AI in Healthcare. Will it Affect Life Insurance?

Dr. Tim Meagher

MUD, New York, January 28th 2025

Munich RE

AI in Medicine – Current Uses

Public Health

Identification of outbreaks by monitoring internet traffic

Contact tracing within an outbreak

Tracking of cases, outcomes and relationships to local factors

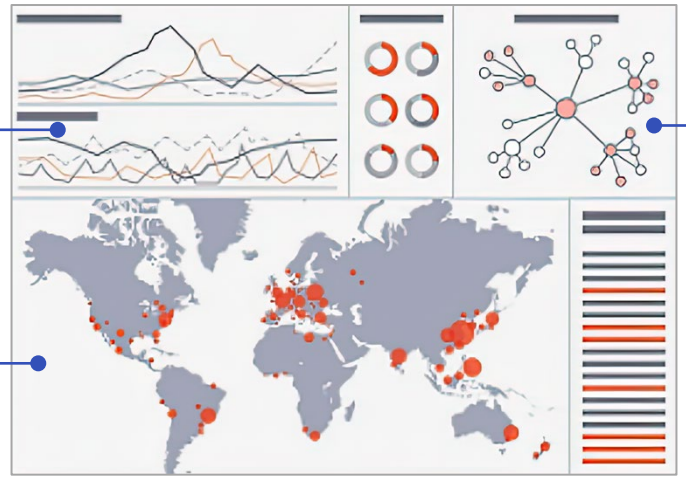
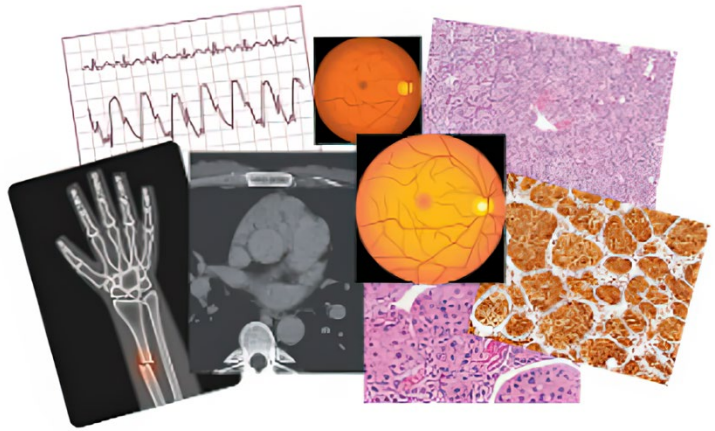


Image Analysis



Clinical Trial Performance

- ✓ Decision support in trial design
- ✓ Patient identification, recruitment, and retainment
- ✓ Outcome and side-effect monitoring

Retrieval of Medical Information

- ✓ Use of multiple information sources about a patient to make a diagnosis
- ✓ Internet search engines
- ✓ EMR decision support

Operational Organization

- ✓ Operation room scheduling
- ✓ Billing and collections
- ✓ Patient follow-up

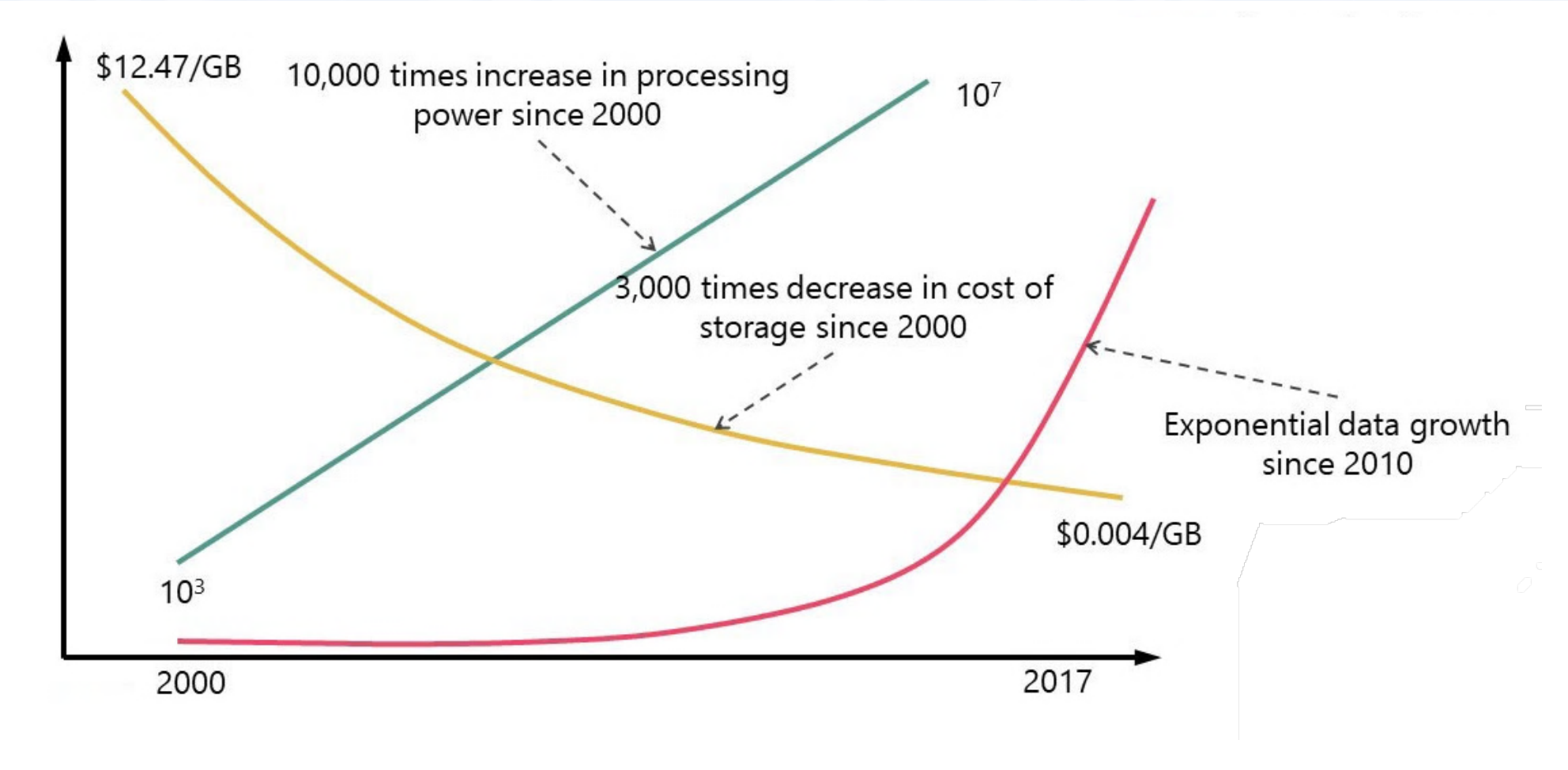
March 30, 2023 N Engl J Med 2023; 388:1201-1208. DOI: 10.1056/NEJMra2302038

The 3 Ingredients for AI progress

Data

Cheap Storage

Computing power



https://rpradeepmenon.medium.com/an-executive-primer-to-deep-learning-80c1ece69b34

AI Will Make Its Mark If...

More Accurate and Earlier Diagnoses

Better Therapies

Better Prevention

More Efficient Healthcare

More Accurate and Earlier Diagnoses

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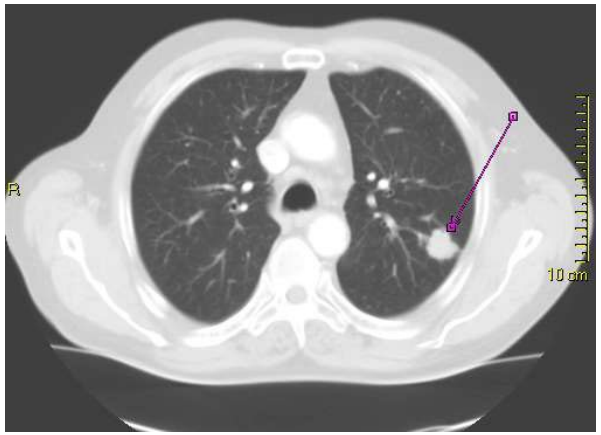
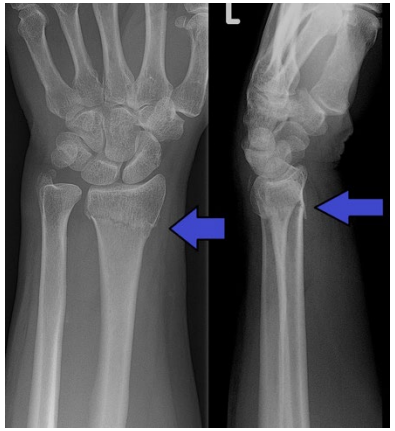
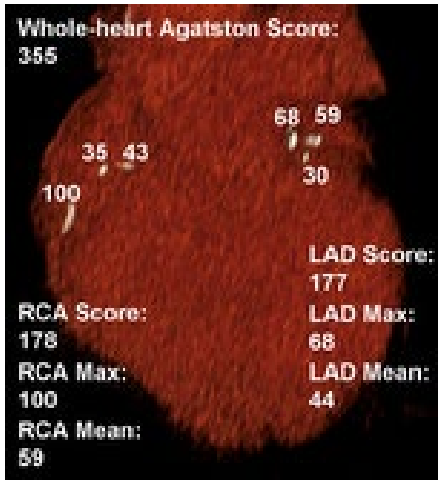
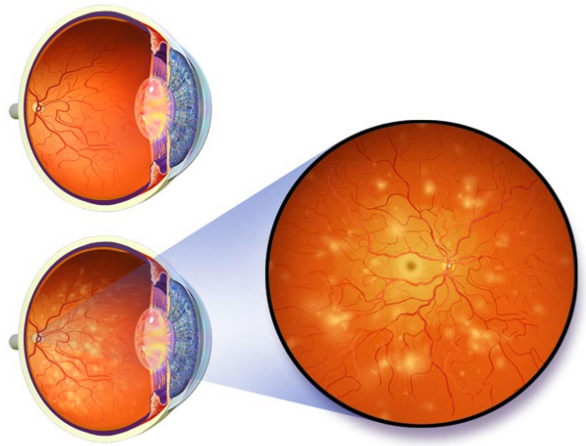
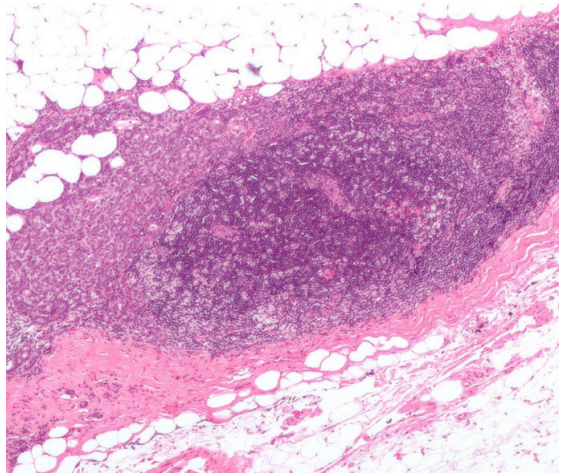
AI-assisted Imaging in 2025

