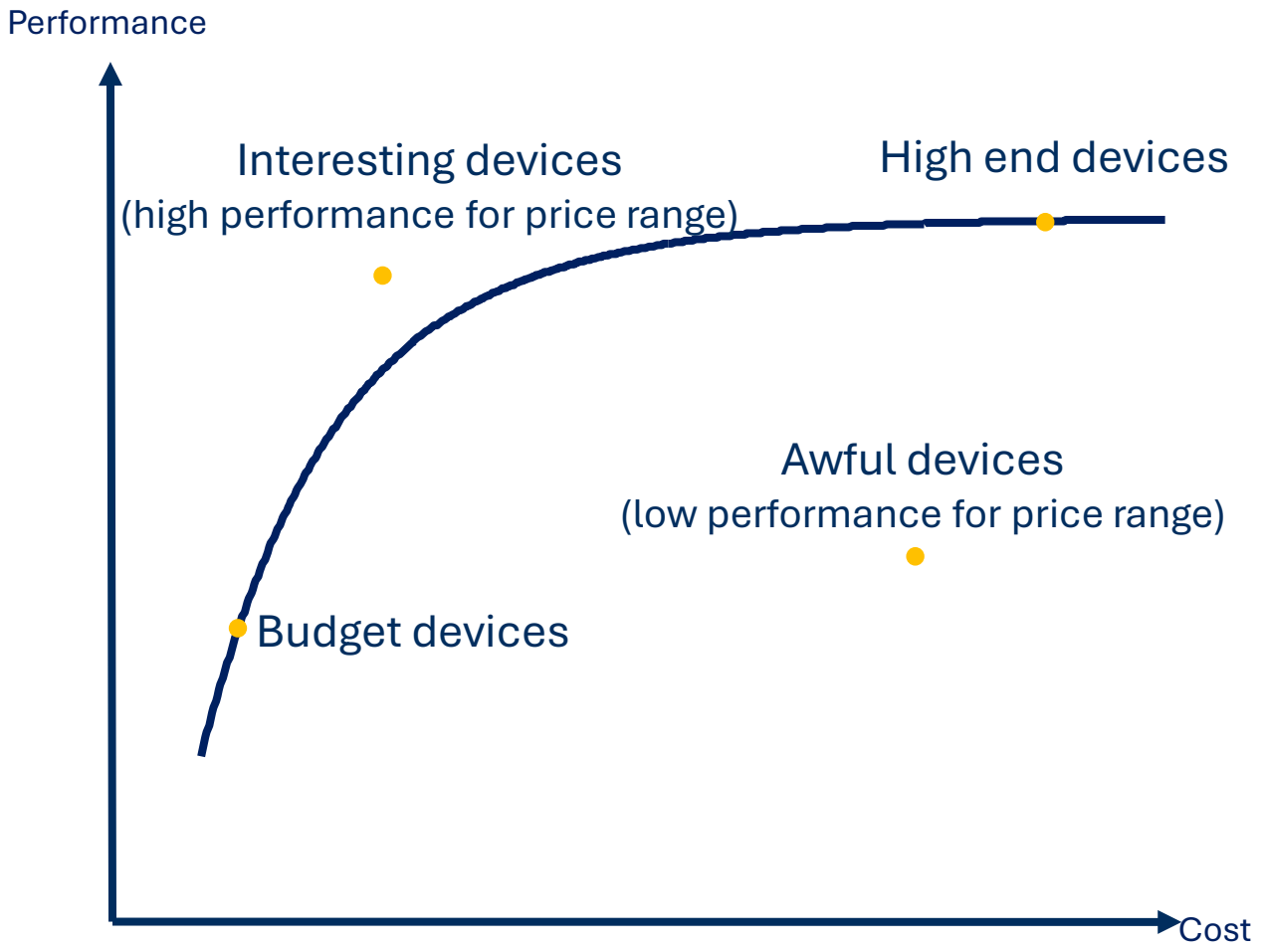
