Precision Medicine Centre Karolinska

Digital Futures Hub, KTH

2022-03-25

Karolinska Institutet | Karolinska University Hospital

Precision medicine originates from the development of genomics over the last two decades

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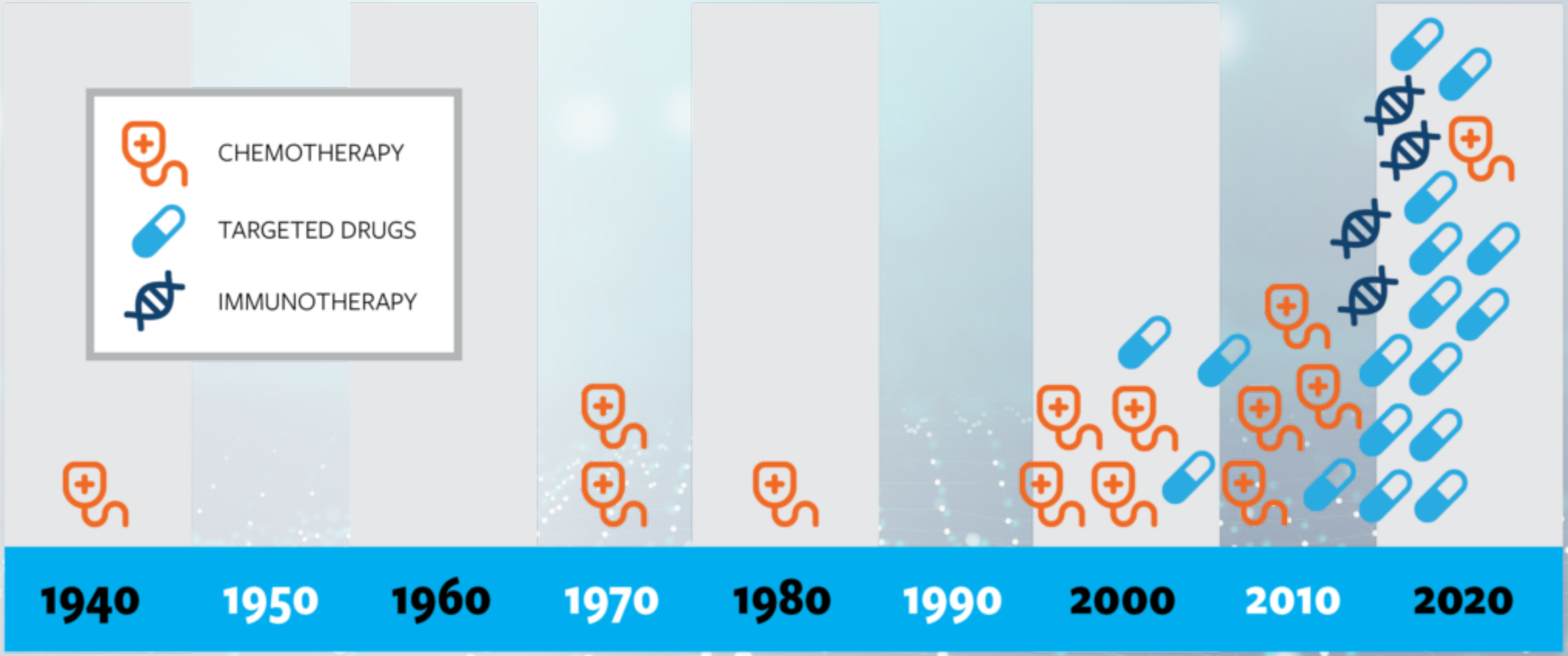
>100,000 fold reduction in sequencing cost during last 15 years

- 2005	2007	2018
		
Human Genome Project 2.7 BUSD Years / genome	**454 / Pyrosequencing** 240 days / human genome	**NovaSeq** 2 day / human genome <1000 USD / genome