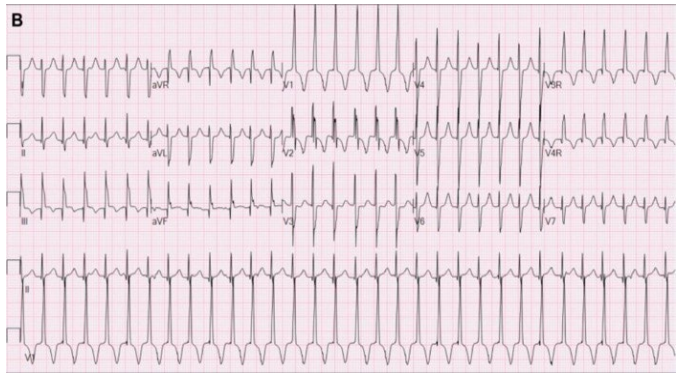












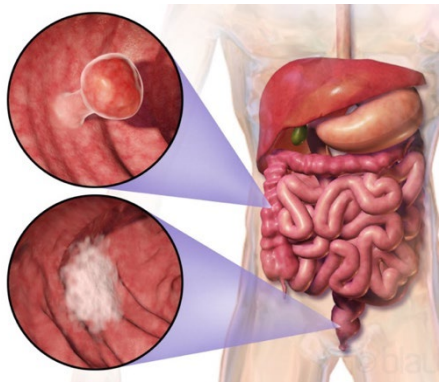


Image: Wikimedia Commons

CXR of the Future?

nature › nature communications › articles › article

Article | Open access | Published: 07 July 2023

Opportunistic detection of type 2 diabetes using deep learning from frontal chest radiographs

Original Research | 26 March 2024

Deep Learning to Estimate Cardiovascular Risk From Chest Radiographs: A Risk Prediction Study

Authors: Jakob Weiss, MD, Vineet K. Raghu, PhD, Kaavya Paruchuri, MD, Aniket Zinzuwadia, AB, Pradeep Natarajan, MD, MMSc, Hugo J.W.L. Aerts, PhD, and Michael T. Lu, MD, MPH | AUTHOR, ARTICLE, & DISCLOSURE INFORMATION

Publication: Annals of Internal Medicine • Volume 177, Number 4 • https://doi.org/10.7326/M23-1898

nature › nature communications › articles › article

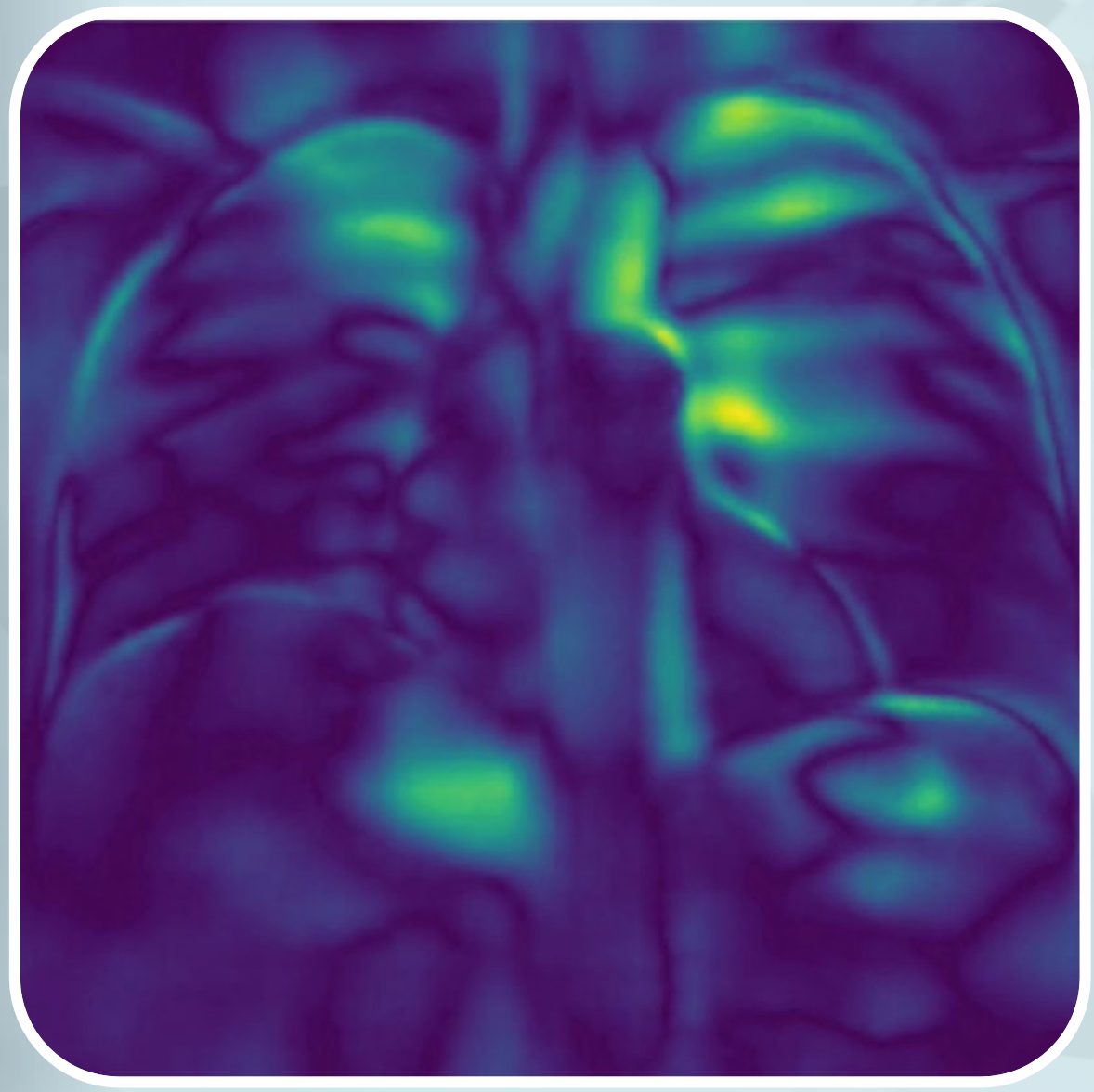
Article | Open access | Published: 16 May 2023

Deep learning to estimate lung disease mortality from chest radiographs

Is the Chest X-ray the New Sleuth?

CXR to Diagnose Diabetes

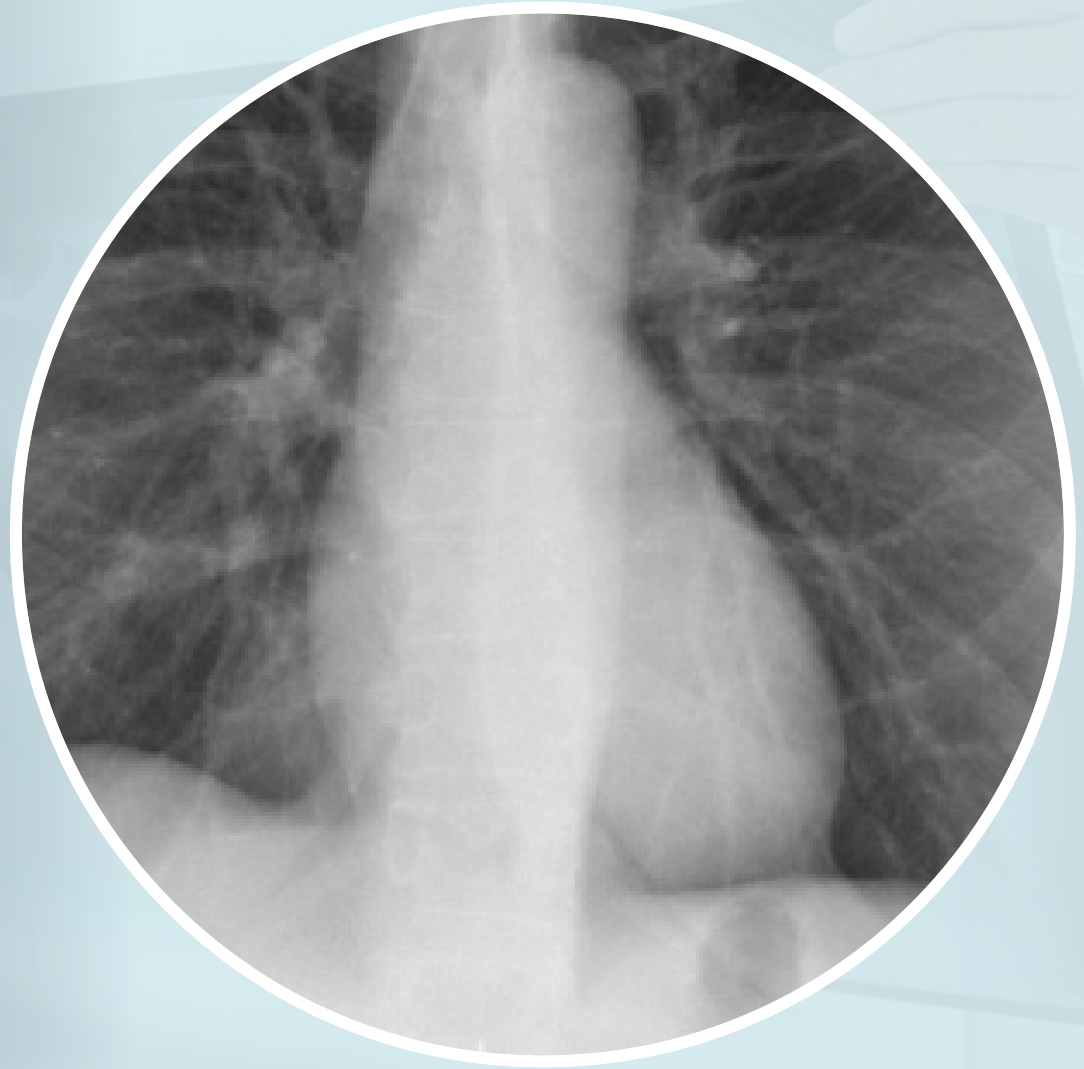
- 271,000 CXRs; 160,00 subjects
- 16% prevalence and 14% ‘suspicious’- AUC 0.84
- AUC 0.89 in subjects with BMI <25, who would not be candidates for screening
- Better performance than A1c



Nat Commun 14, 4039 (2023). https://doi.org/10.1038/s41467-023-39631-x

CXR to Estimate EF, and Detect Valvular Heart Disease

- 22,000 CXRs and 22,000 echos, from 17,000 subjects
- AUC 0.92 for EF <40%
- AUC 0.87 for valvular heart disease
- Used ‘saliency maps’ of the cardiac silhouette to impute echo results