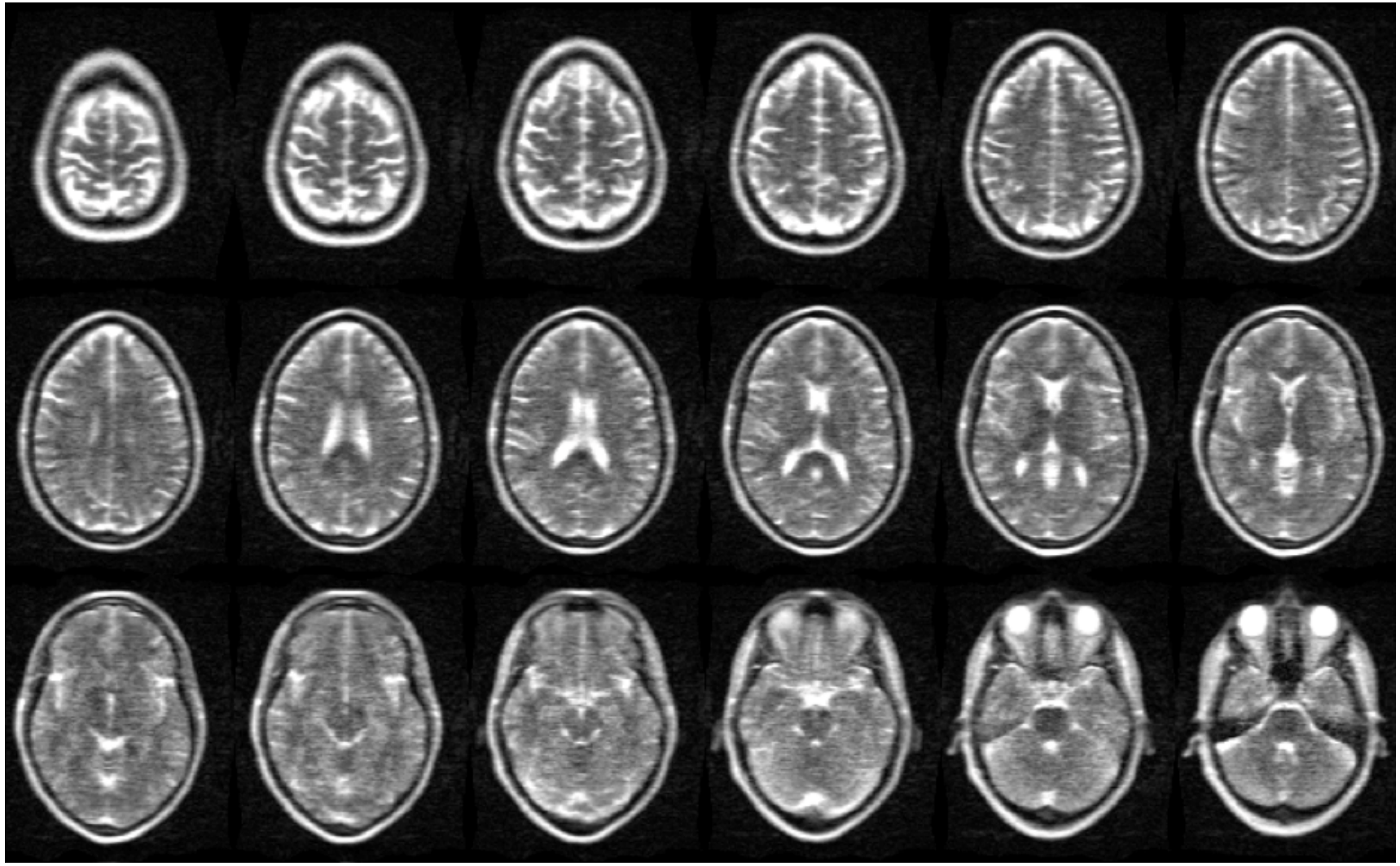