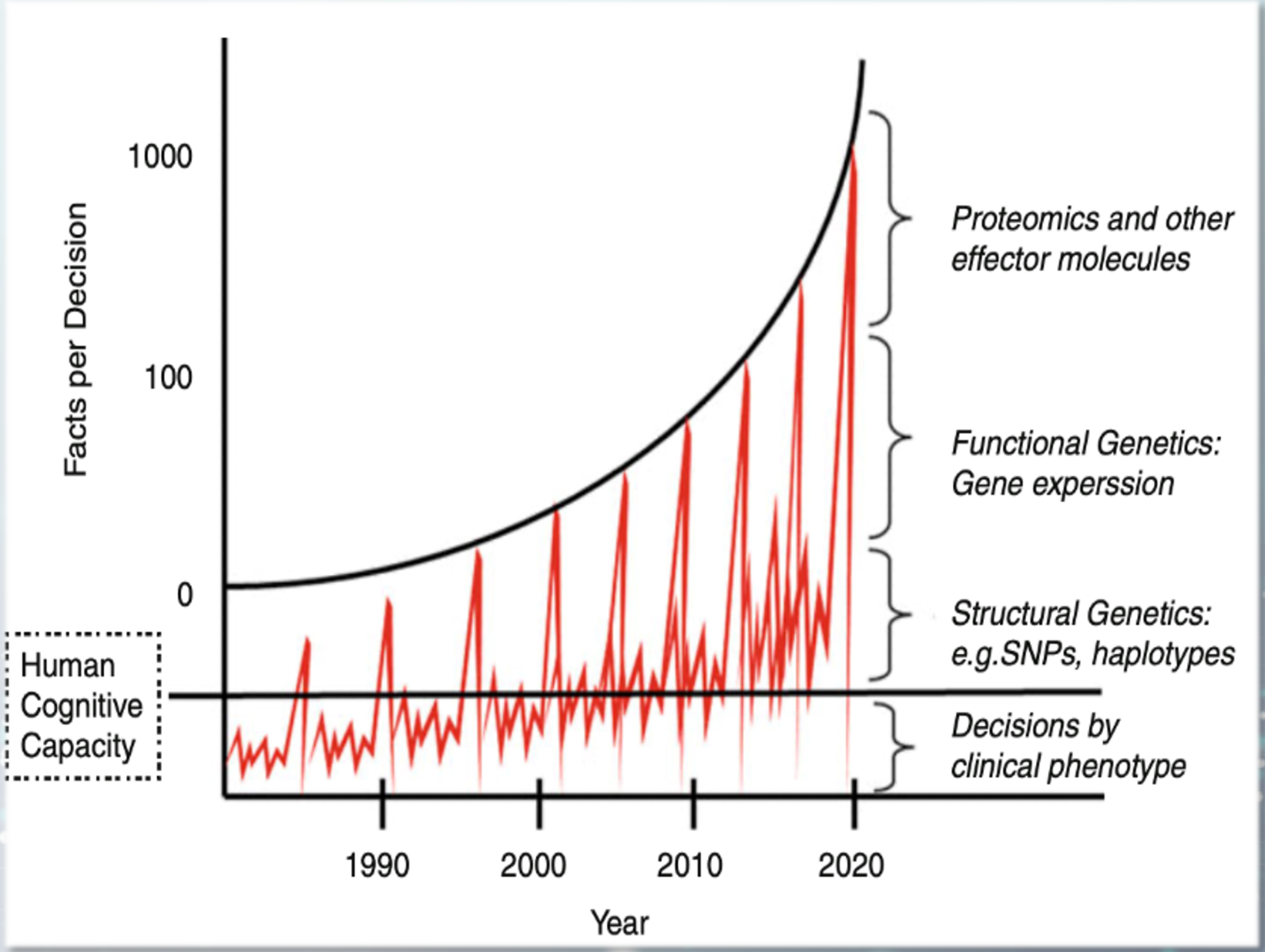
Today genome sequencing is comprehensive, affordable and rapid
Next-generation sequencing is ready for clinical use in the routine healthcare

