Tailored to Heal:
The New Era of Individualised Medicine

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Chair Professor of Pharmacology

FMS, USJ

Helen gives '*pharmakon',* an Egyptian drug, with wine to Telemachus, who was sad about the absence of his father, Odysseus.
Pharmakon was used to ease grief and anger, allowing people to forget their troubles.

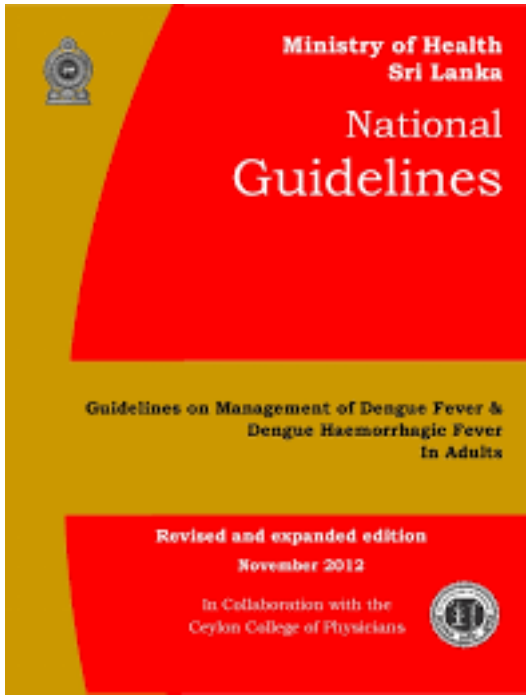
- Odyssey by Hormer

The Doctor (Detail) – Luke Fildes, 1891
Image credits: Wikipedia

Guidelines

Guidelines provide evidence-based, standardised approaches to patient care

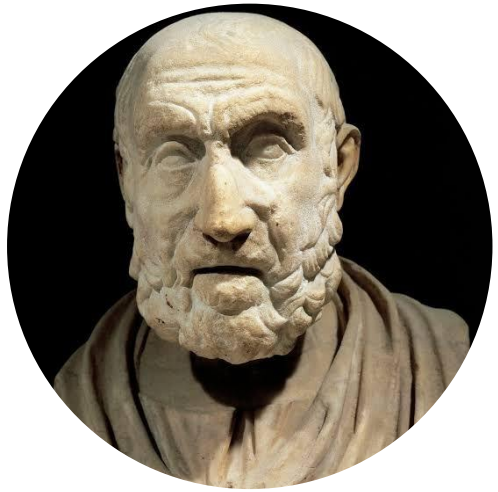
- Support clinical decision-making
- Improve patient outcomes
- Enhance quality of care
- Reduce variation in practice



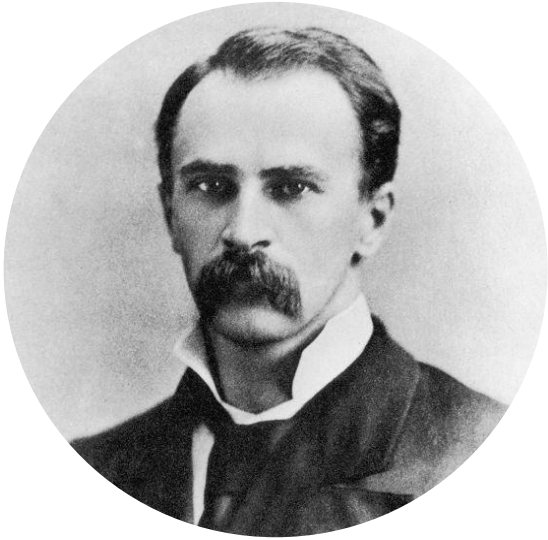
- Mr A and Mr B are patients in their 50s with T2DM, HT, and dyslipidaemia
  - Had similar control, no complications

- Both experienced NSTEMIs
  - Stented
  - prescribed DAT

- 10 days after stent placement
  - Mr B presented with stent thrombosis
  - Mr A remained well



There is great interindividual variability in the response to a standard dose of most drugs



Hippocrates (460-377 BCE)

Sir William Osler, 1849–1919

"….. different [drugs] to different patients, for the sweet ones do not benefit everyone, nor do the astringent ones, nor are all the patients able to drink the same things."

- Corpus Hippocraticum

"Variability is the law of life, and as no two faces are the same, so no two bodies are alike, and no two individuals react alike, and behave alike ."

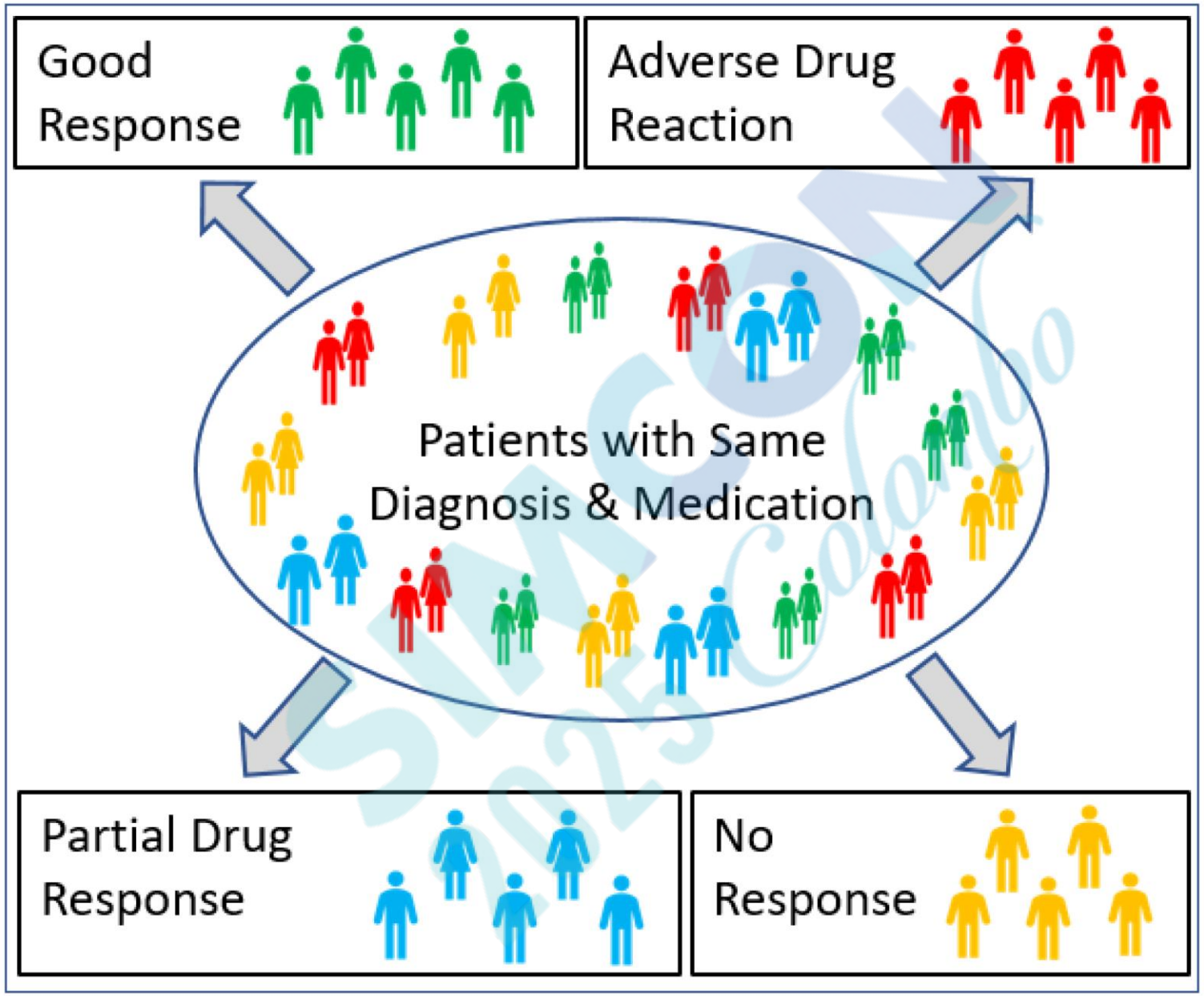
Efficacy

"…Drugs out there on the market work, but they don't work in everybody.
> 90% of drugs work in only 30-50% of patients."
– Dr Allen Roses
Worldwide VP of Genetics at GlaxoSmithKline (GSK)

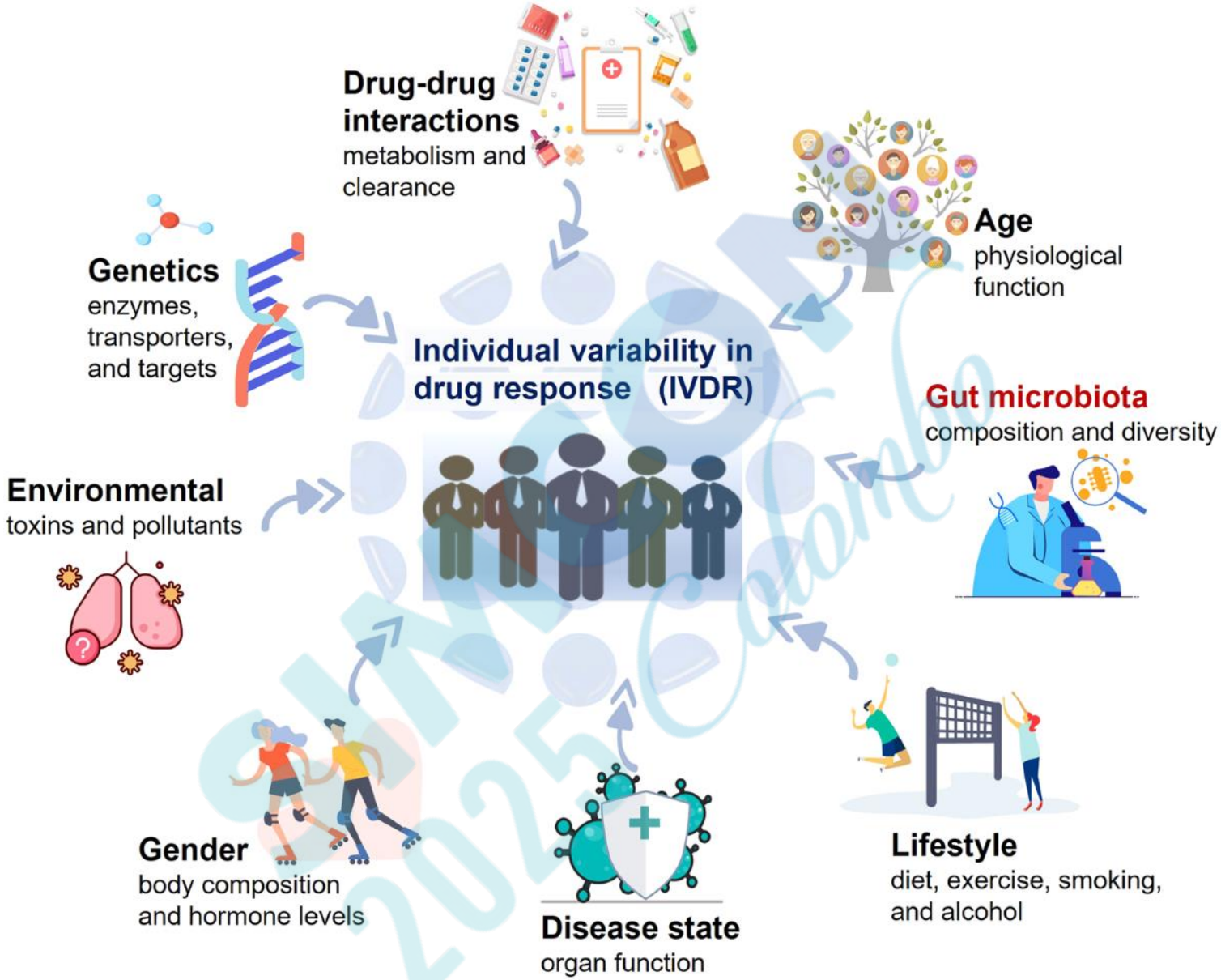
Safety

- "6.5% of all hospital admissions are due to ADRs"
- "Increases to >15% in those with multimorbidity"

- UK data


Good Response
Adverse Drug Reaction
Patients with Same Diagnosis & Medication
Partial Drug Response
No Response

Who is which?



Zhao, Q., Chen, Y., Huang, W. *et al.* Drug-microbiota interactions: an emerging priority for precision medicine. *Sig Transduct Target Ther* **8**, 386 (2023).

- **Precision** - the quality, condition or fact of being exact and accurate
  - *Oxford Dictionary of English*

- **Precision medicine**
  - Uses combined knowledge (i.e. clinical, genetic, genomic, and epigenetic/environmental) to anticipate a person's
    - vulnerability
    - prognosis of their disease
    - response to therapy
  - Enhance individual's health

In this presentation….