Slide idea courtesy discussion with Andrew Webb, PhD



Field strength withheld

Should someone pay $450,000 to purchase a scanner that makes these images?

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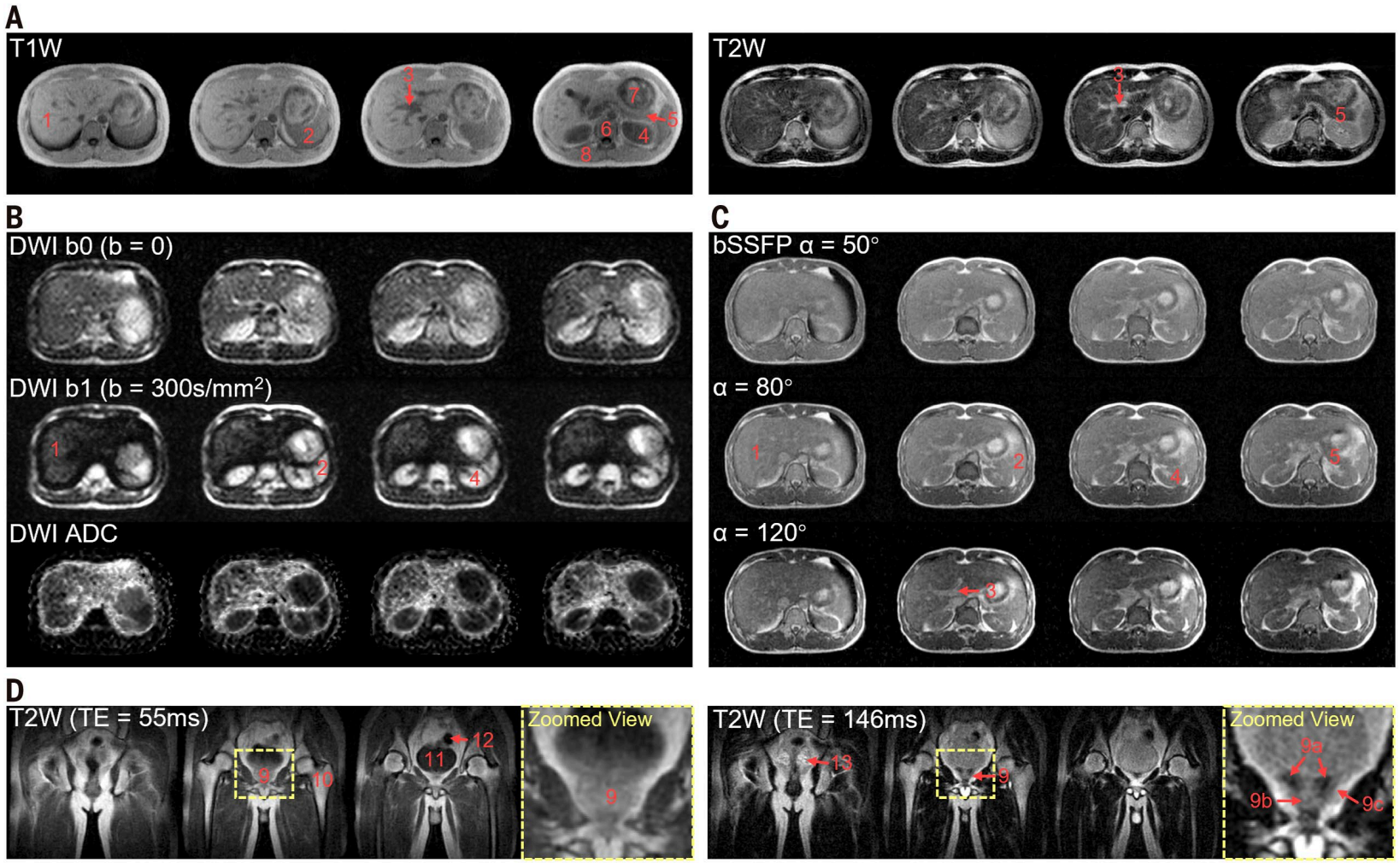
Rising/new devices: 0.05T, cost TBD