A surge of treatment options…

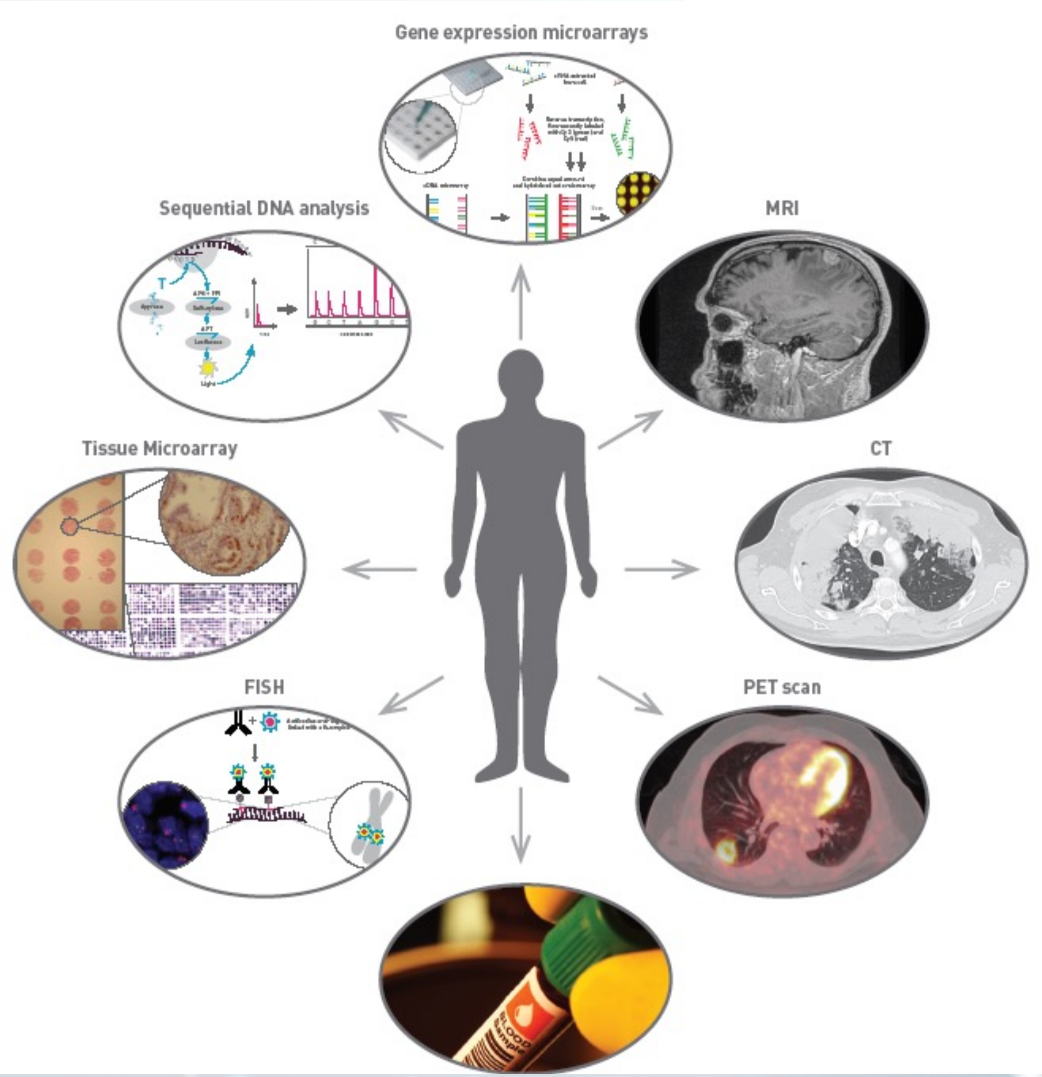
FDA approved drugs for lung cancer

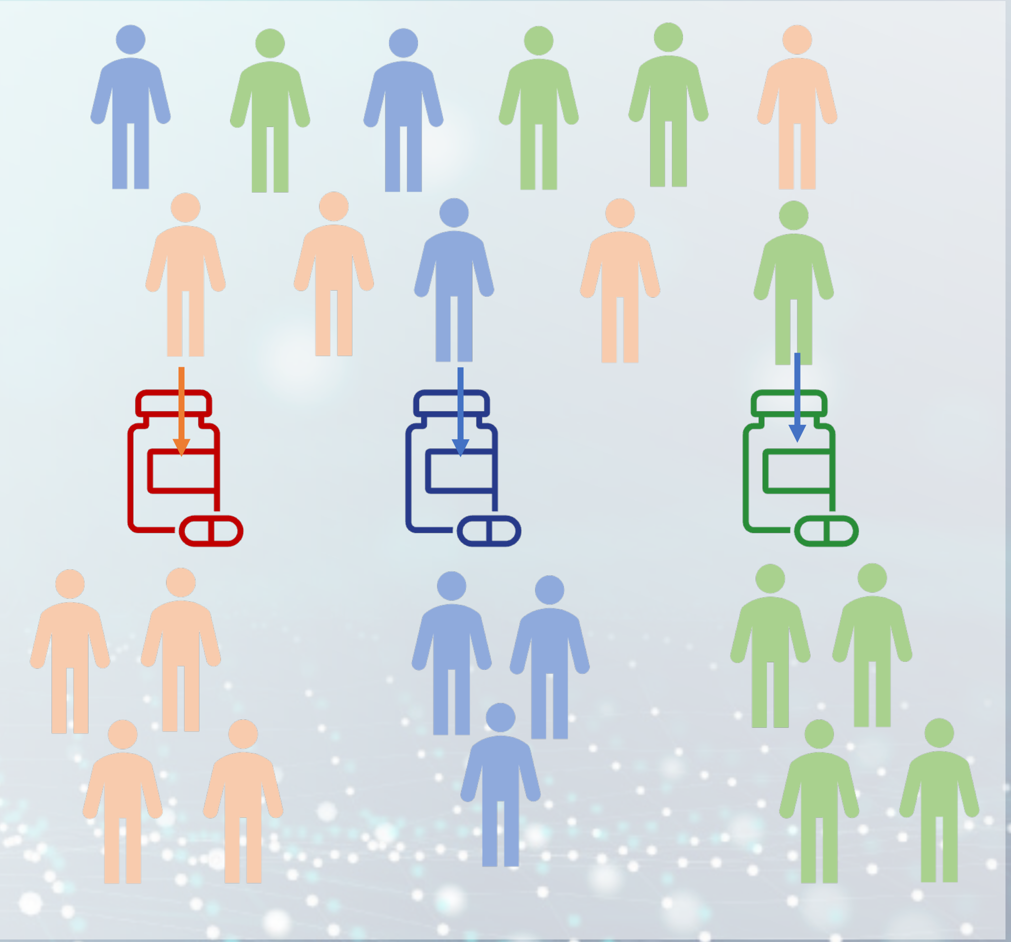


…and of data in need of storage, treatment and analysis



Multimodal patient stratification and monitoring is key to precision medicine

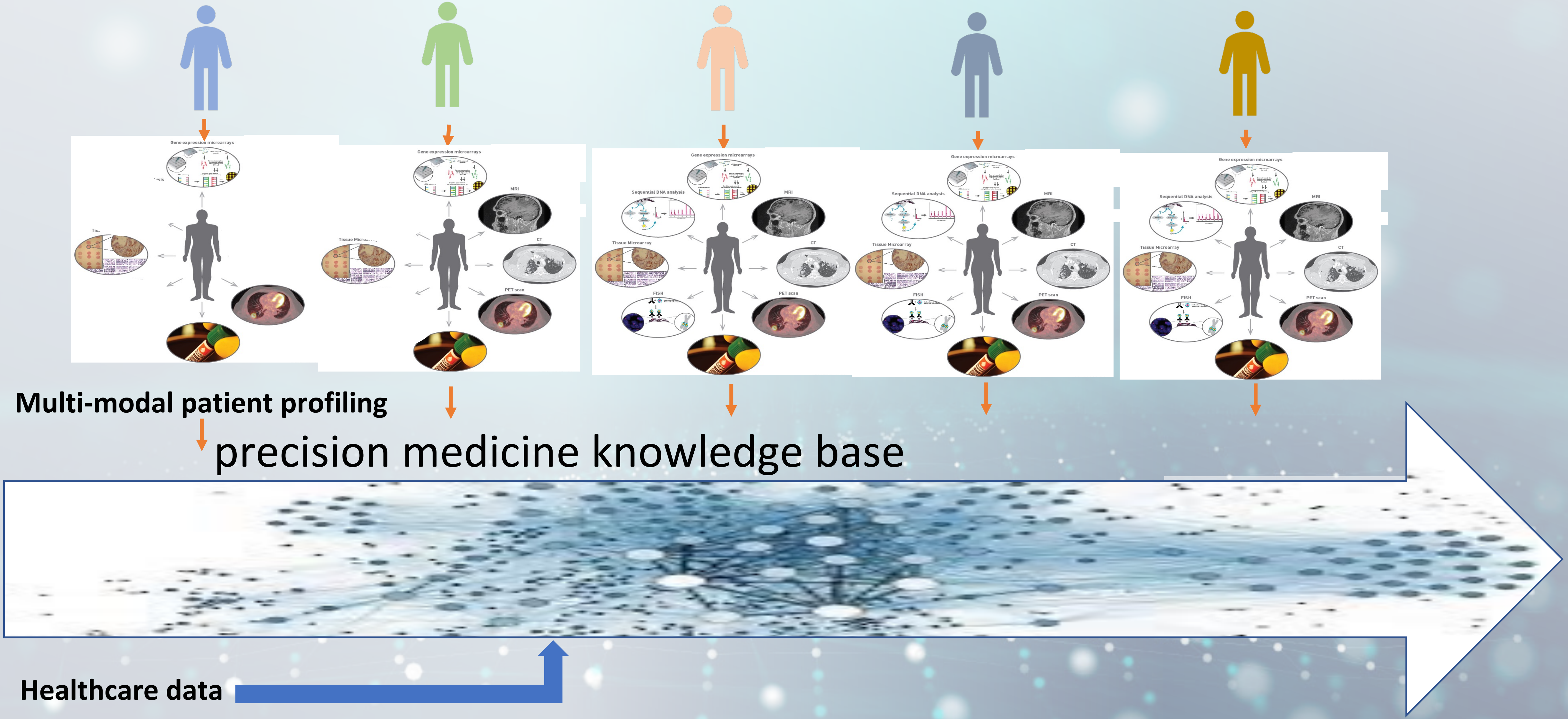




Predictive medicine for effective customized treatment and treatment monitoring

Multimodal patient stratification and monitoring

Knowledge base for PM research and development