- Precision medicine
  - Pharmacogenomics
  - Digital human twins
- Dilemmas and challenges in the application of precision medicine

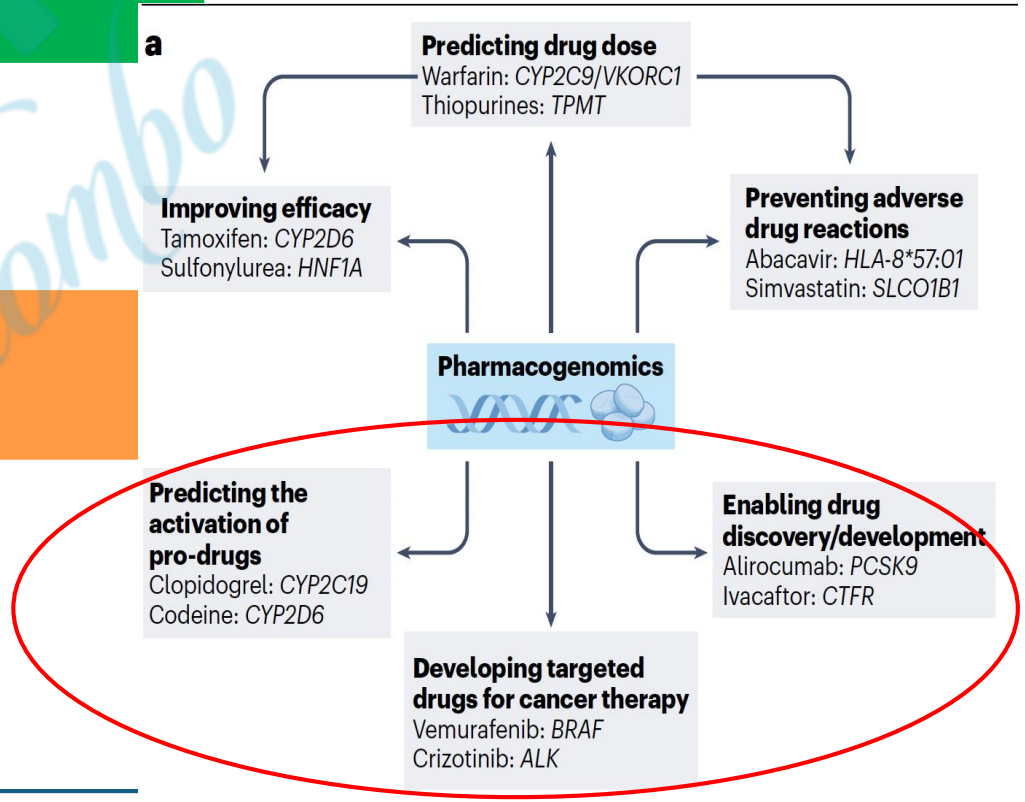
Pharmcogenomics (PGx)

Current definition

Study of how a person's genetic make-up affects their response (efficacy and/or safety) to a drug

Broader definition

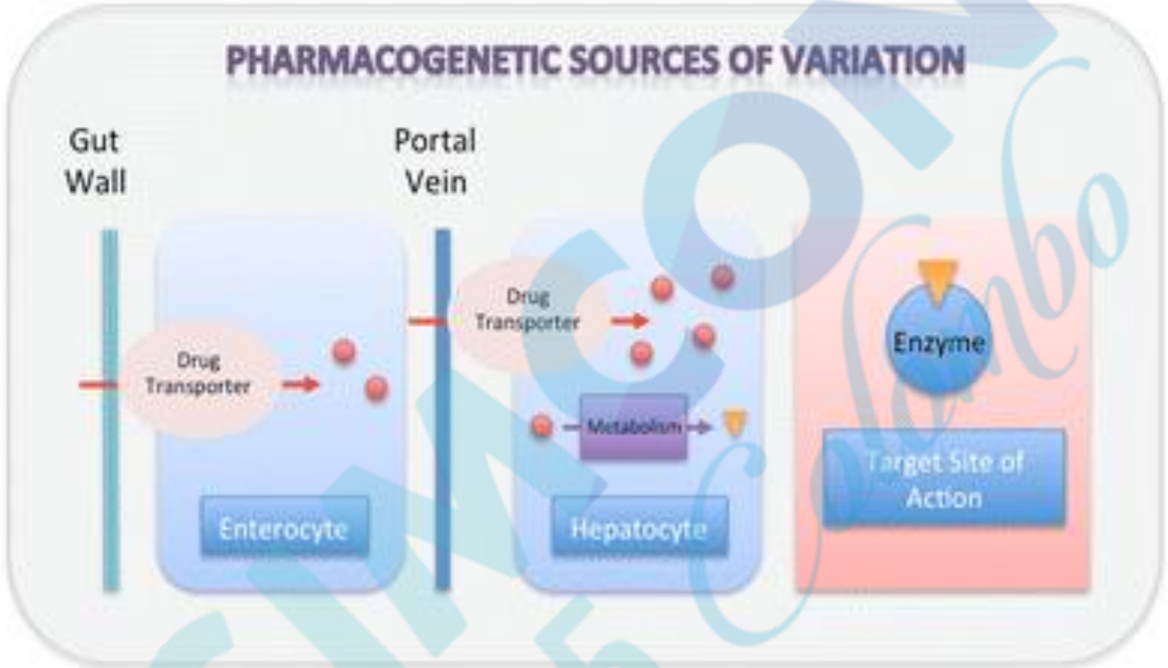
Study of genomic technologies to enable the discovery and development of novel drugs, and the optimisation of drug dose and choice in individual patients to maximise efficacy and minimise toxicity

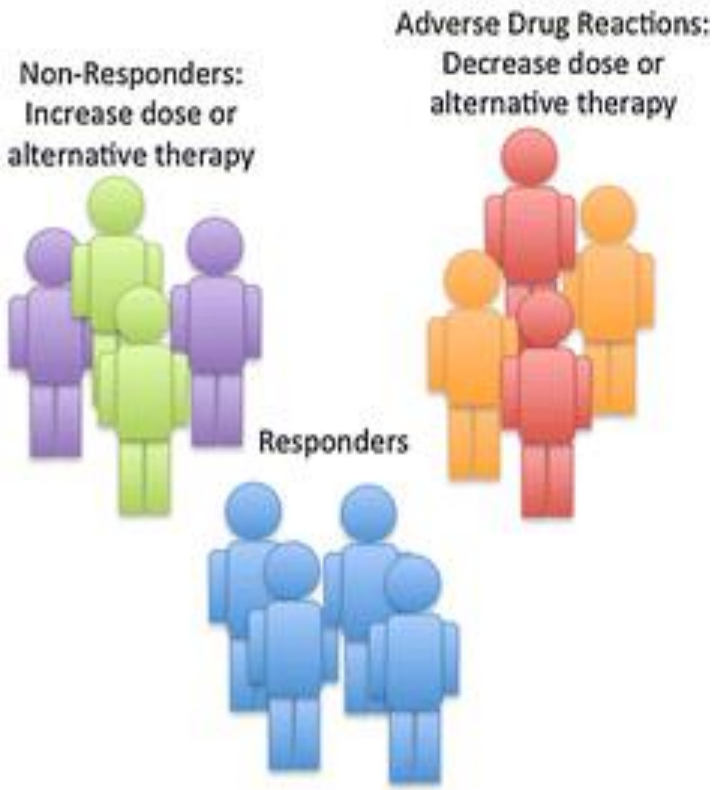


Pirmohamed, M. Pharmacogenomics: current status and future perspectives. *Nat Rev Genet* **24**, 350–362 (2023).

Pharmcogenomics

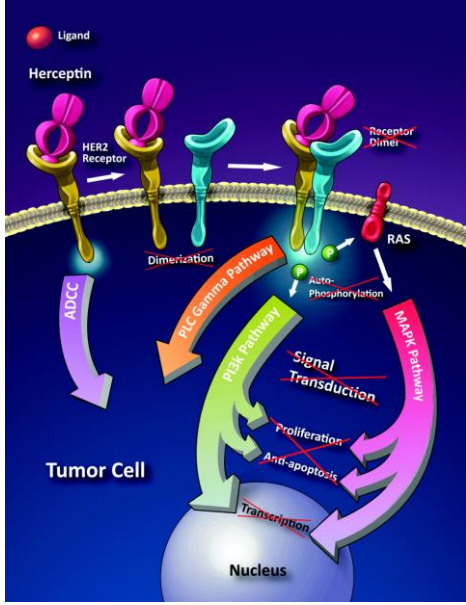
- Utilise information about a person's genes, including his nucleotide sequence
- Seek to identify genetic contributors to human variation in drug efficacy and toxicity
- Aims to improve clinical outcomes for the individual by making drugs better and safer





Gong, I.Y., Kim, R.B. Pharmacogenetic Advances in Cardiovascular Medicine: Relevance to Personalized Medicine. *Curr Genet Med Rep* **1**, 1–14 (2013).

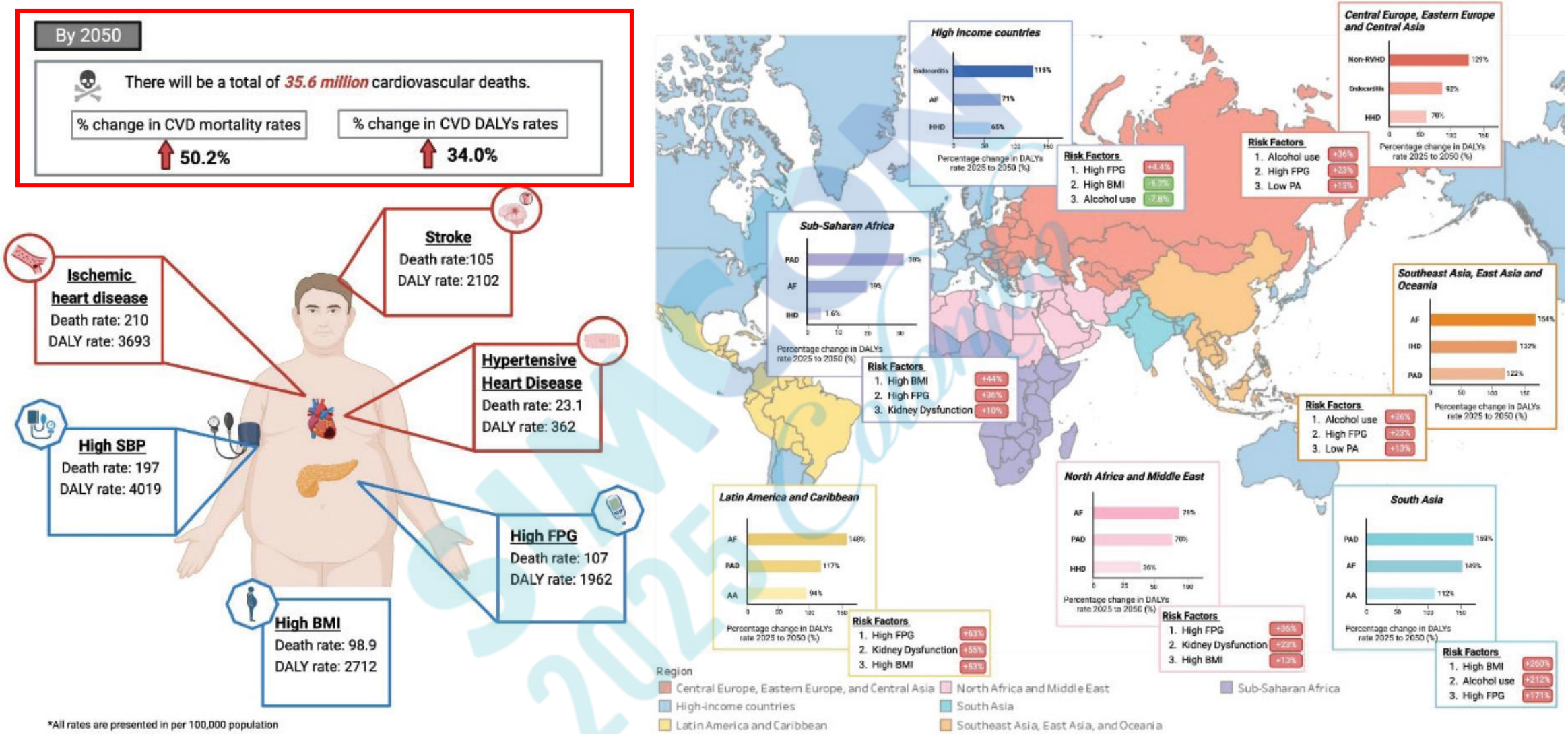
PGx – practical application



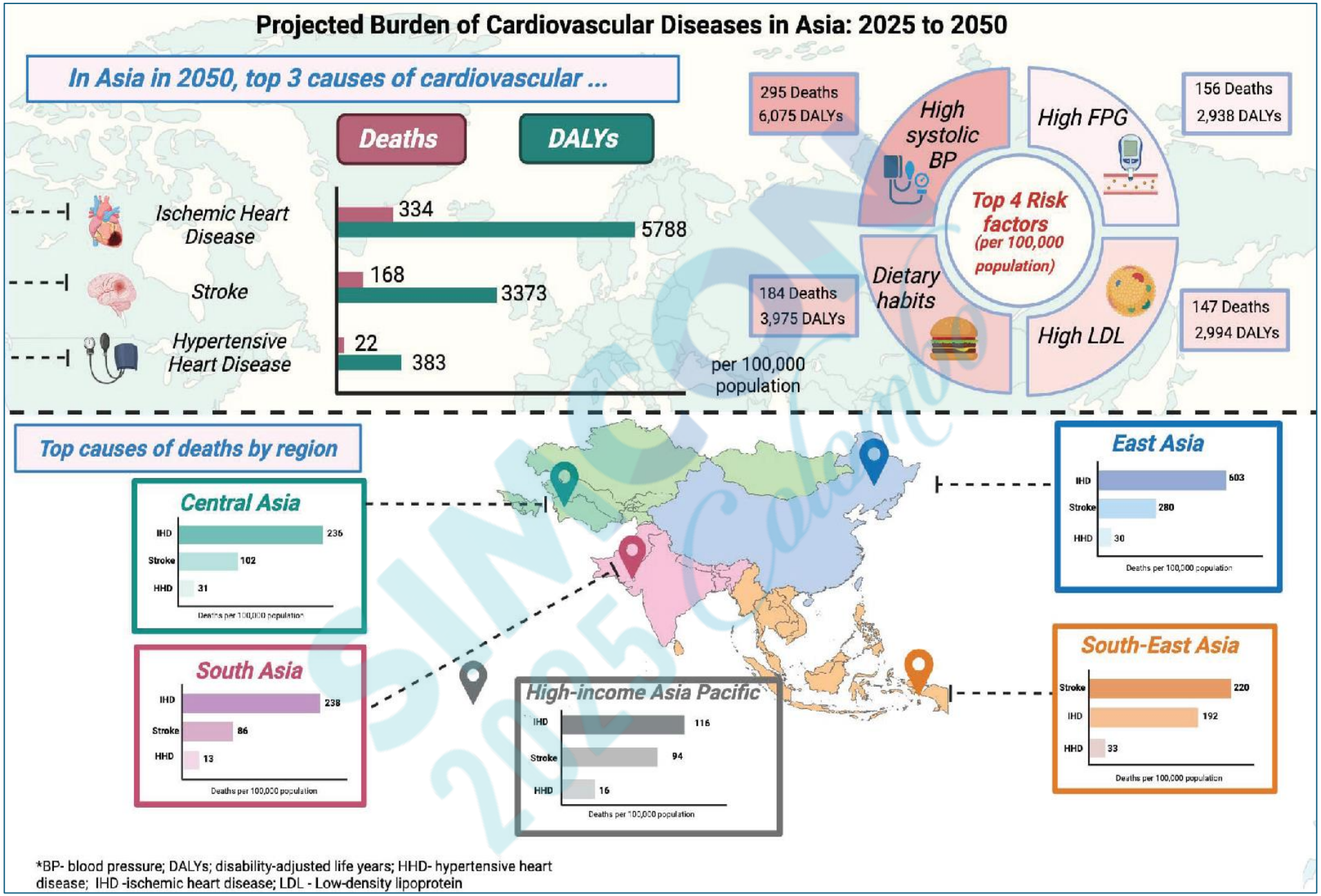
- HER 2 gene predicts the response to *trastuzumab (Herceptin®)* in women with breast cancer