1 Liver 2 Spleen 3 Hepatic vessels 4 Kidney 5 Pancreas 6 Spine
7 Stomach 8 Muscle 9 Prostate (9a central zone; 9b transition zone; 9c peripheral zone)
10 Femur 11 Urinary bladder 12 Sigmoid colon 13 Seminal vesicle

Zhao et al., Science 2024; 384, eadm7168

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Open questions

- Final cost?
- Robustness?
- Use cases?

What should we consider“access?”

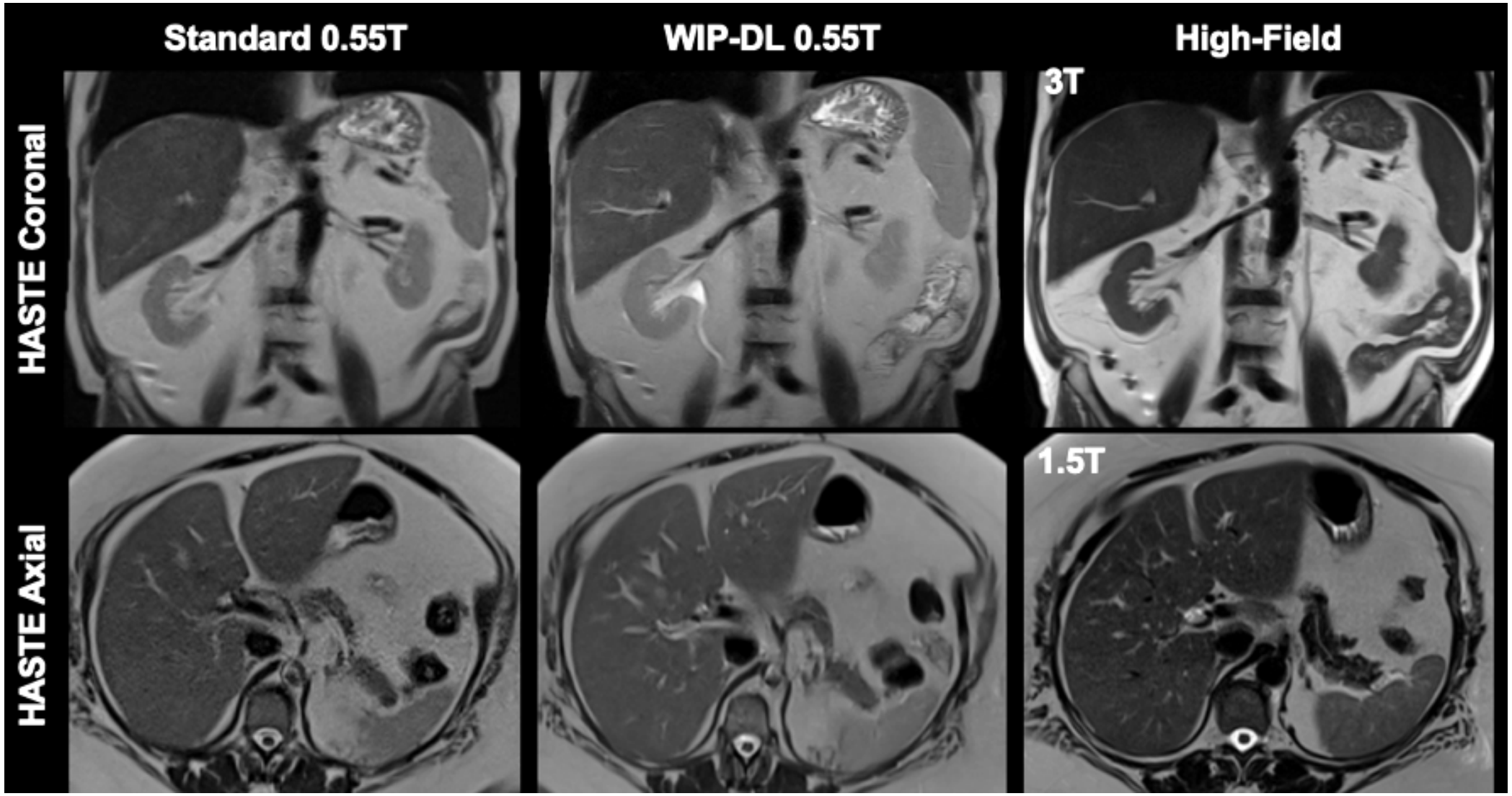
Access?