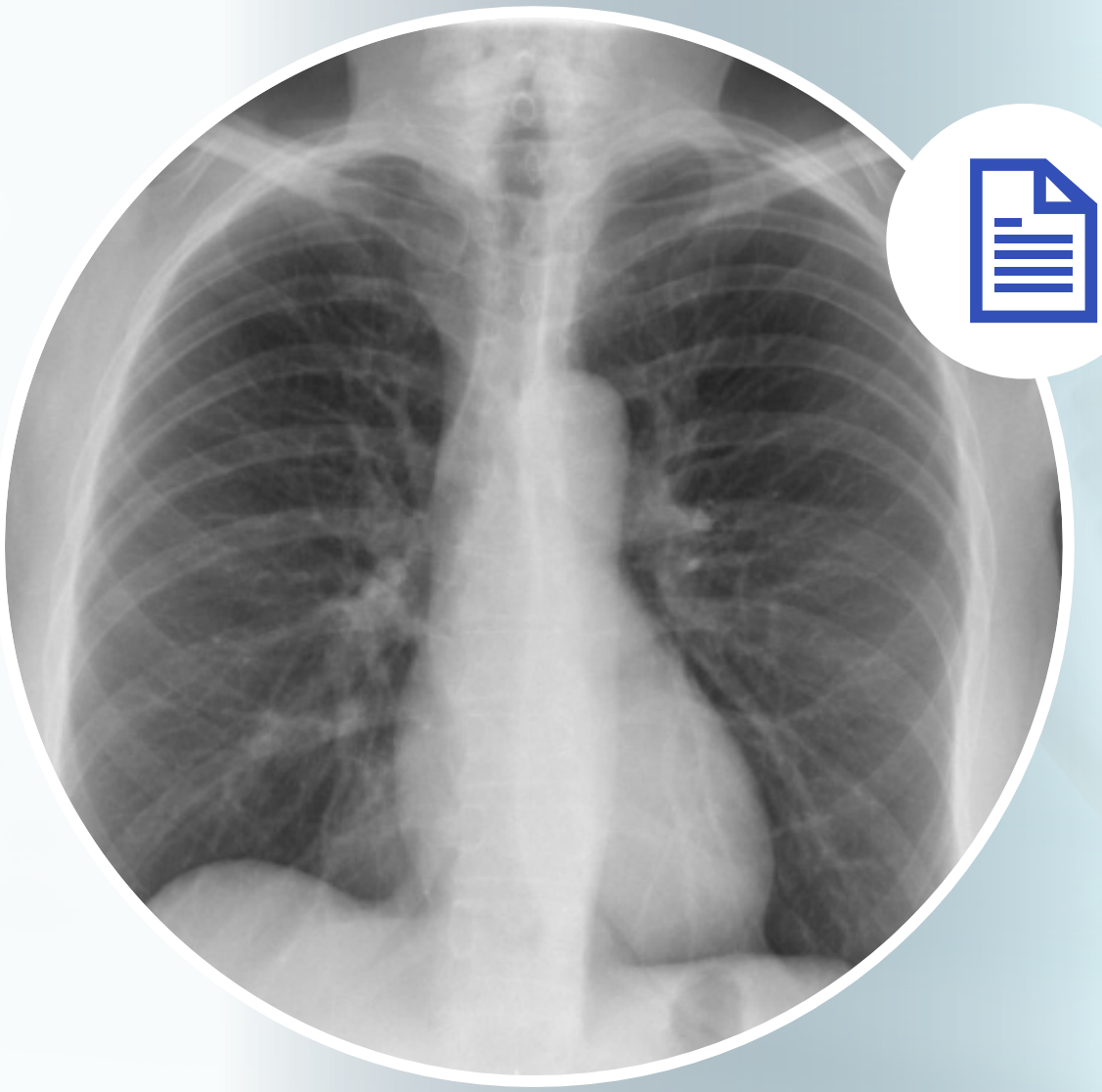


Lancet Digital Health, July 6 2023 DOI: 10.1016/S2589-7500(23)00107-3

CXR to Predict Lung-related Mortality

- 147,000 CXRs in 40,000 asymptomatic subjects
- “CXR- Lung-Risk”
- Validated in 3 different datasets
- Adjusted HR 12.15 for highest risk group

Nat Commun 14, 2797 (2023). https://doi.org/10.1038/s41467-023-37758-5



CXR Report of the Future

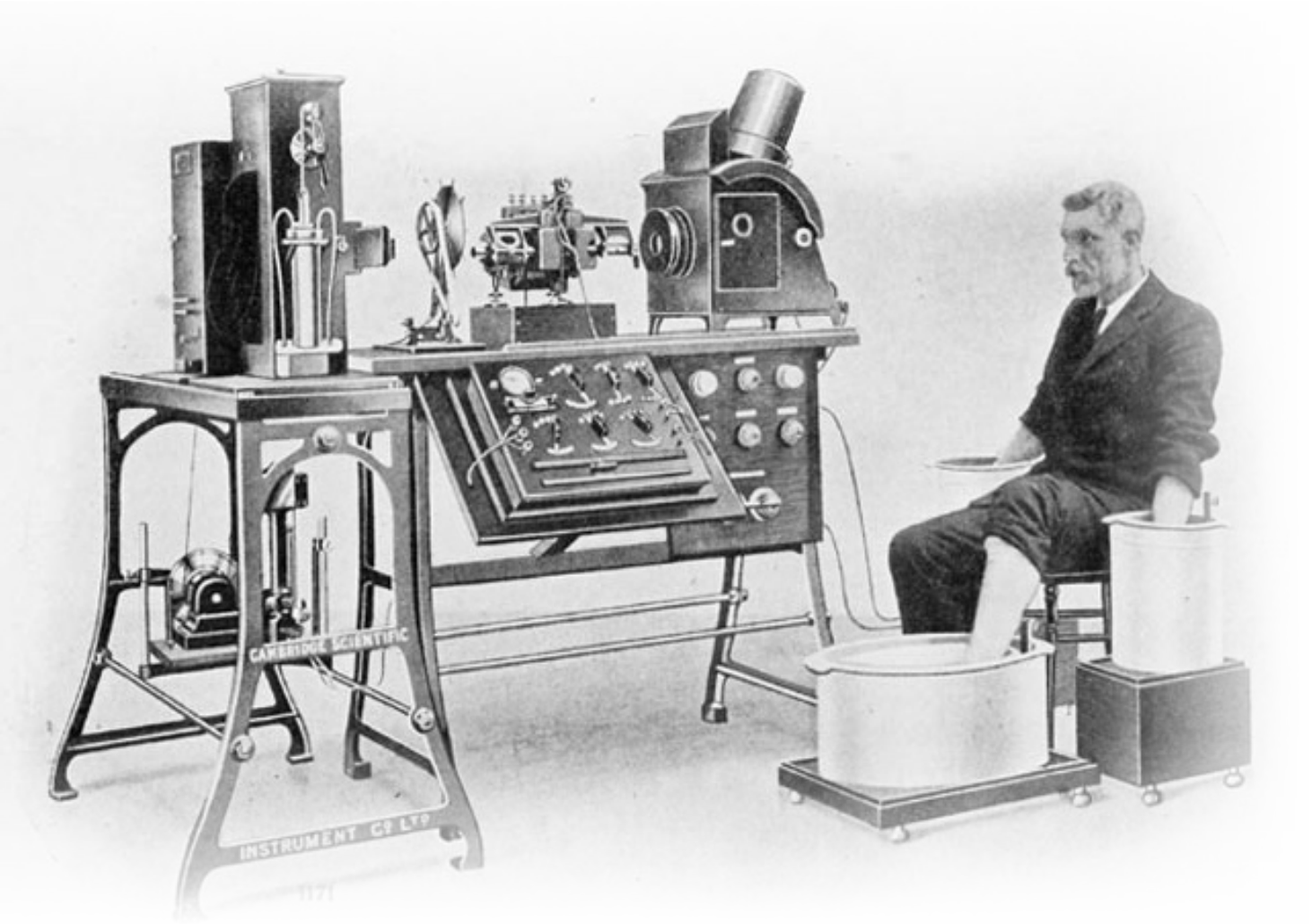
Your chest x-ray indicates that...

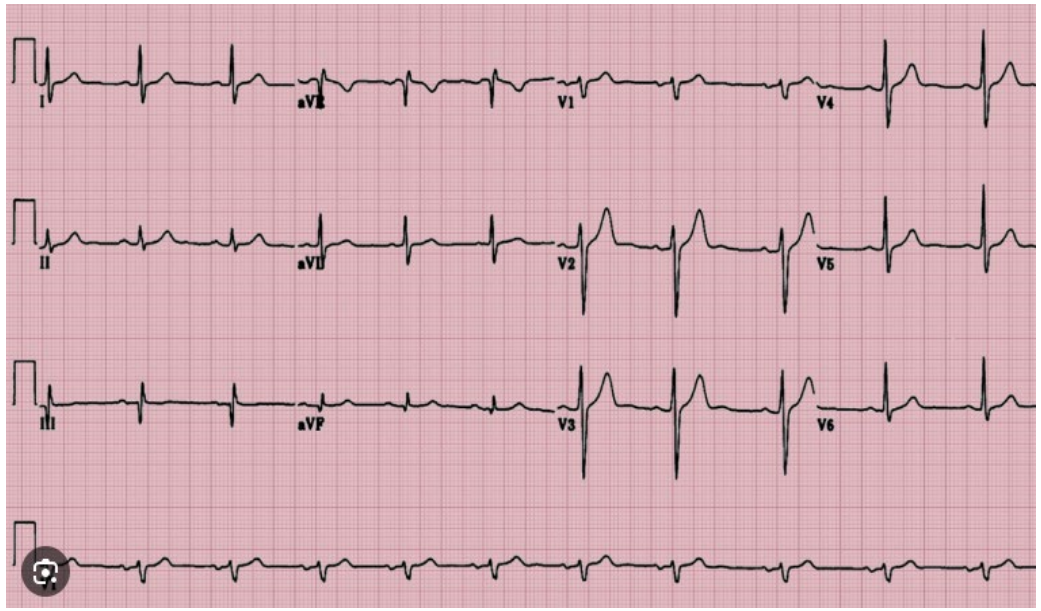
- You may have type 2 diabetes
- Your coronary calcium score is 976
- Your ejection fraction is normal
- Your 10-year cardiovascular risk of a heart attack, stroke, or death from cardiovascular disease is 14.1%

Please review with your physician regarding potential addition or intensification of a statin to your medications.

www.thelancet.com Vol 403 May 11, 2024

The EKG – Another Sleuth?





ECG of the Future

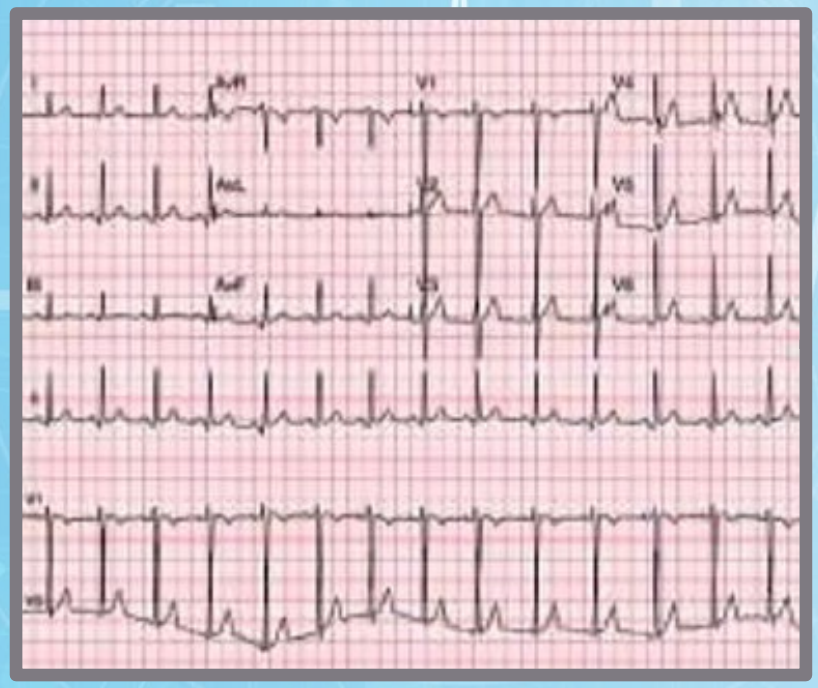
Clinical Trial > Lancet. 2022 Oct 8;400(10359):1206-1212. doi: 10.1016/S0140-6736(22)01637-3. Epub 2022 Sep 27.