- Use of trastuzumab (anti-oestrogen therapy) in patients whose tumours were HER2-positive
  - improves disease-free and overall survival
  - avoid unnecessary toxicity

Global Burden of Cardiovascular Diseases: Projections to 2050



*AA - aortic aneurysm; AF - atrial fibrillation and flutter; DALYs - disability adjusted life years; HHD - hypertensive heart disease; IHD - ischemic heart disease; Non-RVHD - non-rheumatic valvular heart disease; SBP - systolic blood pressure; PA - physical activity



Goh, Rachel Sze Jen et al. *JACC* 2024; 83:1940-1940

Clopidogrel

- Marked interpatient variation in responsiveness
- 21% - non-responders: at risk for CVD (MI & strokes) and stent thrombosis after PCI

Statins

- Substantial interindividual variability in PK and PD
- Some patients
  - fail to attain sufficient cholesterol reduction and prevention of cardiovascular events
  - At a higher risk of ADRs – e.g. myopathy

Warfarin

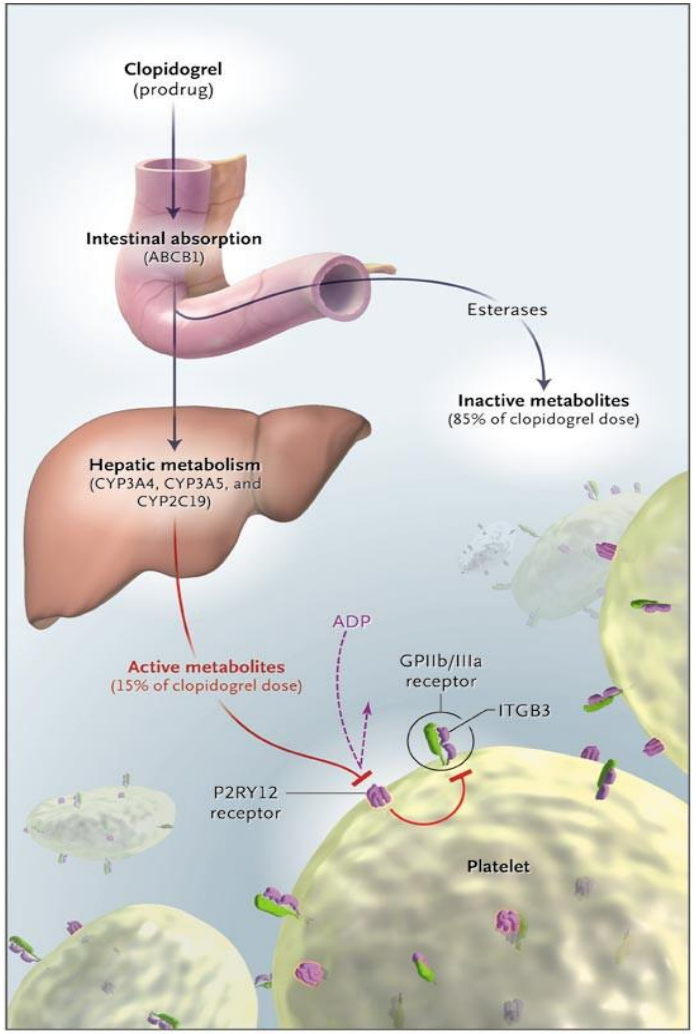
- Marked interindividual variations
- Narrow therapeutic range

Clopidogrel

- Clopidogrel is a prodrug
  - Activation catalysed by several CYP isozymes

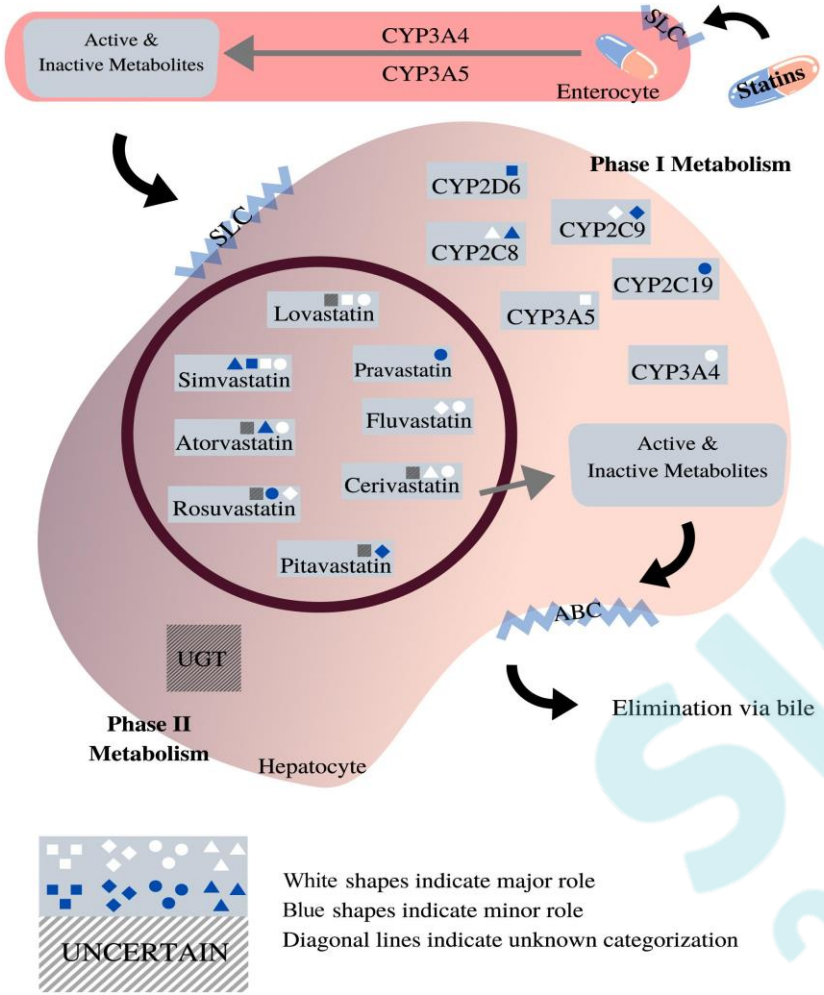
- CYP2C19*2 (rs4244285) and CYP2C19*3 (rs4986893) - loss-of-function SNPs - result in
  - lower platelet inhibition
  - increased risk of major cardiovascular events particularly stent thrombosis in PCI patients

- CYP2C19 is thought to represent only a portion of the observed variation in antiplatelet response



Simon T, Verstuyft C, Mary-Krause M, et al. Genetic determinants of response to clopidogrel and cardiovascular events. *N Engl J Med* 2009;360:363-375

Statins

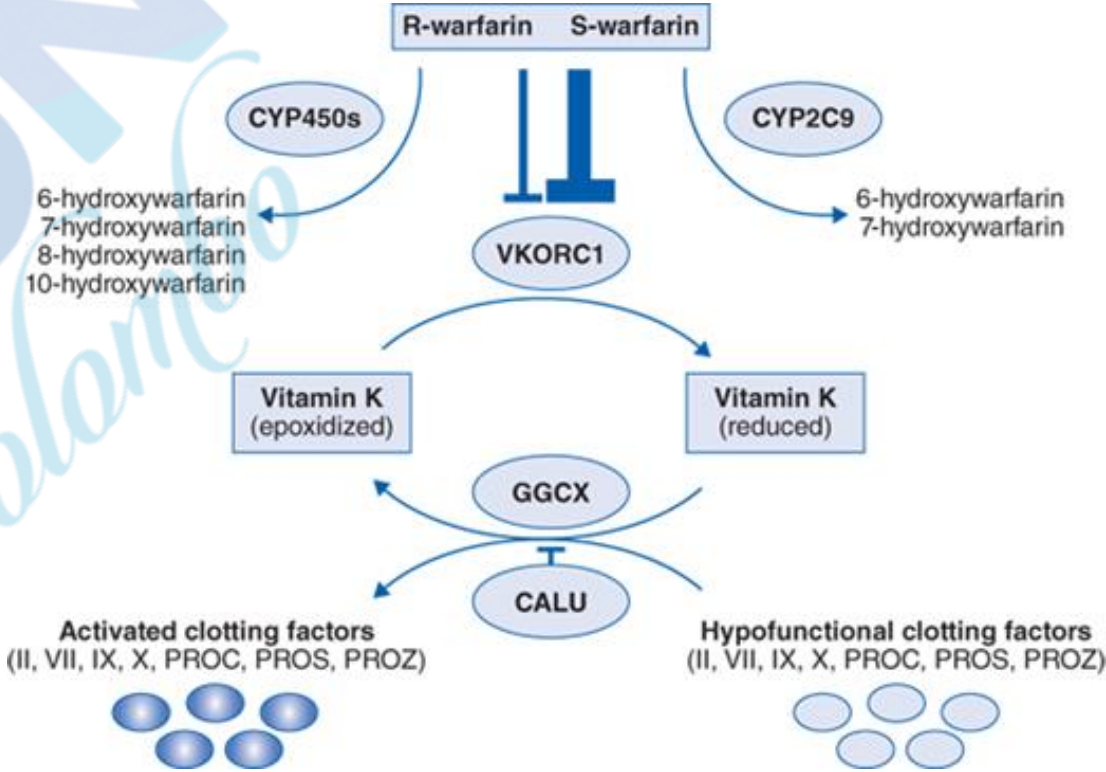


Kee PS, Chin PKL, Kennedy MA, Maggo SDS. Pharmacogenetics of Statin-Induced Myotoxicity. Front Genet. 2020 Oct 16;11:575678.

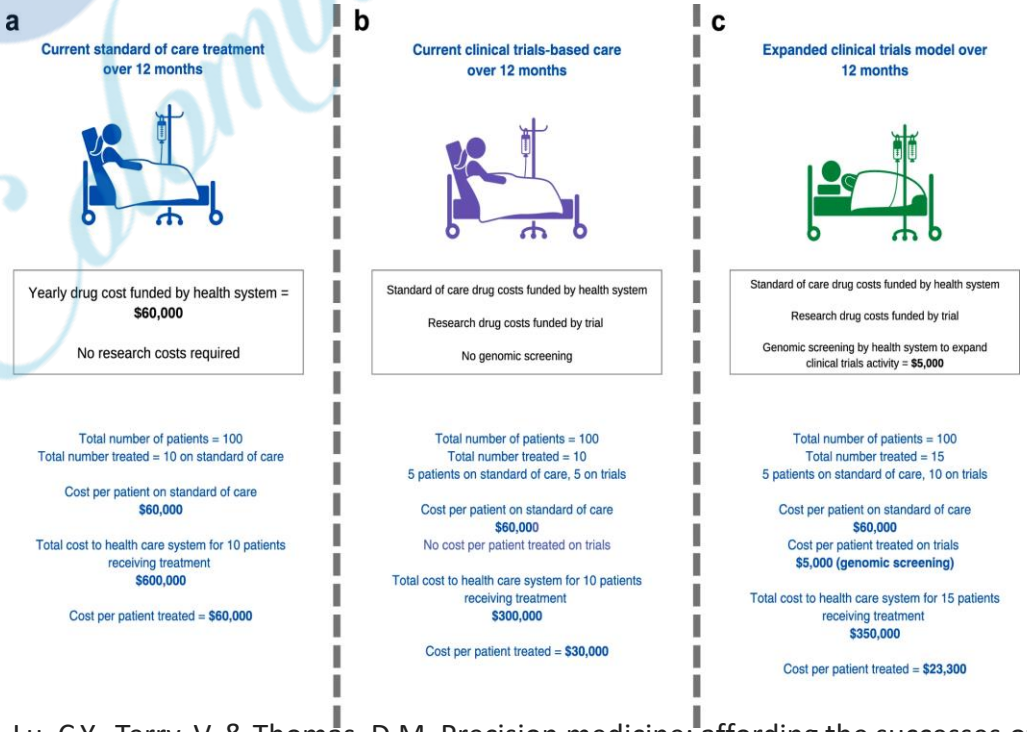
- Different CYP enzymes metabolise different statins
  - Variants can affect LDL lowering effect
- Statin-induced myopathy (SIM)
  - Prevalence – 7 – 30%
  - Dose dependent
  - Higher risk of SIM with a polymorphism in the SLCO1B1 gene