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A paradigm shift in health care

- The body of knowledge is increasing exponentially
- Rapid development in advanced technology and diagnostic tools
- New biomarkers explored and available
- Increasing amount of complex data per patient
- More and more advanced treatments that use biomarkers
- New opportunities require new conditions

The right treatment at the right time for every individual patient

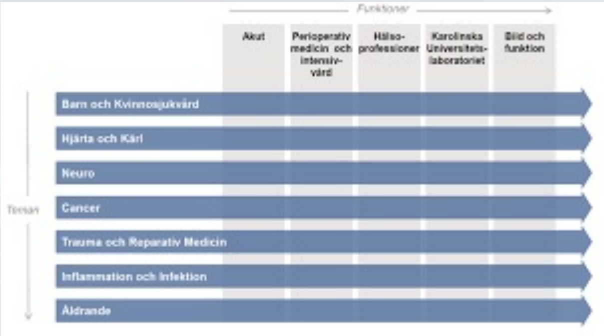
Precision medicine presents many challenges

Separate organizations for health care (regional) and research and education (state)

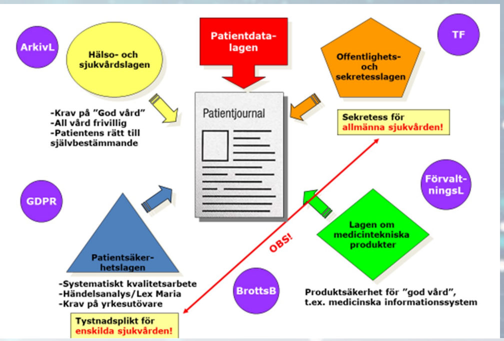
SciLifeLab

Secure storage and management of large scale data

Health care run by
21 regions
New reimbursement schemes



New competencies and ways of working within health care



Legal and regulatory challenges

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A unique collaboration

- New seamless organization
- Cross collaboration between disciplines, academy and health care
- Sharing knowledge and infrastructure
- Geographic proximity