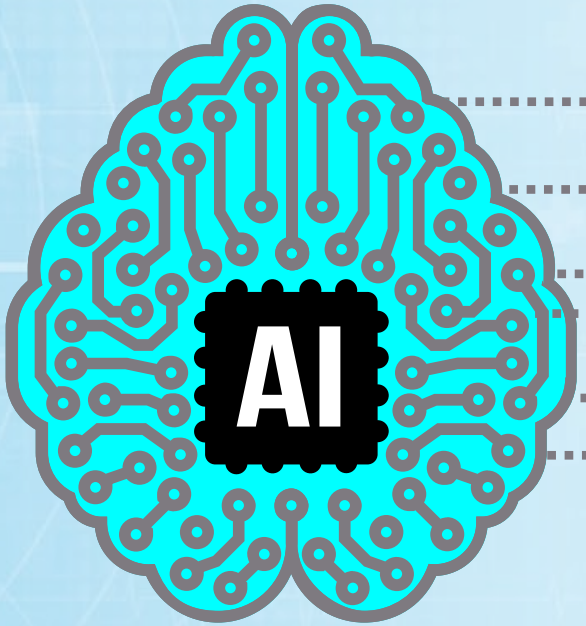
Artificial intelligence-guided screening for atrial fibrillation using electrocardiogram during sinus rhythm: a prospective non-randomised interventional trial

Digital health
Original research

Machine-learning algorithm to non-invasively detect diabetes and pre-diabetes from electrocardiogram

AI-ECG





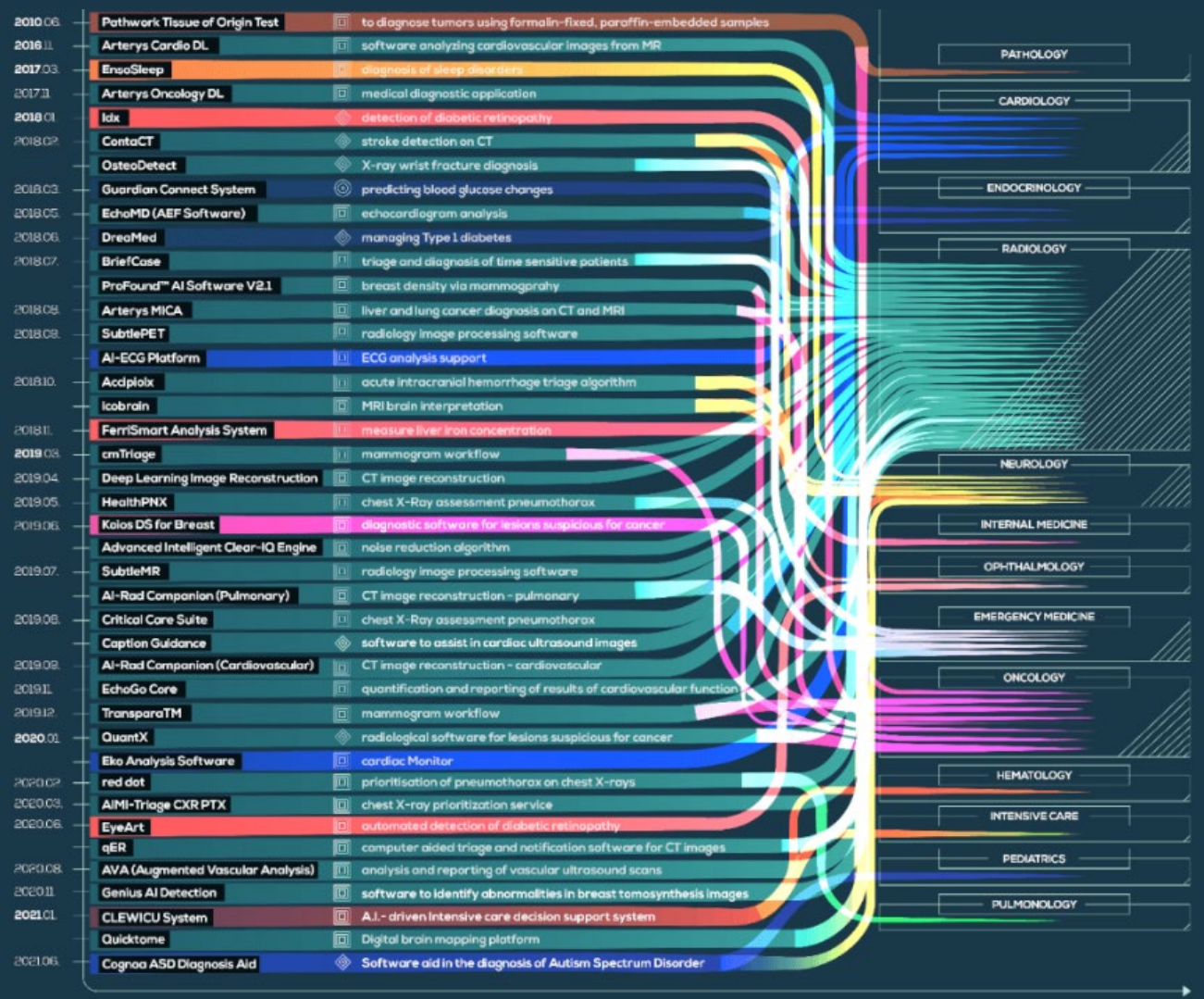
- Current Rhythm
- AF in NSR
- Low Ejection Fraction
- Valvular Diseases
- Channelopathies
- Hypertrophic Cardiomyopathy

J Insur Med (2024) 51 (2): 64–76. https://doi.org/10.17849/insm-51-2-64-76.1

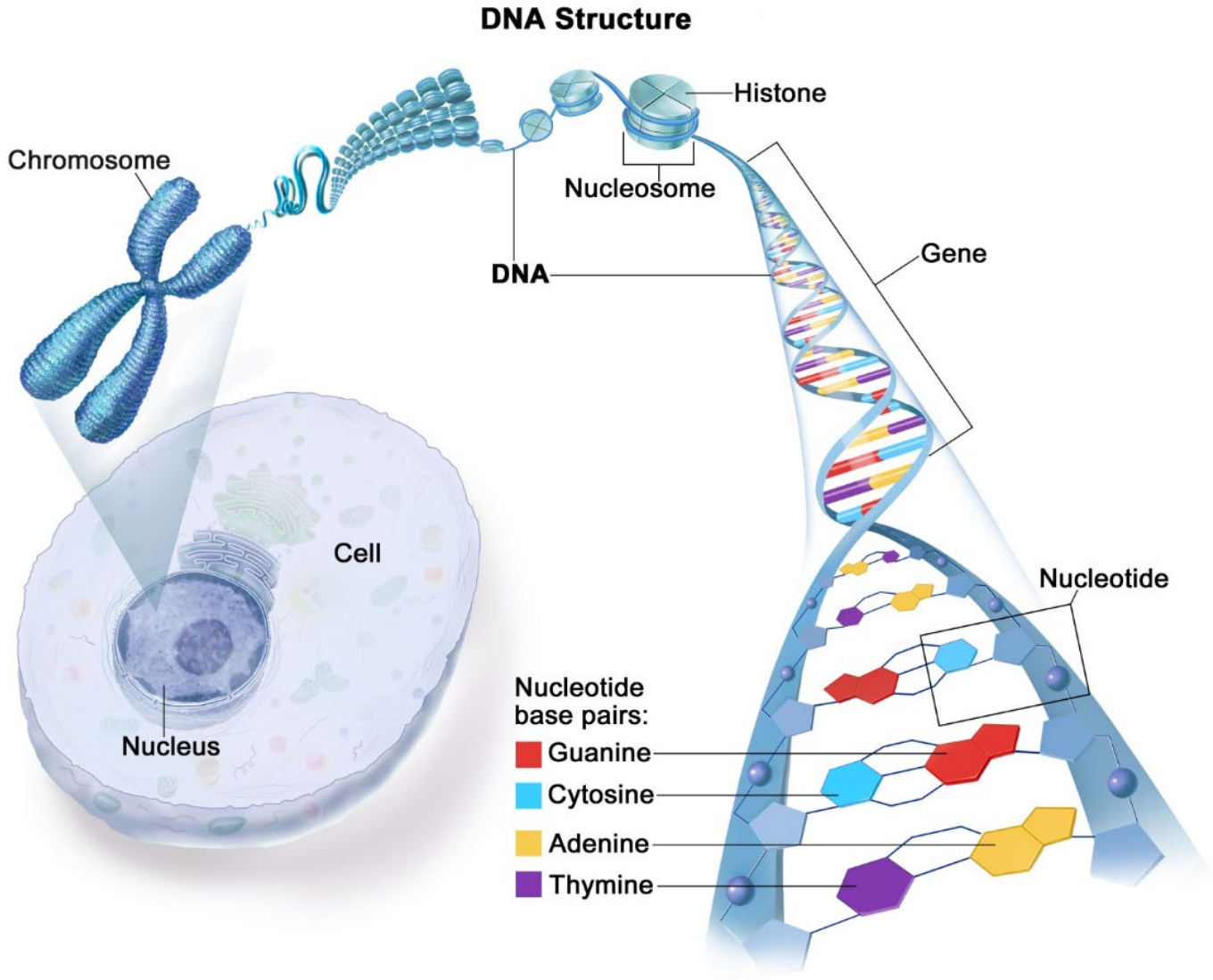
FDA Approvals for AI-based Devices in Medicine