Warfarin

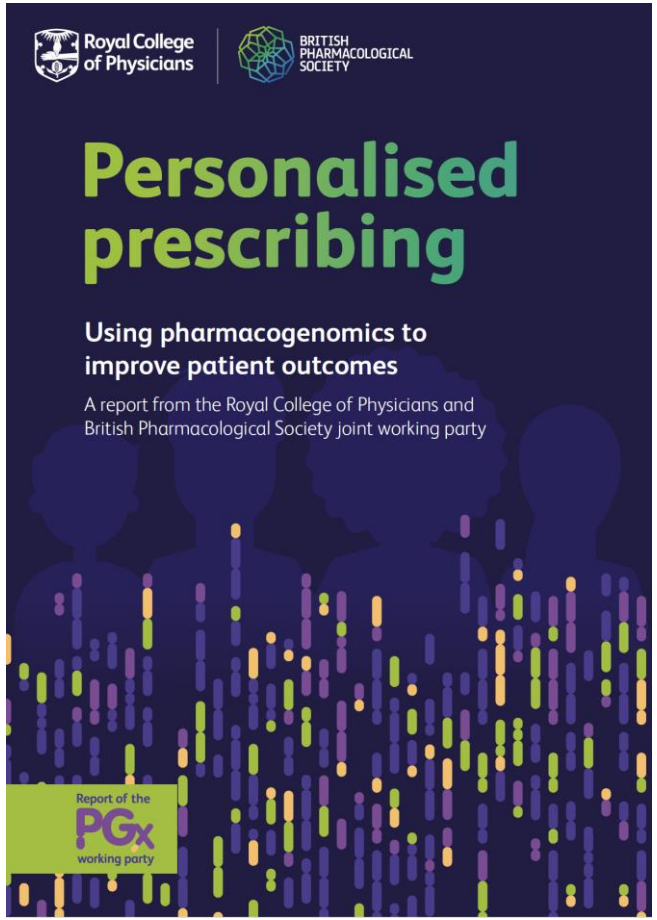
- 2 isomers – S & R
  - S more potent
- SNPs of CYP2C9 reduce metabolism of S warfarin
  - reduces requirement by 36 -72%
- VKORC1
  - Determines how a person responds to warfarin
  - Genetic variations determine the dosage



- Pharmacogenomic data
  - can be used to guide the choice of medicine and dose
  - increase the likelihood that each person receives the most effective medicine for them, at the best dose, the first time they are treated
  - Can be economical



Lu, C.Y., Terry, V. & Thomas, D.M. Precision medicine: affording the successes of science. *npj Precis. Onc.* **7**, 3 (2023)



Box 1

Recommendations for the implementation of pharmacogenomics in clinical practice[75]

- Clinical implementation of pharmacogenomics should occur in all health-care settings and should focus on drugs that have actionable information. One model might be to start with a small number of drug–gene pairs and gradually increase to a comprehensive service.
- Appropriate funding is needed for implementing a pharmacogenomic clinical service; active efforts should be made from the beginning to ensure that the service does not exacerbate health inequalities.
- The pharmacogenomic service should be adaptable — that is, able to modify and refine the available tests based on new evidence.
- A comprehensive education and training package that is relevant to all involved health-care professionals should accompany the implementation of a pharmacogenomic service.
- Support is needed for clinicians, including clinical decision support systems, to minimize errors and maximize cost efficiency.
- The pharmacogenomic service should undergo continuous audit and evaluation, leading to the development of a learning health system that maximizes patient benefits.
- A pharmacogenomic service should be accompanied by funding for research — not only biomedical research, but also research into ethical, legal and social issues.
- Clear lines of communication should be established with health-care managers, patient representative bodies, the public and the media.

Examples of 'Informative' PGx Data in Drug Labels

CYP2D6 Poor metabolizers have higher than expected plasma concentrations of tricyclic antidepressants (TCAs) when given usual doses

Reduce the starting dose of Beleodaq to 750 mg/m2 in patients known to be homozygous for the UGT1A1*28 allele to minimize dose limiting toxicities

Genetic variants of the TPMT gene may contribute to cisplatin-induced ototoxicity; although this association has not been consistent across populations and study designs

LIPITOR reduces LDL-C in some patients with homozygous familial hypercholesterolemia (a genetic disease)

Table of Pharmacogenetic Associations

Precision Medicine

Table of Pharmacogenetic Associations

FDA Recognition of Public Human Genetic Variant Databases

Pharmacogenetic tests, along with other information about patients and their disease or condition, can play an important role in drug therapy. When a health care provider is considering prescribing a drug, knowledge of a patient's genotype may be used to aid in determining a therapeutic strategy, determining an appropriate dosage, or assessing the likelihood of benefit or toxicity.

On this page:

Content current as of:
10/26/2022

Regulated Product(s)
Medical Devices

Feedback

The fact that the FDA has included a particular gene-drug interaction in the table does not necessarily mean the FDA advocates using a pharmacogenetic test before prescribing the corresponding medication, unless the test is a companion diagnostic. Tests that are essential for the safe and effective use of a therapeutic product, including those that identify patients for which the drug is contraindicated, are companion diagnostics.

CPIC Guidelines Genes-Drugs Alleles Publications Meetings Resources Working Groups Members Contact

CPIC®
Clinical Pharmacogenetics Implementation Consortium

Search CPIC Website

What is CPIC?

The Clinical Pharmacogenetics Implementation Consortium (CPIC®) is an international consortium of individual volunteers and a small dedicated staff who are interested in facilitating use of pharmacogenetic tests for patient care.

One barrier to implementation of pharmacogenetic testing in the clinic is the difficulty in translating genetic laboratory test results into actionable prescribing decisions for affected drugs.

CPIC's goal is to address this barrier to clinical implementation of pharmacogenetic tests by creating, curating, and posting freely available, peer-reviewed, evidence-based, updatable, and detailed gene/drug clinical practice guidelines (click here for all CPIC publications). CPIC guidelines follow standardized formats, include systematic grading of evidence and clinical recommendations, use standardized terminology, are peer-reviewed, and are published in a leading journal (in partnership with

Search: warfarin

Guidelines	Drugs	Genes
CYP2C9, VKORC1, CYP4F2 and Warfarin	warfarin	CYP2C9 CYP4F2 VKORC1

Showing 1 to 1 of 1 entries (filtered from 29 total entries)

CPIC Guidelines Genes-Drugs Alleles Publications Meetings Resources Working Groups Members Contact

Guidelines

CPIC guidelines are designed to help clinicians understand HOW available genetic test results should be used to optimize drug therapy, rather than WHETHER tests should be ordered. A key assumption underlying the CPIC guidelines is that clinical high-throughput and pre-emptive (pre-prescription) genotyping will become more widespread, and that clinicians will be faced with having patients' genotypes available even if they have not explicitly ordered a test with a specific drug in mind. CPIC's guidelines, processes and projects have been endorsed by several professional societies – read more.

Each CPIC guideline adheres to a standard format, and includes a standard system for grading levels of evidence linking genotypes to phenotypes, how to assign phenotypes to clinical genotypes, prescribing recommendations based on genotype/phenotype, and a standard system for assigning strength to each prescribing recommendation. The SOP for guideline creation has been published in Current Drug Metabolism: Incorporation of Pharmacogenomics into Routine Clinical Practice: The Pharmacogenetics Implementation Consortium (CPIC) Guideline Development Process. The CPIC authorship guidelines contain more details on minimizing and managing conflicts of interest.

View CPIC's process for prioritizing CPIC guidelines

Search:

Guidelines	Drugs	Genes
CFTR and Ivacaftor	ivacaftor	CFTR
CYP2B6 and efavirenz	efavirenz	CYP2B6
CYP2B6 and methadone	methadone	CYP2B6

CYP2C9 CPIC guidelines

CPIC guideine for NSAIDs based on *CYP2C9* genotype

CPIC guideline for phenytoin based on *CYP2C9* and *HLA-B* genotype

CPIC guideline for warfarin based on *CYP2C9*, *VKORC1* and *CYP4F2* genotype

For gene-specific information tables (i.e. *CYP2C9* allele definition, allele functionality, diplotype-phenotype and frequency tables) see guideline pages or PharmGKB.

Circulation
Volume 150, Issue 6, 6 August 2024; Pages e129-e150
https://doi.org/10.1161/CIR.0000000000001257

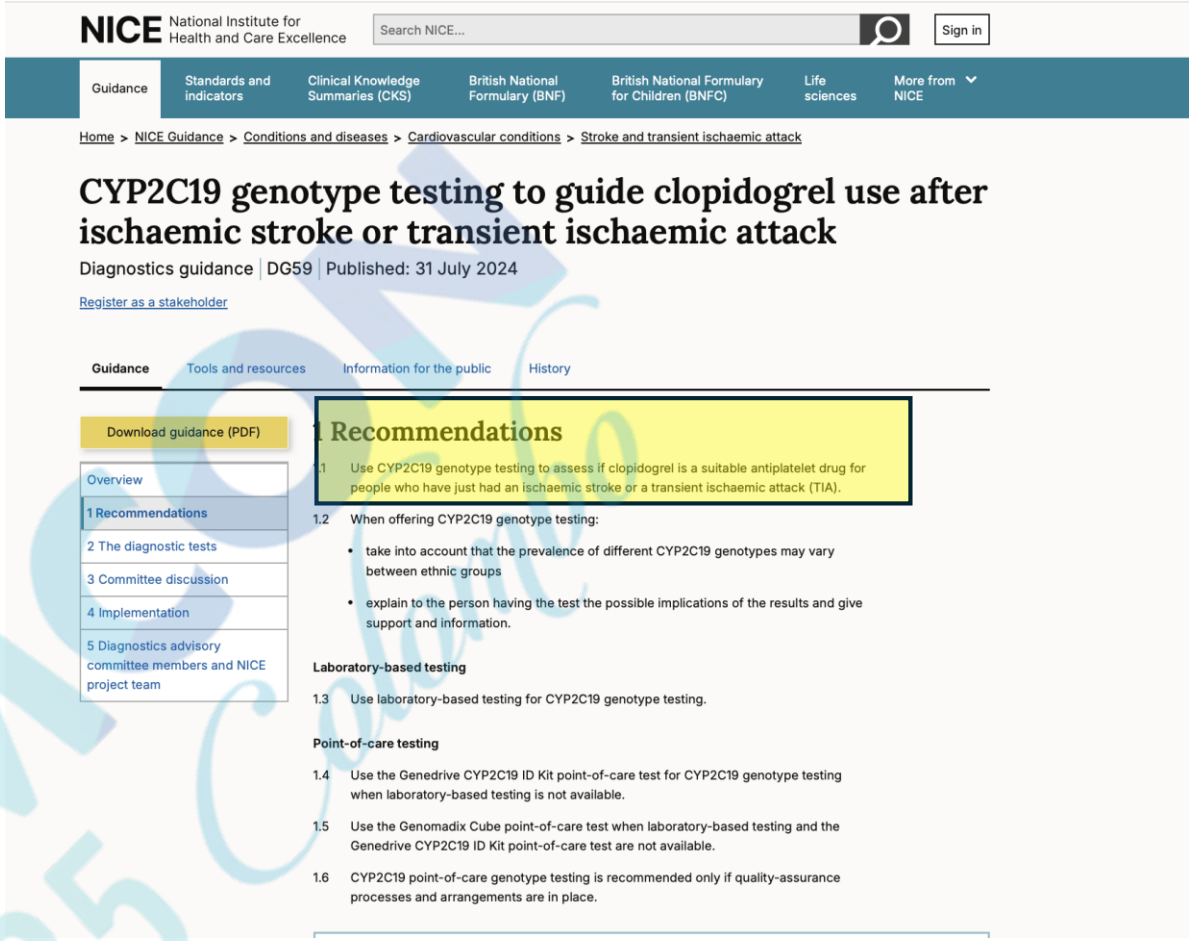
AHA SCIENTIFIC STATEMENTS

CYP2C19 Genetic Testing for Oral P2Y12 Inhibitor Therapy: A Scientific Statement From the American Heart Association

Naveen L. Pereira, MD, FAHA, Chair, Sharon Cresci, MD, FAHA, Vice Chair, Dominick J. Angiolillo, MD, PhD, Wayne Batchelor, MD, MHS, Quinn Capers IV, MD, Larisa H. Cavallari, PharmD, Dana Leifer, MD, FAHA, Jasmine A. Luzum, PharmD, PhD, FAHA, Dan M. Roden, MD, FAHA, Konstantinos Stellos, MD, FAHA, Stephanie L. Turrise, PhD, RN, FAHA, and Sony Tuteja, PharmD, MS, FAHA on behalf of the American Heart Association Professional/Public Education and Publications Committee of the Council on Genomic and Precision Medicine; Council on Arteriosclerosis, Thrombosis and Vascular Biology; Council on Cardiovascular and Stroke Nursing; Council on Clinical Cardiology; Council on Peripheral Vascular Disease; and Stroke Council

Abstract: There is significant variability in the efficacy and safety of oral P2Y12 inhibitors, which are used to prevent ischemic outcomes in common diseases such as coronary and peripheral arterial disease and stroke. Clopidogrel, a prodrug, is the most used oral P2Y12 inhibitor and is activated primarily after being metabolized by a highly polymorphic hepatic cytochrome CYP2C219 enzyme. Loss-of-function genetic variants in *CYP2C219* are common, can result in decreased active metabolite levels and increased on-treatment platelet aggregation, and are associated with increased ischemic events on clopidogrel therapy. Such patients can be identified by *CYP2C19* genetic testing and can be treated with alternative therapy. Conversely, universal use of potent oral P2Y12 inhibitors such as ticagrelor or prasugrel, which are not dependent on CYP2C19 for activation, has been recommended but can result in increased bleeding. Recent clinical trials and meta-analyses have demonstrated that a precision medicine approach in which loss-of-function carriers are prescribed ticagrelor or prasugrel and noncarriers are prescribed clopidogrel results in reducing ischemic events without increasing bleeding risk. The evidence to date supports *CYP2C19* genetic testing before oral P2Y12 inhibitors are prescribed in patients with acute coronary syndromes or percutaneous coronary intervention. Clinical implementation of such genetic testing will depend on among multiple factors: rapid availability of results or adoption of the concept of performing preemptive genetic testing, provision of easy-to-understand results with therapeutic recommendations, and seamless integration in the electronic health record.