Filled by any scanner

Equity?

Should be able to do most tasks

Mid-field General Use Scanners



Hero Hussain, MD

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>200 installations in Latin American, Association of Southeast Asian Nations, and Africa

Gulani et al., editorial in Radiology 2025; in Press

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All India Institute of Medical Sciences (AIIMS), New Delhi, India
Comprehensive Rural Health Services Program (CRHSP/AIIMS), Ballabgarh, Haryana, India
Siemens Healthineers, Erlangen, Germany
University of Michigan, Ann Arbor

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COMMENT | 14 March 2023

Five steps to make MRI scanners more affordable to the world

Fifty years since the basis of magnetic resonance imaging was published, MRI scanners remain expensive – and impractical in many countries. Here's how we are making them smaller and less costly.

By Andrew Webb ✉ & Johnes Obungoloch

(1) Improve low-field technologies

(2) Build physicians' confidence

(3) Prioritize open-source approaches

(4) Develop AI tools for LMIC contexts

(5) Boost funding for sustainable MRI

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What have we experienced

- Perseverance
- Government regulations are a major barrier
- Cultural components were critical
- On-the-ground knowledge of AIIMS team is critical
- Respectful collaboration is imperative
- Infrastructural considerations (power, space, stability)
- ~10% of patients would have foregone scans [cost 30-50% of monthly income]
- Techs can operate with minimal training due AI enabled scanner interface
- Physicians (remote) satisfied with image quality
- Providing contrast coverage complicated

Gulani et al., editorial in Radiology 2025; in Press

Recommendations for improving access to midfield and 1.5 T

- Commercial scanners compliant with local clinical regulations
- Governmental cooperation should be sought for site selection and power access
- Address cultural concerns of patient populations
- Scanners should be capable of performing the most common clinical exams
- Develop profitable business models (needs, pricing, service models, etc.) for LMICs
- Scans should be simple to perform and require minimal support
- Resilience to challenging environmental conditions (power grid, cryogens, service)
- Professional organizations needed for safety training material, webinars, knowledge
- Radiologists (or AI?) needed for protocoling and image interpretation*

Gulani et al., editorial in Radiology 2025; in Press

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1.5 T very low cost scanners?