TMF
THE MEDICAL FUTURIST

TYPE OF FDA APPROVAL
- 510(K) PREMARKET NOTIFICATION
- DE NOVO PATHWAY
- PMA

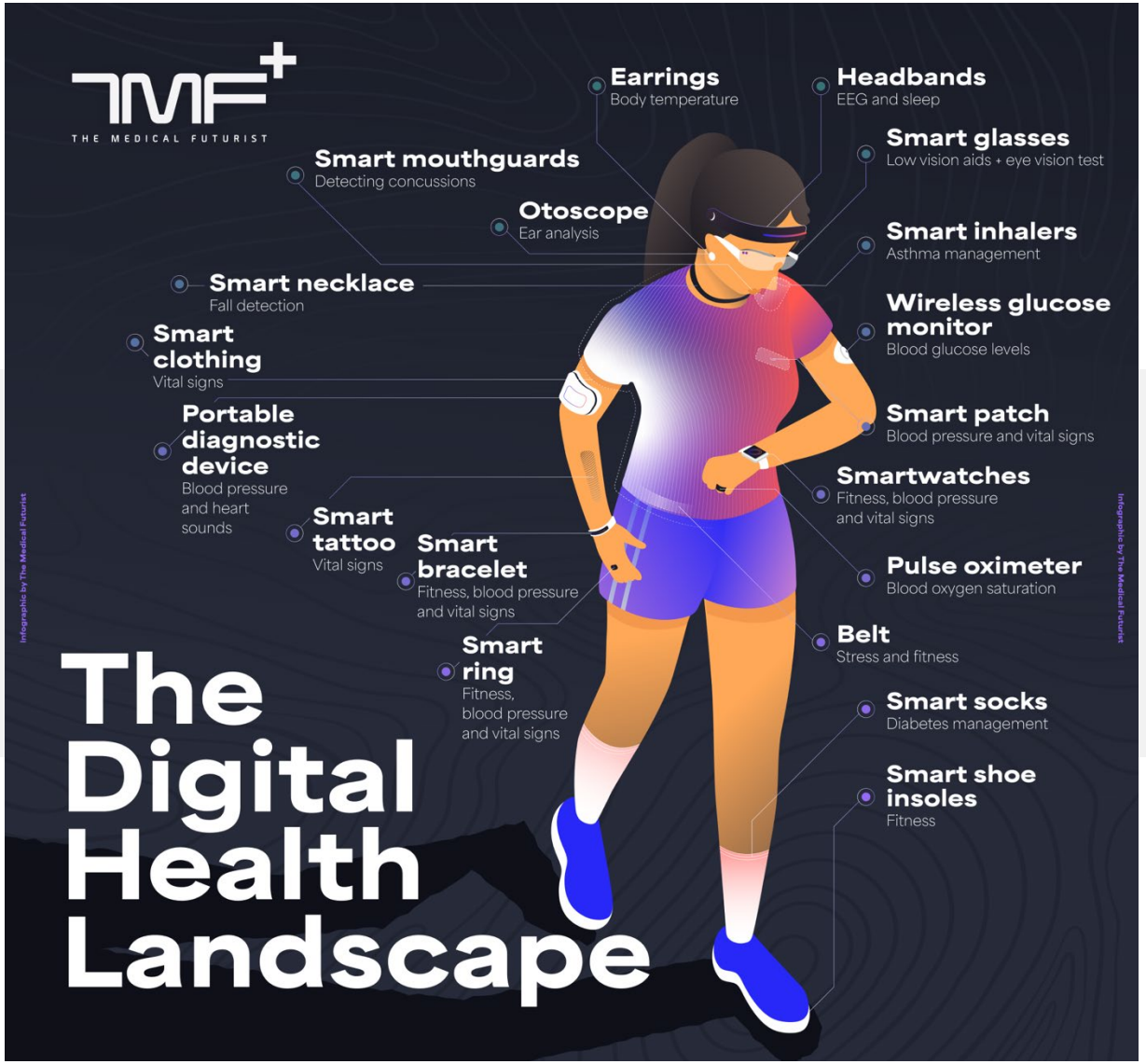


AI-assisted Genomics



Digital Biomarkers

"Just measure it!"



Is AI as Good as Doctors?

Research Letter

April 1, 2024

Clinical Reasoning of a Generative Artificial Intelligence Model Compared With Physicians

Stephanie Cabral, MD[1]; Daniel Restrepo, MD[2]; Zahir Kanjee, MD, MPH[1]; et al

» Author Affiliations | Article Information

JAMA Intern Med. 2024;184(5):581-583. doi:10.1001/jamainternmed.2024.0295

Better Therapies

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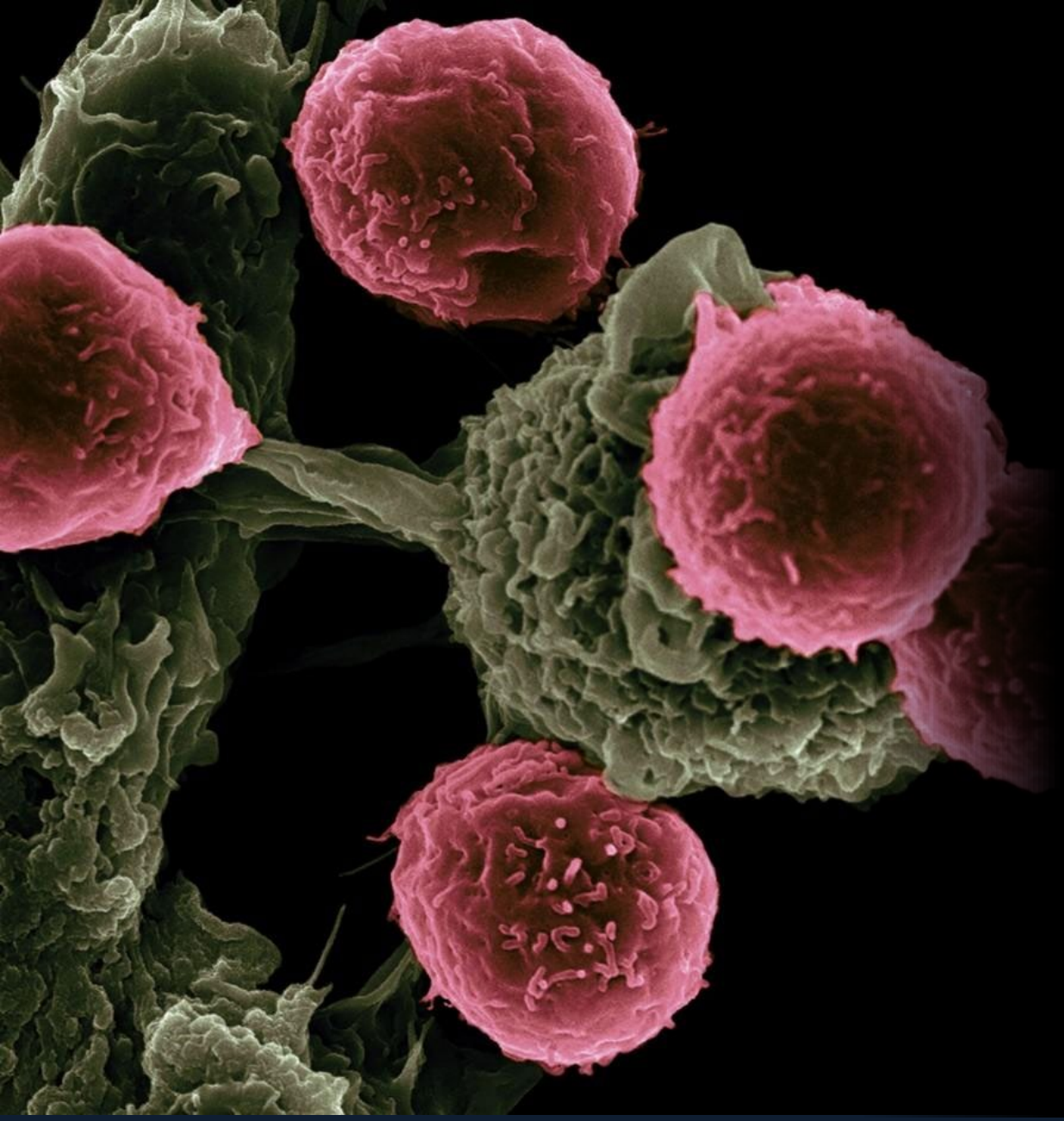
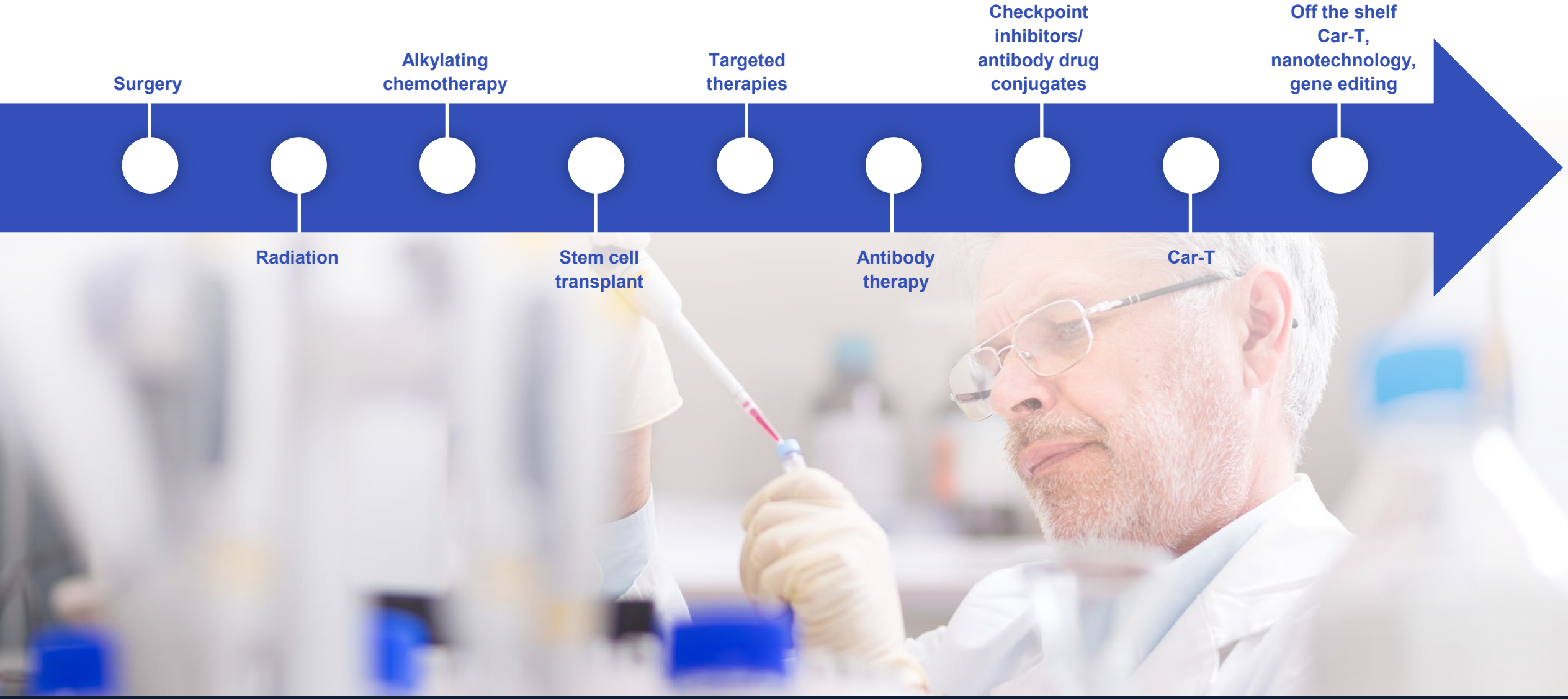


Cancer Treatment

Put away the shotgun approach!

NCI: Victor Segura Ibarra and Rita Serda, Ph.D.