Key Words: AHA Scientific Statements ▪ genetic testing ▪ platelet inhibitors



NICE National Institute for Health and Care Excellence

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CYP2C19 genotype testing to guide clopidogrel use after ischaemic stroke or transient ischaemic attack

Diagnostics guidance | DG59 | Published: 31 July 2024

Register as a stakeholder

Guidance | Tools and resources | Information for the public | History

Download guidance (PDF)

Overview
1 Recommendations
2 The diagnostic tests
3 Committee discussion
4 Implementation
5 Diagnostics advisory committee members and NICE project team

1 Recommendations

1.1 Use CYP2C19 genotype testing to assess if clopidogrel is a suitable antiplatelet drug for people who have just had an ischaemic stroke or a transient ischaemic attack (TIA).

1.2 When offering CYP2C19 genotype testing:

- take into account that the prevalence of different CYP2C19 genotypes may vary between ethnic groups
- explain to the person having the test the possible implications of the results and give support and information.

Laboratory-based testing

1.3 Use laboratory-based testing for CYP2C19 genotype testing.

Point-of-care testing

1.4 Use the Genedrive CYP2C19 ID Kit point-of-care test for CYP2C19 genotype testing when laboratory-based testing is not available.

1.5 Use the Genomadix Cube point-of-care test when laboratory-based testing and the Genedrive CYP2C19 ID Kit point-of-care test are not available.

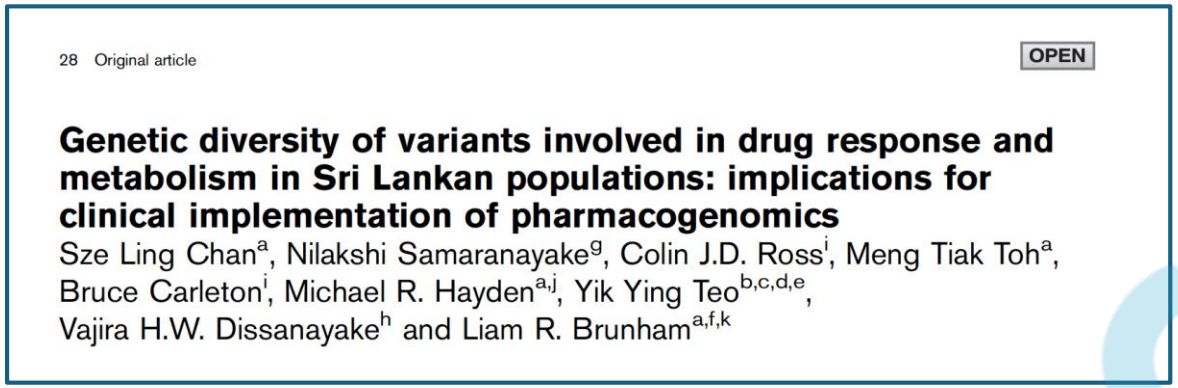
1.6 CYP2C19 point-of-care genotype testing is recommended only if quality-assurance processes and arrangements are in place.

This guidance does not replace existing guidance on antiplatelet therapy when genotype testing is not available, or when results from testing have not been received. Starting antiplatelet treatment should not be delayed while waiting for test results.

N=838 unrelated individuals representing 4 major ethnic groups

Perera, N., Galhena, G., & Ranawaka, G. (2021). X-chromosomal STR based genetic polymorphisms and demographic history of Sri Lankan ethnicities and their relationship with global populations. *Scientific reports*, *11*(1), 1-12.

Sri Lankan data



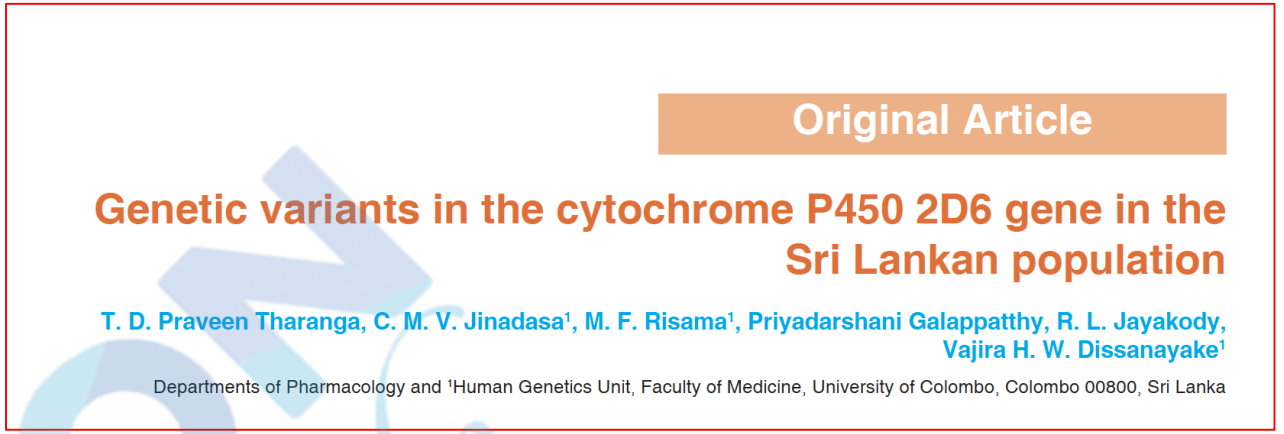
28 Original article OPEN

Genetic diversity of variants involved in drug response and metabolism in Sri Lankan populations: implications for clinical implementation of pharmacogenomics

Sze Ling Chan[a], Nilakshi Samaranayake[g], Colin J.D. Ross[i], Meng Tiak Toh[a], Bruce Carleton[i], Michael R. Hayden[a,j], Yik Ying Teo[b,c,d,e], Vajira H.W. Dissanayake[h] and Liam R. Brunham[a,f,k]

Pharmacogenetics and Genomics, 2015. 26:28–39

"substantial differentiation between Sri Lankan and European populations for important pharmacogenomic variants related to warfarin (VKORC1 rs9923231) and clopidogrel (CYP2C19 rs4986893) response."



Original Article

Genetic variants in the cytochrome P450 2D6 gene in the Sri Lankan population

T. D. Praveen Tharanga, C. M. V. Jinadasa[1], M. F. Risama[1], Priyadarshani Galappatthy, R. L. Jayakody, Vajira H. W. Dissanayake[1]

Departments of Pharmacology and [1]Human Genetics Unit, Faculty of Medicine, University of Colombo, Colombo 00800, Sri Lanka

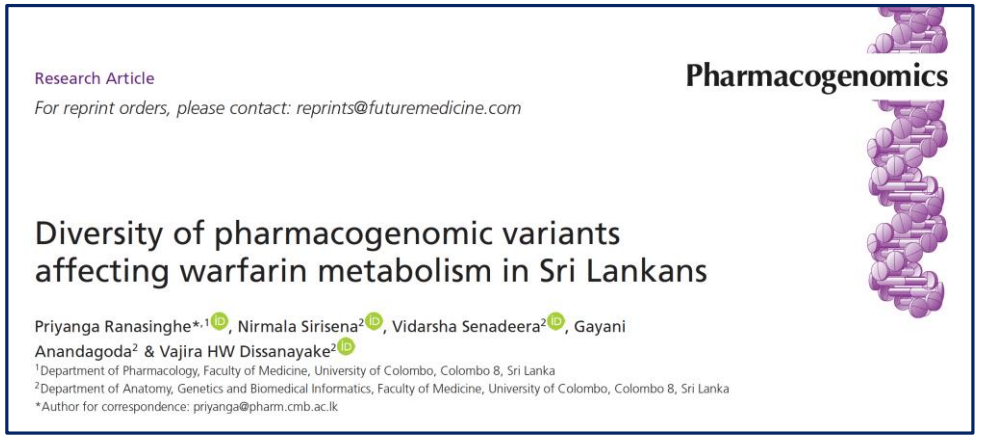
Indian Journal of Human Genetics October-December 2013

CYP2D6 *3, *4 and *10 variants
- associated with reduced or loss of CYP2D6 enzyme function
- found in our population in significant frequencies
- CYP2D6*4, reported to be a Caucasian variant was also found in all three ethnic groups.

- *A high percentage of Sri Lankans carry enzyme inactivation alleles of the CYP2D6 gene*

"This warrants prescription of smaller doses of drugs metabolized through CYP2D6 enzymes when such drugs are prescribed."

Sri Lankan data


Research Article

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Pharmacogenomics

Diversity of pharmacogenomic variants affecting warfarin metabolism in Sri Lankans

Priyanga Ranasinghe*,[1], Nirmala Sirisena[2], Vidarsha Senadeera[2], Gayani Anandagoda[2] & Vajira HW Dissanayake[2]

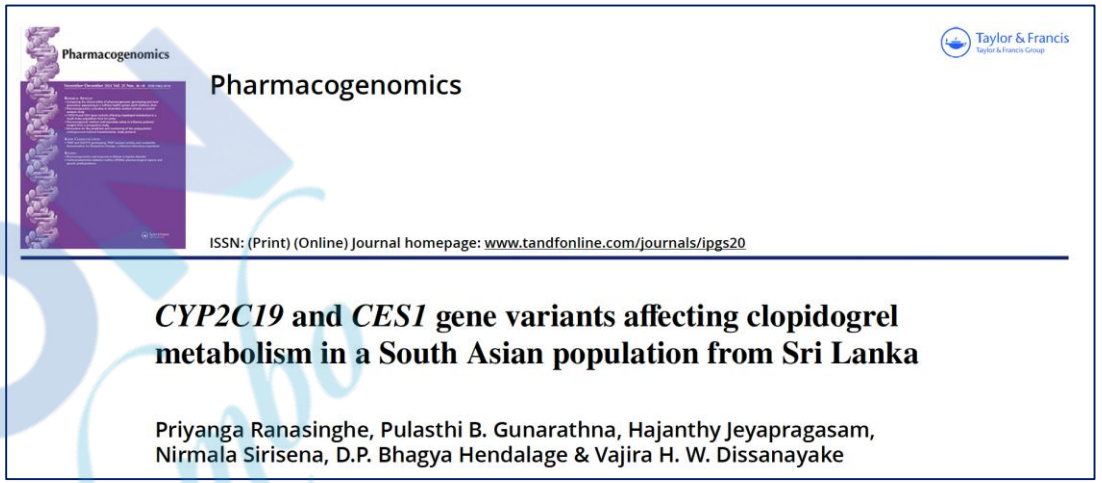
[1]Department of Pharmacology, Faculty of Medicine, University of Colombo, Colombo 8, Sri Lanka

[2]Department of Anatomy, Genetics and Biomedical Informatics, Faculty of Medicine, University of Colombo, Colombo 8, Sri Lanka

*Author for correspondence: priyanga@pharm.cmb.ac.lk

Pharmacogenomics (2022) 23(17), 917–923

- The distribution of CYP2C9,VKORC1 and CYP4F2 genes in the Sri Lankan population is different from that observed in other populations.
  - *The CYP2C9*2 variant - significantly less frequent but CYP2C9*3 variant - significantly more frequent*
  - *SNVs in the VKORC1 and CYP4F2 more frequent*
- *N= 400*


Pharmacogenomics

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Pharmacogenomics

ISSN: (Print) (Online) Journal homepage: www.tandfonline.com/journals/ipgs20

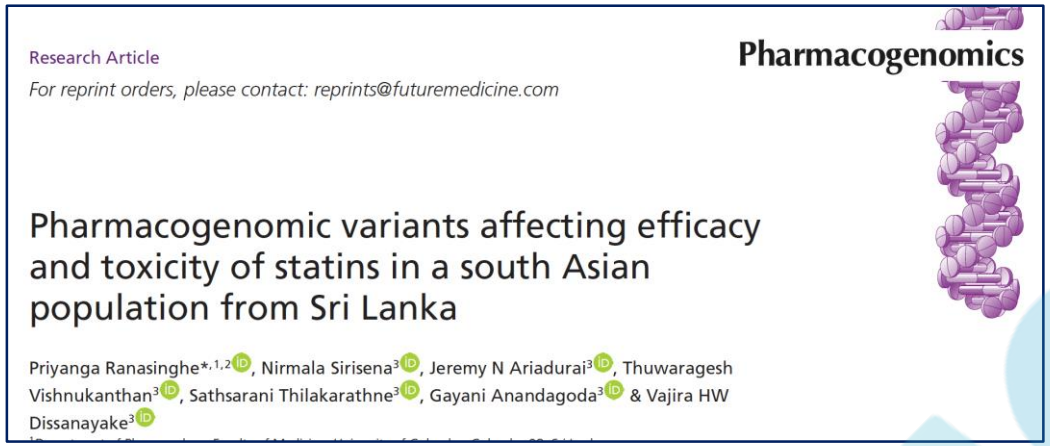
***CYP2C19* and *CES1* gene variants affecting clopidogrel metabolism in a South Asian population from Sri Lanka**