Similar questions in NM space

Dr. Andrew Scott touched on theranostics yesterday

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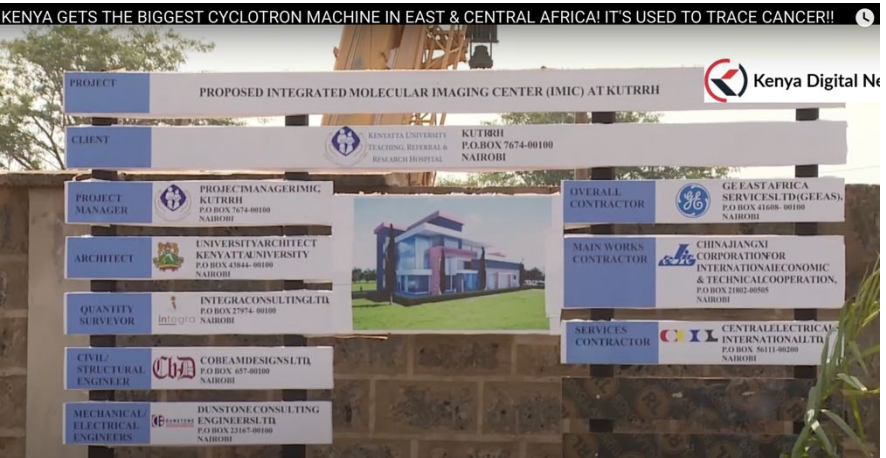
PET for LMIC – Rightsizing infrastructure

- PETtrace and Minitrace by GE HealthCare
- $2M PETtrace large cyclotron for supporting mature research programs and large-scale distribution
- $1M Minitrace more compact, simpler, and affordable system designed for in-house production and local distribution in smaller developing markets



NM Resource Constrained Settings

- Limited funding
- Variable infrastructure (e.g. power, water)
- Kenya: Kenyatta University Teaching, Referral & Research Hospital's cyclotron delivered in 2021
  - HUB AND SPOKE model
  - Part of larger Integrated Molecular Imaging Center
    - 2 PET-CTs, SPECT-CT, 256 Slice CT, 3.0 T MRI.

Peter Scott, PhD

https://www.kutrrh.go.ke/cyclotron-machine-at-kutrrh/

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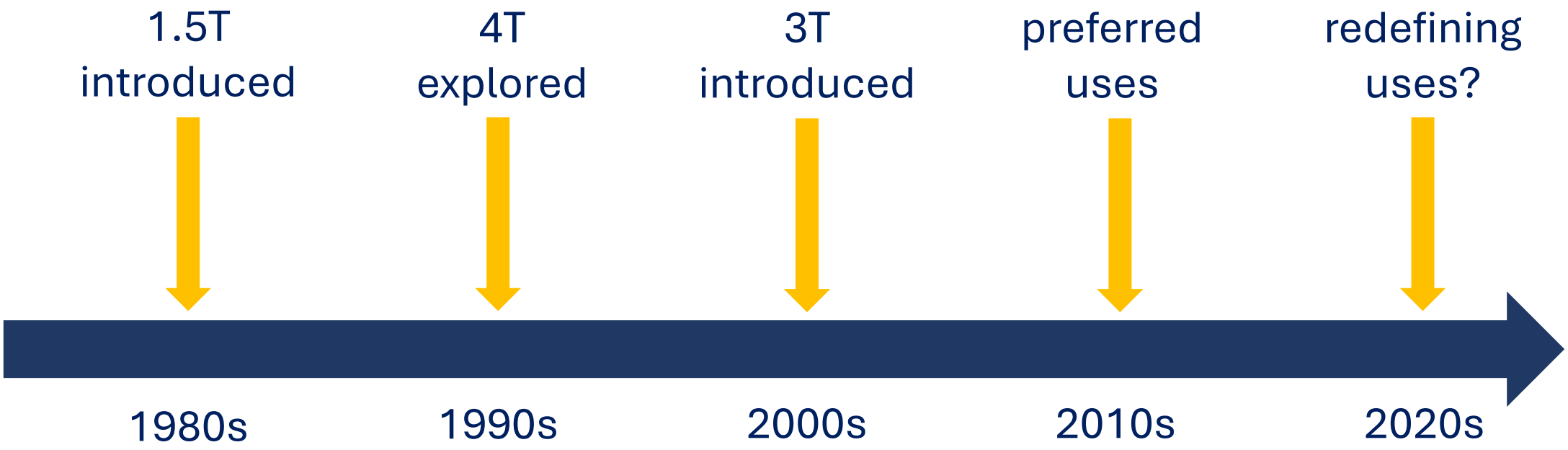
SNMMI: Future Directions

- Some similarities to high resource countries
  - Securing a reliable isotope supply chain
  - Manufacturing capabilities
  - Need scanner infrastructure, trained workforce
- Affordable equipment and accessible in underserved areas
  - Needs and volumes are smaller today
- Knowledge transfer essential
  - This includes scientific education
  - practical knowhow (e.g. GMP, QA)
  - regulatory infrastructure
  - scan interpretation
  - reimbursement mechanisms etc.