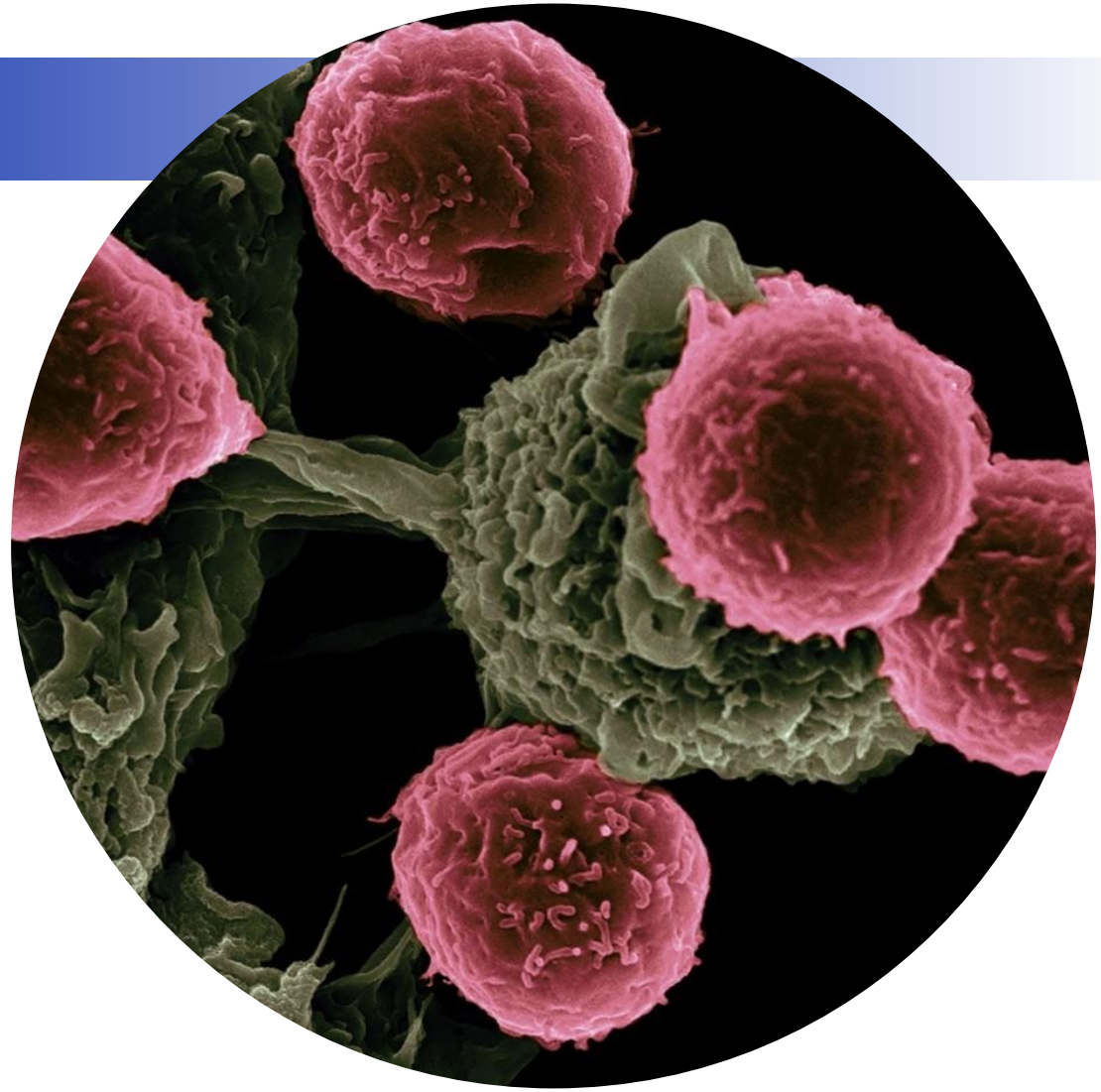
Evolution of Cancer Therapy



Cancer Treatment

More effective and/or safer “targeted” treatment

- Genotyping of tumor to guide treatment –
- Each tumor is molecularly unique – however, certain pathways are repeatedly affected
- New tumor-specific treatment based on those pathways



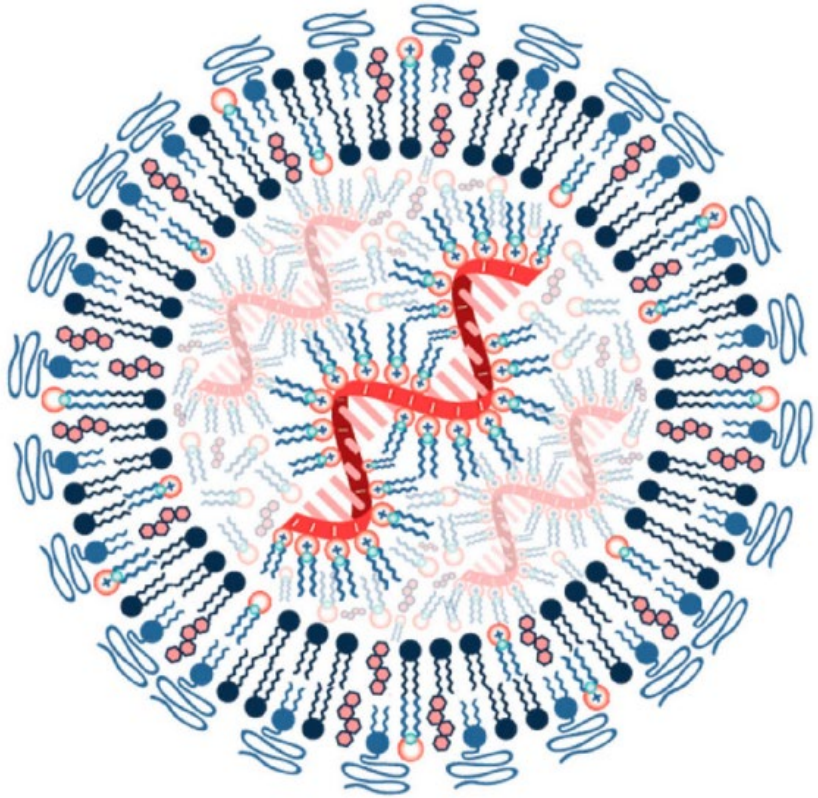
Cancer Vaccines

Create markers on tumor cells that immune cells can target

- **mRNA vaccines**
  - Uses DNA from the tumor to identify antigens unique to a patient's cancer → **Neoantigens produced**
  - Triggers a tumor cell specific immune response
  - Early successes for a number of solid tumors

5-year survival with advanced melanoma:

15% in 2004 → 52% in 2022



Credit: NCI doi.org/10.3390/vaccines90

Epistemic Progress

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AI-mammography Identifies New High-risk Features!

Science that inspires

Trends in Cancer Supports open access

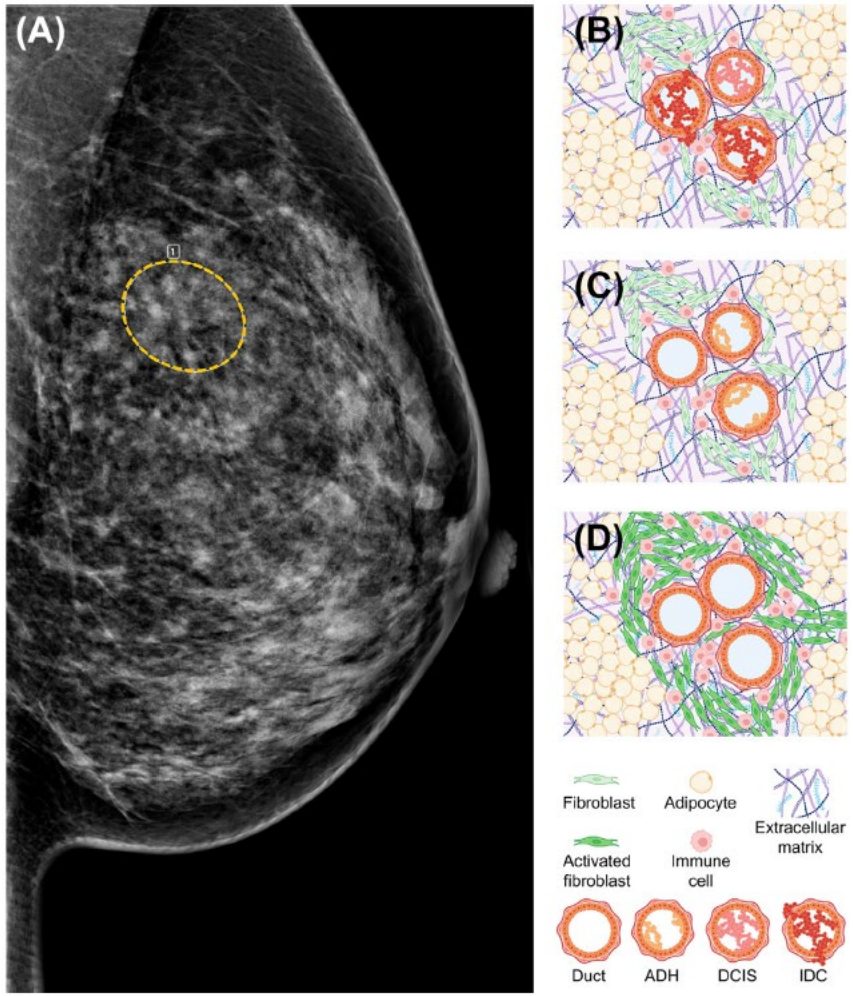
This journal Journals Publish News & events About Cell Press

SCIENCE & SOCIETY · Online now, December 12, 2024

Artificial intelligence improves mammography-based breast cancer risk prediction

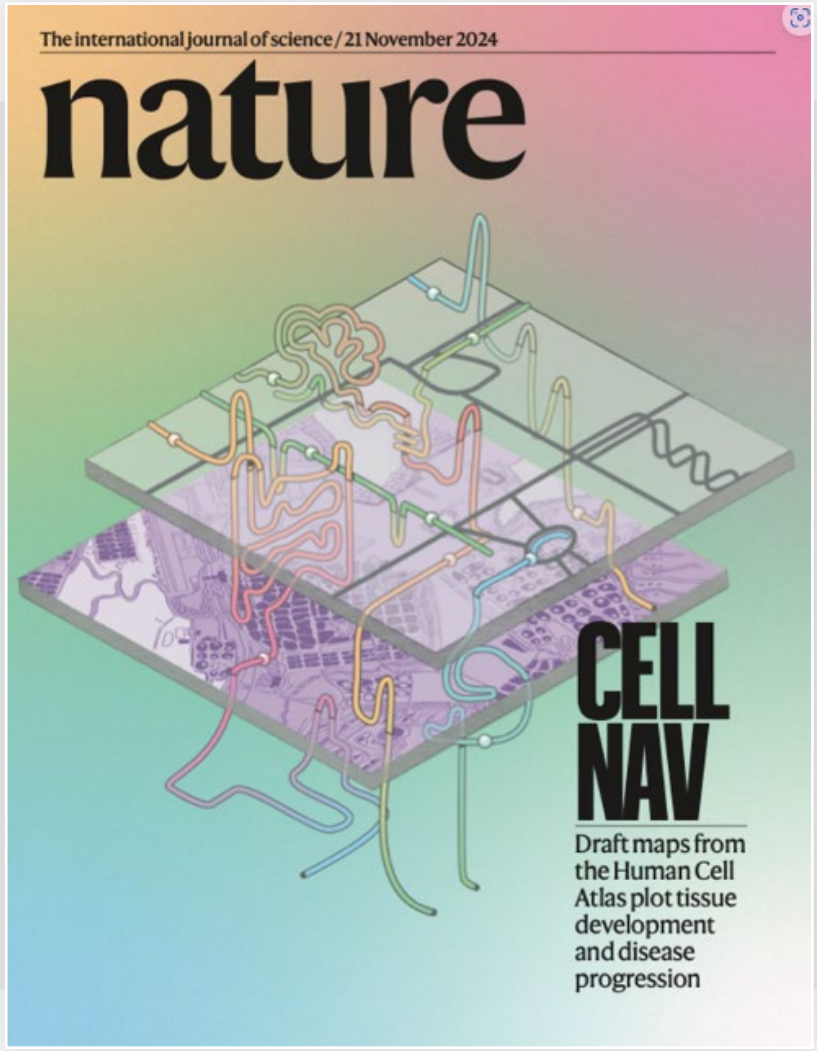
Wendy V. Ingman [1,2] · Kara L. Britt [3,4,5] · Jennifer Stone [6] · Tuong L. Nguyen [7] · John L. Hopper [7,10] · Erik W. Thompson [8,9,10]