Priyanga Ranasinghe, Pulasthi B. Gunarathna, Hajanthy Jeyapragasam, Nirmala Sirisena, D.P. Bhagya Hendalage & Vajira H. W. Dissanayake

Pharmacogenomics 2024, 25(16–18), 657–660

- MAFs of variants *CYP2C19* rs12769205 (A>G) and *CYP2C19* rs4244285 (G>A) were almost 42%
  - significantly higher compared to Europeans.
- It can be *postulated* that a significant proportion of the Sri Lankan population is likely poor responders to clopidogrel therapy
- N= 690

Sri Lankan data



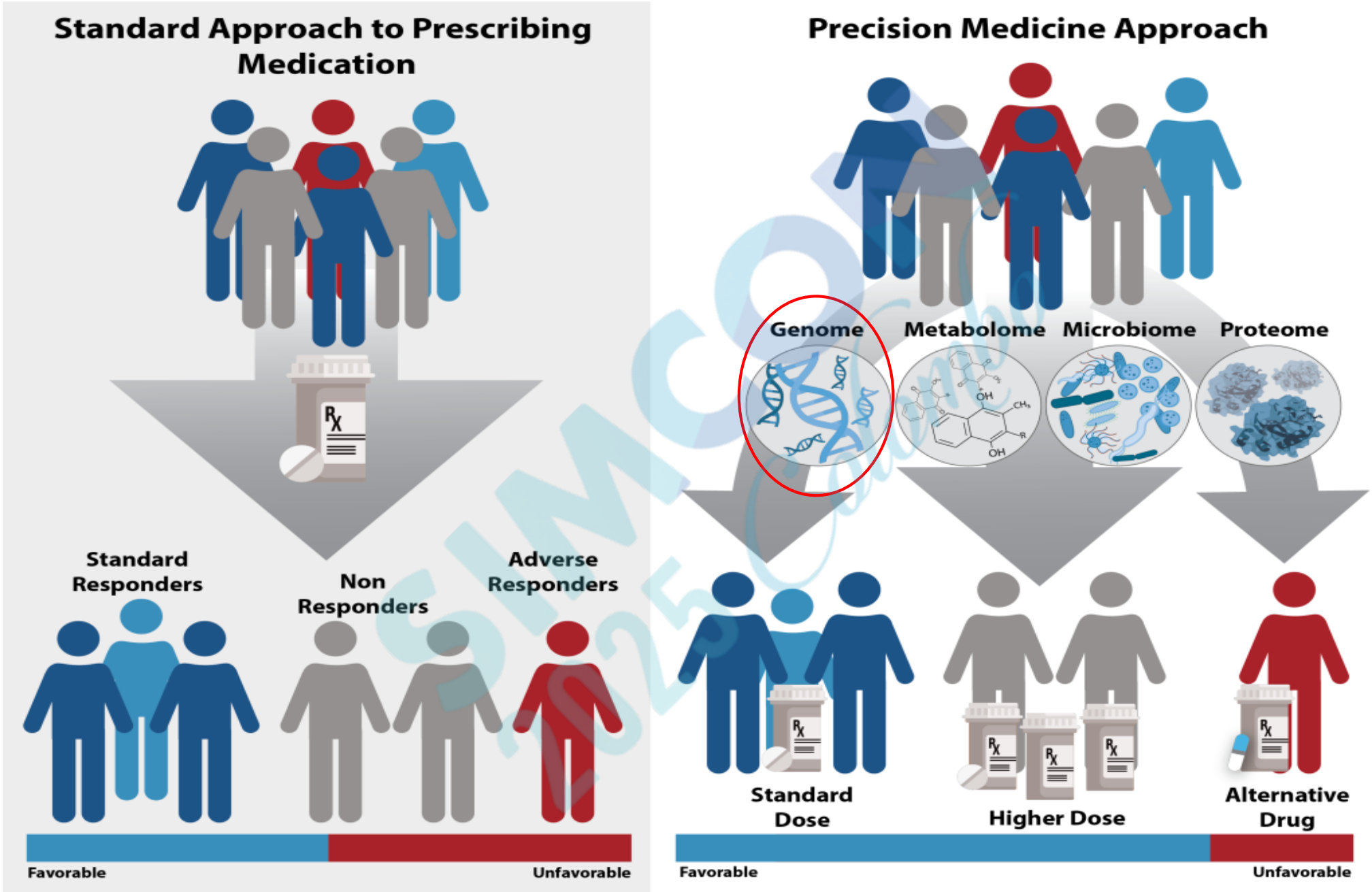
Pharmacogenomics (2023) 24(15), 809–819

SLCO1B1*5, CYP2C9*2, CYP2C9*3 - responsible for SIM

- Present in our population
- Distribution differs to that seen in European (and other) populations
- CYP2C9*2 > in SL population
  - > likely to have a favourable response to lower doses
  - < risk of SIM
- N= 346

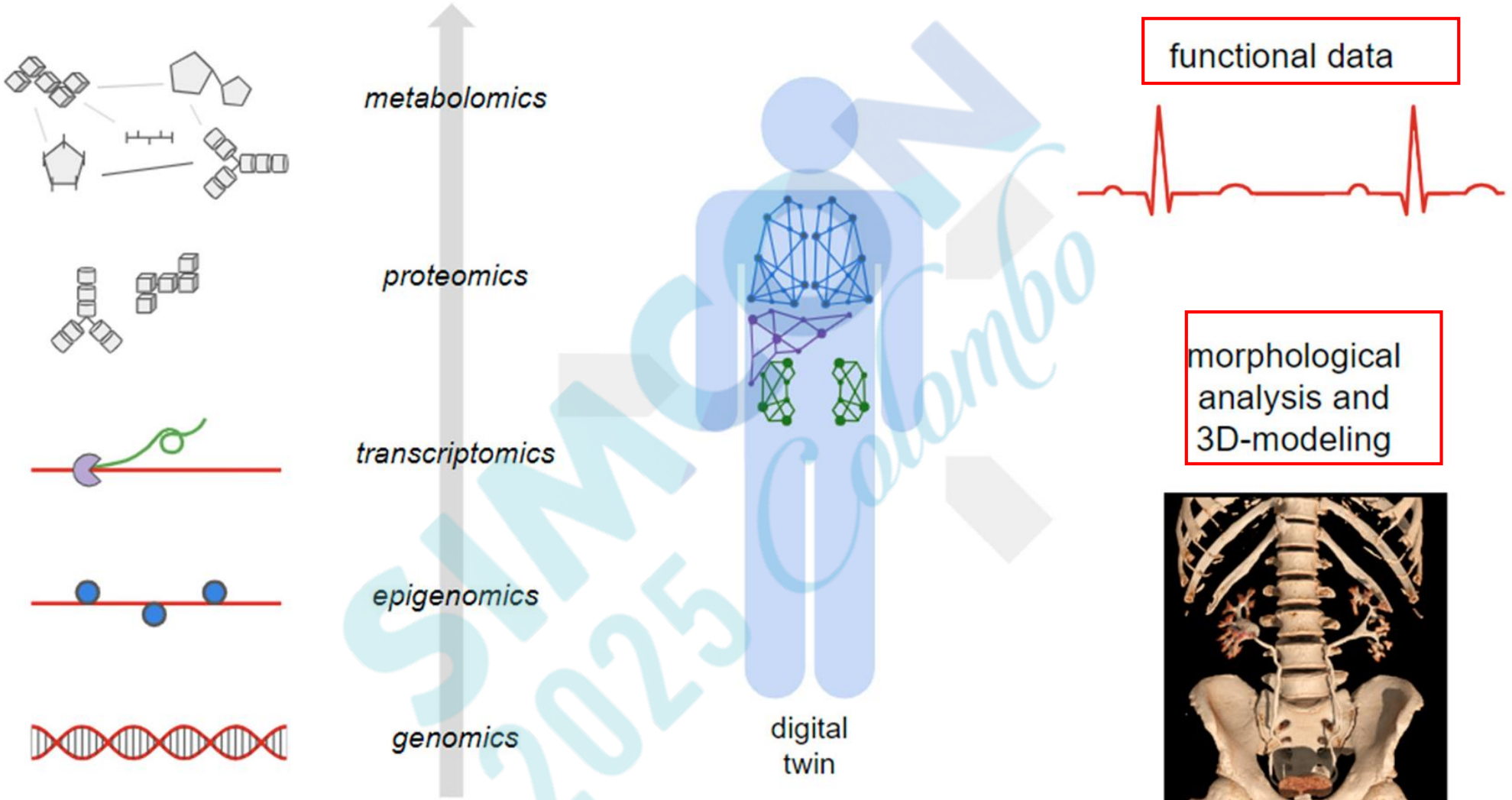
Sri Lankan data

- Alleles that affect pharmacodynamics of commonly prescribed medicines for CVD are present in our population
- They differ from those seen in Caucasian populations
  - Clinical guidelines are typically based on clinical data derived from European and other Western populations
    - *These guidelines are also adopted by countries like Sri Lanka when deriving recommendations for the local population*
- Limitations – small sample (from data stored in the data banks)
  - not representative of the population


Standard Approach to Prescribing Medication
Standard Responders
Non Responders
Adverse Responders
Favorable
Unfavorable
Precision Medicine Approach
Genome
Metabolome
Microbiome
Proteome
Standard Dose
Higher Dose
Alternative Drug
Favorable
Unfavorable

Digital human twins (DHTs): “me who is not me”

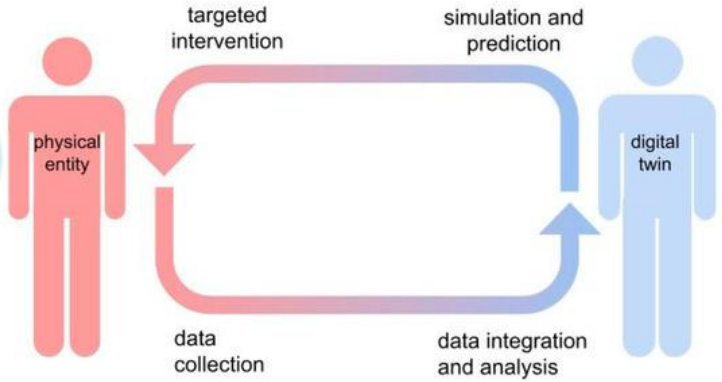
Multi-omics



Cellina, M. et al. Digital Twins: The New Frontier for Personalized Medicine? Appl. Sci. 2023, 13, 7940.

DHTs in Medicine

- DHT - A virtual doppelganger
  - will have all the physical and biological characteristics of the person– tissues, organs, systems etc
  - allows for in silico simulations of several real-world scenarios
- Can be updated real-time with new data
  - can monitor the patient's condition and adjust their treatment plan accordingly
- Unlike humans/human brain – can assimilate and process limitless amounts of data



Cellina, M. et al. Digital Twins: The New Frontier for Personalized Medicine? Appl. Sci. 2023, 13, 7940.

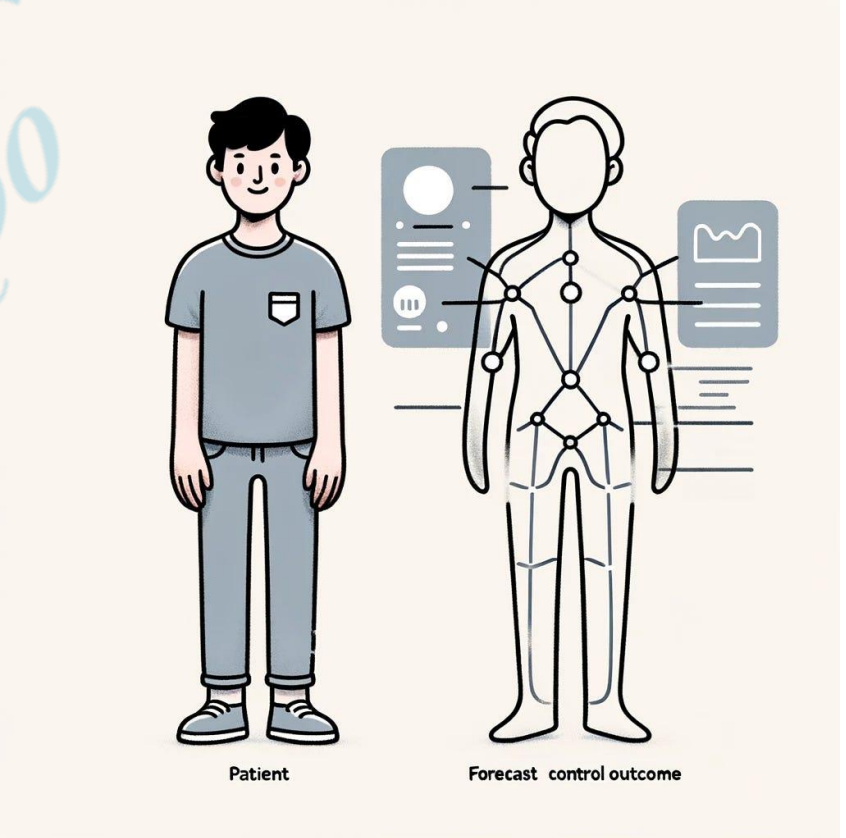
Medical Training and Education

- To learn and practice procedures without risk to actual patients

- Not an effective model to learn the human touch

In clinical trials and research

- As‘research participants’
  - Can simulate the effects of new treatments or drugs on the digital twin
- Safer
  - Phase 1 – avoid use of healthy volunteers/ patients with cancers
- Could bridge the gap in treatment response between clinical trials and real-world clinical practice