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Examples of focus areas

- Academy integrated in health care
- Data handling
  - Storage and computation capacity
  - Bioinformatics (new competences)
  - AI will be instrumental
- Diagnostic development
  - Testbeds
  - Integrated research platforms
  - Structures for implementation of research and innovation
- Clinical trial unit as an integrated part of the patient’s treatment

Examples of AI applications

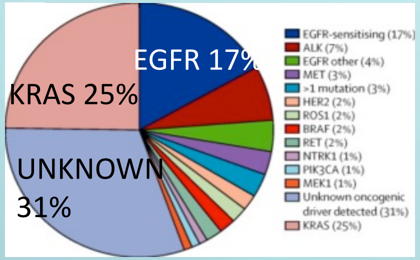
Case	Purpose of AI solution	Implementation Level (34)	TRL(38)
DeepNews Neo	Risk prediction/early warning system of Sepsis in premature infants.	Not yet reached Level 1. Retrospective pilot finalized at KS.	TRL 4; technology validated in lab
PathFX	Survival prediction of metastatic bone cancer patients to support in treatment decision.	Level 2. Integrated into Orthopedic unit Care Plan at KS.	TRL 8; system complete and qualified (CE-marked)
DeepMed	Decision support system to classify fractures according to guidelines to support in treatment decision.	Level 1. Clinical pilot finalized.	TRL 5; technology validated in relevant environment
I-AID	Integrated AI Diagnostics - Three pilots, all within image processing.	**MS:** None.	TRL 4; technology validated in lab
		EEG: None.	TRL 2 – technology concept formulated
		Cancer: None.	TRL 4; technology validated in lab

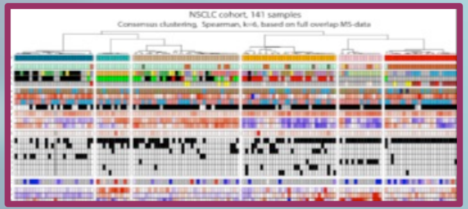
Source: *From pilot to clinical practice: Barriers and facilitators in the implementation of artificial intelligence in health care*, S. Lerenius, 2021

Decision support based on multimodal diagnostics

The future of AI in PM?

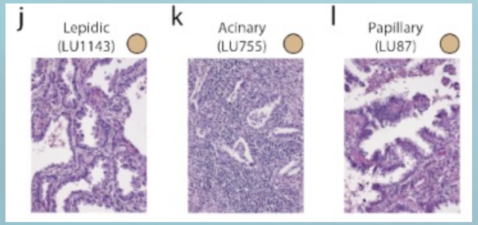
Genomics

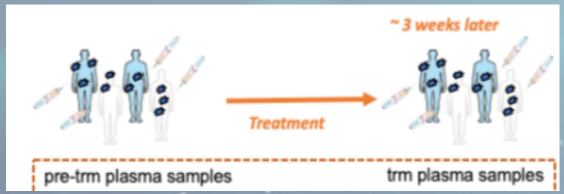




Proteomics

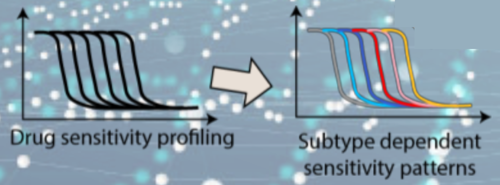
Image analysis





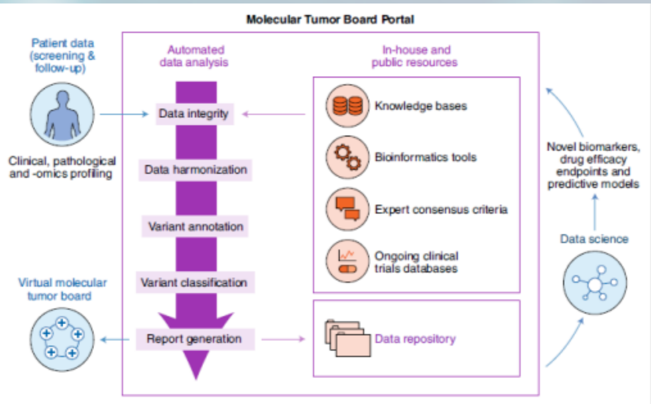
Plasma analysis

Drug screening



Patient symptoms

Clinical decision support tool



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Thank you!

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