Affiliations & Notes Article Info



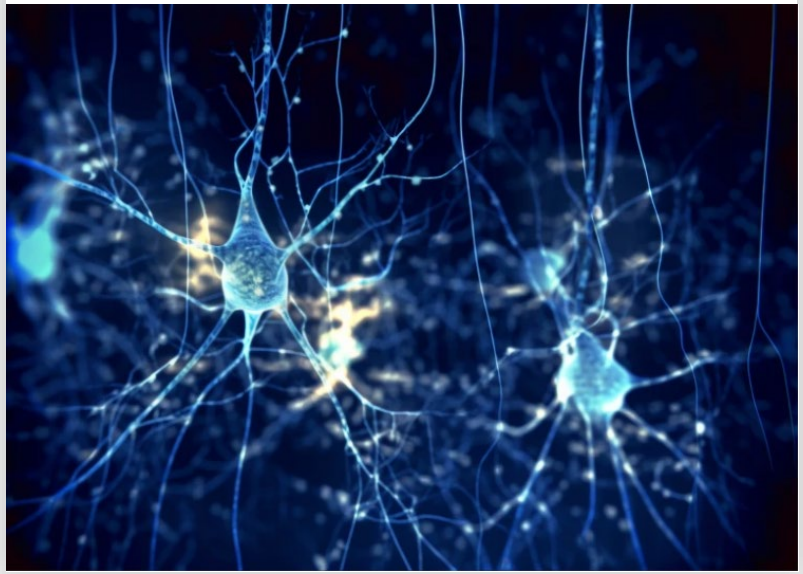
AI Prediction of Protein Structure

The Human Cell Atlas

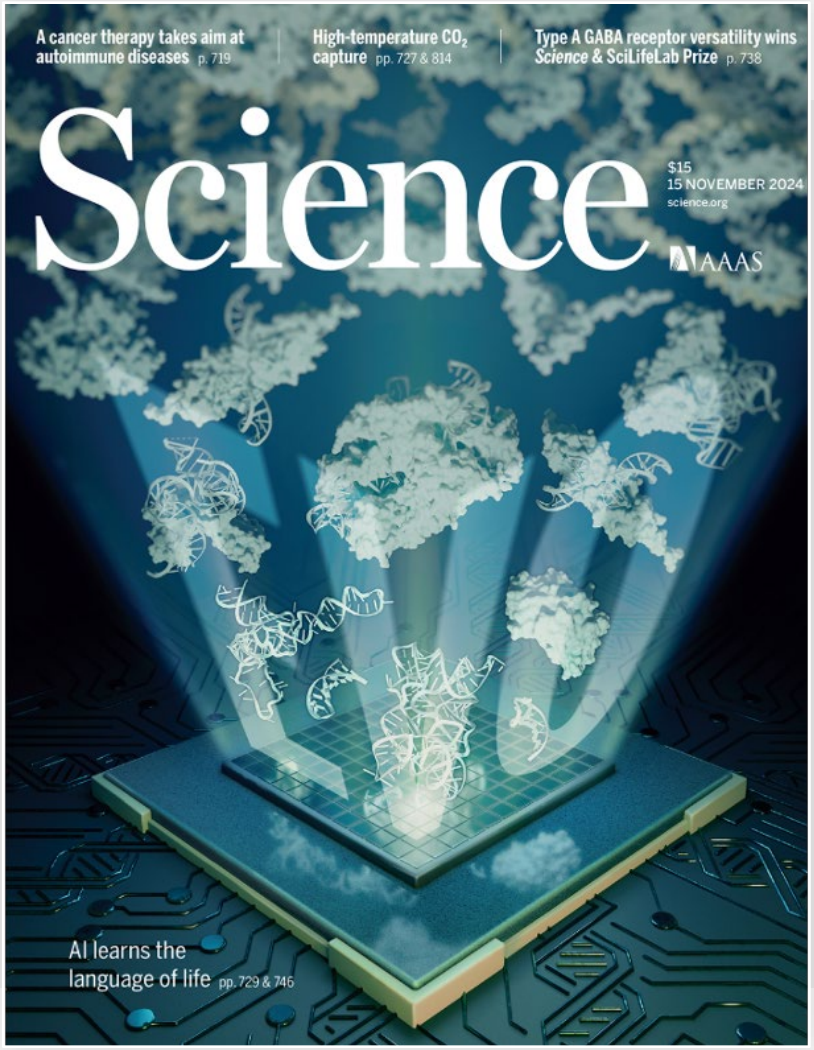


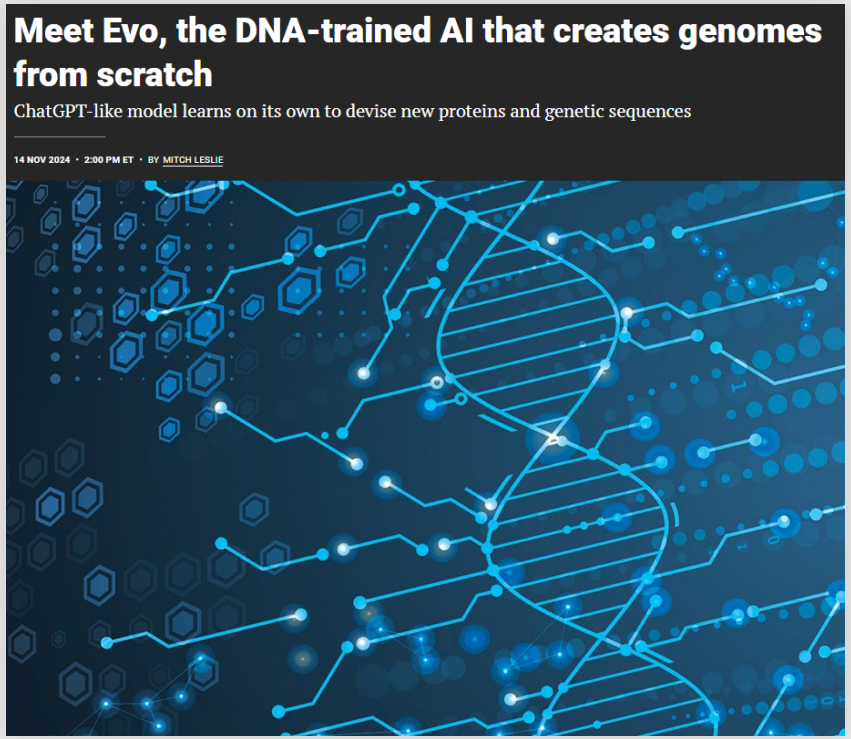
EDITORIAL | 20 November 2024

A 'Wikipedia for cells': researchers get an updated look at the Human Cell Atlas, and it's remarkable



AI-generated Gene Sequence Analysis





And, Then There's Quantum Computing...

Computing

Google unveils 'mindboggling' quantum computing chip

Chip takes minutes to complete tasks that would otherwise take 10,000,000,000,000,000,000,000,000 years

Robert Booth *UK technology editor*

Mon 9 Dec 2024 16.00 GMT

Share

Dr Erik Lucero, lead engineer of Google Quantum AI, points to motherboards while leading media on a tour of the Quantum Computing Lab in September 2022. Photograph: Frederic J Brown/AFP/Getty Images

Better Prevention

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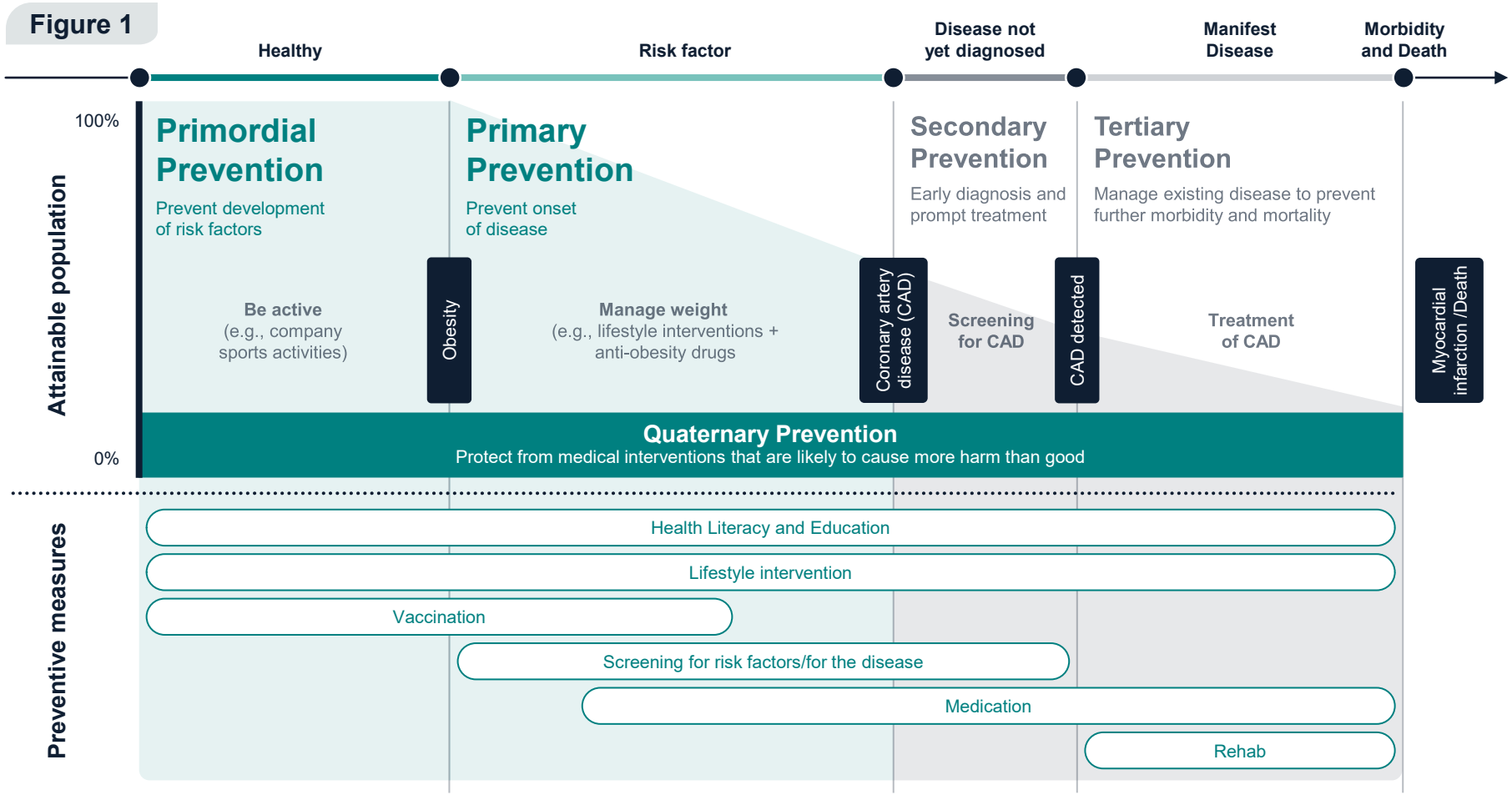
The New World of Prevention