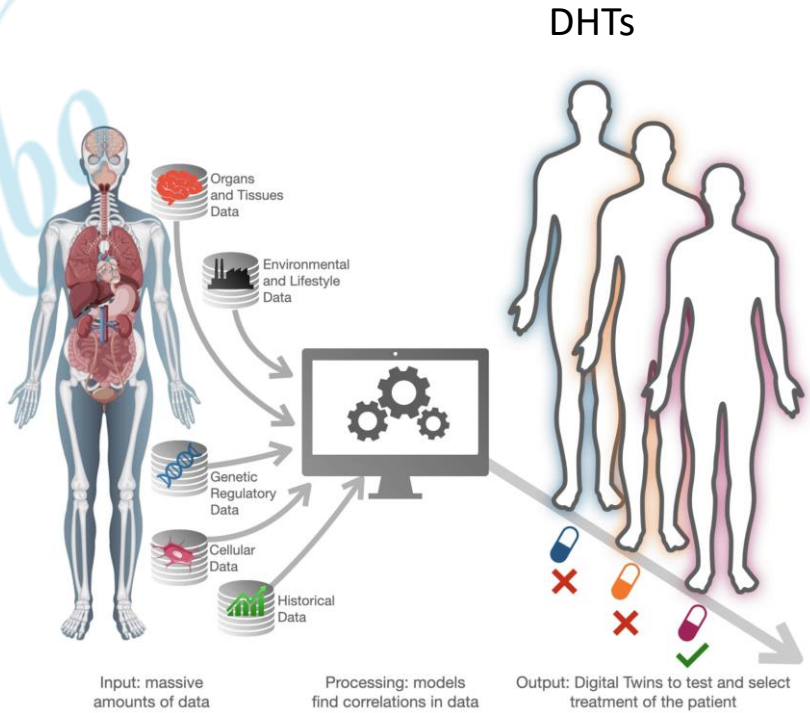
Personalised medicine

- Predict how a particular drug/ management plan will affect the individual patient
  - Could try multiple therapies before the actual

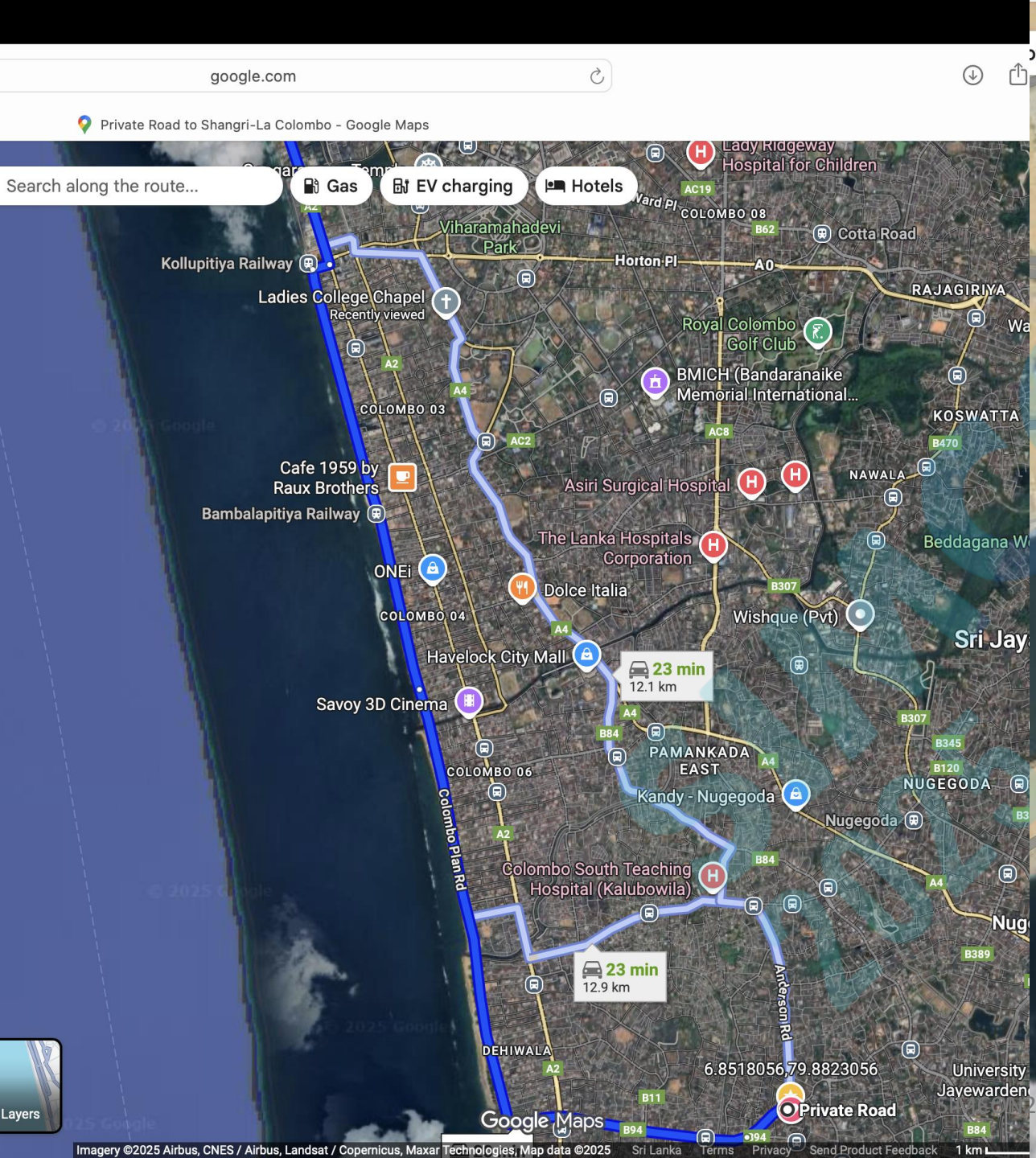
- Predictive analysis
  - Forecast health risks
  - Detect early signs of disease
  - Simulate different scenarios to predict the outcome

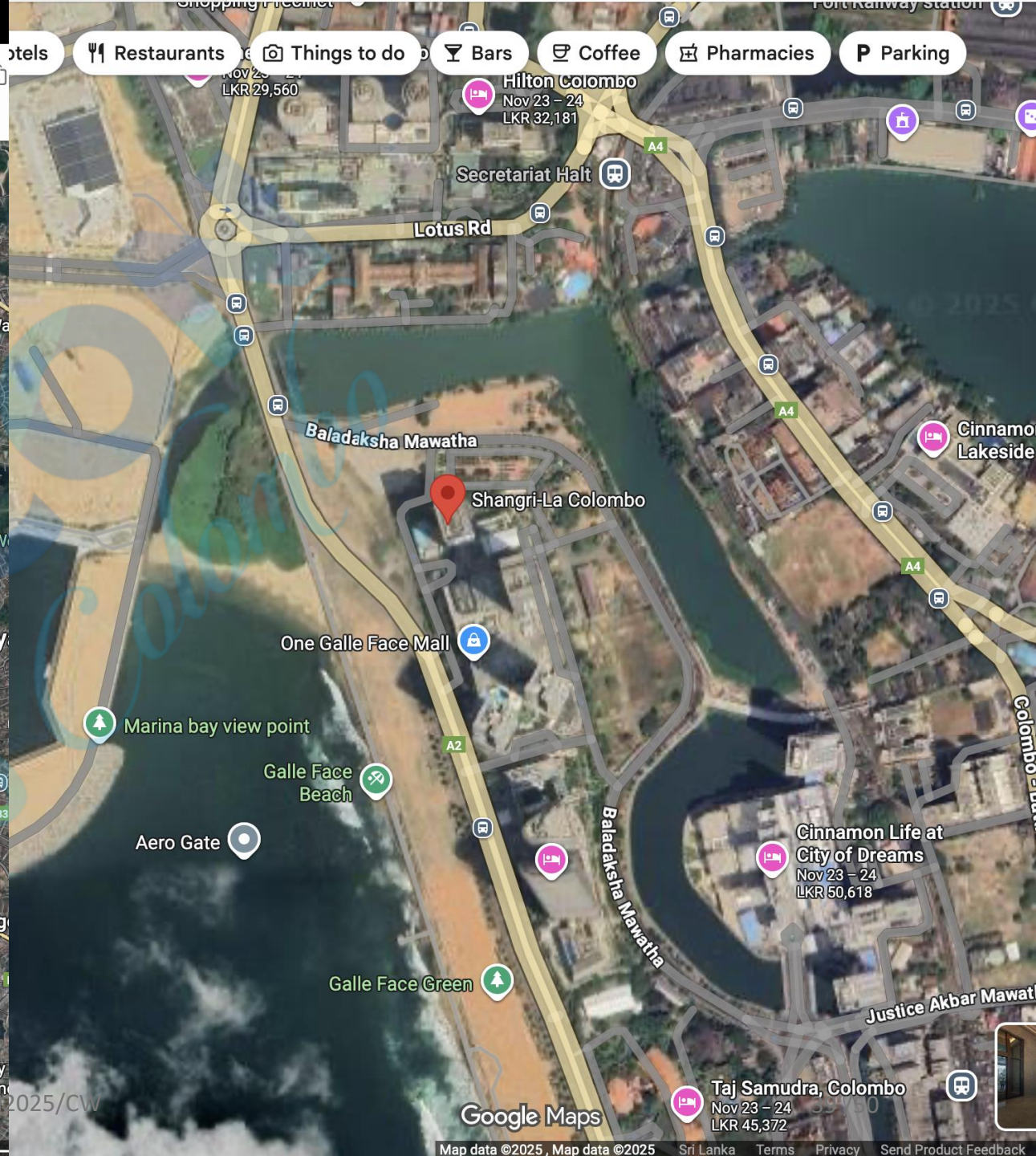
Timely interventions

- Can be effective when discussing management options with patients



De Domenico, M., Allegri, L., Caldarelli, G. *et al.* Challenges and opportunities for digital twins in precision medicine from a complex systems perspective. *npj Digit. Med.* **8**, 37 (2025)


google.com
Private Road to Shangri-La Colombo - Google Maps
Search along the route...
Gas
EV charging
Hotels
Lady Ridgeway Hospital for Children
Viharamahadevi Park
Kollupitiya Railway
Ladies College Chapel
Recently viewed
Horton Pl
COLOMBO 08
Cotta Road
RAJAGIRIYA
Royal Colombo Golf Club
BMICH (Bandaranaike Memorial International...
COLOMBO 03
KOSWATTA
Cafe 1959 by Raux Brothers
Bambalapitiya Railway
Asiri Surgical Hospital
NAWALA
The Lanka Hospitals Corporation
Beddagana W
ONEi
Dolce Italia
COLOMBO 04
Wishque (Pvt)
Sri Jay
Havelock City Mall
23 min
12.1 km
Savoy 3D Cinema
PAMANKADA EAST
NUGEGODA
COLOMBO 06
Kandy - Nugegoda
Nugegoda
Colombo Plan Rd
Colombo South Teaching Hospital (Kalubowila)
23 min
12.9 km
Anderson Rd
DEHIWALA
6.8518056,79.8823056
University Jayewarden
Private Road
Layers
Google Maps
Imagery ©2025 Airbus, CNES / Airbus, Landsat / Copernicus, Maxar Technologies, Map data ©2025
Sri Lanka
Terms
Privacy
Send Product Feedback
1 km


Restaurants
Things to do
Bars
Coffee
Pharmacies
Parking
LKR 29,560
Hilton Colombo
Nov 23 – 24
LKR 32,181
Secretariat Halt
Lotus Rd
Baladaksha Mawatha
Shangri-La Colombo
Cinnamo
Lakeside
One Galle Face Mall
Marina bay view point
Galle Face Beach
Aero Gate
Cinnamon Life at City of Dreams
Nov 23 – 24
LKR 50,618
Galle Face Green
Justice Akbar Mawat
Taj Samudra, Colombo
Nov 23 – 24
LKR 45,372
Google Maps
Map data ©2025 , Map data ©2025
Sri Lanka
Terms
Privacy
Send Product Feedback

Challenges and limitations

Digital Human Twins

Massive amounts of data from different people needed

- Issues with data privacy, confidentiality, security
- Issues with informed consent

Wide variation in available data

- Must be high quality, accurate, and complete
- Need for standardisation and proper integration

Digital Human Twins

A model based of past and present data

- Data may not be accurate
- Medical records – incomplete in many instances

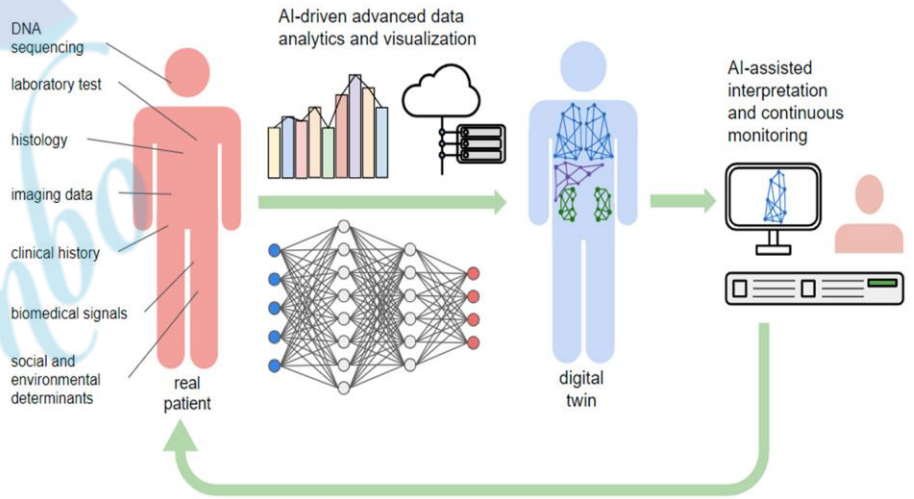
Expensive

- Fairness – access to technology
- Need for highly skilled and specialised personnel
  - More likely to gravitate to resource-rich countries

Digital Human Twins

Liability

- Inaccurate prediction or wrong diagnoses
  - Who is responsible and accountable for the decisions?