New use cases?

When did we sort out 1.5T vs 3T best uses?



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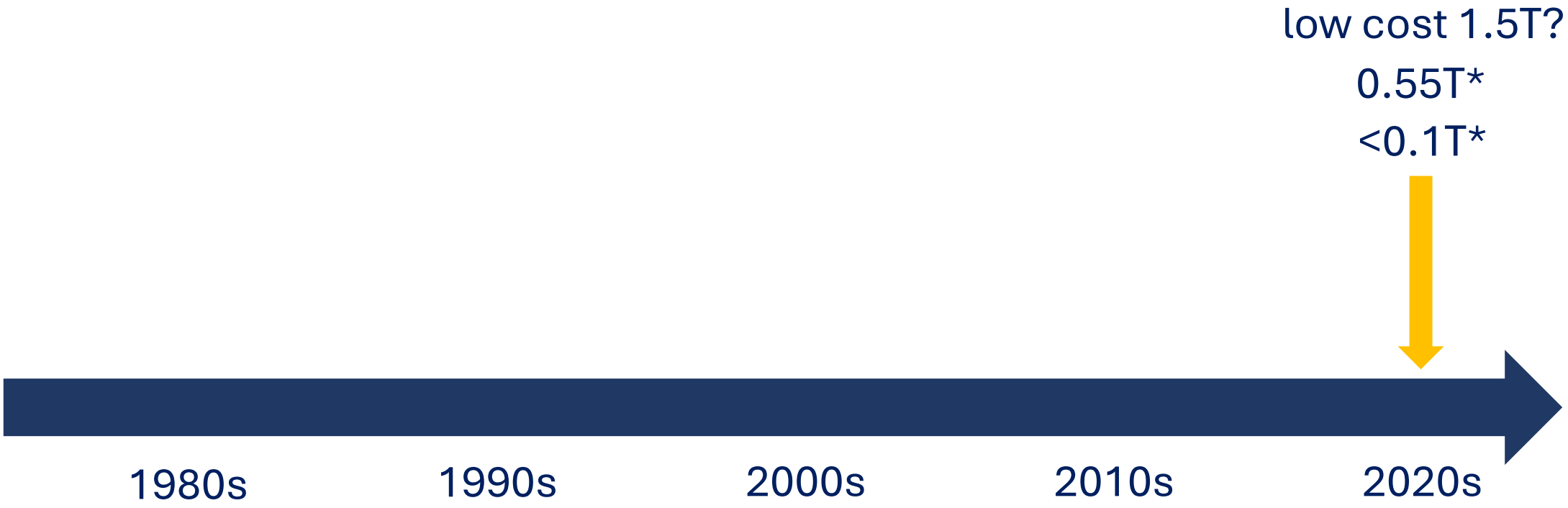

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The ultrasound experience

- Handheld, portable devices
- Solar powered
- User-friendly interface compatible with smartphones or tablets
- Online software upgrades
- AI equipped for initial diagnosis, physician interpretation can follow
- Have improved outcomes when deployed
- Locally produced food thickening agents used as USN gel to ↓cost

Frija G, et al. EClinicalMedicine. 2023;62:102114. Epub 20230726. doi: 10.1016/j.eclinm.2023.102114.

"Which is more important," asked Big Panda, "the journey or the destination?"

"The company." said Tiny Dragon.

jamesnorbury.com

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