Time course of disease development and stages and methods of prevention



There are many hurdles…

This Issue | Views 47,302 | Citations 8 | Altmetric 62 | Comments 12

Viewpoint | AI in Medicine

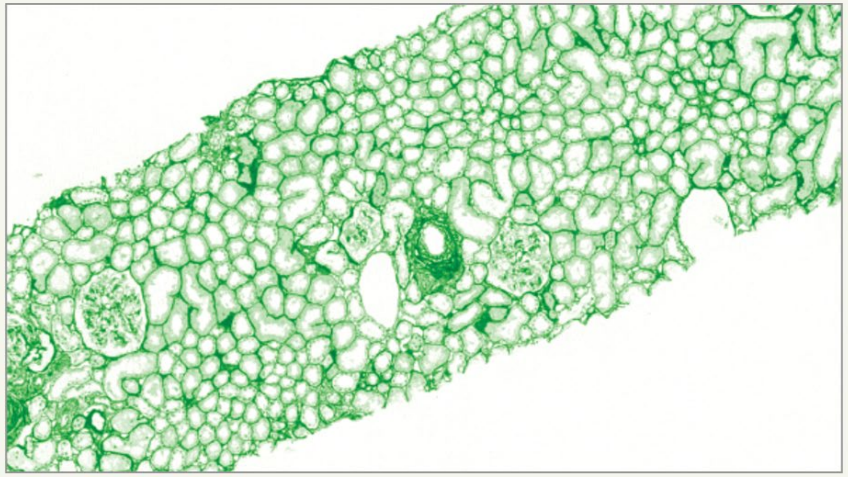
January 19, 2024

AI's Threat to the Medical Profession

Agnes B. Fogo, MD[1]; Andreas Kronbichler, MD, PhD[2]; Ingeborg M. Bajema, MD, PhD[3]

» Author Affiliations | Article Information

JAMA. 2024;331(6):471-472. doi:10.1001/jama.2024.0018



No. of glomeruli:	23
Global sclerosis:	4
Segmental sclerosis detected:	No
GBM changes detected:	No
Crescents detected:	No
Endocapillary hypercellularity:	2%
Podocyte density:	86.8 (below normal value)
Mesangial hypercellularity (maximum):	5
Adhesions:	No
Interstitial fibrosis:	17.4%
Tubular atrophy:	13.9%
Inflammation, area:	12.1%
Inflammatory cells detected:	Lymphocytes (82%) Granulocytes (1.2%) Plasma cells (3.5%) Undetermined (13.3%)
IF/IH:	Still in process
EM:	Still in process

More Efficient Healthcare

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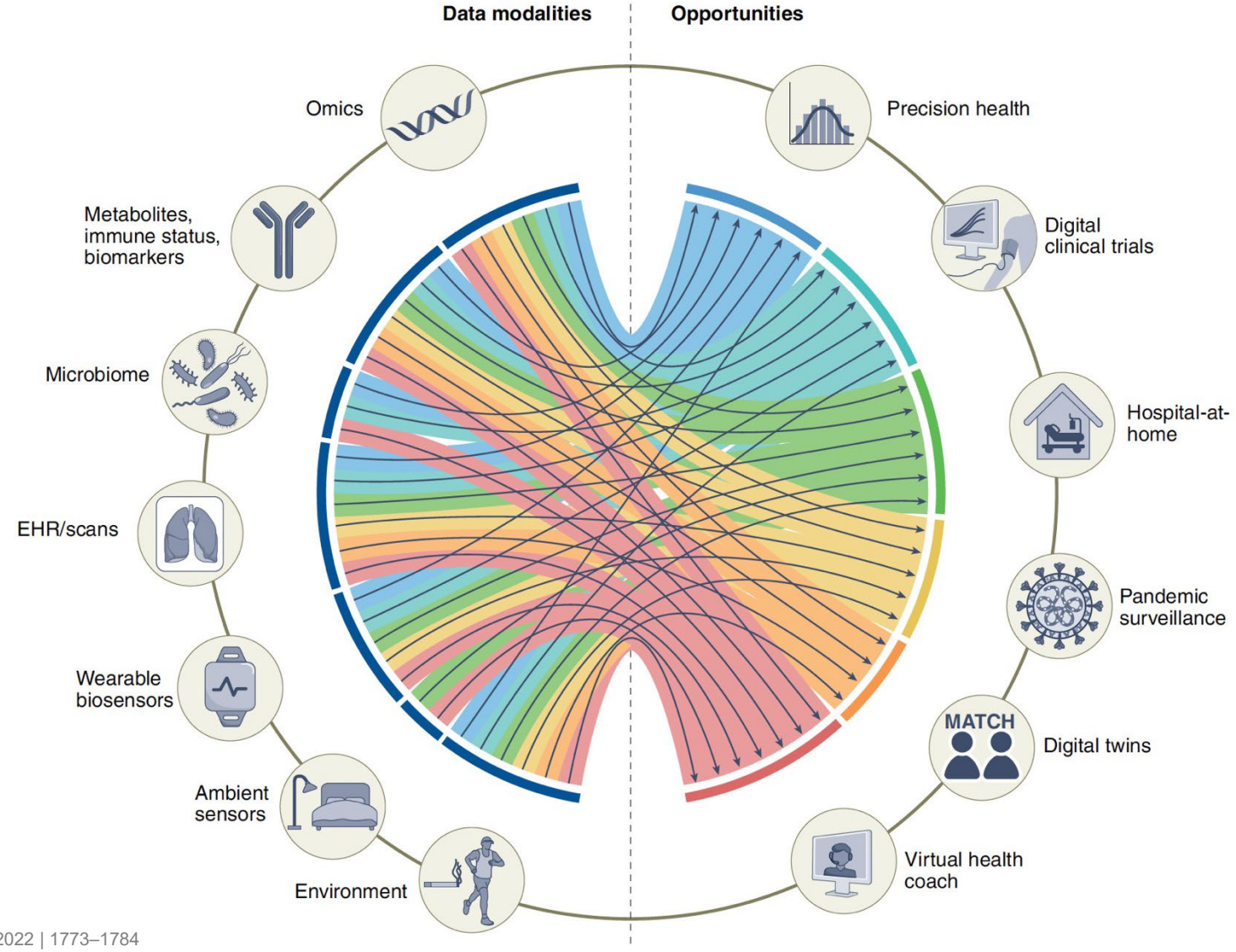
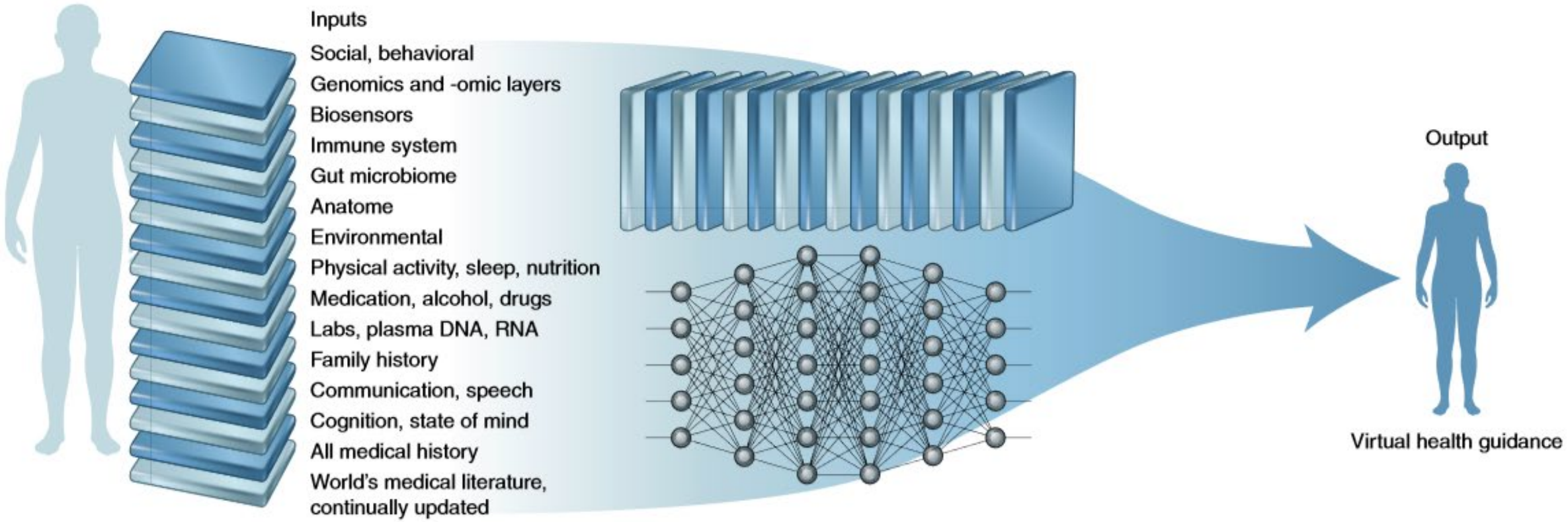
Putting AI to Work...



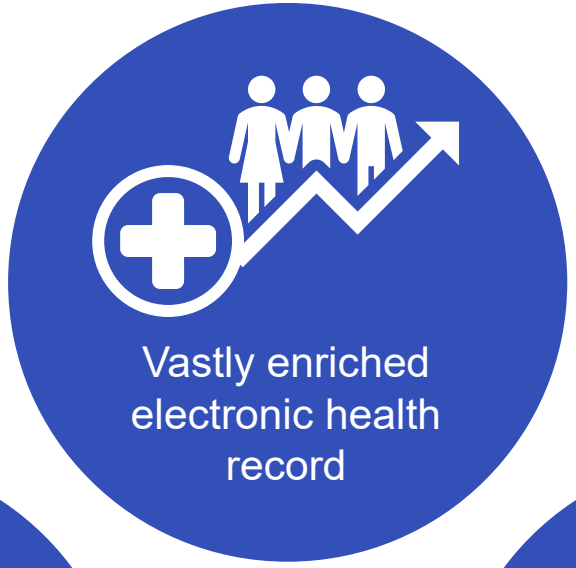
Topol.E Nature Medicine | VOL 28 | September 2022 | 1773–1784

...Towards a Redefinition of Health



Source: Topol, Nature Medicine Vol 25 | January 2019 44–56

Impact on Life Insurance




Thank you!
Munich RE

Life Sciences Report- 2025