Cellina, M. et al. Digital Twins: The New Frontier for Personalized Medicine? Appl. Sci. 2023, 13, 7940.

Pharmacogenomics

Pharmacogenomic testing - restricted to few centres

Expensive

- Need Electronic Health Records systems, biotechnology resources
- Evidence of clinical utility - not easy to obtain
- Cost-effectiveness - not known for many
- High-cost medicines (cancer drugs) + cost of testing

Equality – not readily available for everyone

Pharmacogenomics

‘Genetic exceptionalism’

- Less acceptance by clinicians and regulators of the need for dose modification based on genetic variants
- Variations in recommendations

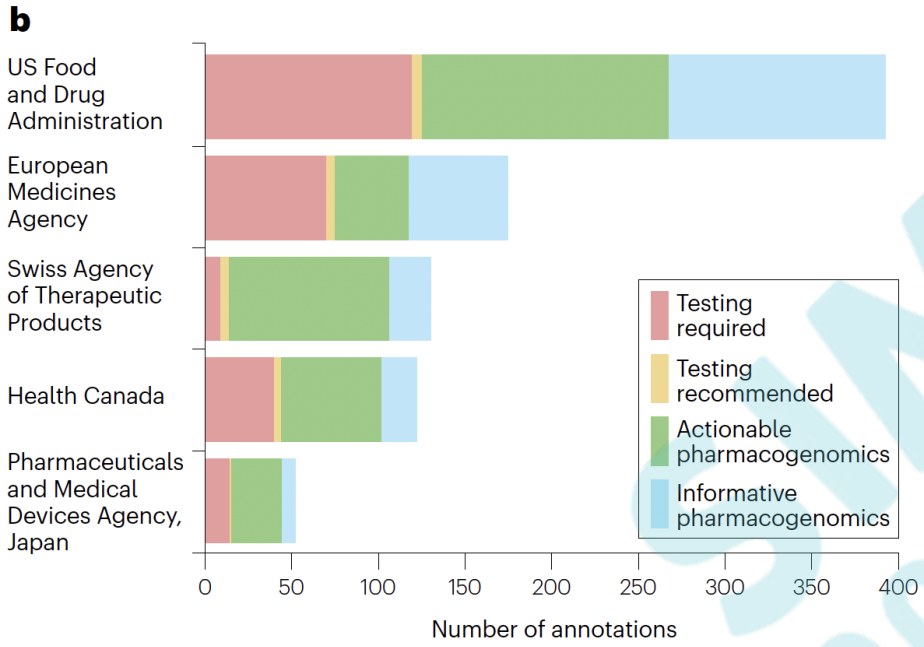
Ethical issue – what should be done if a variant is detected

- Should the choice of medicines be based on the presence of a variant
- Possibility of discrimination of individuals – e.g. insurance

What genetic variants should we in Sri Lanka test for

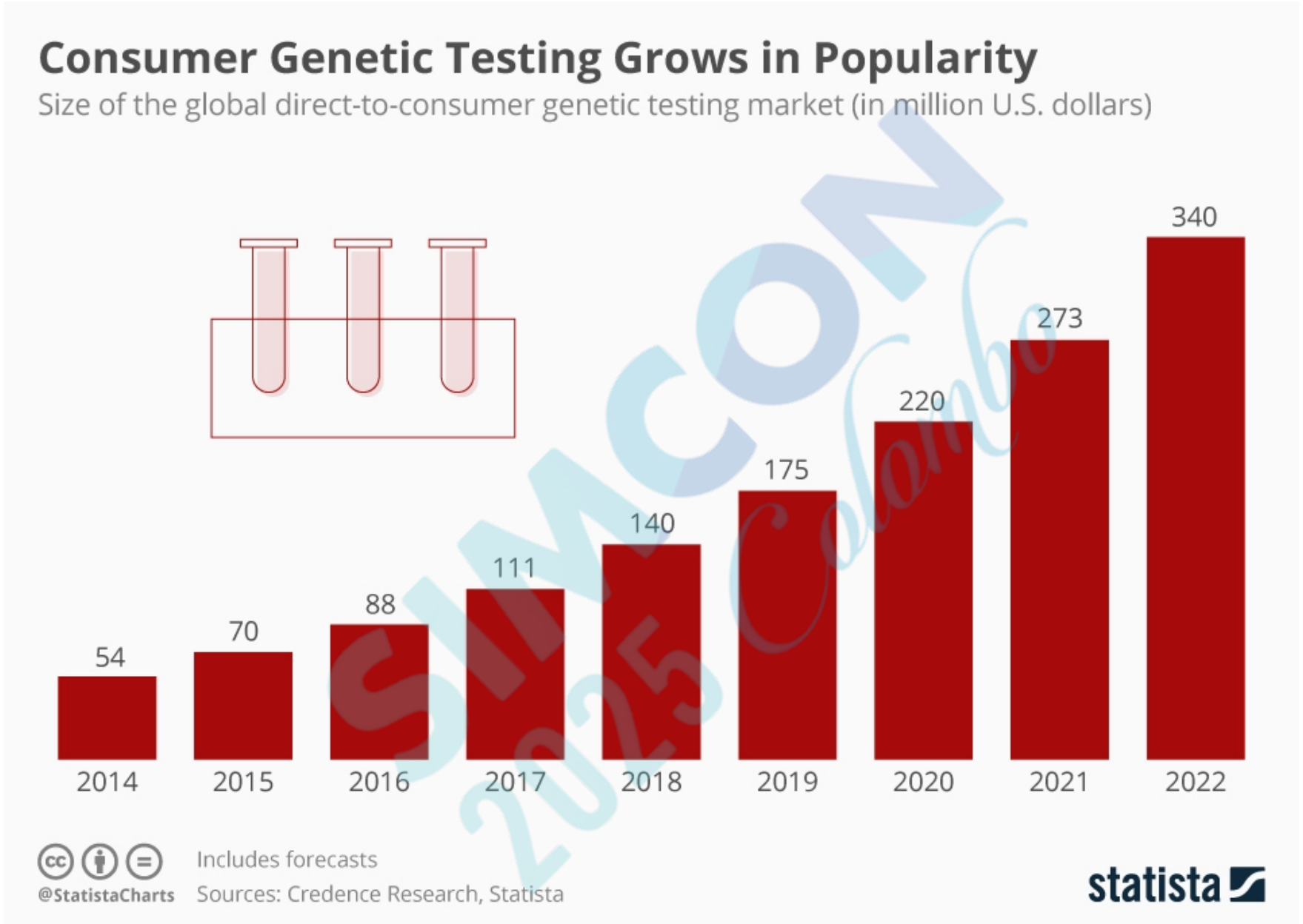
PGx – drug labelling and recommendations

Pharmacogenomic information contained in drug labels from different regulatory agencies



- Vary between different agencies
- 'Testing recommended/ required' – must be done
- 'Actionable pharmacogenomics'
  - Label provides information on drug genetic interaction
  - Does not require/recommend testing
- "Informative pharmacogenomics'
  - a drug–gene interaction has been ruled out, OR
  - is not clinically significant, OR
  - for which the label appears on the FDA biomarker list but does not fit into the above categories

Pirmohamed, M. Pharmacogenomics: current status and future perspectives. *Nat Rev Genet* **24**, 350–362 (2023).


Consumer Genetic Testing Grows in Popularity
Size of the global direct-to-consumer genetic testing market (in million U.S. dollars)
54
70
88
111
140
175
220
273
340
2014
2015
2016
2017
2018
2019
2020
2021
2022
Includes forecasts
@StatistaCharts
Sources: Credence Research, Statista
statista

In conclusion

Precision medicine is Rapidly evolving, Personalised and Promising

- DHTs are more for the future
- **PGx is already here and here to stay**
  - customises prevention, diagnosis, and treatment based on individual characteristics
- Enormous potential to improve patient care

Physicians need to be trained to harness its full potential
BUT should be aware of its limitations

FDA APPROVED

FIRST TRIPLE FIXED-DOSE COMBINATION FOR HYPERTENSION

WIDAPLIK®

WHAT MAKES WIDAPLIK® GROUNDBREAKING?

- **Telmisartan** (ARB)
- **Amlodipine** (CCB)
- **Indapamide** (thiazide-like diuretic)

MECHANISM OF ACTION

- Telmisartan blocks angiotensin II receptors to reduce vasoconstriction and fluid retention
- **Amlodipine** relaxes arterial smooth muscle to improve circulation
- **Indapamide** helps excrete sodium and water to reduce blood volume
- Together, they act **synergistically** for better BP control

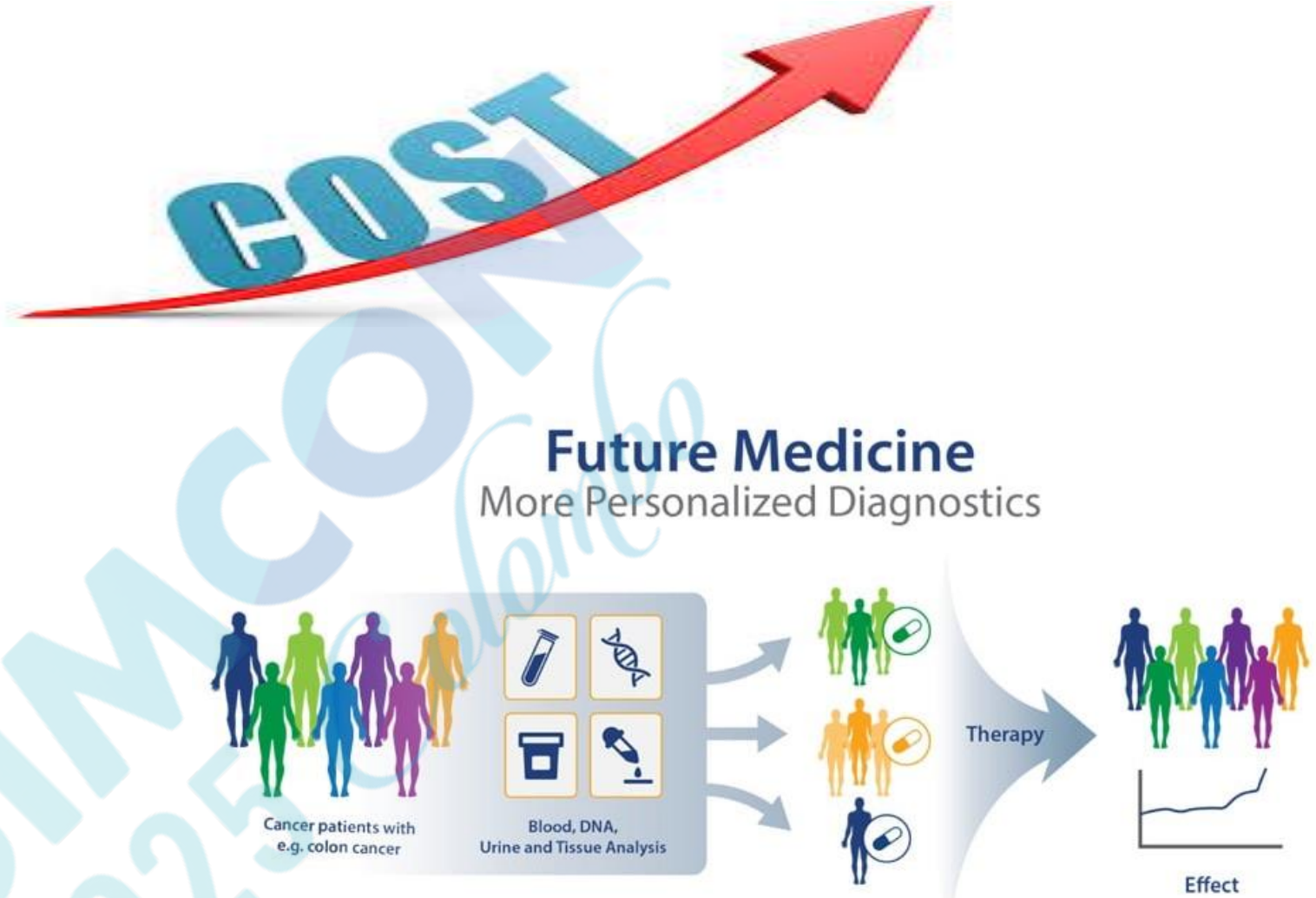
DOSING OPTIONS

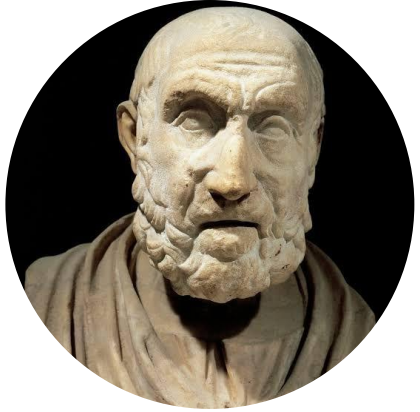
- 10/1.25/0.625 mg
- 20/2.5/1.25 mg
- 40/5/2.5 mg

SAFETY

- Generally well tolerated
- Most common AE symptomatic hypotension

APPROVED BY FDA IN JUNE 2025





Hippocrates
(460-377 BCE)

"It is far more important to know what person the disease has than what disease the person has"

The Doctor – Luke Fildes, 1891
Image credits: Wikipedia